



Certificate of Calibration 校正證書

Certificate No. : C213338
證書編號

ITEM TESTED / 送檢項目 (Job No. / 序引編號 : IC21-1010)

Date of Receipt / 收件日期 : 25 May 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 : 2684503
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 : $(23 \pm 2)^{\circ}\text{C}$
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 : 8 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
簽發日期

9 June 2021

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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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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. The results presented are the mean of 3 measurements at each calibration point.
3. Test equipment :

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

4. Test procedure : MA101N.

5. Results :

- 5.1 Sound Pressure Level :

- 5.1.1 Reference Sound Pressure Level

UUT Setting				Applied Value		UUT Reading	IEC 61672 Class 1 Spec.
Range (dB)	Parameter	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)	(dB)	(dB)
50 - 130	L _{AFP}	A	F	94.00	1	94.0	± 1.1

- 5.1.2 Linearity

UUT Setting				Applied Value		UUT Reading
Range (dB)	Parameter	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)	(dB)
50 - 130	L _{AFP}	A	F	94.00	1	94.0 (Ref.)
				104.00		104.0
				114.00		114.0

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

- 5.2 Time Weighting

UUT Setting				Applied Value		UUT Reading	IEC 61672 Class 1 Spec.
Range (dB)	Parameter	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)	(dB)	(dB)
50 - 130	L _{AFP}	A	F	94.00	1	94.0	Ref.
	L _{ASP}		S			94.0	± 0.3

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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

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

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5.3 Frequency Weighting

5.3.1 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	67.8	-26.2 ± 1.5
					125 Hz	77.8	-16.1 ± 1.5
					250 Hz	85.3	-8.6 ± 1.4
					500 Hz	90.7	-3.2 ± 1.4
					1 kHz	94.0	Ref.
					2 kHz	95.2	+1.2 ± 1.6
					4 kHz	95.0	+1.0 ± 1.6
					8 kHz	92.9	-1.1 (+2.1 ; -3.1)
					12.5 kHz	89.7	-4.3 (+3.0 ; -6.0)

5.3.2 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	93.2	-0.8 ± 1.5
					125 Hz	93.8	-0.2 ± 1.5
					250 Hz	94.0	0.0 ± 1.4
					500 Hz	94.0	0.0 ± 1.4
					1 kHz	94.0	Ref.
					2 kHz	93.8	-0.2 ± 1.6
					4 kHz	93.1	-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 : 2682524

- 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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ITEM TESTED / 送檢項目 (Job No. / 序引編號 : IC21-1010)

Date of Receipt / 收件日期 : 25 May 2021

Description / 儀器名稱 : Sound Calibrator
Manufacturer / 製造商 : Brüel & Kjær
Model No. / 型號 : 4231
Serial No. / 編號 : 3004068
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 : $(23 \pm 2)^{\circ}\text{C}$
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 : 8 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).

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- Fluke Everett Service Center, USA

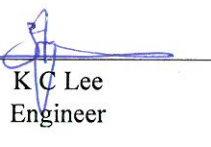
Tested By
測試

:


K P Cheuk
Project Engineer

Certified By
核證

:


K C Lee
Engineer

Date of Issue
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- 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 :

Equipment ID	Description	Certificate No.
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 :

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ENVIROTECH SERVICES CO.

High-Volume TSP Sampler
5-Point Calibration Record

Location : AMS5(Ma Wan Chung Village)
Calibrated by : P.F.Yeung
Date : 16/09/2021

Sampler

Model : TE-5170
Serial Number : S/N3640

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
Service Date : 28 January 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) : 1009
Ta(K) : 303

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC	Y
1	18 holes	10.5	3.207	1.563	50	49.49
2	13 holes	7.3	2.674	1.305	44	43.55
3	10 holes	5.3	2.279	1.113	39	38.60
4	7 holes	3.8	1.929	0.943	34	33.65
5	5 holes	2.2	1.468	0.720	28	27.71

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): 26.008 Intercept(b): 9.243 Correlation Coefficient(r): 0.9999

Checked by: Magnum Fan

Date: 20/09/2021

ENVIROTECH SERVICES CO.

High-Volume TSP Sampler
5-Point Calibration Record

Location : AMS5(Ma Wan Chung Village)
Calibrated by : P.F.Yeung
Date : 11/11/2021

Sampler

Model : TE-5170
Serial Number : S/N3640

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
Service Date : 28 January 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) : 1018
Ta(K) : 296

Resistance Plate		dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC	Y
1	18 holes	11.2	3.366	1.641	55	55.3
2	13 holes	8.6	2.950	1.439	50	50.3
3	10 holes	6.4	2.545	1.242	45	45.3
4	7 holes	4.1	2.037	0.995	38	38.2
5	5 holes	2.5	1.590	0.779	30	30.2

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): 28.841 Intercept(b): 8.696 Correlation Coefficient(r): 0.9966

Checked by: Magnum Fan

Date: 19/11/2021



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

ENVIROTECH SERVICES CO.

High-Volume TSP Sampler
5-Point Calibration Record

Location : AMS2(Tung Chung Development Pier)
Calibrated by : P.F.Yeung
Date : 29/05/2021

Sampler

Model : TE-5170
Serial Number : S/N3641

Calibration Orifice and Standard Calibration Relationship

Serial Number : 2454
Service Date : 18 January 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 (indicated flow)	Y
1	18 holes	8.4	2.861	1.395	53	52.32
2	13 holes	6.8	2.574	1.256	49	48.37
3	10 holes	5.2	2.251	1.099	43	42.45
4	7 holes	3.3	1.793	0.877	37	36.52
5	5 holes	2.0	1.396	0.685	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): 31.7571 Intercept(b): 8.110 Correlation Coefficient(r): 0.9987

Checked by: Magnum Fan

Date: 31/05/2021

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

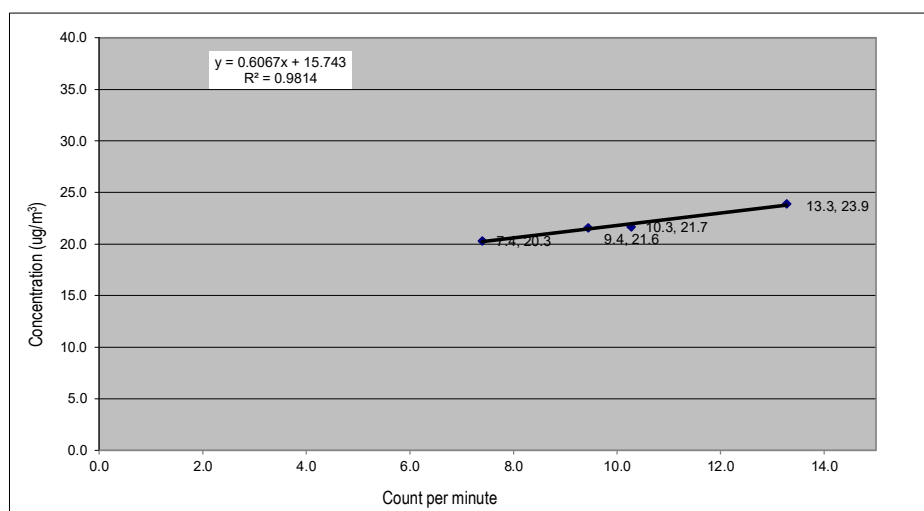
Date (dd-mmm-yy)	Time		Ambient Condition		Concentration (ug/m ³) Y-axis	Total Count	Count/Minute X-axis
			Temp (°C)	R.H. (%)			
08-Jun-21	14:50	16:50	31.4	63%	21.6	1133	9.4
08-Jun-21	16:56	17:56	30.8	65%	20.3	444	7.4
18-Jun-21	12:38	14:38	33.0	63%	21.7	1233	10.3
02-Jul-21	15:48	17:48	32.9	62%	23.9	1593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

Date: 12-Jul-21

Checked by: Ruby Law

Signature:

Date: 12-Jul-21