



# 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

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所書面批准。

# Certificate of Calibration

## 校正證書

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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 :

<u>Equipment ID</u>	<u>Description</u>	<u>Certificate No.</u>
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 (dB)	IEC 61672 Class 1 Spec. (dB)
Range (dB)	Parameter	Frequency Weighting	Time Weighting	Level (dB)	Freq. (kHz)		
50 - 130	L <sub>AFP</sub>	A	F	94.00	1	94.0	± 1.1

- 5.1.2 Linearity

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

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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 <sub>AFP</sub>	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 <sub>CFP</sub>	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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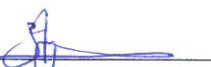
Tested By  
測試

:

  
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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- 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 : 05/01/2022

**Sampler**

Model : TE-5170  
Serial Number : S/N3640

**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) : 1017  
Ta(K) : 295

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC	Y
1   18 holes	11.4	3.400	1.660	54	54.4
2   13 holes	9.0	3.021	1.477	49	49.3
3   10 holes	6.6	2.587	1.268	43	43.3
4   7 holes	4.2	2.064	1.015	36	36.3
5   5 holes	2.4	1.560	0.772	28	28.2

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): 29.264                      Intercept(b): 6.056                      Correlation Coefficient(r): 0.9994

Checked by: Magnum Fan

Date: 08/01/2022

ENVIROTECH SERVICES CO.

**High-Volume TSP Sampler**  
**5-Point Calibration Record**

Location : AMS5(Ma Wan Chung Village)  
Calibrated by : P.F.Yeung  
Date : 04/03/2022

**Sampler**

Model : TE-5170  
Serial Number : S/N3640

**Calibration Orifice and Standard Calibration Relationship**

Serial Number : 2454  
Service Date : 27 December 2021  
Slope (m) : 2.07035  
Intercept (b) : -0.003737  
Correlation Coefficient(r) : 0.99990

**Standard Condition**

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

**Calibration Condition**

Pa (hpa) : 1015  
Ta(K) : 294

Resistance Plate	dH [green liquid] (inch water)	Z	X=Qstd (cubic meter/min)	IC	Y
1   18 holes	11.2	3.373	1.647	54	54.4
2   13 holes	8.8	2.990	1.462	49	49.4
3   10 holes	6.2	2.509	1.230	44	44.3
4   7 holes	4.2	2.065	1.016	37	37.3
5   5 holes	2.4	1.561	0.772	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): 27.555                      Intercept(b): 9.367                      Correlation Coefficient(r): 0.9980

Checked by: Magnum Fan

Date: 07/03/2022





# 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: <b>2454</b>		

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
<b>QSTD</b>	<b>m=</b>	<b>2.07035</b>	<b>QA</b>	<b>m=</b>	<b>1.29642</b>
	<b>b=</b>	<b>-0.03737</b>		<b>b=</b>	<b>-0.02378</b>
	<b>r=</b>	<b>0.99990</b>		<b>r=</b>	<b>0.99990</b>

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= $Va / \Delta Time$
<b>For subsequent flow rate calculations:</b>	
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: 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 <sup>3</sup> ) 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

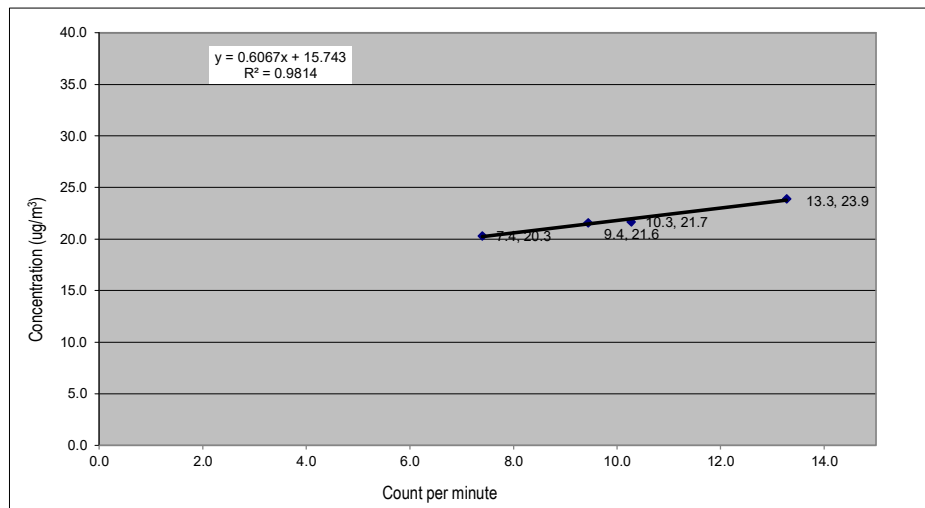
Be Linear Regression of Y or X

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