

**APPENDIX C  
COPIES OF CALIBRATION  
CERTIFICATES**



## Calibration Certificate

Certificate No. : CSA33530

Page : 1 of 2

### Information Provided by Customer

Customer : ETS - Testconsult Limited  
Address : 8/F., Block B, Veristrong Industrial Centre, 34 - 36 Au Pui Wan Street, Fotan, Shatin, Hong Kong

### Information of Unit-under-test (UUT)

Description : Sound Level Calibrator  
Manufacturer : Castle  
Type : GA607  
Equipment I.D. : ET/EN/002/07  
Serial No. : 038641

### Laboratory Information

Lab. Ref. No. : Q/CAL/23/4006/I  
Date of Calibration : 19-May-2023  
Date of Issue : 19-May-2023  
Procedure : CQS/002/A  
Date of Receipt : 17-May-2023  
Calibration Location : Calibration Laboratory

### Calibration Condition

Ambient Temperature : (20 ± 3) °C  
Stabilizing Time : 30 minutes  
Ambient Pressure : (1000 ± 50) hPa  
Relative Humidity : (50±20) %  
Sampling : As received

### Reference equipment

- Multi-function sound calibrator, ET/2801/01
- Measuring Amplifier, ET/2702/01/01
- Signal generator, ET/2503/01
- Reference Oscilloscope, ET/2502/01

### Calibration specification

- To perform the calibration of sound level calibrator.

### Calibration result

- The results are detailed on the subsequent pages.

### Remarks

- The calibration results apply to the particular unit-under-test only.
- The values given in this calibration certificate only to the values measured at the time of test & any uncertainties quoted will not include allowance for the equipment long term drift, varifications with environmental changes, vibration and shock during transportation, overloading, mis-handling, or the capability of any other laboratory to repeat the measurement

Calibrated By : Tony MA  
(Technician)

Approved By: CHAN Chi Wai



## Calibration Certificate

Certificate No. : CSA33530

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### Calibration Result:

1. Measured Sound Pressure Level:

Nominal Frequency (Hz)	Nominal Output Sound Pressure (dB)	Measured Output (dB)	Expanded Uncertainty (dB)	Coverage Factor
1000	94.0	94.1	0.13	2.0
1000	104.0	104.0	0.13	2.0

2. Actual Output Frequency:

Nominal Frequency (Hz)	Nominal Output Sound Pressure (dB)	Measured Output (Hz)	Expanded Uncertainty (Hz)	Coverage Factor
1000	94.0	1000.020	0.057	2.0
1000	104.0	1000.017	0.057	2.0

Remark:

- The uncertainty quoted is based on 95 % confidence level.
- Measured output are mean of three measurements.

\*\*\*End of certificate\*\*\*



## Calibration Certificate

Certificate No. : CSA34546  
Page : 1 of 3

### Information Provided by Customer

Customer : ETS - Testconsult Limited  
Address : 8/F., Block B, Veristrong Industrial Centre, 34 - 36 Au Pui Wan Street, Fotan, Shatin, Hong Kong

### Information of Unit-under-test (UUT)

	Sound Level Meter	Microphone	Pre-amplifier
Manufacturer	RION	RION	RION
Type	NL-52	UC-59	NH-25
Equipment I.D. no.	ET/EN/003/17	-	-
Serial No.	00264519	03558	64644
Adaptors used	-	-	-
Resolution	0.1 dB	-	-

### Laboratory Information

Lab. Ref. No. : Q/CAL/23/5141/I  
Date of Calibration : 28-Jun-2023  
Date of Issue : 28-Jun-2023  
Procedure : CQS/001/A  
Date of Receipt : 21-Jun-2023  
Calibration Location : Calibration Laboratory

### Calibration Condition

Ambient Temperature : (20 ± 3) °C  
Stabilizing Time : 30 minutes  
Ambient Pressure : (1000 ± 50) hPa  
Relative Humidity : (50 ± 20) %  
Sampling : As received

### Reference equipment

- Multi-function sound calibrator, ET/2801/01
- Signal generator, ET/2503/01

### Calibration specification

- To perform the calibration of linearity and frequency response by multi-function sound calibrator.

### Calibration result

- The results are detailed on the subsequent pages.

### Remarks

- The calibration results apply to the particular unit-under-test only.
- The values given in this calibration certificate only to the values measured at the time of test & any uncertainties quoted will not include allowance 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 measurement.

Calibrated By : Tony MA  
(Technician)

Approved By: CHAN Chi Wai



## Calibration Certificate

Certificate No. : CSA34546

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### Calibration Result:

1 Reference Sound Pressure Level : (Unit in: dB)

Range / Mode			Reference Level	REF Frequency (kHz)	UUT Reading	Deviation	Expanded Uncertainty	Coverage Factor
A-Weighting	Self-cal	Before	94.0	1	93.7	-0.3	0.13	2.0
	Range	30 to 130	104.0		103.7	-0.3	0.13	2.0
	Mode	Fast	114.0		113.7	-0.3	0.13	2.0
A-Weighting	Self-cal	After	94.0	1	94.0	0.0	0.13	2.0
	Range	30 to 130	104.0		104.1	0.1	0.13	2.0
	Mode	Fast	114.0		114.1	0.1	0.13	2.0
	Self-cal	After	94.0	1	94.0	0.0	0.13	2.0
	Range	30 to 130	104.0		104.1	0.1	0.13	2.0
	Mode	Slow	114.0		114.1	0.1	0.13	2.0
C-Weighting	Self-cal	-	94.0	1	94.0	0.0	0.13	2.0
	Range	30 to 130	104.0		104.1	0.1	0.13	2.0
	Mode	Fast	114.0		114.0	0.0	0.13	2.0
	Self-cal	-	94.0	1	94.0	0.0	0.13	2.0
	Range	30 to 130	104.0		104.1	0.1	0.13	2.0
	Mode	Slow	114.0		114.0	0.0	0.13	2.0
Z-Weighting	Self-cal	-	94.0	1	94.0	0.0	0.13	2.0
	Range	30 to 130	104.0		104.1	0.1	0.13	2.0
	Mode	Fast	114.0		114.1	0.1	0.13	2.0
	Self-cal	-	94.0	1	94.0	0.0	0.13	2.0
	Range	30 to 130	104.0		104.1	0.1	0.13	2.0
	Mode	Slow	114.0		114.0	0.0	0.13	2.0

Remark:

- The uncertainty quoted is based on 95 % confidence level.
- UUT reading are mean of three measurements.
- Deviation = UUT Reading - Reference Level
- Laboratory reference multi-function sound calibrator was used to adjust the "Self cal" reading of UUT.

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## Calibration Certificate

Certificate No. : CSA34546

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### Calibration Result:

#### Acoustic Sensitivity and Frequency Response:

#### 2 Frequency Response A-Weighting (Unit in: dB)

Range	Mode	Applied Level	Frequency (Hz)	Reference Level	UUT Reading	Deviation	Expanded Uncertainty	Coverage Factor
30 to 130	Fast	94	31.5	54.6	40.5	-14.1	0.29	2.6
			63	67.8	57.2	-10.6	0.22	2.3
			125	77.9	72.2	-5.7	0.13	2.0
			250	85.4	83.6	-1.8	0.12	2.0
			500	90.8	90.9	0.1	0.12	2.0
			1000 (Ref.)	94.0	94.0	0.0	0.13	2.0
			2000	95.1	94.0	-1.1	0.13	2.0
			4000	94.9	92.3	-2.6	0.13	2.0
			8000	92.9	85.4	-7.5	0.14	2.0
			12500	89.7	76.0	-13.7	0.14	2.0
16000	87.5	71.6	-15.9	0.16	2.0			

#### 3 Frequency Response C-Weighting (Unit in: dB)

Range	Mode	Applied Level	Frequency (Hz)	Reference Level	UUT Reading	Deviation	Expanded Uncertainty	Coverage Factor
30 to 130	Fast	94	31.5	91.0	74.6	-16.4	0.22	2.3
			63	93.2	82.4	-10.8	0.15	2.0
			125	93.8	88.1	-5.7	0.15	2.0
			250	94.0	92.2	-1.8	0.14	2.0
			500	94.0	94.1	0.1	0.12	2.0
			1000 (Ref.)	94.0	94.0	0.0	0.13	2.0
			2000	93.7	92.6	-1.1	0.13	2.0
			4000	93.1	90.5	-2.6	0.13	2.0
			8000	91.0	83.5	-7.5	0.14	2.0
			12500	87.8	74.1	-13.7	0.16	2.0
16000	85.6	69.8	-15.8	0.20	2.2			

#### 4 Frequency Response Z-Weighting (Unit in: dB)

Range	Mode	Applied Level	Frequency (Hz)	Reference Level	UUT Reading	Deviation	Expanded Uncertainty	Coverage Factor
30 to 130	Fast	94	31.5	94.0	77.6	-16.4	0.14	2.0
			63	94.0	83.2	-10.8	0.15	2.0
			125	94.0	88.3	-5.7	0.13	2.0
			250	94.0	92.2	-1.8	0.14	2.0
			500	94.0	94.0	0.0	0.12	2.0
			1000 (Ref.)	94.0	94.0	0.0	0.13	2.0
			2000	94.0	92.8	-1.2	0.13	2.0
			4000	94.0	91.3	-2.7	0.13	2.0
			8000	94.0	86.4	-7.6	0.14	2.0
			12500	94.0	80.7	-13.3	0.14	2.0
16000	94.0	79.4	-14.6	0.14	2.0			

Remark:

- Signal level at 1000 Hz is set as indication of reference sound pressure level.
- The uncertainty quoted is based on 95 % confidence level with coverage factor k=2.0.
- UUT reading are mean of three measurements.
- Deviation = UUT Reading - Reference Level

\*\*\*End of certificate\*\*\*



# Certificate of Calibration

Calibration Certification Information			
Cal. Date: January 17, 2023	Rootsmeter S/N: 438320	Ta: 294	°K
Operator: Jim Tisch		Pa: 741.4	mm Hg
Calibration Model #: TE-5025A	Calibrator S/N: <b>4128</b>		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4370	3.2	2.00
2	3	4	1	1.0170	6.4	4.00
3	5	6	1	0.9140	8.0	5.00
4	7	8	1	0.8640	8.8	5.50
5	9	10	1	0.7170	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)
0.9846	0.6852	1.4063	0.9957	0.6929	0.8905
0.9803	0.9639	1.9888	0.9914	0.9748	1.2594
0.9782	1.0702	2.2235	0.9892	1.0823	1.4081
0.9771	1.1309	2.3321	0.9881	1.1437	1.4768
0.9718	1.3553	2.8126	0.9827	1.3706	1.7811
<b>QSTD</b>	m=	<b>2.09676</b>	<b>QA</b>	m=	<b>1.31296</b>
	b=	<b>-0.03027</b>		b=	<b>-0.01917</b>
	r=	<b>0.99991</b>		r=	<b>0.99991</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/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

# Certificate of Calibration

**Calibration Certification Information**

<b>Cal. Date:</b> January 15, 2024	<b>Rootsmer S/N:</b> 438320	<b>Ta:</b> 295 °K
<b>Operator:</b> Jim Tisch		<b>Pa:</b> 756.4 mm Hg
<b>Calibration Model #:</b> TE-5025A	<b>Calibrator S/N:</b> 4228	

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4400	3.3	2.00
2	3	4	1	1.0250	6.4	4.00
3	5	6	1	0.9240	8.0	5.00
4	7	8	1	0.8780	8.9	5.50
5	9	10	1	0.7230	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)
1.0010	0.6951	1.4180	0.9956	0.6914	0.8832
0.9969	0.9726	2.0054	0.9915	0.9674	1.2490
0.9948	1.0766	2.2421	0.9894	1.0708	1.3964
0.9936	1.1316	2.3515	0.9882	1.1256	1.4646
0.9884	1.3671	2.8361	0.9831	1.3597	1.7664
<b>QSTD</b>	<b>m=</b>	<b>2.11633</b>	<b>QA</b>	<b>m=</b>	<b>1.32521</b>
	<b>b=</b>	<b>-0.04857</b>		<b>b=</b>	<b>-0.03025</b>
	<b>r=</b>	<b>0.99987</b>		<b>r=</b>	<b>0.99987</b>

**Calculations**

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

**Standard Conditions**

Tstd:	298.15 °K
Pstd:	760 mm Hg
<b>Key</b>	
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





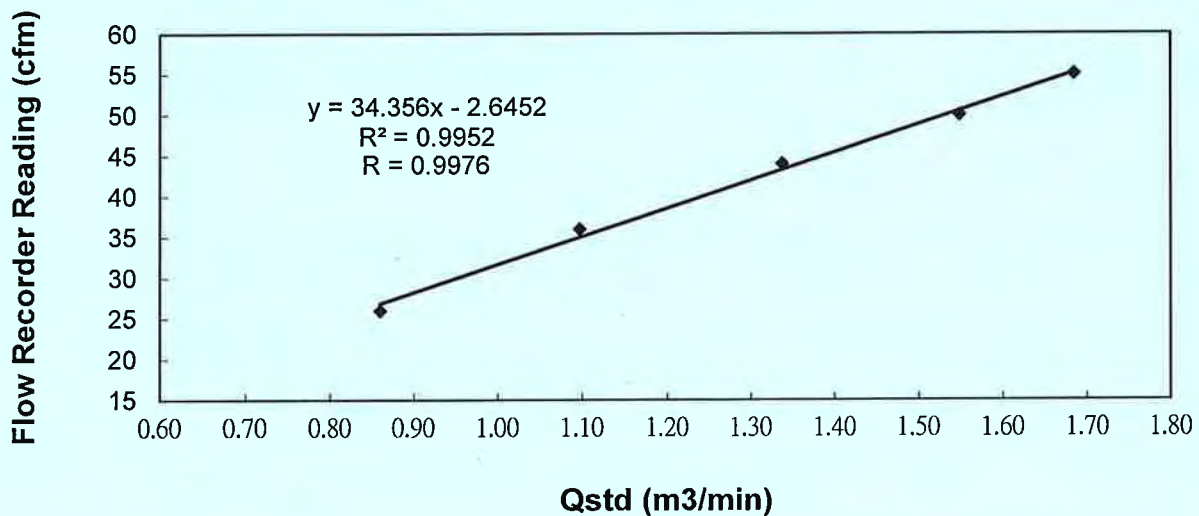
TEST REPORT

Calibration Report  
of  
High Volume Air Sampler

Manufacturer : Graseby GMW Date of Calibration : 20 December 2023  
Serial No. : 1180 ( ET / EA / 003 / 04 ) Calibration Due Date : 19 February 2024  
Method : Based on Operations Manual for the 5-point calibration using standard calibration kit manufactured by Tisch TE-5025 A

Results	Flow recorder reading (cfm)	55	50	44	36	26
	Qstd (Actual flow rate, m <sup>3</sup> /min)	1.68	1.55	1.34	1.10	0.86
	Pressure : 767.54 mm Hg	Temp. : 287 K				

**Sampler 1180 Calibration Curve**  
Site: Tuen Mun (TM-RA2)



Acceptance Criteria : Correlation coefficient (r) of the calibration curve greater than 0.990 after a 5-point calibration

The high volume sampler complies\* / ~~does not comply\*~~ with the specified requirements and is deemed acceptable\* / ~~unacceptable\*~~ for use.

Calibrated by : MAK Kei Wai  
MAK, Kei Wai  
(Assistant Supervisor)

Checked by : LAU Chi Leung  
LAU, Chi Leung  
(Environmental Team Leader)

- END OF REPORT -



**TEST REPORT**

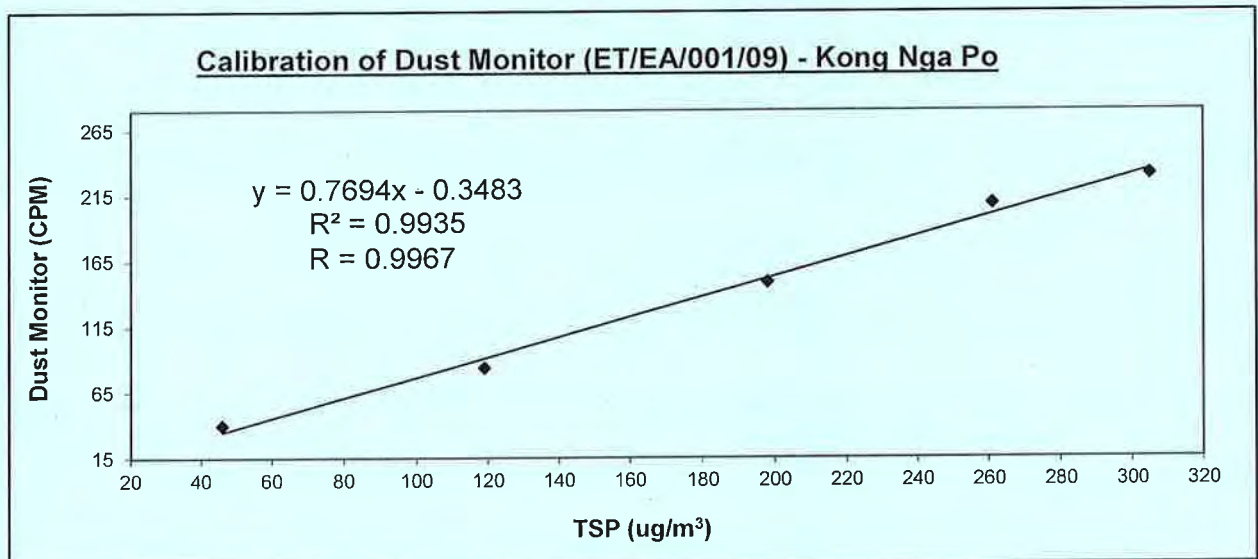
**Internal Calibration Report  
of  
Dust Monitor**

**Manufacturer** : SIBATA (LD-3B) Date of Calibration : 28 November 2023

**Serial No.** : 155331 (ET/EA/001/09) Calibration Due Date : 27 January 2024

**Method** : Parallel measurement (Five-point calibration) by placing the Dust Monitor and High Volume Air Samper together under the same environmental condition

<b>Results</b>	Dust Monitor (CPM)	40	84	149	209	231
	TSP (ug/m <sup>3</sup> )	46	119	198	261	305
	High Volume Air Sampler Serail No.: 1180	Calibration Due Date: 20 December 2023				



Acceptance Criteria : Correlation coefficient (R) of the calibration curve greater than 0.990 after a five-point calibration

The Dust Trak Monitor complies \* / does not comply \* with the internal calibration procedures and is deemed acceptable \* / unacceptable \* for use.

Calibrated by : Toby  
CHENG, Hei Mah  
(Technician)

Checked by : LAU, Chi Leung  
(Environmental Team Leader)



**TEST REPORT**

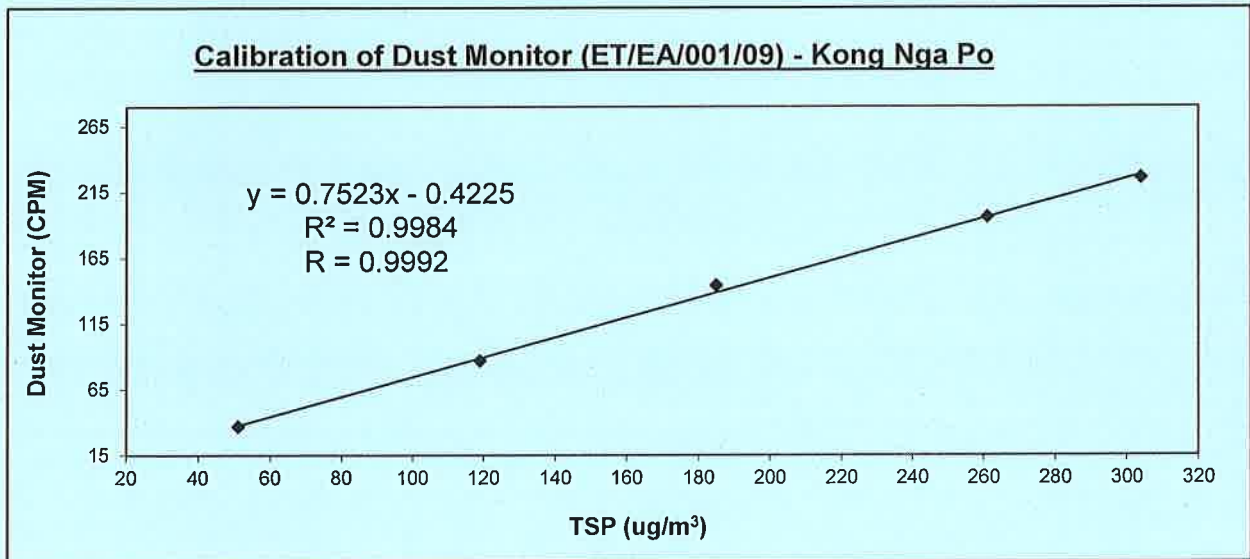
**Internal Calibration Report  
of  
Dust Monitor**

Manufacturer : SIBATA (LD-3B) Date of Calibration : 26 January 2024

Serial No. : 155331 (ET/EA/001/09) Calibration Due Date : 25 April 2024

Method : Parallel measurement (Five-point calibration) by placing the Dust Monitor and High Volume Air Samper together under the same environmental condition

Results :	Dust Monitor (CPM)	37	87	144	196	226
	TSP (ug/m <sup>3</sup> )	51	119	185	261	304
	High Volume Air Sampler Serial No.: 1180	Calibration Due Date: 19 February 2024				



Acceptance Criteria : Correlation coefficient (R) of the calibration curve greater than 0.990 after a five-point calibration

The Dust Trak Monitor complies \* / ~~does not comply~~ \* with the internal calibration procedures and is deemed acceptable \* / unacceptable \* for use.

Calibrated by :   
CHENG, Hei Man  
(Technician)

Checked by :   
LAU, Chi Leung  
(Environmental Team Leader)



**TEST REPORT**

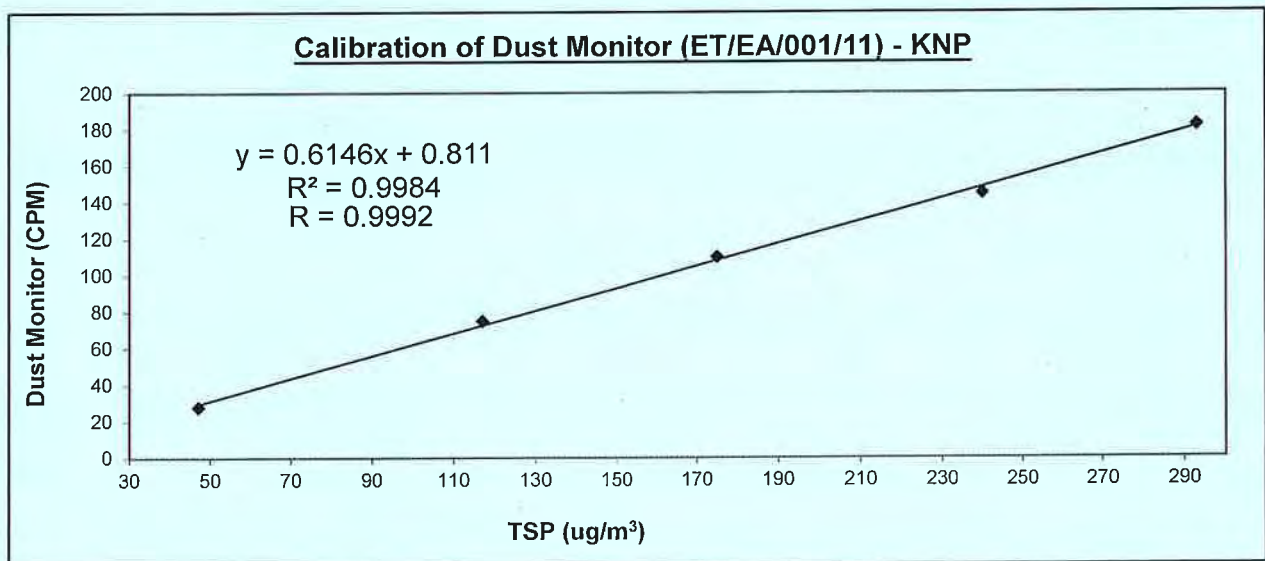
**Internal Calibration Report  
of  
Dust Monitor**

Manufacturer : SIBATA (LD-3B) Date of Calibration : 28 November 2023

Serial No. : 255863 (ET/EA/001/11) Calibration Due Date : 27 January 2024

Method : Parallel measurement (Five-point calibration) by placing the Dust Monitor and High Volume Air Samper together under the same environmental condition

Results	Dust Monitor (CPM)	28	75	110	145	182
	TSP (ug/m <sup>3</sup> )	47	117	175	240	293
High Volume Air Sampler Serail No.:1180		Calibration Due Date: 20 December 2023				



Acceptance Criteria : Correlation coefficient (R) of the calibration curve greater than 0.990 after a five-point calibration

The Dust Trak Monitor complies \* / does not comply \* with the internal calibration procedures and is deemed acceptable \* / unacceptable \* for use.

Calibrated by :   
CHENG, Hei Man  
(Technician)

Checked by :   
LAU, Chi Leung  
(Environmental Team Leader)



TEST REPORT

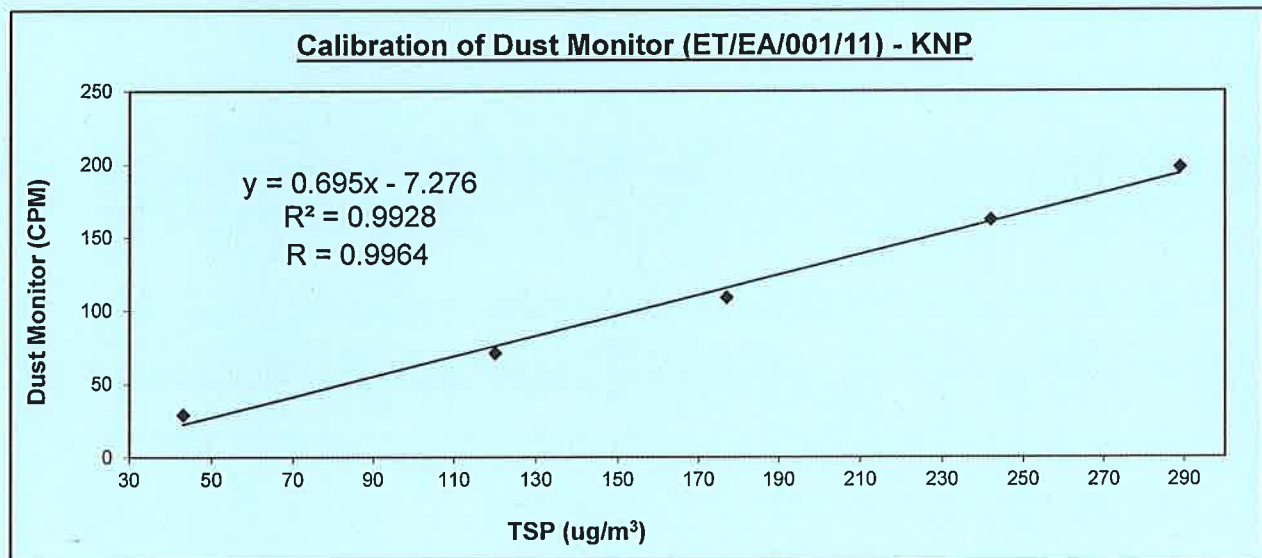
Internal Calibration Report  
of  
Dust Monitor

Manufacturer : SIBATA (LD-3B) Date of Calibration : 26 January 2024

Serial No. : 255863 (ET/EA/001/11) Calibration Due Date : 25 April 2024


Method : Parallel measurement (Five-point calibration) by placing the Dust Monitor and High Volume Air Samper together under the same environmental condition


Results	Dust Monitor (CPM)	29	71	109	162	198
	TSP (ug/m <sup>3</sup> )	43	120	177	242	289
	High Volume Air Sampler Serail No.:1180	Calibration Due Date: 19 February 2024				



Acceptance Criteria : Correlation coefficient (R) of the calibration curve greater than 0.990 after a five-point calibration

The Dust Trak Monitor complies \* / ~~does not comply~~ \* with the internal calibration procedures and is deemed acceptable \* / unacceptable \* for use.

Calibrated by :   
CHENG, Hei Man  
(Technician)

Checked by :   
LAU, Chi Leung  
(Environmental Team Leader)

- END OF REPORT -