TISCH Environmental

RECALIBRATION DUE DATE:
November 2, 2021

Certificate of Calibration

Calibration Certification Information				
Cal. Date:	November 2, 2020	**Rootsmeter S/N:** 438320	**Ta:** 294	°K
Operator:	Jim Tisch		**Pa:** 756.7	mm Hg
Calibration Model #:	TE-5025A	**Calibrator S/N:** **3543**		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4310	3.2	2.00
2	3	4	1	1.0110	6.4	4.00
3	5	6	1	0.9000	8.0	5.00
4	7	8	1	0.8560	8.9	5.50
5	9	10	1	0.7100	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)	$\sqrt{\Delta H\left(Ta/Pa\right)}$ (y-axis)
1.0049	0.7022	1.4207	0.9958	0.6959	0.8815
1.0006	0.9897	2.0091	0.9915	0.9808	1.2467
0.9985	1.1094	2.2463	0.9894	1.0994	1.3938
0.9973	1.1651	2.3559	0.9882	1.1545	1.4619
0.9920	1.3971	2.8414	0.9830	1.3844	1.7631
QSTD	**m=**	**2.03936**	**QA**	**m=**	**1.27701**
	b=	**-0.01298**		**b=**	**-0.00805**
	r=	**0.99995**		**r=**	**0.99995**

Calculations

Vstd=	ΔVol((Pa-ΔP)/Pstd)(Tstd/Ta)	**Va=**	ΔVol((Pa-ΔP)/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= $1/m\left(\left(\sqrt{\Delta H\left(Ta/Pa\right)}\right)-b\right)$

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

Tisch Environmental, Inc.
145 South Miami Avenue
Village of Cleves, OH 45002

www.tisch-env.com
TOLL FREE: (877)263-7610
FAX: (513)467-9009

TE-5170 Calibration Worksheet

Site Information

Location: AM3A	Site ID: Zones 2A at West Kowloon Cultural	Date: 11-Nov-20
Sampler: TE-5170	Serial No: 4340	Tech: CS Tang

Site Conditions

Barometric Pressure (in Hg): 30.14	Corrected Pressure (mm Hg): 766
Temperature (deg F): 73	Temperature (deg K): 296
Average Press. (in Hg): 30.14	Corrected Average (mm Hg): 766
Average Temp. (deg F): 73	Average Temp. (deg K): 296

Calibration Orifice

Make: Tisch	Qstd Slope: 2.03936
Model: TE-5025A	Qstd Intercept: -0.01298
Serial#: 3543	Date Certified: 2-Nov-20

Calibration Information

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)
1	12.20	1.732	53.0	53.39
2	10.50	1.607	48.0	48.36
3	7.30	1.341	41.0	41.30
4	4.40	1.043	33.0	33.24
5	2.30	0.756	23.0	23.17

Linear Regression
Slope: 29.9241
Intercept: 1.1241
Corr. Coeff: 0.9982

# of Observations: 5

Calculations

Qstd = 1/m[Sqrt(H2O(Pa/Pstd)(Tstd/Ta))-b]
IC = I[Sqrt(Pa/Pstd)(Tstd/Ta)]

Qstd = standard flow rate
IC = corrected chart response
I = actual chart response
m = calibrator Qstd slope
b = calibrator Qstd intercept
Ta = actual temperature during calibration (deg K)
Pa = actual pressure during calibration (mm Hg)
Tstd = 298 deg K
Pstd = 760 mm Hg
For subsequent calculation of sampler flow:
1/m((I)[Sqrt(298/Tav)(Pav/760)]-b)

m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure

Average I (chart): 40
Average Flow Calculation m3/min
1.295591082
Average Flow Calculation in CFM
45.74732111
Sample Time (Hrs): 1.0
Total Flow in m3/min
77.73546492
Total Flow in CFM
2744.839266

NOTE: Ensure calibration orifice has been certified within 12 months of use

TE-5170 Calibration Worksheet

Site Information

Location: AM4A	Site ID: Zones 2A at West Kowloon Cultural	Date: 11-Nov-20
Sampler: TE-5170	Serial No: 3998	Tech: CS Tang

Site Conditions

Barometric Pressure (in Hg): 30.14	Corrected Pressure (mm Hg): 766
Temperature (deg F): 73	Temperature (deg K): 296
Average Press. (in Hg): 30.14	Corrected Average (mm Hg): 766
Average Temp. (deg F): 73	Average Temp. (deg K): 296

Calibration Orifice

Make: Tisch	Qstd Slope: 2.03936
Model: TE-5025A	Qstd Intercept: -0.01298
Serial#: 3543	Date Certified: 2-Nov-20

Calibration Information

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)
1	12.50	1.753	53.0	53.39
2	10.20	1.584	48.0	48.36
3	7.60	1.368	41.0	41.30
4	4.20	1.019	33.0	33.24
5	2.20	0.739	23.0	23.17

Linear Regression
Slope: 29.0451
Intercept: 2.3506
Corr. Coeff: 0.9976
# of Observations: 5

Calculations

Qstd = 1/m[Sqrt(H2O(Pa/Pstd)(Tstd/Ta))-b]
IC = I[Sqrt(Pa/Pstd)(Tstd/Ta)]

Qstd = standard flow rate
IC = corrected chart response
I = actual chart response
m = calibrator Qstd slope
b = calibrator Qstd intercept
Ta = actual temperature during calibration (deg K)
Pa = actual pressure during calibration (mm Hg)
Tstd = 298 deg K
Pstd = 760 mm Hg
For subsequent calculation of sampler flow:
1/m((I)[Sqrt(298/Tav)(Pav/760)]-b)

m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure

Average I (chart): 40
Average Flow Calculation m3/min
1.292573154
Average Flow Calculation in CFM
45.64075807
Sample Time (Hrs): 1.0
Total Flow in m3/min
77.55438925
Total Flow in CFM
2738.445484

NOTE: Ensure calibration orifice has been certified within 12 months of use

TE-5170 Calibration Worksheet

Site Information

Location: AM5A	Site ID: Zones 2A at West Kowloon Cultural	Date: 11-Nov-20
Sampler: TE-5170	Serial No: 4344	Tech: CS Tang

Site Conditions

Barometric Pressure (in Hg): 30.14	Corrected Pressure (mm Hg): 766
Temperature (deg F): 73	Temperature (deg K): 296
Average Press. (in Hg): 30.14	Corrected Average (mm Hg): 766
Average Temp. (deg F): 73	Average Temp. (deg K): 296

Calibration Orifice

Make: Tisch	Qstd Slope: 2.03936
Model: TE-5025A	Qstd Intercept: -0.01298
Serial#: 3543	Date Certified: 2-11-2020

Calibration Information

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)
1	12.10	1.725	53.0	53.39
2	10.10	1.576	48.0	48.36
3	7.30	1.341	41.0	41.30
4	4.10	1.007	33.0	33.24
5	2.20	0.739	23.0	23.17

Linear Regression
Slope: 29.6386
Intercept: 2.0292
Corr. Coeff: 0.9975
# of Observations: 5

Calculations

Qstd = 1/m[Sqrt(H2O(Pa/Pstd)(Tstd/Ta))-b]
IC = I[Sqrt(Pa/Pstd)(Tstd/Ta)]

Qstd = standard flow rate
IC = corrected chart response
I = actual chart response
m = calibrator Qstd slope
b = calibrator Qstd intercept
Ta = actual temperature during calibration (deg K)
Pa = actual pressure during calibration (mm Hg)
Tstd = 298 deg K
Pstd = 760 mm Hg
For subsequent calculation of sampler flow:
1/m((I)[Sqrt(298/Tav)(Pav/760)]-b)

m = sampler slope
b = sampler intercept
I = chart response
Tav = daily average temperature
Pav = daily average pressure

Average I (chart): 40
Average Flow Calculation m3/min
1.277533737
Average Flow Calculation in CFM
45.10971624
Sample Time (Hrs): 1.0
Total Flow in m3/min
76.6520242
Total Flow in CFM
2706.582975

NOTE: Ensure calibration orifice has been certified within 12 months of use

CERTIFICATE OF ACCREDITATION

This is to attest that

AQUALILTY TESTCONSULT LIMITED

11A&B, KAI FONG GARDEN, PING CHE ROAD
FANLING, HONG KONG

Calibration Laboratory CL-207

has met the requirements of AC204, *IAS Accreditation Criteria for Calibration Laboratories*, and has demonstrated compliance with ISO/IEC Standard 17025:2017, *General requirements for the competence of testing and calibration laboratories.* This organization is accredited to provide the services specified in the scope of accreditation.

Effective Date October 19, 2020

Expiration Date December 1, 2021

President

Visit www.iasonline.org for current accreditation information.

SCOPE OF ACCREDITATION

International Accreditation Service, Inc.

3060 Saturn Street, Suite 100, Brea, California 92821, U.S.A. | www.iasonline.org

AQUALILTY TESTCONSULT LIMITED

www.aqtlgroup.com

Contact Name Lee Mei Yee Julia **Contact Phone** + 852-6309-2280

Accredited to ISO/IEC 17025:2017 *Effective Date October 19, 2020*

CALIBRATION AND MEASUREMENT CAPABILITY (CMC)*

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION PROCEDURE AND/OR STANDARD EQUIPMENT USED
Dimensional			
Caliper -Vernier, Dial & Electronic[3]	0 mm to 300 mm	30 µm	Checker by comparison method (BS 887:1982)
Steel Ruler[3]	1 mm to 1000 mm	280 µm	Reference Steel Rule by comparison method (BS 4372:1968)
Dial Indicator / Gauge (Plunger) [3]	0 mm to 50 mm	8 µm	Reference micrometer head by comparison method (BS 907:2008)
Feeler Gauge[3]	0.01 mm to 1 mm	8 µm	Reference Dial Gauge by comparison method (BS BS957-2008)
Measuring tape[3]	0 m to 1.5 m	1200 µm	Reference steel ruler by comparison method (BS 4035:1966)
Engineering Square[3]	Length 0 mm to 160 mm	20 µm	Reference engineering square and Feeler Gauge (BS 939:2007)
Slump cone[3]	Diameter = 0 mm to 200 mm Thickness = 1.5 mm Height = 0 mm to 300 mm	560 µm 100 µm 560 µm	Reference Caliper & Reference Steel ruler by direct measurement (Verification in accordance with in-house method for the dimensional requirements as specified CS1:1990 Vol.1 A4; CS1: 2010 Vol. 1, A5)
Tamping rod[3]	Diameter = 0 mm to 16 mm Length = 600 mm	600 µm 950 µm	Reference steel ruler & Reference Caliper by direct measurement (Verification in accordance with in-house method for the dimensional

** If information in this CMC is presented in non-SI units, the conversion factors stated in NIST Special Publication 811 "Guide for the Use of the International System of Units (SI)" apply.*

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION PROCEDURE AND/OR STANDARD EQUIPMENT USED
			requirements as specified CS1:1990 Vol.1 A5;CS1: 2010 Vol. 1, A6)
Cube mould[3]	(Max dimensions 150 mm per side) Dimension Flatness Perpendicularity Parallelism	 50 µm 10 µm 10 µm 50 µm	Reference Caliper, straight edge & feeler gauge by direct measurement. (Verification in accordance with in-house method for the dimensional requirements as specified in BS1881: Part 108:1983; CS1:1990 Vol1, A21; CS1:2010 Vol 1, A25; BS EN 12390-2:2000)
Compacting Bar[3]	Ramming Face = 25 mm Length = 380 mm Weight = 1.8 kg	100 µm 560 µm 1 g	Reference Caliper & Steel ruler by direct measurement. (Verification in accordance with in-house method for the dimensional & mass requirements as specified in BS1881: Part 105:1984 Cl 3.3; CS1:1990 Vol 2, E3 CS1:2010 Vol 1, A15.3; BS EN 12350 -5:2000 Cl 4.3.)
Covermeter	20 mm to 103 mm	2.9 mm	Reference concrete block (Verification in accordance with in-house method for the dimensional requirements as specified in BS 1881:Part 204:1988 Cl.6.4- Method C)
Flow table[3]	15 kg to 17 kg 1 mm to 71 mm	12 g 600 µm	Weighing Balance, Reference caliper & Reference steel ruler by direct measurement
Test Sieve[3]	4 mm to 50 mm	50 µm	Reference Caliper bydirect measurement
Mechanical			
Force Measuring Machine[3] (Compression Mode)	1 kN to 3000 kN	0.4 %	Ref. Load cell by direct measurement BS 1610: Part 1:1985; BS 1610: Part 1:1992; BS EN ISO 12390-4:2000 Annex B; BS EN ISO 7500-1:2004
Laser Dust Meter[3]	Dust particles 0.001 mg/m^3 to 10.00 mg/m^3	0.9 mg/m^3	By comparison method by using reference laser dust meter

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION PROCEDURE AND/OR STANDARD EQUIPMENT USED
Rebound Hammer[3]	80 unit (hardness)	1.6 rebound count	Reference Rebound count by comparison method. BS1881: Part 202:1986; BS EN 12504-2:2001; BS EN 12504-2:2012
Mass (F2 class and coarser)	1 g to 200 g 200 g to 5 kg 5 kg to 10 kg 10 kg to 50 kg	1.3 mg 0.5 g 1 g 7 g	Standard Weight E2/ F1 Class & Weighing Balances by comparison method (OIMLR111)
Weighing Scale & Balance[3]	1 g to 200 g 200 g to 5 kg 5 kg to 50 kg	1 mg 1 g 15 g	Standard weight of E2/F1 Grade by direct measurement
Volumetric Glassware	1 mL to 100 mL 100 mL to 1000 mL	0.004 mL 0.09 mL	Standard weight E2 Class, Weighing Balances & Distilled water by gravimetric method
Thermal			
Digital/Liquid in Glass Thermometers & *RTD*/ Thermocouples with or without Indicators	15 °C to 55°C 55°C to 95°C	0.4 °C 0.9 °C	Water Baths, Reference Sensor and Indictor by Comparison Method (OIML R133)
Curing Tank[3]	(Calibration at 20 °C & 27 °C @ 30 min) 20 °C Temperature distribution 27 °C Temperature distribution Efficiency of circulation	 0.4 °C 0.8 °C 5 s	Reference Temperature datalogger by Mapping Method & Reference Stop Watch (Verification in accordance with in-house method for the Temp & Time requirements as specified in BS1881-111:1983 CS1:1990 Vol 1 App A24 CS1:2010 Vol 1 App A28 BE EN 12390-2:2000
Oven[3]	40.0 °C to 180.0 °C	1.5 °C	Reference Temperature datalogger by Mapping Method (AS 2853:1986)
Furnace[3]	200 °C to 1300 °C	6 °C	Reference Thermocouple with Indicator By single point Calibration (AS 2853:1986)
Water bath[3]	15 °C to 95 °C	0.2 °C	Reference Temperature datalogger by Mapping Method (AS 2853:1986)
Time and Frequency			
Stop Watch/ Timer[3]	10 s to 3600 s	0.2 s	Reference stop watch

MEASURED QUANTITY or DEVICE TYPE CALIBRATED	RANGE	UNCERTAINTY[1,2] (±)	CALIBRATION PROCEDURE AND/OR STANDARD EQUIPMENT USED
Grout Flow Cone[3]	7 s to 9 s	0.2 s	Reference stop watch by direct method (ASTM C939-10 Cl.9)

[1]The uncertainty covered by the Calibration and Measurement Capability (CMC) is expressed as the expanded uncertainty having a coverage probability of approximately 95 %. It is the smallest measurement uncertainty that a laboratory can achieve within its scope of accreditation when performing calibrations of a best existing device. The measurement uncertainty reported on a calibration certificate may be greater than that provided in the CMC due to the behavior of the calibration item and other factors that may contribute to the uncertainty of a specific calibration.

[2]When uncertainty is stated in relative terms (such as percent, a multiplier expressed as a decimal fraction or in scientific notation), it is in relation to instrument reading or instrument output, as appropriate, unless otherwise indicated.

[3]Also available as site calibration. Note that actual measurement uncertainties achievable at a customer's site can normally be expected to be larger than the uncertainties listed on this Scope of Accreditation.

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CERTIFICATE OF CALIBRATION

Report Number : 201108MCA-126F
Date of Report : 12-Nov-20
Page Number : 1 of 2
Customer * : Apex Testing & Certification Ltd.
Customer Address* : Unit D6A, 10/F, TML Tower, 3 Hoi Shing Road, Tsuen Wan, N.T., HK
Customers Ref. * : A005

Item Under Calibration (IUC)*
Equipment No. : N/A
Manufacturer : Sibata Scientific Technology Ltd
Model No. : LD-3B
Serial No. : 235811
Scale Division : 0.001 mg/m3
Range : 0.001 to 1 mg/m3
Condition of Item : Normal

Date Item Received : 8-Nov-20
Date Calibrated : 8-Nov-20
Calibration Location : AQuality Calibration Lab.
Date of Next Calibration : 7-Nov-21
Calibrated By : Jessica Liu

Test Environment
Ambient Temperature : 27.5 °C to 23.9 °C
Relative Humidity : 51 % to 83 %

Calibration Results

Reference True Reading (mg/m3)	Average IUC Reading (mg/m^3)	Correction (mg/m^3)	Error of IUC Reading (%)	Expanded Uncertainty (mg/m^3)	Coverage Factor K
0.158	0.167	-0.008	5.1%	0.020	2.0
5.164	5.647	-0.484	8.5%	0.463	2.0
10.100	11.141	-1.041	9.3%	0.904	2.0

Remarks :
1. * Denotes information supplied by customer.
2. The results relate only to the items calibrated.
3. The results apply to the items as received.
4. Correction = Average of (Ref reading - IUC reading)
5. The technical requirement of laser dust meter. +/- 20% error for the particles concentration.

Approved by: _____
LEE Mei Yee, Julia
Managing Director

AQuality 東恒測試顧問有限公司
AQUALITY TESTCONSULT LIMITED
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TEL : 852-3582-9589 FAX : 852-2674-1177 EMAIL : cal.aqtl@gmail.com WEBSITE: www.aqtlgroup.com

CERTIFICATE OF CALIBRATION

Report Number : 201108MCA-126F
Date of Report : 12-Nov-20

Customer * : Apex Testing & Certification Ltd.
Customers Ref. * : A005

Details of Calibration

1. The calibration was performed in accordance with AQuality Testconsult Procedure Number ENV-L-003 (in-house method), by comparison with the laboratory's reference equipment which have traceable international standards of measurement.

2. The item under calibration (IUC) was allowed to stabilize in the laboratory for 0.25 hour before commencement of calibration.

3. A set of readings were made at each calibration concentration. The values quoted in the results are the average of each set of readings.

4. The values given in this calibration certificate only relate to the values measured at the time of calibration. Any uncertainties quoted do not include allowance for the capabiliy of any other laboratory to repeat the measurement. The uncertainty quoted relate only to item at time of calibration. AQuality Testconsult Limited is not liable for any loss or damage resulting from the use of this equipment.

5. The identification, calibration certificate numbers for the reference equipment used were as follows :

Equipment Number	Certificate Number	Description
CH-LDM-1	HBW202001563	粉尘测试仪

6. Copies of the Calibration certificates of the reference equipment used in this calibration may be obtained from AQuality Testconsult Limited, if necessary.

- End of Report -

AQuality
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TEL : 852-3582-9589
FAX : 852-2674-1177
EMAIL : cal.aqtl@gmail.com
WEBSITE: www.aqtlgroup.com

CERTIFICATE OF CALIBRATION

Apex Testing & Certification Ltd. Unit D6A, 10/F, TML Tower, 3 Hoi Shing Road, Tsuen Wan, N.T., HK	Test Report No.	201108MCA-126F
	Date of Issue	12-Nov-20
	Date of Testing	8-Nov-20
	Page	1 of 1

Item for Calibration

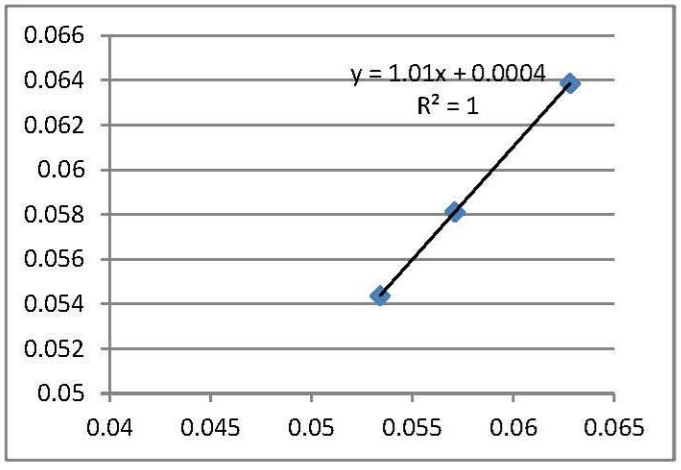
Description : Laser Dust Monitor
Manufacturer : Sibata Scientific Technology Ltd
Model No. : LD-3B
Serial No. : 235811

Standard Equipment

Description : High Volume Sampler / Calibration Orifice
Manufacturer : Tisch Environmental, Inc.
Model No. : TE-5170 / TE-5025A
Serial No. 4344 / 3543
Last Calibration : 8-Nov-20 / 2-Nov-20

Date	Time	Mean Temp (°C)	Mean Pressure (hPa)	Concentration Standard Equipment (mg/m3)	Concentration Calibrated Equipment (mg/m3)
8-Nov-20	20:15	25.7	1017.2	0.0628	0.0639
8-Nov-20	21:20	25.7	1017.2	0.0534	0.0544
8-Nov-20	22:25	25.7	1017.2	0.0571	0.0581

By Linear Regression of Y or X
Slope (K-factor) : 1.0100
Correlation Coefficient : 1.0000
Validity of Calibration : 7-Nov-21



Recorded by : Jessica Liu Signature: Jessica Date: 8-Nov-20

Checked by : S Tang Signature: Tang Date: 8-Nov-20

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CERTIFICATE OF CALIBRATION

Report Number : 201108MCA-123F
Date of Report : 12-Nov-20
Page Number : 1 of 2
Customer * : Apex Testing & Certification Ltd.
Customer Address* : Unit D6A, 10/F, TML Tower, 3 Hoi Shing Road, Tsuen Wan, N.T., HK
Customers Ref. * : A005

Item Under Calibration (IUC)*
Equipment No. : N/A
Manufacturer : Sibata Scientific Technology Ltd
Model No. : LD-3B
Serial No. : 336338
Scale Division : 0.001 mg/m3
Range : 0.001 to 1 mg/m3
Condition of Item : Normal

Date Item Received : 8-Nov-20
Date Calibrated : 8-Nov-20
Calibration Location : AQuality Calibration Lab.
Date of Next Calibration : 7-Nov-21
Calibrated By : Jessica Liu

Test Environment
Ambient Temperature : 27.5 °C to 23.9 °C
Relative Humidity : 51 % to 83 %

Calibration Results

Reference True Reading (mg/m3)	Average IUC Reading (mg/m^3)	Correction (mg/m^3)	Error of IUC Reading (%)	Expanded Uncertainty (mg/m^3)	Coverage Factor K
0.158	0.168	-0.010	5.7%	0.026	2.0
5.164	5.562	-0.398	7.1%	0.462	2.0
10.100	10.936	-0.837	7.6%	0.905	2.0

Remarks :
1. * Denotes information supplied by customer.
2. The results relate only to the items calibrated.
3. The results apply to the items as received.
4. Correction = Average of (Ref reading - IUC reading)
5. The technical requirement of laser dust meter. +/- 20% error for the particles concentration.

Approved by: _____
LEE Mei Yee, Julia
Managing Director

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CERTIFICATE OF CALIBRATION

Report Number : 201108MCA-123F
Date of Report : 12-Nov-20

Customer * : Apex Testing & Certification Ltd.
Customers Ref. * : A005

Details of Calibration

1. The calibration was performed in accordance with AQuality Testconsult Procedure Number ENV-L-003 (in-house method), by comparison with the laboratory's reference equipment which have traceable international standards of measurement.

2. The item under calibration (IUC) was allowed to stabilize in the laboratory for 0.25 hour before commencement of calibration.

3. A set of readings were made at each calibration concentration. The values quoted in the results are the average of each set of readings.

4. The values given in this calibration certificate only relate to the values measured at the time of calibration. Any uncertainties quoted do not include allowance for the capabiliy of any other laboratory to repeat the measurement. The uncertainty quoted relate only to item at time of calibration. AQuality Testconsult Limited is not liable for any loss or damage resulting from the use of this equipment.

5. The identification, calibration certificate numbers for the reference equipment used were as follows :

Equipment Number	Certificate Number	Description
CH-LDM-1	HBW202001563	粉尘测试仪

6. Copies of the Calibration certificates of the reference equipment used in this calibration may be obtained from AQuality Testconsult Limited, if necessary.

- End of Report -

AQuality
東恒測試顧問有限公司
AQUALITY TESTCONSULT LIMITED
香港新界粉嶺坪輋路啟芳園11A&11B號
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TEL : 852-3582-9589
FAX : 852-2674-1177
EMAIL : cal.aqtl@gmail.com
WEBSITE: www.aqtlgroup.com

CERTIFICATE OF CALIBRATION

Apex Testing & Certification Ltd. Unit D6A, 10/F, TML Tower, 3 Hoi Shing Road, Tsuen Wan, N.T., HK	Test Report No.	201108MCA-123F
	Date of Issue	12-Nov-20
	Date of Testing	8-Nov-20
	Page	1 of 1

Item for Calibration

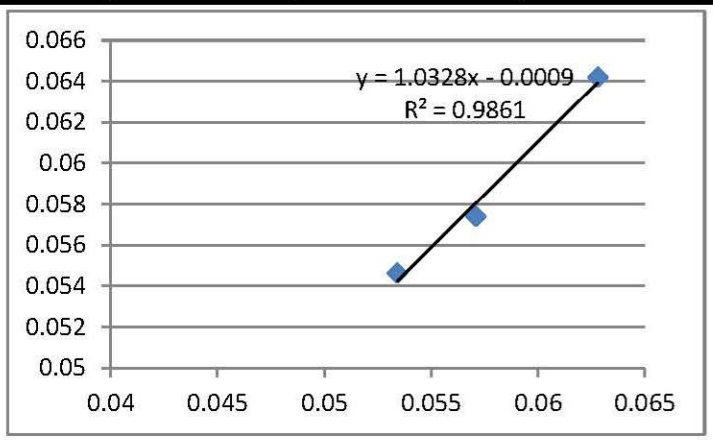
Description : Laser Dust Monitor
Manufacturer : Sibata Scientific Technology Ltd
Model No. : LD-3B
Serial No. : 336338

Standard Equipment

Description : High Volume Sampler / Calibration Orifice
Manufacturer : Tisch Environmental, Inc.
Model No. : TE-5170 / TE-5025A
Serial No. 4344 / 3543
Last Calibration : 8-Nov-20 / 2-Nov-20

Date	Time	Mean Temp (°C)	Mean Pressure (hPa)	Concentration Standard Equipment (mg/m3)	Concentration Calibrated Equipment (mg/m3)
8-Nov-20	20:15	25.7	1017.2	0.0628	0.0642
8-Nov-20	21:20	25.7	1017.2	0.0534	0.0546
8-Nov-20	22:25	25.7	1017.2	0.0571	0.0574

By Linear Regression of Y or X
Slope (K-factor) : 1.0328
Correlation Coefficient : 0.9861
Validity of Calibration : 7-Nov-21



Recorded by : Jessica Liu Signature: Jessica Date: 8-Nov-20

Checked by : S Tang Signature: S Tang Date: 8-Nov-20

AQuality 東恒測試顧問有限公司
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CERTIFICATE OF CALIBRATION

Report Number : 201108MCA-125F
Date of Report : 12-Nov-20
Page Number : 1 of 2
Customer * : Apex Testing & Certification Ltd.
Customer Address* : Unit D6A, 10/F, TML Tower, 3 Hoi Shing Road, Tsuen Wan, N.T., HK
Customers Ref. * : A005

Item Under Calibration (IUC)*
- Equipment No. : N/A
- Manufacturer : Sibata Scientific Technology Ltd
- Model No. : LD-3B
- Serial No. : 567188
- Scale Division : 0.001 mg/m3
- Range : 0.001 to 1 mg/m3
- Condition of Item : Normal

Date Item Received : 8-Nov-20
Date Calibrated : 8-Nov-20
Calibration Location : AQuality Calibration Lab.
Date of Next Calibration : 7-Nov-21
Calibrated By : Jessica Liu

Test Environment

Ambient Temperature	:	27.5	°C to	23.9	°C
Relative Humidity	:	51	% to	83	%

Calibration Results

Reference True Reading (mg/m3)	Average IUC Reading (mg/m^3)	Correction (mg/m^3)	Error of IUC Reading (%)	Expanded Uncertainty (mg/m^3)	Coverage Factor K
0.158	0.167	-0.008	4.9%	0.023	2.0
5.164	5.693	-0.530	9.3%	0.463	2.0
10.100	11.045	-0.945	8.6%	0.905	2.0

Remarks :
1. * Denotes information supplied by customer.
2. The results relate only to the items calibrated.
3. The results apply to the items as received.
4. Correction = Average of (Ref reading - IUC reading)
5. The technical requirement of laser dust meter. +/- 20% error for the particles concentration.

Approved by: _____
LEE Mei Yee, Julia
Managing Director

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CERTIFICATE OF CALIBRATION

Report Number : 201108MCA-125F
Date of Report : 12-Nov-20

Customer * : Apex Testing & Certification Ltd.
Customers Ref. * : A005

Details of Calibration

1. The calibration was performed in accordance with AQuality Testconsult Procedure Number ENV-L-003 (in-house method), by comparison with the laboratory's reference equipment which have traceable international standards of measurement.

2. The item under calibration (IUC) was allowed to stabilize in the laboratory for 0.25 hour before commencement of calibration.

3. A set of readings were made at each calibration concentration. The values quoted in the results are the average of each set of readings.

4. The values given in this calibration certificate only relate to the values measured at the time of calibration. Any uncertainties quoted do not include allowance for the capabiliy of any other laboratory to repeat the measurement. The uncertainty quoted relate only to item at time of calibration. AQuality Testconsult Limited is not liable for any loss or damage resulting from the use of this equipment.

5. The identification, calibration certificate numbers for the reference equipment used were as follows :

Equipment Number	Certificate Number	Description
CH-LDM-1	HBW202001563	粉尘测试仪

6. Copies of the Calibration certificates of the reference equipment used in this calibration may be obtained from AQuality Testconsult Limited, if necessary.

- End of Report -

AQuality
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CERTIFICATE OF CALIBRATION

Apex Testing & Certification Ltd. Unit D6A, 10/F, TML Tower, 3 Hoi Shing Road, Tsuen Wan, N.T., HK	Test Report No.	201108MCA-125F
	Date of Issue	12-Nov-20
	Date of Testing	8-Nov-20
	Page	1 of 1

Item for Calibration

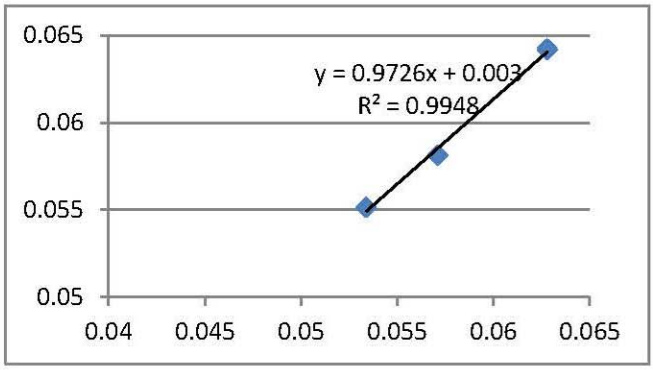
Description : Laser Dust Monitor
Manufacturer : Sibata Scientific Technology Ltd
Model No. : LD-3B
Serial No. : 567188

Standard Equipment

Description : High Volume Sampler / Calibration Orifice
Manufacturer : Tisch Environmental, Inc.
Model No. : TE-5170 / TE-5025A
Serial No. 4344 / 3543
Last Calibration : 8-Nov-20 / 2-Nov-20

Date	Time	Mean Temp (°C)	Mean Pressure (hPa)	Concentration Standard Equipment (mg/m3)	Concentration Calibrated Equipment (mg/m3)
8-Nov-20	20:15	25.7	1017.2	0.0628	0.0642
8-Nov-20	21:20	25.7	1017.2	0.0534	0.0552
8-Nov-20	22:25	25.7	1017.2	0.0571	0.0581

By Linear Regression of Y or X
Slope (K-factor) : 0.9726
Correlation Coefficient : 0.9948
Validity of Calibration : 7-Nov-21



Recorded by : Jessica Liu Signature: Jessica Date: 8-Nov-20

Checked by : S Tang Signature: S Tang Date: 8-Nov-20

綜合試驗有限公司
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E-mail: smec@cigismec.com Website: www.cigismec.com
Tel: (852) 2873 6860
Fax: (852) 2555 7533

CERTIFICATE OF CALIBRATION

Item tested

Description:	Sound Level Meter (Class 1)	,	Microphone
Manufacturer:	Hangzhou Aihua Instruments Co., Ltd	,	-
Type/Model No.:	AWA5661	,	AWA14425
Serial/Equipment No.:	304723	,	9792
Adaptors used:	-	,	-

Item submitted by

Customer Name:	Apex Testing & Certification Ltd.
Address of Customer:	Unit D6A, 10/F, TML Tower, 3 Hoi Shing Road, Tsuen Wan, N.T.
Request No.:	-
Date of receipt:	08-Apr-2020

Date of test: 10-Apr-2020

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Multi function sound calibrator	B&K 4226	2288444	23-Aug-2020	CIGISMEC
Signal generator	DS 360	33873	10-May-2020	CEPREI

Ambient conditions

Temperature:	21 ± 1 °C
Relative humidity:	55 ± 10 %
Air pressure:	1000 ± 5 hPa

Test specifications

1, The Sound Level Meter has been calibrated in accordance with the requirements as specified in BS 7580: Part 1: 1997 and the lab calibration procedure SMTP004-CA-152.

2, The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.

3, The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responsess of the Sound Level Meter.

Test results

This is to certify that the Sound Level Meter conforms to BS 7580: Part 1: 1997 for the conditions under which the test was performed.

Details of the performed measurements are presented on page 2 of this certificate.

Actual Measurement data are documented on worksheets.

Approved Signatory: Feng Junqi **Date:** 14-Apr-2020 **Company Chop:**

Comments: The results reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 20CA0408 04-02 Page 2 of 2

1, Electrical Tests

The electrical tests were perfomed using an equivalent capacitance substituted for the microphone. The results are given in below with test status and the estimated uncertainties. The "Pass" means the result of the test is inside the tolerances stated in the test specifications. The "-" means the result of test is outside these tolerances.

Test:	Subtest:	Status:	Expanded Uncertainty (dB)	Coverage Factor
Self-generated noise	A	Pass	0.3	
	C	Pass	0.8	2.1
	Lin	Pass	1.6	2.2
Linearity range for Leq	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
	Reference SPL on all other ranges	Pass	0.3	
	2 dB below upper limit of each range	Pass	0.3	
	2 dB above lower limit of each range	Pass	0.3	
Linearity range for SPL	At reference range , Step 5 dB at 4 kHz	Pass	0.3	
Frequency weightings	A	Pass	0.3	
	C	Pass	0.3	
	Lin	Pass	0.3	
Time weightings	Single Burst Fast	Pass	0.3	
	Single Burst Slow	Pass	0.3	
Peak response	Single 100μs rectangular pulse	Pass	0.3	
R.M.S. accuracy	Crest factor of 3	Pass	0.3	
Time weighting I	Single burst 5 ms at 2000 Hz	Pass	0.3	
	Repeated at frequency of 100 Hz	Pass	0.3	
Time averaging	1 ms burst duty factor $1/10^3$ at 4kHz	Pass	0.3	
	1 ms burst duty factor $1/10^4$ at 4kHz	Pass	0.3	
Pulse range	Single burst 10 ms at 4 kHz	Pass	0.4	
Sound exposure level	Single burst 10 ms at 4 kHz	Pass	0.4	
Overload indication	SPL	Pass	0.3	
	Leq	Pass	0.4	

2, Acoustic tests

The complete sound level meter was calibrated on the reference range using a B&K 4226 acoustic calibrator with 1000Hz and SPL 94 dB. The sensitivity of the sound level meter was adjusted. The test result at 125 Hz and 8000 Hz are given in below with test status and the estimated uncertainties.

Test:	Subtest	Status	Expanded Uncertainty (dB)	Coverage Factor
Acoustic response	Weighting A at 125 Hz	Pass	0.3	
	Weighting A at 8000 Hz	Pass	0.5	

3, Response to associated sound calibrator

N/A

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

- End -

Calibrated by: Fung Chi Yip
Date: 10-Apr-2020

Checked by: Shek Kwong Tat
Date: 14-Apr-2020

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.

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SMECLab

Test Data for Sound Level Meter

Sound level meter type:	AWA5661	Serial No.	304723	Date	10-Apr-2020
Microphone type:	AWA14425	Serial No.	9792	Report:	20CA0408 04-02

SELF GENERATED NOISE TEST

The noise test is performed in the most sensitive range of the SLM with the microphone replaced by an equivalent impedance.

Noise level in A weighting	12.1	dB
Noise level in C weighting	12.4	dB
Noise level in Lin	21.1	dB

LINEARITY TEST

The linearity is tested relative to the reference sound pressure level using a continuous sinusoidal signal of frequency 4 kHz. The measurement is made on the reference range for indications at 5 dB intervals starting from the 94 dB reference sound pressure level. And until within 5 dB of the upper and lower limits of the reference range, the measurements shall be made at 1 dB intervals.(SLM set to LEQ/SPL)

Reference/Expected level	Actual level		Tolerance	Deviation	
	non-integrated	integrated		non-integrated	integrated
dB	dB	dB	+/- dB	dB	dB
94.0	94.0	94.0	0.7	0.0	0.0
99.0	98.9	98.9	0.7	-0.1	-0.1
104.0	103.9	103.9	0.7	-0.1	-0.1
109.0	108.9	108.9	0.7	-0.1	-0.1
114.0	113.9	113.9	0.7	-0.1	-0.1
115.0	114.9	114.9	0.7	-0.1	-0.1
116.0	115.9	115.9	0.7	-0.1	-0.1
117.0	116.9	116.9	0.7	-0.1	-0.1
118.0	117.9	117.9	0.7	-0.1	-0.1
119.0	118.9	118.9	0.7	-0.1	-0.1
120.0	119.9	119.9	0.7	-0.1	-0.1
89.0	89.0	89.0	0.7	0.0	0.0
84.0	84.0	84.0	0.7	0.0	0.0
79.0	79.0	79.0	0.7	0.0	0.0
74.0	74.0	74.0	0.7	0.0	0.0
69.0	69.0	69.0	0.7	0.0	0.0
64.0	64.0	64.0	0.7	0.0	0.0
59.0	59.0	59.0	0.7	0.0	0.0
54.0	54.0	54.0	0.7	0.0	0.0
49.0	48.9	48.9	0.7	-0.1	-0.1
44.0	43.9	43.9	0.7	-0.1	-0.1
39.0	39.0	39.0	0.7	0.0	0.0
34.0	34.0	34.0	0.7	0.0	0.0
29.0	28.9	28.9	0.7	-0.1	-0.1
28.0	28.0	28.0	0.7	0.0	0.0

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Fax: (852) 2555 7533

SMECLab

Test Data for Sound Level Meter

Sound level meter type: AWA5661 Serial No. 304723 Date 10-Apr-2020
Microphone type: AWA14425 Serial No. 9792
Report: 20CA0408 04-02

27.0	27.1	27.1	0.7	0.1	0.1
26.0	26.2	26.2	0.7	0.2	0.2
25.0	25.1	25.1	0.7	0.1	0.1

Measurements for an indication of the reference SPL on all other ranges which include it

Other ranges	Expected level	Actual level	Tolerance	Deviation
dB	dB	dB	+/- dB	dB
25-120	94.0	94.0	0.7	0.0
45-140	94.0	94.0	0.7	0.0

Measurements on all level ranges for indications 2 dB below the upper limit and 2 dB above the lower limit

Ranges	Reference/Expected level	Actual level	Tolerance	Deviation
dB	dB	dB	+/- dB	dB
25-120	27.0	27.0	0.7	0.0
	118.0	117.9	0.7	-0.1
45-140	47.0	46.8	0.7	-0.2
	138.0	137.8	0.7	-0.2

FREQUENCY WEIGHTING TEST

The frequency response of the weighting netwoks are tested at octave intervals over the frequency ranges 31.5 Hz to 12500 Hz. The signal level at 1000 Hz is set to give an indication of the reference SPL.

Frequency weighting A:

Frequency	Ref. level	Expected level	Actual level	Tolerance(dB)		Deviation
Hz	dB	dB	dB	+	-	dB
1000.0	94.0	94.0	94.0	0.0	0.0	0.0
31.6	94.0	54.6	54.4	1.5	1.5	-0.2
63.1	94.0	67.8	67.7	1.5	1.5	-0.1
125.9	94.0	77.9	77.8	1.0	1.0	-0.1
251.2	94.0	85.4	85.3	1.0	1.0	-0.1
501.2	94.0	90.8	90.7	1.0	1.0	-0.1
1995.0	94.0	95.2	95.2	1.0	1.0	0.0
3981.0	94.0	95.0	95.2	1.0	1.0	0.2
7943.0	94.0	92.9	93.5	1.5	3.0	0.6
12590.0	94.0	89.7	89.4	3.0	6.0	-0.3

Frequency weighting C:

Frequency	Ref. level	Expected level	Actual level	Tolerance(dB)		Deviation
Hz	dB	dB	dB	+	-	dB
1000.0	94.0	94.0	94.0	0.0	0.0	0.0
31.6	94.0	91.0	90.9	1.5	1.5	-0.1
63.1	94.0	93.2	93.1	1.5	1.5	-0.1
125.9	94.0	93.8	93.8	1.0	1.0	0.0

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SMECLab

Test Data for Sound Level Meter

Sound level meter type: AWA5661 Serial No. 304723 Date 10-Apr-2020
Microphone type: AWA14425 Serial No. 9792
Report: 20CA0408 04-02

251.2	94.0	94.0	94.0	1.0	1.0	0.0
501.2	94.0	94.0	94.0	1.0	1.0	0.0
1995.0	94.0	93.8	94.0	1.0	1.0	0.2
3981.0	94.0	93.2	93.5	1.0	1.0	0.3
7943.0	94.0	91.0	91.7	1.5	3.0	0.7
12590.0	94.0	87.8	87.5	3.0	6.0	-0.3

Frequency weighting Lin:

Frequency	Ref. level	Expected level	Actual level	Tolerance(dB)		Deviation
Hz	dB	dB	dB	+	-	dB
1000.0	94.0	94.0	94.0	0.0	0.0	0.0
31.6	94.0	94.0	93.9	1.5	1.5	-0.1
63.1	94.0	94.0	93.9	1.5	1.5	-0.1
125.9	94.0	94.0	93.9	1.0	1.0	-0.1
251.2	94.0	94.0	93.9	1.0	1.0	-0.1
501.2	94.0	94.0	93.9	1.0	1.0	-0.1
1995.0	94.0	94.0	93.9	1.0	1.0	-0.1
3981.0	94.0	94.0	93.9	1.0	1.0	-0.1
7943.0	94.0	94.0	93.9	1.5	3.0	-0.1
12590.0	94.0	94.0	93.9	3.0	6.0	-0.1

TIME WEIGHTING FAST TEST

Time weighting F is tested on the reference range with a single sinusoidal burst of duration 200 ms at a frequency 2000 Hz and an amplitude which produces an indication 4 dB below the upper limit of the primary indicator range when the signal is continuous. (Weight A, Maximum hold)

Ref. level	Expected level	Actual level	Tolerance(dB)		Deviation
dB	dB	dB	+	-	dB
116.0	115.0	115.0	1.0	1.0	0.0

TIME WEIGHTING SLOW TEST

Time weighting S is tested on the reference range with a single sinusoidal burst of duration 500 ms at a frequency 2000 Hz and an amplitude which produces an indication 4 dB below the upper limit of the primary indicator range when the signal is continuous. (Weight A, Maximum hold)

Ref. level	Expected level	Actual level	Tolerance(dB)		Deviation
dB	dB	dB	+	-	dB
116.0	111.9	111.9	1.0	1.0	0.0

PEAK RESPONSE TEST

The onset time of the peak detector is tested on the reference range by comparing the response to a 100 us rectangular test pulse with the response to a 10 ms reference pulse of the same amplitude. The amplitude of the 10 ms reference pulse is such as to produce an indication 1 dB below the upper limit of the primary indicator range.

Positive polarities: (Weighting Z, set the generator signal to single, Lzpeak)

Ref. level	Response to 10 ms	Response to 100 us	Tolerance	Deviation

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SMECLab

Test Data for Sound Level Meter

Sound level meter type: AWA5661 Serial No. 304723 Date 10-Apr-2020
Microphone type: AWA14425 Serial No. 9792
Report: 20CA0408 04-02

dB	dB	dB	+/- dB	dB
119.0	119.0	119.5	2.0	0.5

Negative polarities:

Ref. level	Response to 10 ms	Response to 100 us	Tolerance	Deviation
dB	dB	dB	+/- dB	dB
119.0	119.0	119.5	2.0	0.5

RMS ACCURACY TEST

The RMS detector accuracy is tested on the reference range for a crest factor of 3.

Test frequency: 2000 Hz
Amplitude: 2 dB below the upper limit of the primary indicator range.
Burst repetition frequency: 40 Hz
Tone burst signal: 11 cycles of a sine wave of frequency 2000 Hz. (Set to INT)

Time wighting	Ref. Level	Expected level	Tone burst signal	Tolerance	Deviation
	dB	dB	indication(dB)	+/- dB	dB
Slow	116.0+6.6	116.0	115.7	0.5	-0.3

TIME WEIGHTING IMPULSE TEST

Time weighting I is tested on the reference range (Set the SLM to LAImax)
Test frequency: 2000 Hz
Amplitude: The upper limit of the primary indicator range.

Single sinusoidal burst of duration 5 ms:

Ref. Level	Single burst indication		Tolerance	Deviation
dB	Expected (dB)	Actual (dB)	+/- dB	dB
120.0	111.2	111.1	2.0	-0.1

Repeated at 100 Hz

Ref. Level	Repeated burst indication		Tolerance	Deviation
dB	Expected (dB)	Actual (dB)	+/- dB	dB
120.0	117.3	117.1	1.0	-0.2

TIME AVERAGING TEST

This test compares the SLM reading for continuous sine signals with readings obtained from a sine tone burst sequence having the same RMS level. The test level is 30 dB below the upper limit of the linearity range and repeated for Type 1 SLM with 40 dB below the upper limit of the linearity.

Frequency of tone burst: 4000 Hz
Duration of tone burst: 1 ms

Repetition Time	Level of tone burst	Expected Leq	Actual Leq	Tolerance	Deviation	Remarks
msec	dB	dB	dB	+/- dB	dB	
1000	90.0	90.0	89.9	1.0	-0.1	60s integ.
10000	80.0	80.0	79.8	1.0	-0.2	6min. integ.

PULSE RANGE AND SOUND EXPOSURE LEVEL TEST

The test tone burst signal is superimposed on a baseline signal corresponding to the lower limit of reference range

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SMECLab

Test Data for Sound Level Meter

Sound level meter type:	AWA5661	Serial No.	304723	Date	10-Apr-2020
Microphone type:	AWA14425	Serial No.	9792		
				Report:	20CA0408 04-02

Test frequency: 4000 Hz
Integration time: 10 sec

The integrating sound level meter set to Leq:

Duration	Rms level of	Expected	Actual	Tolerance	Deviation
msec	tone burst (dB)	dB	dB	+/- dB	dB
10	90.0	60.0	59.8	1.7	-0.2

The integrating sound level meter set to SEL:

Duration	Rms level of	Expected	Actual	Tolerance	Deviation
msec	tone burst (dB)	dB	dB	+/- dB	dB
10.0	90.0	70.0	70.0	1.7	0.0

OVERLOAD INDICATION TEST

For SLM capable of operating in a non-integrating mode.

Test frequency: 2000 Hz
Amplitude: 2 dB below the upper limit of the primary indicator range.
Burst repetition frequency: 40 Hz
Tone burst signal: 11 cycles of a sine wave of frequency 2000 Hz.

Level	Level reduced by	Further reduced	Difference	Tolerance	Deviation
at overload (dB)	1 dB	3 dB	dB	dB	dB
115.8	114.8	111.8	3.0	1.0	0.0

For integrating SLM, with the instrument indicating Leq.

For integrating SLM, with the instrument indicating Leq and set to the reference range. The test signal as following:
The test tone burst signal is superimposed on a baseline signal corresponding to the lower limit of reference range

Test frequency: 4000 Hz
Integration time: 10 sec
Single burst duration: 1 msec

Rms level	Level reduced by	Expected level	Actual level	Tolerance	Deviation
at overload (dB)	1 dB	dB	dB	dB	dB
122.0	121.0	81.0	80.8	2.2	-0.2

ACOUSTIC TEST

The acoustic test of the complete SLM is tested at the frequency 125 Hz and 8000 Hz using a B&K type 4226 Multifunction Acoustic Calibrator. The test is performed in A weighting.

Frequency	Expected level	Actual level	Tolerance (dB)		Deviation
Hz	dB	Measured (dB)	+	-	dB
1000	94.0	94.0	0.0	0.0	0.0
125	77.9	78.1	1.0	1.0	0.2
8000	92.9	93.4	1.5	3.0	0.5

----------END----------

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CERTIFICATE OF CALIBRATION

Certificate No.: 20CA0616 03-02 **Page:** 1 of 2

Item tested

Description:	Acoustical Calibrator (Class 1)
Manufacturer:	Pulsar
Type/Model No.:	100B
Serial/Equipment No.:	039507
Adaptors used:	Yes

Item submitted by

Customer:	Apex Testing & Certification Ltd.
Address of Customer:	Unit D6A, 10/F, TML Tower, 3 Hoi Shing Road, Tsuen Wan, N.T.
Request No.:	-
Date of receipt:	16-Jun-2020

Date of test: 20-Jun-2020

Reference equipment used in the calibration

Description:	Model:	Serial No.	Expiry Date:	Traceable to:
Lab standard microphone	B&K 4180	2412857	11-May-2021	SCL
Preamplifier	B&K 2673	2743150	03-Jun-2021	CEPREI
Measuring amplifier	B&K 2610	2346941	03-Jun-2021	CEPREI
Signal generator	DS 360	33873	19-May-2021	CEPREI
Digital multi-meter	34401A	US36087050	19-May-2021	CEPREI
Audio analyzer	8903B	GB41300350	18-May-2021	CEPREI
Universal counter	53132A	MY40003662	18-May-2021	CEPREI

Ambient conditions

Temperature:	22 ± 1 °C
Relative humidity:	55 ± 10 %
Air pressure:	1005 ± 5 hPa

Test specifications

1, The Sound Calibrator has been calibrated in accordance with the requirements as specified in IEC 60942 1997 Annex B and the lab calibration procedure SMTP004-CA-156.

2, The calibrator was tested with its axis vertical facing downwards at the specific frequency using insert voltage technique.

3, The results are rounded to the nearest 0.01 dB and 0.1 Hz and have not been corrected for variations from a reference pressure of 1013.25 hectoPascals as the maker's information indicates that the instrument is insensitive to pressure changes.

Test results

This is to certify that the sound calibrator conforms to the requirements of annex B of IEC 60942: 1997 for the conditions under which the test was performed. This does not imply that the sound calibrator meets IEC 60942 under any other conditions.

Details of the performed measurements are presented on **page 2** of this certificate.

Approved Signatory: Feng Junqi **Date:** 22-Jun-2020 **Company Chop:**

Comments: The results reported in this certificate refer to the conditon of the instrument on the date of calibration and carry no implication regarding the long-term stability of the instrument.

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CERTIFICATE OF CALIBRATION

(Continuation Page)

Certificate No.: 20CA0616 03-02 **Page:** 2 **of** 2

1, Measured Sound Pressure Level

The output Sound Pressure Level in the calibrator head was measured at the setting and frequency shown using a calibrated laboratory standard microphone and insert voltage technique. The results are given in below with the estimated uncertainties.

(Output level in dB re 20 μPa)

Frequency Shown Hz	Output Sound Pressure Level Setting dB	Measured Output Sound Pressure Level dB	Estimated Expanded Uncertainty dB
1000	94.00	94.10	0.10

2, Sound Pressure Level Stability - Short Term Fluctuations

The Short Term Fluctuations was determined by measuring the maximum and minimum of the fast weighted DC output of the B&K 2610 measuring amplifier over a 20 second time interval as required in the standard. The Short Term Fluctuation was found to be:

At 1000 Hz **STF = 0.009 dB**

Estimated expanded uncertainty 0.005 dB

3, Actual Output Frequency

The determination of actual output frequency was made using a B&K 4180 microphone together with a B&K 2673 preamplifier connected to a B&K 2610 measuring amplifier. The AC output of the B&K 2610 was taken to an universal counter which was used to determine the frequency averaged over 20 second of operation as required by the standard. The actual output frequency at 1 KHz was:

At 1000 Hz **Actual Frequency = 997.6 Hz**

Estimated expanded uncertainty 0.1 Hz Coverage factor k = 2.2

4, Total Noise and Distortion

For the Total Noise and Distortion measurement, the unfiltered AC output of the B&K 2610 measuring amplifier was connected to an Agilent Type 8903 B distortion analyser. The TND result at 1 KHz was:

At 1000 Hz **TND = 0.9 %**

Estimated expanded uncertainty 0.7 %

The expanded uncertainties have been calculated in accordance with the ISO Publication "Guide to the expression of uncertainty in measurement", and gives an interval estimated to have a level of confidence of 95%. A coverage factor of 2 is assumed unless explicitly stated.

- End -

Calibrated by: Fung Chi Yip **Date:** 20-Jun-2020

Checked by: Shek Kwong Tat **Date:** 22-Jun-2020

The standard(s) and equipment used in the calibration are traceable to national or international recognised standards and are calibrated on a schedule to maintain the required accuracy level.