Appendix D

Calibration Certificates

ALS Technichem (HK) Pty Ltd

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

SUB-CONTRACTING REPORT

CONTACT	: MR MAGNUM FAN	WORK ORDER	:	HK2523079
CLIENT	: ENVIROTECH SERVICES CO.			
ADDRESS	: RM 712, 7/F, MY LOFT 9 HOI WING ROAD, TUEN MUN, N.T. HK	SUB-BATCH	:	1
		DATE RECEIVED	:	3-JUN-2025
		DATE OF ISSUE	:	9-JUN-2025
PROJECT	: ----	NO. OF SAMPLES	:	1
		CLIENT ORDER	:	---

General Comments

- **Sample information (Project name, Sample ID, Sampling date/time, etc.) is provided by client.**
- **Result(s) of sample(s) is/are reported on as received basis, unless otherwise specified. The result(s) is/are related only to the item(s) tested.**
- **Sample(s) was/ were submitted by client. Sample(s) arrived laboratory in ambient condition.**
- **Calibration was subcontracted to Envirotech Services Company.**

Signatories

This document has been signed by those names that appear on this report and are the authorised signatories

Signatories	*Position*
Richard Fung	Managing Director

This report supersedes any previous report(s) with the same work order number.

All pages of this report have been checked and approved for release.

ALS Technichem (HK) Pty Ltd
Part of the ALS Laboratory Group

11/F. Chung Shun Knitting Centre 1 - 3 Wing Yip Street Kwai Chung N.T. Hong Kong
Tel. +852 2610 1044 Fax. +852 2610 2021 **www.alsglobal.com**

WORK ORDER : HK2523079
SUB-BATCH : 1
CLIENT : ENVIROTECH SERVICES CO.
PROJECT : ----

ALS Lab ID	Client's Sample ID	Sample Type	Sample Date	External Lab Report No.
HK2523079-001	Sibata LD-3B (456668)	Equipments	03-Jun-2025	S/N: 456668

-------- END OF REPORT --------

Envirotech Services Co.
Rm. 712, 7/F
My Loft,
9 Hoi Wing Road,
Tuen Mun, H.K.
Tel : 2560 8450
Fax : 2560 6553
E-mail: envirotech@netvigator.com

Equipment Verification Report (TSP)

Equipment Calibrated:

Type:	Laser Dust Monitor
Manufacturer:	Sibata LD-3B
Serial No.:	456668
Equipment Ref.:	N/A
ALS Job Order:	HK2521123

Standard Equipment

Standard Equipment:	High Volume Sampler (TSP)
Location :	Envirotech Room (Calibration Room)
Equipment Ref.:	HVS 8162
Last Calibration Date:	24-May-2025

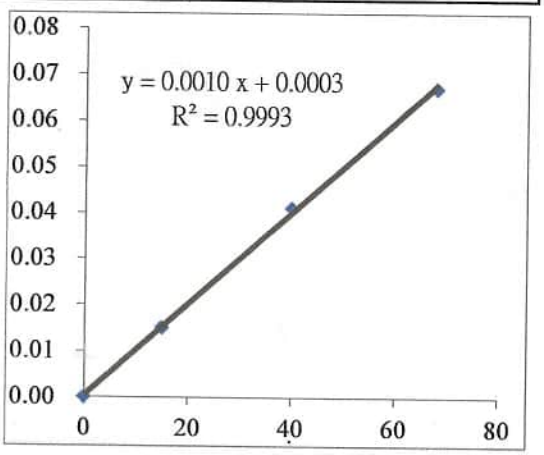
Equipment Verification Results:

Verification Date: 24-May-2025

Hour	Time	Mean Temp °C	Mean Pressure (hpa)	TSP Level in mg (Standard Equipment) (Y-Axis)	Total Count (Calibrated Equipment) (X-Axis)
1hr 00mins	0910-1010	23.8	1013.2	0.015	15
2hr 00mins	1015-1215	24.0	1013.4	0.041	40
3hr 00mins	1315-1615	24.4	1013.5	0.067	68

Linear Regression of Y or X

Slope (K-factor):	0.0010(mg)/Count
Correlation Coefficient (R):	0.9997
Date of Issue:	2-Jun-2025



Remarks:

1 . Strong Correlation (>0.8)

2. Factor 0.0010(mg)/Count should be applied for TSP monitoring

*If R<0.5, repair or verification is required for the equipment

Operator: P.F.Yeung Signature Fai Date: 02 June 2025

QC Reviewer: K.F.Ho Signature [signature] Date: 02 June 2025

TSP SAMPLER CALIBRATION CACULATION SPREADSHEET

Location :	Rm. 712, My Loft, Tuen Mun	Date of Calibration:	24-May-25
HVS ID:	8162	Next Calibration Date:	24-Jul-25
Name and Model :	TISCH HVS Model TE-5170	Operator:	K.F.Ho

CONDITIONS

Sea Level Pressure (hpa)	1013.2	Corrected Pressure (mm Hg)	759.9
Temperature (°C)	23.8	Temperature (K)	296.8

CALIBRATION ORIFICE

Make:	TISCH	Qstd Slope	2.08315
Model:	TE-5025A	Qstd Intercept	-0.04938
Serial#:	2454		

CALIBRATION

Plate No.	H2O(L) (in)	H20(R) (in)	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	6.4	6.4	12.8	1.745	58	58.13	Slope= 33.91
13	5.1	5.1	10.2	1.560	52	52.12	Intercept= -0.9035
10	4.0	4.0	8.0	1.385	46	46.10	Corr. Coeff.= 0.9999
7	2.4	2.5	4.9	1.089	36	36.08	
5	1.5	1.5	3.0	0.857	28	28.06	

Calulations:

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)

For **subsequent calculation of sampler flow:**

1/m((I)[Sqrt(298/Tav)(Pav/760)]-b)

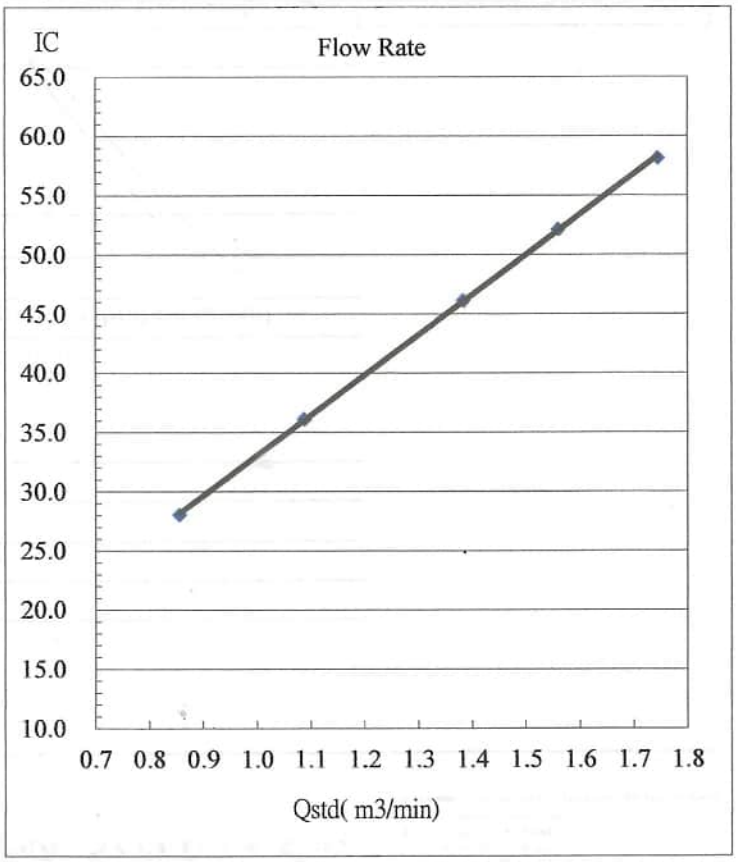
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



TISCH Environmental

RECALIBRATION DUE DATE:
December 2, 2025

Certificate of Calibration

Calibration Certification Information				
Cal. Date:	December 2, 2024	**Rootsmeter S/N:** 438320	**Ta:** 293	°K
Operator:	Jim Tisch		**Pa:** 757.4	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	1.4200	3.2	2.00
2	3	4	1	1.0170	6.4	4.00
3	5	6	1	0.9090	7.9	5.00
4	7	8	1	0.8700	8.8	5.50
5	9	10	1	0.7140	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)	$\sqrt{\Delta H\left(Ta/Pa\right)}$ (y-axis)
1.0093	0.7108	1.4238	0.9958	0.7013	0.8796
1.0051	0.9883	2.0136	0.9916	0.9750	1.2439
1.0031	1.1035	2.2512	0.9896	1.0886	1.3907
1.0018	1.1515	2.3611	0.9884	1.1361	1.4586
0.9965	1.3956	2.8476	0.9831	1.3769	1.7592
QSTD	**m=**	**2.08315**	**QA**	**m=**	**1.30443**
	b=	**-0.04938**		**b=**	**-0.03050**
	r=	**0.99985**		**r=**	**0.99985**

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

ALS Technichem (HK) Pty Ltd

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

SUB-CONTRACTING REPORT

CONTACT	: MR MAGNUM FAN	WORK ORDER	:	HK2511675
CLIENT	: ENVIROTECH SERVICES CO.			
ADDRESS	: RM 712, 7/F, MY LOFT 9 HOI WING ROAD, TUEN MUN, N.T. HK	SUB-BATCH	:	1
		DATE RECEIVED	:	25-MAR-2025
		DATE OF ISSUE	:	31-MAR-2025
PROJECT	: ----	NO. OF SAMPLES	:	1
		CLIENT ORDER	:	---

General Comments

- **Sample information (Project name, Sample ID, Sampling date/time, etc.) is provided by client.**
- **Result(s) of sample(s) is/are reported on as received basis, unless otherwise specified. The result(s) is/are related only to the item(s) tested.**
- **Sample(s) was/ were submitted by client. Sample(s) arrived laboratory in ambient condition.**
- **Calibration was subcontracted to Envirotech Services Company.**

Signatories

This document has been signed by those names that appear on this report and are the authorised signatories

Signatories	*Position*
Richard Fung	Managing Director

This report supersedes any previous report(s) with the same work order number.

All pages of this report have been checked and approved for release.

ALS Technichem (HK) Pty Ltd
Part of the ALS Laboratory Group

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Tel. +852 2610 1044 Fax. +852 2610 2021 www.alsglobal.com

WORK ORDER : HK2511675
SUB-BATCH : 1
CLIENT : ENVIROTECH SERVICES CO.
PROJECT : ----

ALS Lab ID	Client's Sample ID	Sample Type	Sample Date	External Lab Report No.
HK2511675-001	Sibata LD-3B (6Z7784)	Equipments	25-Mar-2025	S/N: 6Z7784

-------- END OF REPORT --------

Envirotech Services Co.
Rm. 712, 7/F
My Loft,
9 Hoi Wing Road,
Tuen Mun, H.K.
Tel : 2560 8450
Fax : 2560 6553
E-mail: envirotech@netvigator.com

Equipment Verification Report (TSP)

Equipment Calibrated:

Type:	Laser Dust Monitor
Manufacturer:	Sibata LD-3B
Serial No.:	6Z7784
Equipment Ref.:	N/A
ALS Job Order:	HK2510963

Standard Equipment

Standard Equipment:	High Volume Sampler (TSP)
Location :	Envirotech Room (Calibration Room)
Equipment Ref.:	HVS 8162
Last Calibration Date:	17-Mar-2025

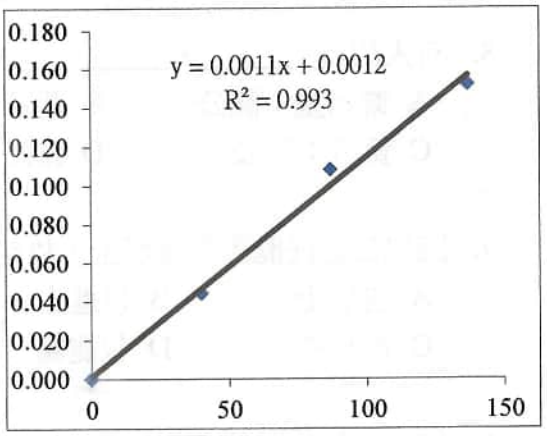
Equipment Verification Results:

Verification Date: 18-Mar-2025

Hour	Time	Mean Temp °C	Mean Pressure (hpa)	TSP Level in mg (Standard Equipment) (Y-Axis)	Total Count (Calibrated Equipment) (X-Axis)
1hr 00mins	0900-1000	15.8	1022.2	0.044	40
2hr 00mins	1005-1205	16.3	1022.0	0.108	87
3hr 00mins	1315-1615	16.5	1022.0	0.152	137

Linear Regression of Y or X

Slope (K-factor):	0.0011(mg)/Count
Correlation Coefficient (R):	0.9965
Date of Issue:	24-Mar-2025



Remarks:

1 . Strong Correlation (>0.8)

2. Factor 0.0011(mg)/Count should be applied for TSP monitoring

*If R<0.5, repair or verification is required for the equipment

Operator: P.F.Yeung Signature Tai Date: 25 March 2025

QC Reviewer: K.F.Ho Signature [signature] Date: 25 March 2025

TSP SAMPLER CALIBRATION CACULATION SPREADSHEET

Location :	Rm. 712, My Loft, Tuen Mun	Date of Calibration:	17-Mar-25
HVS ID:	8162	Next Calibration Date:	16-May-25
Name and Model :	TISCH HVS Model TE-5170	Operator:	K.F.Ho

CONDITIONS

Sea Level Pressure (hpa)	1022	Corrected Pressure (mm Hg)	766.6
Temperature (°C)	18.0	Temperature (K)	291

CALIBRATION ORIFICE

Make:	TISCH	Qstd Slope	2.08315
Model:	TE-5025A	Qstd Intercept	-0.04938
Serial#:	2454		

CALIBRATION

Plate No.	H2O(L) (in)	H20(R) (in)	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
18	6.8	6.9	13.7	1.830	62	63.03	Slope= 39.645
13	5.2	5.3	10.5	1.605	56	56.93	Intercept= -8.4950
10	4.8	4.8	9.6	1.536	50	50.83	Corr. Coeff.= 0.9912
7	2.8	2.8	5.6	1.179	40	40.66	
5	1.6	1.6	3.2	0.897	25	25.41	

Calulations:

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)

For subsequent calculation of sampler flow:

1/m((I)[Sqrt(298/Tav)(Pav/760)]-b)

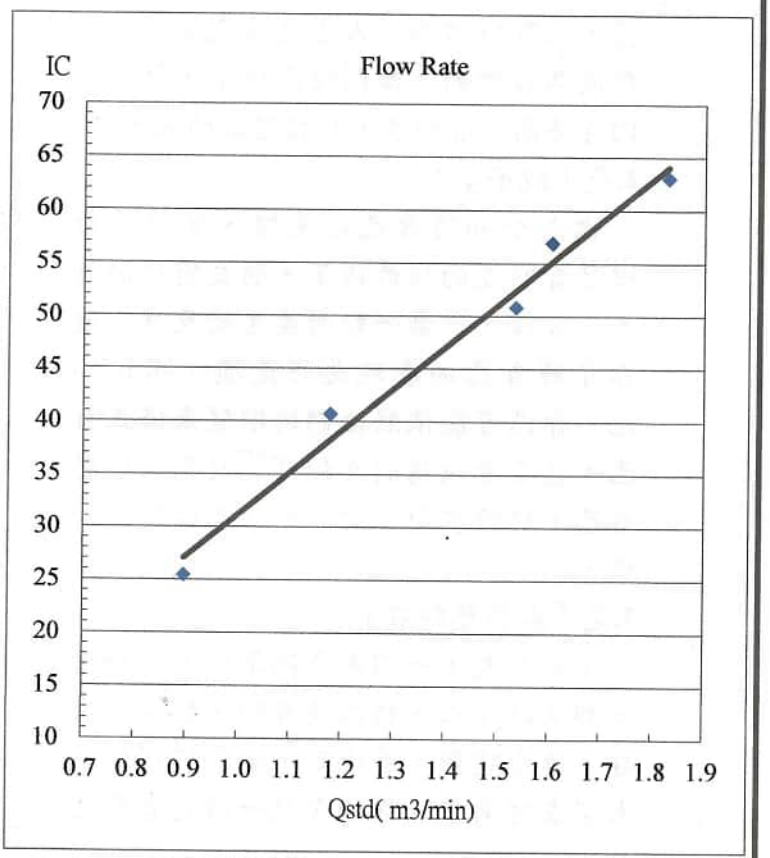
m = sampler slope

b = sampler intercept

I = chart response

Tav = daily average temperature

Pav = daily average pressure



TISCH Environmental

RECALIBRATION DUE DATE:
December 2, 2025

Certificate of Calibration

Calibration Certification Information				
Cal. Date:	December 2, 2024	**Rootsmeter S/N:** 438320	**Ta:** 293	°K
Operator:	Jim Tisch		**Pa:** 757.4	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	1.4200	3.2	2.00
2	3	4	1	1.0170	6.4	4.00
3	5	6	1	0.9090	7.9	5.00
4	7	8	1	0.8700	8.8	5.50
5	9	10	1	0.7140	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)	$\sqrt{\Delta H\left(Ta/Pa\right)}$ (y-axis)
1.0093	0.7108	1.4238	0.9958	0.7013	0.8796
1.0051	0.9883	2.0136	0.9916	0.9750	1.2439
1.0031	1.1035	2.2512	0.9896	1.0886	1.3907
1.0018	1.1515	2.3611	0.9884	1.1361	1.4586
0.9965	1.3956	2.8476	0.9831	1.3769	1.7592
QSTD	**m=**	**2.08315**	**QA**	**m=**	**1.30443**
	b=	**-0.04938**		**b=**	**-0.03050**
	r=	**0.99985**		**r=**	**0.99985**

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

Certificate of Calibration

Certificate No.: B250042

Description:	**Sound calibrator**
Make:	Larson and Davis
Model:	CAL200
Serial No.:	10227
Class:	1
Customer:	Envirotech Services Co.
Department:	-
Address:	RM113, 1/F, MY LOFT, 9 HOI WING ROAD, TUEN MUN, N.T.
Date of receipt the calibration item:	2025-11-25
Environmental conditions:	
Pressure:	(100.6 ±0.50) kPa
Temperature:	(23.4 ± 1.0) °C
Humidity:	(31.5 ± 2.0)%RH
Date of calibration:	2025-11-27
Date of issue:	2025-11-27

Prepared by:

Wong Hau Chun

Checked by:

Choi Pui Sum

Approved Signatory:

Choi Pui Sum

Hong Kong Accreditation Service (HKAS) has accredited this laboratory (Reg. No. HOKLAS 302) under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific calibration activities as listed in the HOKLAS directory of accredited laboratories. The results shown in this certificate are traceable to the International System of Unit (SI) or recognised measurement standards. This certificate shall not be reproduced except in full.

ESG Matters Limited – Acoustic Calibration Centre
Unit 1813, 1815-16, 18/F, Tower A, Regent Centre, 63 Wo Yi Hop Road, Kwai Chung, Hong Kong
Tel : 2525 8033 Website : www.esgmatters.asia Email : email@esgmatters.asia

Certificate No.: B250042

Preconditioning:
The equipment was preconditioned for more than 12 hours at the measurement conditions of pressure, temperature and humidity.

Measurement method:
A description of the in-house test procedure (ESG-NOISE-003) is available separately from the calibration laboratory.

Test Specification:
The Sound Calibrator has been calibrated in accordance with the requirements as specified the in-house test procedure ESG-NOISE-003.

Reference equipment used in the calibration:

Description:	Model:	Serial No.	Calibration Date:	Traceable to:
Multimeter	Agilent 34401A	MY41030277	2025-08-22	Metcal Technologies (M) Sdn Bhd
Meteo Station HM30	HM30	J120806	2025-09-02	China Ceprei Laboratory Calibration & Testing Centre
Reference microphone	Nor 1225	505480	2025-10-09	The Government of HKSAR Standards and Calibration Laboratory
Reference Calibrator	B&K 4231	3014997	2025-08-26	Soils & Materials Engineering Co., LTD.
Audio Analyzer	8903B	3011A11797	2025-09-04	China Ceprei Laboratory Calibration & Testing Centre

ESG Matters Limited – Acoustic Calibration Centre
Unit 1813, 1815-16, 18/F, Tower A, Regent Centre, 63 Wo Yi Hop Road, Kwai Chung, Hong Kong
Tel: 2525 8033 Website: www.esgmatters.asia Email: email@esgmatters.asia

Uncertainty:
The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k, which with the reported effective degree of freedom corresponds to coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA publication EA-4/02.

The measurement uncertainty evaluation has been carried out in accordance with principles in the Evaluation of Measurement Data – Guide to the Expression of Uncertainty in Measurement, JCGM 100:2008. The expanded measurement uncertainty U, with its coverage factor k, corresponds to an approximate 95% probability that the value of measurand Y lies within the interval y-U to y+U. The combined standard measurement uncertainty u_c can be calculated as $u_c = U/k$ and its degree of freedom V_{eff} is given by the t-distribution with the respective k value.

Comment:
The values given in this Certificate of Calibration only relate to values measured at the time of the test and any measurement uncertainties quoted will not include allowances for the equipment long term drift, variations with environmental changes, vibration and shock during transportation, or the capability of any other laboratory to repeat the measurement. The results apply to the item as received.

All tests are performed according to in-house test procedure ESG-Noise-003.

The results in this Certificate of Calibration only apply to the sample / calibration item as received.

ESG Matters Limited – Acoustic Calibration Centre
Unit 1813, 1815-16, 18/F, Tower A, Regent Centre, 63 Wo Yi Hop Road, Kwai Chung, Hong Kong
Tel: 2525 8033 Website: www.esgmatters.asia Email: email@esgmatters.asia

ESG Matters

Certificate No.: B250042

Table 1

Sound Pressure Level Test Results

Description:

Performance tests were carried out in accordance with Annex B.3.4.3.2 of IEC 60942:2003. The sound pressure level generated by the equipment was compared to the reference sound pressure level by the reference equipment B&K 4231 (Equipment No.:3014997).

Larson and Davis CAL200			Measured Deviation (b) – (a)			Acceptance Limits	Maximum Permitted Uncertainty
Frequency Setting	Sound Pressure Level		Value	Measurement Uncertainty			
	Expected Reading (a)	Measured Reading (b)	y	Expanded Measurement Uncertainty U	Coverage Factor k		
(Hz)	(dB)	(dB)	(dB)	(dB)		(dB)	(dB)
1000.00	94.00	94.08	0.08	0.13	1.96	±0.40	0.15
	114.00	114.06	0.06	0.13	1.96	±0.40	0.15

The calibrator was placed on top of the reference microphone, only held in place by gravity. At least three repetitions have been performed. No adapter ring was needed to obtain half inch configuration.

The calibrator level was not adjusted.

ESG Matters Limited – Acoustic Calibration Centre
Unit 1813, 1815-16, 18/F, Tower A, Regent Centre, 63 Wo Yi Hop Road, Kwai Chung, Hong Kong
Tel: 2525 8033 Website: www.esgmatters.asia Email: email@esgmatters.asia

Table 2

Frequency Test Results

Description:

Relevant tests were carried out in accordance with Annex B.3.5 of IEC 60942:2003. The frequency of sound pressure level generated by the equipment was measured by the multimeter (Equipment No.: MY41030277).

Larson and Davis CAL200			Measured Deviation [=([b] – [a])/[a] x 100%]			Acceptance Limits	Maximum Permitted Uncertainty
Sound Pressure Level Setting	Frequency		Value	Measurement Uncertainty			
	Expected Reading (a)	Measured Reading (b)	y	Expanded Measurement Uncertainty U	Coverage Factor k		
(dB)	(Hz)	(Hz)	(%)	(Hz)		(%)	(%)
94.00	1000.00	1008.16	0.82	0.20	1.96	±1.00	0.30
114.00	1000.00	1008.17	0.82	0.20	1.96	±1.00	0.30

The calibrator was placed on top of the reference microphone, only held in place by gravity. At least three repetitions have been performed. No adapter ring was needed to obtain half inch configuration.

The calibrator level was not adjusted.

ESG Matters Limited – Acoustic Calibration Centre
Unit 1813, 1815-16, 18/F, Tower A, Regent Centre, 63 Wo Yi Hop Road, Kwai Chung, Hong Kong
Tel: 2525 8033 Website: www.esgmatters.asia Email: email@esgmatters.asia

Table 3

Total Distortion Test Results

Description:

Relevant tests were carried out in accordance with Annex B.3.6 of IEC 60942:2003. The total distortion of the acoustic signal generated by the equipment was measured by the Laboratory's audio analyzer (Equipment No.: 3011A11797).

Larson and Davis CAL200		Measured Total Distortion			Acceptance Limits	Maximum Permitted Uncertainty
Frequency Setting	Sound Pressure Level Setting	Value y	Measurement Uncertainty			
			Expanded Measurement Uncertainty U	Coverage Factor k		
(Hz)	(dB)	(%)	(%)		(%)	(%)
1000.00	94.00	2.25	0.40	1.96	±3.00	0.50
	114.00	0.81	0.30	1.96	±3.00	0.50

The calibrator was placed on top of the reference microphone, only held in place by gravity. At least three repetitions have been performed. No adapter ring was needed to obtain half inch configuration.

The calibrator level was not adjusted.

The stated levels are relative to 20μPa. The distortion value (in %) is the signal to total noise ratio.

- END -

ESG Matters Limited – Acoustic Calibration Centre
Unit 1813, 1815-16, 18/F, Tower A, Regent Centre, 63 Wo Yi Hop Road, Kwai Chung, Hong Kong
Tel: 2525 8033 Website: www.esgmatters.asia Email: email@esgmatters.asia

Certificate of Calibration

Certificate No.: A250074

Description:	**Sound level meter**	**Microphone**	**Preamplifier**
Make:	Rion	Rion	Rion
Model:	NL-53	UC-59	NH-25
Serial No.:	01141565	26697	44507
Type:	1	-	-

Customer: Envirotech Services Co.
Department: -
Address: RM113, 1/F, MY LOFT, 9 HOI WING ROAD, TUEN MUN, N.T.

Date of receipt the calibration item: 2025-11-25

Environmental conditions:
Pressure: (100.42 ±0.50) kPa
Temperature: (24.2 ± 1.0) °C
Humidity: (35.7 ± 2.0)%RH

Date of calibration: 2025-11-26
Date of issue: 2025-11-26

Prepared by:

Wong Hau Chun

Checked by:

Choi Pui Sum

Approved Signatory:

Choi Pui Sum

Hong Kong Accreditation Service (HKAS) has accredited this laboratory (Reg. No. HOKLAS 302) under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for specific calibration activities as listed in the HOKLAS dirctory of accredited laboratories. The results shown in this certificate are traceable to the International System of Unit (SI) or recognised measurement standards. This certificate shall not be reproduced except in full.

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Preconditioning:
The equipment was preconditioned for more than 12 hours at the measurement conditions of pressure, temperature and humidity.

Measurement method:
A description of the in-house test procedure (ESG-NOISE-001) is available separately from the calibration laboratory.

Test Specification:
The Sound Level Meter has been calibrated in accordance with the requirements as specified the electrical tests in IEC 61672-3:2013 **(Clause 11.2, 13, 14, 15, 16, 17(If necessary) *, 18, 19, 20 and 21).**

*The application of Clause 17 is based on the more than one level range of Sound Level Meter.

Reference equipment used in the calibration:

Description:	Model:	Serial No.	Calibration Date:	Traceable to:
Signal generator	DS 360	123901	2025-08-25	Metcal Technologies (M) Sdn Bhd
Meteo Station HM30	HM30	J120806	2025-09-02	China Ceprei Laboratory Calibration & Testing Centre

Uncertainty:
The measurement uncertainty evaluation has been carried out in accordance with principles in the Evaluation of Measurement Data – Guide to the Expression of Uncertainty in Measurement, JCGM 100:2008. The expanded measurement uncertainty U, with its coverage factor k, corresponds to an approximate 95% probability that the value of measurand Y lies within the interval y-U to y+U. The combined standard measurement uncertainty u_c can be calculated as $u_c = U/k$ and its degree of freedom V_{eff} is given by the t-distribution with the respective k value.

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Summary of Measurement Results
Self-generated noise - IEC 61672-3 Ed.2.0 Clause 11
Frequency weightings: A Network - IEC 61672-3 Ed.2.0 Clause 13.3
Frequency weightings: C Network - IEC 61672-3 Ed.2.0 Clause 13.3
Frequency weightings: Z Network - IEC 61672-3 Ed.2.0 Clause 13.3
Frequency and time weightings at 1 kHz IEC 61672-3 Ed.2.0 Clause 14
Long term stability test - IEC 61672-3 Ed.2.0 Clause 15
Level linearity on the reference level range - IEC 61672-3 Ed.2.0 Clause 16
Toneburst response - IEC 61672-3 Ed.2.0 Clause 18
Peak C sound level - IEC 61672-3 Ed.2.0 Clause 19
Overload indication - IEC 61672-3 Ed.2.0 Clause 20
High level stability test - IEC 61672-3 Ed.2.0 Clause 21

Verification:
The verification measurements have been performed using the calibration system Nor1504A with software SlmCal62Y8.exe.

Detailed measurement results are printed on the following pages.

Comment:
The values given in this Certificate of Calibration only relate to values measured at the time of the test and any measurement uncertainties quoted will not include allowances for the equipment long term drift, variations with environmental changes, vibration and shock during transportation, or the capability of any other laboratory to repeat the measurement. The results apply to the item as received.

The results in this Certificate of Calibration only apply to the sample / calibration item as received.

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Measurement results

Self-generated noise test - IEC 61672-3:2013 Clause 11		
Description: Relevant tests were carried out in accordance with Section 11 of IEC 61672-3:2013. The noise test is performed in the most sensitive condition of the SLM with the microphone replaced by an equivalent impedance.		
Noise level in A weighting network	12.3	dB
Noise level in C weighting network	15.5	dB
Noise level in Z (Lin) weighting network	21.4	dB

Frequency weighting test - IEC 61672-3:2013 Clause 13.3

Description:
Relevant tests were carried out in accordance with Section 13.3 of IEC 61672-3:2013. The frequency response of the weighting networks are tested at octave intervals over the frequency ranges 63.1Hz to 15848.9 Hz.

On the reference level range and for each frequency weighting to be tested, the level of a 1 kHz input signal shall be adjusted to yield an indication that is 45 dB less than the upper boundary stated in the Instruction Manual for the linear operating range at 1 kHz on the reference level range.

Frequency weighting A:

Frequency	Reference Level	Measured Level	Expanded Measurement Uncertainty U	Coverage Factor k	Deviation	Acceptance Limit (dB)		Maximum permitted Uncertainty#
Hz	dB	dB	dB		dB	+	-	dB
63.1	93.0	93.0	0.2		0.0	1.0	1.0	
125.9	93.0	92.9	0.2		-0.1	1.0	1.0	
251.2	93.0	92.9	0.2		-0.1	1.0	1.0	
501.2	93.0	93.0	0.2		0.0	1.0	1.0	0.6
1000.0	93.0	93.0	0.2	1.96	0.0	0.7	0.7	
1995.3	93.0	93.0	0.2		0.0	1.0	1.0	
3981.1	93.0	92.9	0.2		-0.1	1.0	1.0	
7943.3	93.0	93.0	0.2		0.0	1.5	2.5	0.7
15848.9	93.0	92.3	0.2		-0.7	2.5	16.0	1.0

Frequency weighting C:

Frequency	Reference Level	Measured Level	Expanded Measurement Uncertainty U	Coverage Factor k	Deviation	Acceptance Limit (dB)		Maximum permitted Uncertainty#
Hz	dB	dB	dB		dB	+	-	dB
63.1	93.0	93.0	0.2		0.0	1.0	1.0	
125.9	93.0	93.0	0.2		0.0	1.0	1.0	
251.2	93.0	92.9	0.2		-0.1	1.0	1.0	
501.2	93.0	93.0	0.2		0.0	1.0	1.0	0.6
1000.0	93.0	93.0	0.2	1.96	0.0	0.7	0.7	
1995.3	93.0	93.0	0.2		0.0	1.0	1.0	
3981.1	93.0	93.0	0.2		0.0	1.0	1.0	
7943.3	93.0	93.0	0.2		0.0	1.5	2.5	0.7
15848.9	93.0	92.2	0.2		-0.8	2.5	16.0	1.0

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Frequency weighting Z:								
Frequency	Reference Level	Measured Level	Expanded Measurement Uncertainty U	Coverage Factor k	Deviation	Acceptance Limit (dB)		Maximum permitted Uncertainty#
Hz	dB	dB	dB		dB	+	-	dB
63.1	93.0	93.0	0.2	1.96	0.0	1.0	1.0	0.6
125.9	93.0	93.0	0.2		0.0	1.0	1.0	
251.2	93.0	93.0	0.2		0.0	1.0	1.0	
501.2	93.0	93.0	0.2		0.0	1.0	1.0	
1000.0	93.0	93.0	0.2		0.0	0.7	0.7	
1995.3	93.0	93.0	0.2		0.0	1.0	1.0	
3981.1	93.0	92.9	0.2		-0.1	1.0	1.0	
7943.3	93.0	92.9	0.2		-0.1	1.5	2.5	0.7
15848.9	93.0	93.0	0.2		0.0	2.5	16.0	1.0

Frequency and time weighting test at 1kHz- IEC 61672-3:2013 Clause 14

Description:

Relevant tests were carried out in accordance with Section 14 of IEC 61672-3:2013. For a steady sinusoidal electrical input signal at 1 kHz on the reference level range and with an input signal that yields an indication of the reference sound pressure level with frequency weighting A ,C and Z, with the sound level meter set to display F-time-weighted sound level, or time averaged sound level, as available. In addition, the indications with frequency weighting A shall be recorded with the sound level meter set to display F-time-weighted sound level, S-time-weighted sound level, and time-averaged sound level.

Parameter Setting	Reference Level	Measured Level	Expanded Measurement Uncertainty U	Coverage Factor k	Deviation	Acceptance Limits (dB)		Maximum permitted Uncertainty#
	dB	dB	dB		dB	+	-	dB
L_{AF}SPL	94.0	94.0	0.2	1.96	0.0	0.2	0.2	0.2
L_{CF}SPL	94.0	94.0	0.2		0.0			
L_{ZF}SPL	94.0	94.0	0.2		0.0			
L_{AS}SPL	94.0	94.0	0.2		0.0	0.1	0.1	
LAeq	94.0	94.0	0.2		0.0			
LAE	114.0	114.0	0.2		0.0			

Long term stability test - IEC 61672-3:2013 Clause 15

Description:

Relevant tests were carried out in accordance with Section 15 of IEC 61672-3:2013. The long-term stability of a sound level meter is evaluated from the difference between the A-weighted sound levels indicated in response to steady 1 kHz signals applied at the beginning and end of a period of operation. The period of continuous operation shall be between 25 min and 35 min.

Test signal: Sine wave at 1 kHz

Time Interval	Reading at Beginning	Reading at Ending	Expanded Measurement Uncertainty U	Coverage Factor k	Deviation	Acceptance Limits (dB)		Maximum permitted Uncertainty#
mm:ss	dB	dB	dB		dB	+	-	dB
27:08	94.0	94.0	0.2	1.96	0.0	0.1	0.1	0.1

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Level linearity on the reference level range test - IEC 61672-3:2013 Clause 16

Description:

Relevant tests were carried out in accordance with Section 16 of IEC 61672-3:2013. Level linearity shall be tested with steady sinusoidal electrical signals at a frequency of 8 kHz with the sound level meter set for frequency-weighting A. Level linearity shall be measured in 5 dB steps of increasing input signal level from the starting point up to within 5 dB of the upper boundary stated in the Instruction Manual for the linear operating range at 8 kHz, then at 1 dB steps of increasing input signal level up to, but not including, the first indication of overload.* The test of level linearity shall then be continued at 5 dB steps of decreasing input signal level from the starting point down to within 5 dB of the specified lower boundary, then at 1 dB steps of decreasing input signal level down to, but not including, the first indication of an under-range condition.

Reference Level	Measured Level	Expanded Measurement Uncertainty U	Coverage Factor k	Deviation	Acceptance Limit (dB)		Maximum permitted Uncertainty#
dB	dB	dB		dB	+	-	dB
94.0	93.9	0.2	1.96	-0.1	0.8	0.8	0.3
99.0	98.9	0.2		-0.1			
104.0	103.9	0.2		-0.1			
109.0	108.9	0.2		-0.1			
114.0	113.9	0.2		-0.1			
119.0	118.9	0.2		-0.1			
124.0	123.9	0.2		-0.1			
129.0	128.9	0.2		-0.1			
134.0	133.9	0.2		-0.1			
135.0	134.9	0.2		-0.1			
136.0	135.9	0.2		-0.1			
137.0	136.9	0.2		-0.1			
138.0	137.9	0.2		-0.1			
94.0	93.9	0.2		-0.1			
89.0	88.9	0.2		-0.1			
84.0	83.9	0.2		-0.1			
79.0	78.8	0.2		-0.2			
74.0	73.8	0.2		-0.2			
69.0	68.8	0.2		-0.2			
64.0	63.8	0.2		-0.2			
59.0	58.8	0.2		-0.2			
54.0	53.8	0.2		-0.2			
49.0	48.8	0.2		-0.2			
44.0	43.8	0.2		-0.2			
39.0	38.8	0.2		-0.2			
34.0	33.8	0.2		-0.2			
30.0	29.8	0.2		-0.2			
29.0	28.8	0.2		-0.2			
28.0	27.8	0.2		-0.2			
27.0	26.8	0.2		-0.2			
26.0	25.7	0.2		-0.3			
25.0	24.7	0.2		-0.3			

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Toneburst response test - IEC 61672-3:2013 Clause 18

Description:

Relevant tests were carried out in accordance with Section 18 of IEC 61672-3:2013. For the toneburst signals, indications of the sound level meter to be recorded are maximum F-time-weighted sound level, maximum S-time-weighted sound level, and sound exposure level. The level of the steady input signal shall be adjusted to display an F-time-weighted, S-time-weighted, or time-averaged sound level, as appropriate, that is 3 dB less than the upper boundary stated in the Instruction Manual for the linear operating range at 4 kHz on the reference level range.

For tests with the F time weighting, the indication shall be recorded of the maximum F-time-weighted sound level in response to tonebursts having durations of 200 ms, 2 ms, and 0.25 ms.

For tests with the S time weighting, the indication shall be recorded of the maximum S-time-weighted sound level in response to tonebursts having durations of 200 ms and 2 ms.

For measurements of sound exposure level (or time-averaged sound level for an averaging time that includes the toneburst), the indications in response to tonebursts having durations of 200 ms, 2 ms, and 0.25 ms.

Parameter Setting	Burst Duration	Reference Level	Measured Level	Expanded Measurement Uncertainty U	Coverage Factor k	Deviation	Acceptance limit (dB)		Maximum permitted Uncertainty#
	ms	dB	dB	dB		dB	+	-	dB
$L_{AF}MAX$	200	134.0	134.0	0.2	1.96	0.0	0.5	0.5	0.3
	2	117.0	117.0	0.2		0.0	1.0	1.5	
	0.25	108.0	107.9	0.2		-0.1	1.0	3.0	
$L_{AS}MAX$	200	127.6	127.6	0.2		0.0	0.5	0.5	
	2	108.0	108.0	0.2		0.0	1.0	3.0	
LAE	200	128.0	128.0	0.2		0.0	0.5	0.5	
	2	108.0	108.0	0.2		0.0	1.0	1.5	
	0.25	99.0	98.9	0.2		-0.1	1.0	3.0	

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Peak C sound level test - IEC 61672-3:2013 Clause 19

Description:
Relevant tests were carried out in accordance with Section 19 of IEC 61672-3:2013. Indications of C-weighted peak sound level shall be tested on the least-sensitive level range. The test signals consist of (a) a single complete cycle of an 8 kHz sinusoid starting and stopping at zero crossings and (b) positive and negative half cycles of a 500 Hz sinusoid that also start and stop at zero crossings.

The level of the steady sinusoidal 8 kHz electrical input signal, from which a single complete cycle is extracted, shall be adjusted to yield an indication of C-weighted, F-time-weighted sound level, or C-weighted, time-averaged sound level, that is 8 dB less than the upper boundary stated in the Instruction Manual for the peak level range at 8 kHz on the least sensitive level range.

The level of the steady sinusoidal 500 Hz electrical input signal, from which positive and negative half cycles are extracted, shall be adjusted to yield an indication of C-weighted, F-time-weighted sound level, or C-weighted, time-averaged sound level, that is 8 dB less than the upper boundary stated in the Instruction Manual for the peak level range on the least-sensitive level range.

Pulse Type	Pulse Frequency	Reference Peak Level	Measured Level	Expanded Measurement Uncertainty U	Coverage Factor k	Deviation	Acceptance Limit (dB)		Maximum permitted Uncertainty#
	Hz	dB	dB	dB		dB	+	-	dB
1 cycle	8000	136.4	135.5	0.2	1.96	-0.9	2.0	2.0	0.35
Positive cycle	500	138.4	138.1	0.2		-0.3	1.0	1.0	
Negative cycle	500	138.4	138.2	0.2		-0.2			

Overload indication test - IEC 61672-3:2013 Clause 20

Description:
Relevant tests were carried out in accordance with Section 20 of IEC 61672-3:2013. The sound level meter set to display A-weighted, time-averaged sound level. Positive and negative one-half cycle sinusoidal electrical signals at a frequency of 4 kHz.

The test shall begin at an indicated time-averaged level for the steady input signal that corresponds to 1 dB less than the upper boundary specified for the linear operating range at 4 kHz. The level of the single positive one-half-cycle input signal shall be increased to the first indication of overload, to a resolution of 0.1 dB. The process shall be repeated for the single negative one-half-cycle signal.

Overload Indication at 4 kHz		Expanded Measurement Uncertainty U	Coverage Factor k	Deviation	Acceptance Limit (dB)		Maximum permitted Uncertainty#
Positive One-Half-Cycle	Negative One-Half-Cycle						
dB	dB	dB		dB	+	-	dB
139.5	139.5	0.2	1.96	0.0	1.5	1.5	0.25

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High level stability test - IEC 61672-3:2013 Clause 21

Description:
Relevant tests were carried out in accordance with Section 21 of IEC 61672-3:2013. The ability of a sound level meter to operate continuously in response to high signal levels without significant change in sensitivity is evaluated from the difference between the A-weighted sound levels indicated in response to a steady 1 kHz electrical signal at the beginning and end of a 5 min period of continuous exposure to the signal.

The level of the steady electrical input signal shall be that which is required to display the sound level that is 1 dB less than the upper boundary of the 1 kHz linear operating range on the least-sensitive level range.

Reading at Beginning	Reading at Ending	Expanded Measurement Uncertainty U	Coverage Factor k	Deviation	Acceptance Limits (dB)		Maximum permitted Uncertainty#
dB	dB	dB		dB	+	-	dB
137.0	137.0	0.2	1.96	0.0	0.1	0.1	0.1

Remark:

1) Acoustical levels are stated relative to 20μPa. Other dB levels are relative values.

2) "*" refer to the test point beyond upper boundary stated in the instruction manual for the linear operating range at 8 kHz are not necessary to test.

3) "#" refer to table B.1 of Annex B in IEC61672-1:2013, the maximum-permitted uncertainties of measurement are not equivalent to the uncertainties associated with the measurement of a sound level.

- END -

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