
ภาคผนวก ข

สำเนาใบรับรองการสอบเทียบเครื่องมือตรวจวัด

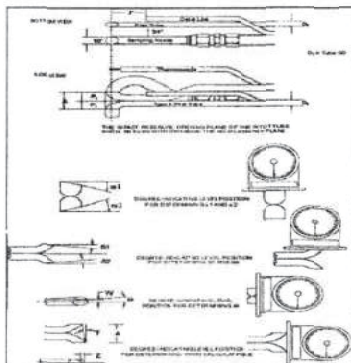
คุณภาพอากาศจากปล่องระบาย



Certificate of Calibration

S-Type Geometric Pitot Tube Calibration

See the Code of Federal Regulations, Title 40, Part 60, Appendix A,
Method 2, Item 4



Pitot tube/Probe No. No. 38/A8464

Parameter	Value	Allowable Range	Check
Assembly Level?	Y	Yes or y	PASS
Ports Damaged?	N	No or n	PASS
$\alpha 1$	0.3	$-10^\circ < \alpha 1 < +10^\circ$	PASS
$\alpha 2$	3.9	$-10^\circ < \alpha 1 < +10^\circ$	PASS
$\beta 1$	-0.8	$-5^\circ < \alpha 1 < +5^\circ$	PASS
$\beta 2$	-2.8	$-5^\circ < \alpha 1 < +5^\circ$	PASS
γ	-4.2	N/A	-
θ	-1.3	N/A	-
D_t	0.375	0.188" to 0.375"	PASS
A	0.944094	$2.10_1 \leq A \leq 3.00_1$	PASS
$A/2D_t$	1.258793	$1.05 \leq P_2/D_t \leq 1.5$	PASS
$Z = A \tan \gamma$	-0.06933	$2 \leq 0.125"$	PASS
$W = A \tan \theta$	-0.02142	$W \leq 0.031"$	PASS

I certify that pitot tube/probe No. 38/A8464 meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification factor of 0.84. See 40 CFR P. 60, App A, EPA Method 2.

Standard Device

Device Name [REDACTED]
Manufacturer BASELINE
Model 12-1057
ID No. QC-1824

Expiration date 18-Dec-24
ENIS No. EN55 12159

Certified by [REDACTED]
Date 8-Jan-94

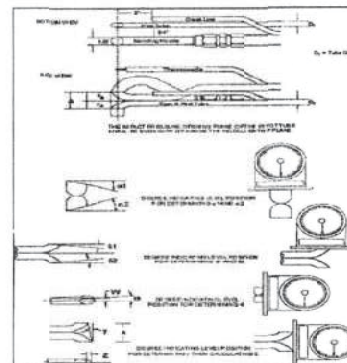
Approved by [REDACTED]
Date 8-Jan-94



Certificate of Calibration

S-Type Geometric Pitot Tube Calibration

See the Code of Federal Regulations, Title 40, Part 60, Appendix A,
Method 2, Item 4



Pitot tube/Probe No. No. 55/A10394

Parameter	Value	Allowable Range	Check
Assembly Level?	Y	Yes or y	PASS
Ports Damaged?	N	No or n	PASS
$\alpha 1$	2	$-10^\circ < \alpha 1 < +10^\circ$	PASS
$\alpha 2$	-1.9	$-10^\circ < \alpha 1 < +10^\circ$	PASS
$\beta 1$	-1.6	$-5^\circ < \alpha 1 < +5^\circ$	PASS
$\beta 2$	-1.3	$-5^\circ < \alpha 1 < +5^\circ$	PASS
γ	-3	N/A	-
θ	0.3	N/A	-
D_t	0.375	0.188" to 0.375"	PASS
A	0.918898	$2.10_1 \leq A \leq 3.00_1$	PASS
$A/2D_t$	1.225197	$1.05 \leq P_2/D_t \leq 1.5$	PASS
$Z = A \tan \gamma$	-0.04816	$2 \leq 0.125"$	PASS
$W = A \tan \theta$	0.064811	$W \leq 0.031"$	PASS

I certify that pitot tube/probe No. 55/A10394 meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube certification factor of 0.84. See 40 CFR P. 60, App A, EPA Method 2.

Standard Device

Device Name [REDACTED]
Manufacturer BASELINE
Model 12-1057
ID No. QC-1824

Expiration date 18-Dec-24
ENIS No. EN55 12159

Certified by [REDACTED]
Date 8-Jan-94

Approved by 8 Jan 94
Date [REDACTED]





Meter Console Verification

Dry Gas Meter ID. : ENSS 039 Date of Calibration : 08/10/2023
Instrument Brand : Apex / Model 572 Calibrated By : OC

Wet gas meter Information

Wet gas Brand : Shinagawa Wet gas S/N : 544122
Wet gas Model : W-NK-2.5A Expire Date : August 30, 2025

Orifice Setting $\Delta H@$ (mm H ₂ O)	Wet gas		Metering System		Time (min)	Yi	$\Delta H@$
	V _w (L)	T _w (°C)	V _d (L)	T _m (°C)			
13	135.88	23.5	140.0	23.0	12.22	0.9679	49.386
13	135.66	23.6	140.0	23.0	12.22	0.9660	49.579
26	135.46	23.6	140.0	23.5	8.92	0.9643	52.975
26	136.74	23.7	140.0	24.0	8.97	0.9752	52.519
40	271.82	23.7	280.0	23.5	13.73	0.9664	47.878
40	271.86	23.7	280.0	24.0	13.73	0.9682	47.783
50	271.68	23.9	280.0	23.5	12.07	0.9643	46.583
50	272.16	24.1	280.0	24.0	12.03	0.9672	46.516
70	271.56	24.1	280.0	23.5	10.13	0.9614	46.64
70	271.92	24.0	280.0	24.5	10.17	0.9664	46.163
90	269.94	23.9	280.0	25.0	8.97	0.9594	46.828
90	271.68	23.8	280.0	25.0	8.97	0.9658	46.214
Average						0.9661	48.255

Remark : Yi $\leq \pm 0.02$ from average
Yi = 1.00 \pm 0.05
 $\Delta H@ \leq \pm 5.03$ mm.H₂O from average
 $\Delta H@ = 46.7 \pm 6.4$ mm.H₂O

Checked By : _____

Position : Store Manager
Date : 09/10/2023

Approved By : _____

Position : Technical Manager
Date : 09/10/2023

VERIFIED

DATE Oct 26, 2023



Temperature Display Verification

Dry Gas Meter ID. : ENSS 039 Date of Calibration : 8/10/2023
Instrument Brand : Apex / Model 572 Calibrated By : MW

Temperature Simulator Information

Simulator Brand : Handy Cal Simulator S/N : T111015
Simulator Model : CA11E Expire Date : 11/07/2024

Standard Value	Instrument Display				
	Stack	Probe	Filter	Aux	Exit
300	301	300	300	301	-
200	200	200	201	200	-
150	150	151	150	151	-
100	100	100	101	101	101
50	50	51	50	50	49
0	0	0	0	0	0
Difference	0.1 %	1.0	1.0	1.0	1.0

Remark : Stack $\leq \pm 1.5$ % Absolute
Probe $\leq \pm 3.0$ °C
Filter $\leq \pm 3.0$ °C
Aux $\leq \pm 3.0$ °C
Exit $\leq \pm 3.0$ °C

Checked By : _____

Position : Store Manager
Date : 09/10/2023

Approved By : _____

Position : Technical Manager
Date : 09/10/2023

VERIFIED

DATE Oct 26, 2023



Manometer Verification

Dry Gas Meter ID : ENSS 039 Date of Calibration : 8/10/2023
Instrument Brand : Apex / Model 572 Calibrated By : MW

Magnetic gauge Information

Magnetic Brand : Dwyer Industries, Inc. Magnetic S/N : R060822A1109
Magnetic Model : 20C0-100MM Expire Date : 2/10/2024

Manometer data				
Tes. No.	Manometer Reference ΔP (mm.H ₂ O) A	Manometer monitoring ΔP (mm.H ₂ O) B	Difference	Reference/Monitoring A/B
1	2.0	2.0	0.00	1.00
2	6.0	6.4	0.40	0.93
3	10.0	10.2	0.20	0.98
4	16.0	16.4	0.40	0.97
5	20.0	20.4	0.40	0.98
Average			0.28	0.97

Remark : $[\text{Reference(Avg)} / \text{Monitoring(Avg)}] \text{ must be } = 0.95 \text{ to } 1.05$

Checked By :

Position : Store Manager
Date : 09/10/2023

Approved By :

Position : Technical Manager
Date : 09/10/2023

VERIFIED

DATE Oct 26, 2023

คุณภาพอากาศในบรรยากาศ



Agilent Technologies (Thailand) Limited
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968 RAMA 4 ROAD, SILOM, BANGRAK
Bangkok 10500 Thailand

Tel. +662 637 6363
Fax: +662 632 4334
Email: ccc-smt@agilent.com
Website: www.agilent.com/chem

Service Confirmation Number: 6904997715

Service Confirmation Date: 28.06.2023

Customer Contact:

SGS (Thailand) Limited
Branch 00003
1/209 1/211 Moo 1 T Bangchang
A Banchang
RAYONG 21130
TAX ID : 0105532106079

SERVICE REPORT

Customer Purchase Order Number:	Customer Number: 70205138
Service Request:	Service Request Date:
Service Order: 6006193099	Service Confirmation: 6904997715

Invoice To:

SGS (Thailand) Limited
Branch 00003
1/209 1/211 Moo 1 T Bangchang A
Banchang RAYONG 21130

Delivery Site:

SGS (Thailand) Limited
Branch 00003
1/209 1/211 Moo 1 T Bangchang
A Banchang
RAYONG 21130

Location:

Room
Bldg
Lab
Dept

Direct Inquiries to:

Contact Name: Customer Contact Center
Contact E-mail: ccc-smt@agilent.com
Contact Telephone: +662 637 6363
Contact Fax: +662 632 4334

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Tax ID : 0105542068218

Citibank N.A. Bangkok Branch
399 Interchange 21 Building, Sukhumvit Road, Klongtoey Nau
Sub-district, Wattana District, Bangkok 10110 Thailand
Acc. No: 012-4452-007 .
THB:Krung Thai Bank PCL
Siam Square Br.,416/1-2 Rama I Rd.,Pathumwan, BKK 10330
Thailand

ORIGINAL

Service Instrument:

Model Number	Model Description	Serial Number	System Handle	Parent Asset
SYS-GM-5973T	GCMS 5973 Turbo System			
G2579A	5973 Inert MSD Perform Turbo EI Mainfrm	US30965023		SYS-GM-5973T
G1530N	6890N Network GC System	CN10305014	G2004002	SYS-GM-5973T

Service Items:

Item	Service/Part #	Description	Qty	Entitlement	Service Start	Service End
1000	PM	Preventive Maintenance	1.00	Agreement Entitlement - 100 % covered	27.06.2023	27.06.2023
1010	5188-6496	QuickPick Split Vent + Inlet PM Kit	1.00	Agreement Entitlement - 100 % covered		
1020	5188-6497	QuickPick Splitless Inlet/Vent PM Kit	1.00	Agreement Entitlement - 100 % covered		
1030	5191-5851	Agilent Vacuum Fluid 45 Platinum, 1Qt	1.00	Agreement Entitlement - 100 % covered		
1050	G1099-80039	Oil Mist Filter, 3/8 BSP Male Threads	1.00	Agreement Entitlement - 100 % covered		

Additional Information:

Service Confirmation Number: 6904997715

Service Confirmation Date: 28.06.2023

Service Information:

Problem Description: NR-C-PM-GM5973-5001151743		
Service Provided: PM 6890N/5973 MSD. Clean source and replace all consumable parts.		
Service Overview Code: Reason Code: Scheduled Service Diagnosis Code: Scheduled Service Resolution Code: Scheduled Service		
Reported Hours: 5.0	Travel Hours: 2.0	
Customer Field Service Representative Name: [Redacted]	Customer Field Service Representative Signature: [Redacted]	Date: 28 Jun 2023
Customer Name: [Redacted]	Customer Signature: [Redacted]	Date: 28 Jun 2023
Additional Comments:		



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd

วันที่ : 8 กุมภาพันธ์ 2566

รายชื่ออุปกรณ์ / เครื่องมือ : SO₂ Analyzer

บริษัทผู้ผลิต : Teledyne API

รุ่นของอุปกรณ์ / เครื่องมือ : T100

หมายเลขอุปกรณ์ / เครื่องมือ : 1771

TEST VALUES			
API MODEL T100		BEFORE	AFTER
1	RANGE	50 - 20,000 PPB	500
2	STABILITY	≤ 1 PPE	0.0
3	PRESSURE	25 - 35 in - Hg-A	29.2
4	SAMPLE FLOW	650 ± 10% cc/min	623
5	PMT	mV	79.2
6	NORM PMT	mV	63.2
7	UV LAMP	1000 - 4800 mV	3942.1
8	LAMP RATIO	30 To 120 %	97.7
9	STRAY LIGHT	≤ 100 PPB	73.1
10	DARK PMT	-50 ± 200 % mV	47.5
11	DARK LAMP	-50 ± 200 % mV	4.6
12	SO ₂ SLOPE	1.0 ± 0.3	1.345
13	SO ₂ OFFSET	≤ 250 mV	135.7
14	HVPS	400 - 900 V	601
15	RX CELL TEMP	50 ± 1 °C	59.0
16	BOX TEMP	AMBIENT ± 5 °C	36.1
17	PMT TEMP	7 ± 2 °C	8.7
18	SO ₂ SAMPLE READING	PPB	0.1
19	OPTIC TEST	2000 ± 1000 mV	1123.8
20	ELECTRICAL TEST	2000 ± 1000 mV	1095.1
21	VOLTAGE TEST	+5 V -12 V +15 V -15 V	4.8 / 12.2 / 16.2 / -16.2
22	ZERO GAS	0.0C	-55.8
23	SPAN GAS	400.00 PPB	1024.3

หมายเหตุ

- ทำการเปลี่ยน Gintered Filter 1 ชิ้น, O-ring 2 ชิ้น, Spring 1 ชิ้น

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ :

เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทราภิเษก เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : info@kinetics.co.th

MULTI-POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd

EQUIPMENT NAME : SO₂ ANALYZER

MANUFACTURER : Teledyne - API

MODEL : T100

SERIAL NO : 1771

STANDARD GAS CONCENTRATION : 53.79 PPM

CYLINDER NO : CC745169

CYLINDER PRESSURE (psig) : 1550

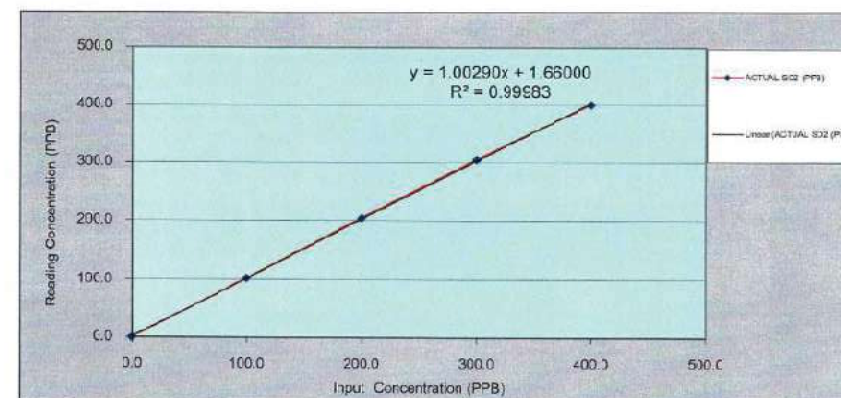
CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10, 2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	IDEAL (PPB)	ACTUAL SO ₂ (PPB)	ERROR SO ₂ (PPB)	% ERROR SO ₂
ZERO	0.0	0.0	0.0	-
1	100.0	102.3	2.3	2.3
2	200.0	204.0	4.0	2.0
3	300.0	304.6	4.6	1.5
4	400.0	400.3	0.3	0.1
AVERAGE (%)				1.5



CALIBRATED BY

ต้องการข้อมูลเพิ่มเติม

เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทราภิเษก เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : info@kinetics.co.th



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd.

วันที่ : 3 พฤษภาคม 2566

รายชื่ออุปกรณ์ / เครื่องมือ : SO₂ Analyzer

บริษัทผู้ผลิต : Teledyne API

รุ่นอุปกรณ์ / เครื่องมือ : T100

หมายเลขอุปกรณ์ / เครื่องมือ : 1385

TEST VALUES			
API MODEL: T100		BEFORE	AFTER
1	RANGE 50 - 20,000 PPB	500.0	500.8
2	SO ₂ STABILITY ≤ 1 PPB	0.2	0.3
3	PRESSURE 25 - 35 in - Hg-A	27.4	28.4
4	SAMPLE FLOW 700 ± 10% cc/min	663	667.9
5	PMT mV	89.1	26.7
6	NORM PMT mV	90.1	30.2
7	UV LAMP 1000 - 4800 mV	3779.6	3494.5
8	LAMP RATIO 30 To 120 %	101.4	93.8
9	STRAY LIGHT ≤ 100 PPB	24.7	12.5
10	DARK PMT -50 ± 200 % mV	18.6	35.1
11	DARK LAMP -50 ± 200 % mV	-3.9	0.7
12	SO ₂ SLOPE 1.0 ± 0.3	1.632	0.926
13	SO ₂ OFFSET < 250 mV	30.3	20.4
14	HVFS 400 - 900 V	605	615
15	RX CELL TEMP 50 ± 1 °C	50.0	56.0
16	BOX TEMP AMBIENT ± 5 °C	34.8	34.1
17	PMT TEMP 7 ± 2 °C	8.7	8.7
18	SO ₂ SAMPLE READING PPB	61.5	0.3
19	OPTIC TEST 2000 ± 1000 mV	1259.1	2154.5
20	ELECTRICAL TEST 2000 ± 1000 mV	1436.1	1926.4
21	VOLTAGE TEST +5 V +12 V +15 V -15 V	5.23/ 12.15/15.28/15.20	5.23/ 12.15/15.28/15.20
22	ZERO GAS 0.01 PPB	24.1	0.1
23	SPAN GAS 400.00 PPB	314.7	-01.2

หมายเหตุ

- ทำการเปลี่ยน Sintered Filter 1 ชิ้น, Spring 1 ชิ้น, O-ring 2 ชิ้น Sample Filter 47mm. 1 ชิ้น

VERIFIED

DATE May 11, 2023

ลงนามเจ้าหน้าที่ (Signature)

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ :

เลขที่ 388 ถนนวิภาวดีรังสิต แขวงจันทน์เกษม เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8996 E-Mail : info@kinetics.co.th

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd.

EQUIPMENT NAME : SO₂ Analyzer

MANUFACTURER : Teledyne - API

MODEL : T100

SERIAL NUMBER : 1385

STANDARD GAS CONCENTRATION (PPM) : 53.79

CYLINDER NO : CG745159

CYLINDER PRESSURE (PSIG) : 1450

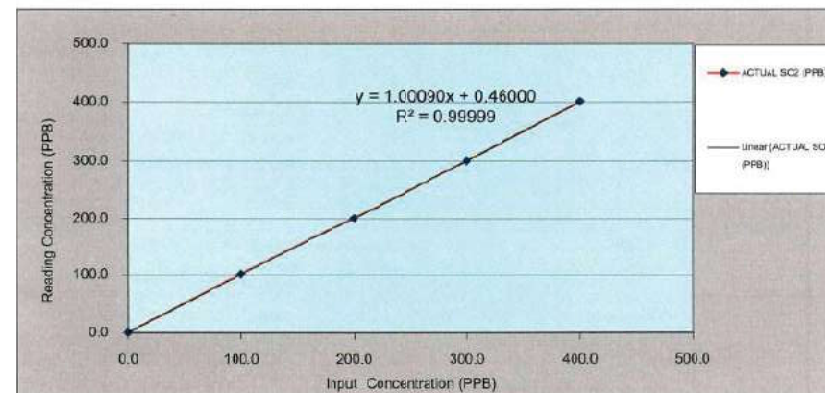
CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10, 2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	IDEAL (PPB)	ACTUAL SO ₂ (PPB)	ERROR SO ₂ (PPB)	% ERROR SO ₂
ZERO	0.00	0.1	0.09	0.00
1	100.0	101.0	1.00	1.00
2	200.0	201.0	1.00	0.50
3	300.0	300.1	0.10	0.03
4	400.0	401.0	1.00	0.25
AVERAGE (%)				0.00



CALIBRATED BY :

DATE : 03/05/2566

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิคเพิ่มเติม :

เลขที่ 388 ถนนวิภาวดีรังสิต แขวงจันทน์เกษม เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8996 โทรสาร : 0-2515-8996 E-Mail : info@kinetics.co.th

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04N199E15A0622 Reference Number: 160-402045691-1
Cylinder Number: CC745169 Cylinder Volume: 144.4 CF
Laboratory: 124 - Plumsteadville - PA Cylinder Pressure: 2015 PSIG
PGVP Number: A12021 Valve Outlet: 663
Gas Code: CO,NO,NOX,SO2,BALN Certification Date: Mar 10, 2021

Expiration Date: Mar 10, 2023

Certification performed in accordance with EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012) document EPA 600/R-12/031, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.
Do Not Use This Cylinder below 100 nsp, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	53.00 PPM	53.41 PPM	G1	+/- 1.1% NIST Traceable	01/03/2021, 03/10/2021
NITRIC OXIDE	53.00 PPM	53.41 PPM	G1	+/- 1.1% NIST Traceable	01/03/2021, 03/10/2021
SULFUR DIOXIDE	53.00 PPM	53.79 PPM	G1	+/- 0.9% NIST Traceable	01/03/2021, 03/10/2021
CARBON MONOXIDE	4500 PPM	4512 PPM	G1	+/- 0.6% NIST Traceable	03/04/2021
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	07360227	EB0079116	104.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Jul 23, 2023
PRM	12386	D665026	6.91 PPM AIR/NITROGEN DIOXIDE	2.0%	Feb 20, 2020
GMIS	124206889	CC323737	4.026 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Aug 15, 2021
NTRM	16010203	KAL003067	57.39 PPM SULFUR DIOXIDE/NITROGEN	+/-0.8%	Dec 23, 2021
NTRM	08012341	KAL004115	4857 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 07, 2024

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS LLTRAMAT 6 N1KD679	NDR	Feb 26, 2021
Nicolet S50 FTIR ALP201G245 NO	FTR	Feb 11, 2021
Nicolet S50 FTIR ALP201G245 NO2	FTR	Feb 22, 2021
Nicolet S50 FTIR ALP201G245 SO2	FTR	Feb 18, 2021

Trace Data Available Upon Request

NOTES:

Gross Weight: 28.1 Kg
Net Weight: 4.5 Kg



Approved for Release

Page 1 of 160-402045691-1

รายงานผลการตรวจและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หมายเลข : SGS (Thailand) Co., Ltd.

วันที่ : 1 มีนาคม 2566

รายชื่ออุปกรณ์ / เครื่องมือ : SO₂ Analyzer

บริษัทผู้ผลิต : Teledyne API

หมายเลขอุปกรณ์ / เครื่องมือ : T100

หมายเลขอุปกรณ์ / เครื่องมือ : 6200

TEST VALUES			
	API MODE: T100	BEFORE	AFTER
1	RANGE	50 - 20,000 PPB	500.0
2	SO ₂ STABILITY	≤ 1 PPE	0.21
3	PRESSURE	25 - 35 in - Hg-A	29.6
4	SAMPLE FLOW	700 ± 10% cc/min	702.7
5	PMT	mV	5.3
6	NORM PWT	mV	13.5
7	UV IAMP	1000 - 4800 mV	1615.4
8	LAMP RATIO	30 To 120 %	39.9
9	STRAY LIGHT	≤ 130 PPB	6.7
10	DARK PNT	-50 ± 200 %mV	50.0
11	DARK LAMP	-50 ± 200 %mV	1.1
12	SO ₂ SLOPE	1.0 ± 0.3	0.977
13	SO ₂ OFFSET	< 250 mV	0.054
14	HVPS	400 - 900 V	511
15	RX CELL TEMP	50 ± 1 °C	50.0
16	BOX TEMP	AMBIENT ± 3 °C	38.5
17	PMT TEMP	7 ± 2 °C	8.4
18	SO ₂ SAMPLE READING	PPB	1.574
19	OPTIC TEST	2000 ± 1000 mV	1443.7
20	ELECTRICAL TEST	2000 ± 1000 mV	1980.6
21	VOLTAGE TEST	+5 V +12 V +15 V -15 V	5.23V 12.15V 15.26V 15.20
22	ZERO GAS	0.00 PPB	-1.097
23	SPAN GAS	400.00 PPB	404.129

หมายเหตุ

- ทำการเปลี่ยน Sintered Filter 1 ชิ้น, Spring 1 ชิ้น, O-ring 2 ชิ้น

VERIFIED

DATE 16/03/2023

ลงนามเจ้าหน้าที่ (Signature)

ต้องการข้อมูลเพิ่มเติมทางอีเมล กรุณาติดต่อ :

เลขที่ 388 ถนนมิตรภาพ แขวงจันทระนารม เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : info@kinetics.co.th

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd.

EQUIPMENT NAME : SO₂ Analyzer

MANUFACTURER : Teledyne - API

MODEL : T100

SERIAL NUMBER : 0200

STANDARD GAS CONCENTRATION (PPM) : 53.79

CYLINDER NO : CC745169

CYLINDER PRESSURE (PSIG) : 1550

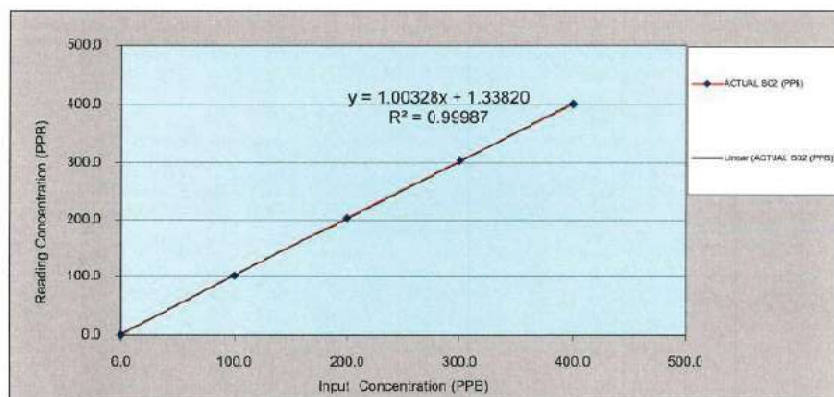
CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10, 2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	IDEAL (PPM)	ACTUAL SO ₂ (PPM)	ERROR SO ₂ (PPM)	% ERROR SO ₂
ZERO	0.000	0.004	0.368	0.000
1	100.000	101.675	1.375	1.375
2	200.000	203.804	3.804	1.902
3	300.000	304.008	4.008	1.336
4	400.000	400.475	0.475	0.119
AVERAGE (%)				0.010



CALIBRATED BY :

ตั้งการสอบเทียบ

เลขที่ 388 ถนนวิภาวดีรังสิต แขวงจันทน์ทร เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : info@kiretics.co.th



Airgas Specialty Gases
Airgas USA, L.L.C.
6141 Easton Road
Bldg 3
Plumsteadville, PA 18919
Airgascom

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04N99E16A0622

Reference Number: 163-402045691-1

Cylinder Number: CC745169

Cylinder Volume: 144.4 CF

Laboratory: 124 - Plumsteadville - PA

Cylinder Pressure: 2015 PSIG

PGVP Number: A12021

Valve Outlet: 663

Gas Code: CO, NO, NOX, SO₂, BALN

Certification Date: Mar 10, 2021

Expiration Date: Mar 10, 2029

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 610R-12/511, using the assay procedures listed. Analytical Methodologies listed not require correction for analytical interference. This cylinder has total analytical uncertainty as stated below with a confidence level of 91%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	03/03/2021, 03/10/2021
NITRIC OXIDE	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	03/03/2021, 03/10/2021
SULFUR DIOXIDE	53.00 PPM	53.79 PPM	G1	+/- 0.9% NIST Traceable	03/03/2021, 03/10/2021
CARBON MONOXIDE	4500 PPM	4512 PPM	G1	+/- 0.6% NIST Traceable	03/04/2021
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	07060227	EB079116	100.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Jul 23, 2023
PRM	12386	D865026	9.01 PPM AIR/NITROGEN DIOXIDE	2.0%	Feb 20, 2020
GMIS	124206889	CC323707	4.026 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Aug 15, 2021
NTRM	16010203	KAL003087	57.59 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Dec 23, 2021
NTRM	08012541	KAL004715	4817 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 07, 2024

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multi-point Calibration
SIEMENS LLTRAMAT 6 NIKO579	NDIR	Feb 26, 2021
Nicolet S50 FTIR ALP2010245 N2	FTIR	Feb 11, 2021
Nicolet S50 FTIR ALP2010245 N2	FTIR	Feb 22, 2021
Nicolet S50 FTIR ALP2010245 SO2	FTIR	Feb 18, 2021

Trace Data Available Upon Request

NOTES:

Gross Weight: 23.1 Kg

Net Weight: 4.6 Kg



Approved for Release



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd

รายชื่ออุปกรณ์ / เครื่องมือ : NO_x Analyzer

รุ่นของอุปกรณ์ / เครื่องมือ : T200

วันที่ : 24 กรกฎาคม 2563

บริษัทผู้ผลิต : Teledyne API

หมายเลขอุปกรณ์ / เครื่องมือ : 1652

TEST VALUES			
	API MODEL T200	BEFORE	AFTER
1	RANGE	50 - 20,000 PPB	500.0
2	STABILITY	≤ 1 PPB	0.1
3	SAMPLE FLOW	500 ± 10% cc/min	491
4	OZONE FLOW	50 ± 10% cc/min	50
5	PMT	nV	130.6
6	NORM PMT	mV	31.0
7	AZERO	20 To 150 MV	137.4
8	HPVS	400 - 900 V	749
9	RX CELL TEMP	50 ± 1 °C	50.0
10	BOX TEMP	AMBIENT ± 5 °C	26.3
11	PMT TEMP	1 ± 2 °C	6.8
12	MOLY TEMP	115 ± 5 °C	115.4
13	RX CELL PRESSURE	< 10 in - Hg-A	-3.0
14	SAMPLE PRESSURE	25 - 25 in - Hg-A	25.0
15	NOX SLOPE	1.0 ± 0.3	1.150
16	NOX OFFSET	50 To 150	3.0
17	NO SLOPE	1.0 ± 0.3	1.086
18	NO OFFSET	50 To 150	1.8
19	NO SAMPLE READING	PPB	2.3
20	NO2 SAMPLE READING	PPB	57.7
21	NOX SAMPLE READING	PPB	59.0
22	OPTIC TEST	2000 ± 1000 mV	2210.6
23	ELECTRICAL TEST	2000 ± 1000 mV	2507.9
24	VOLTAGE TEST	+5 V +12 V +15 V -15 V	5.26 / 12.33 / 15.82 / -15.21
25	ZERO GAS NO/NOX	0.00/0.00 PPB	-3.3 / -3.8
26	SPAN GAS NO/NOX	400.00/400.00 PPB	450.6 / 474.3

หมายเหตุ

- ทำการเปลี่ยน Sintered Filter 3 ชิ้น O-ring 6 ชิ้น Spring 3 ชิ้น
- ตรวจเช็คพบว่า Moly Temp Warning, Relay Board Warning, Ozone Gas และ Sample Flow ไม่สามารถวัดค่าได้ / แก้ไขเรียบร้อยแล้ว
- ทำการเปลี่ยน Pressure Sensor 0-15 PSIA จำนวน 1 ชิ้น

ลงนามเจ้าหน้าที่ (Signature)

VERIFIED

DATE Aug 07, 2020

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ

เลขที่ 368 ถนนรัชดาภิเษก แขวงจันทระนอก เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : info@kinetics.co.th

MULTI-POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd

EQUIPMENT NAME : NO_x Analyzer

MANUFACTURER : Teledyne - API

MODEL : T200

SERIAL NO. : 1652

STANDARD GAS CONCENTRATION (PPM) 53.40

CYLINDER NO : CC745169

CYLINDER PRESSURE (psig) : 1423

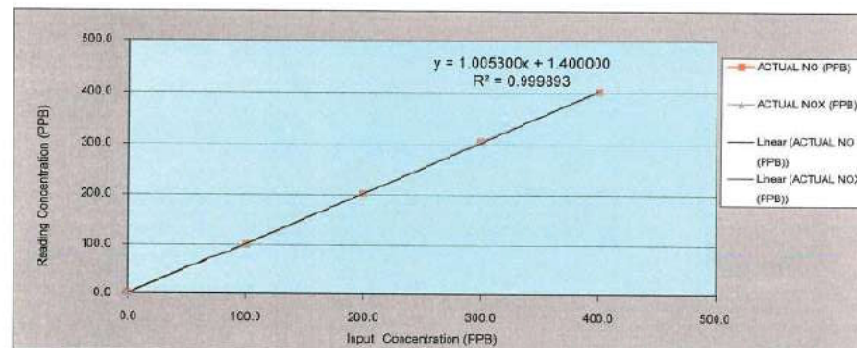
CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10, 2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS						
	IDEAL (PPB)	ACTUAL NO (PPB)	ERROR NO (PPB)	% ERROR NO	ACTUAL NO _x (PPB)	ERROR NO _x (PPB)	% ERROR NO _x
ZERO	0.0	0.5	0.5	-	0.9	0.9	-
1	100.0	101.0	1.0	1.0	101.7	1.7	1.7
2	200.0	202.2	2.2	1.1	202.5	2.5	1.3
3	300.0	305.4	5.4	1.8	305.6	5.6	1.9
4	400.0	401.4	1.4	-0.1	401.6	1.6	0.4
AVERAGE (%)				1.0			1.3



CALIBRATED BY :

ต้องการข้อมูลเพิ่มเติม

เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทระนอก เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8996 โทรสาร : 0-2515-8988 E-Mail : info@kinetics.co.th

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04N199E15A0622 Reference Number: 160-432045691-1
Cylinder Number: CC745169 Cylinder Volume: 144.4 CF
Laboratory: 124 - Plumsteadville - PA Cylinder Pressure: 2015 PSIG
PGVP Number: A12021 Valve Outlet: 660
Gas Code: CO,NO,NOX,SO2,BALN Certification Date: Mar 10, 2021

Expiration Date: Mar 10, 2026

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 820/R-12/001, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Do Not Use This Cylinder below 110 psig (i.e. 0.7 megapascals).

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	01/03/2021, 03/10/2021
NITRIC OXIDE	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	01/03/2021, 03/10/2021
SULFUR DIOXIDE	53.00 PPM	53.79 PPM	G1	+/- 0.9% NIST Traceable	01/03/2021, 03/10/2021
CARBON MONOXIDE	4500 PPM	4512 PPM	G1	+/- 0.6% NIST Traceable	03/04/2021
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	07060227	EB0709116	100.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Jul 23, 2023
PRM	12386	D865025	9.91 PPM AIR/NITROGEN DIOXIDE	2.0%	Feb 20, 2020
GMIS	124206889	CC123707	4.026 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Aug 15, 2021
NTRM	16010203	KAL003087	97.99 PPM SULFUR DIOXIDE/NITROGEN	+/-0.8%	Dec 23, 2021
NTRM	08012541	KAL004115	4817 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 07, 2024

The SRM, PRM or RGM noted above is only in reference to the GMI/USec in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multi-point Calibration
SIEMENS LLTRAMAT 6 N1KD579	NDR	Feb 26, 2021
Nicolet S50 FTIR ALP2010245 NO	FTR	Feb 11, 2021
Nicolet S50 FTIR ALP2010245 NO2	FTR	Feb 22, 2021
Nicolet S50 FTIR ALP2010245 SO2	FTR	Feb 16, 2021

Trace Data Available Upon Request

NOTES:

Gross Weight: 23.1 Kg
Net Weight: 4.5 Kg



Approved for Release

Page 1 of 160-432045691-1

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd

วันที่ : 29 มิถุนายน 2565

รายชื่ออุปกรณ์ / เครื่องมือ : NOx Analyzer

บริษัทผู้ผลิต : Telsdyne API

หมายเลขอุปกรณ์ / เครื่องมือ : T200

หมายเลขอุปกรณ์ / เครื่องมือ : 2975

TEST VALUES			
API MODEL T200		BEFORE	AFTER
1	RANGE	50 - 20,000 PPB	500.0
2	STABILITY	< 1 PPB	0.1
3	SAMPLE FLOW	500 ± 10% cc/min	488
4	OZONE FLOW	80 ± 10% cc/min	76
5	PMT	nV	457.0
6	NORMPMT	nV	510.9
7	A ZERO	-10 To 150 MV	270.7
8	HPVS	400 - 900 V	795
9	RX CELL TEMP	50 ± 1 °C	50.0
10	BOX TEMP	AMBIENT ± 5 °C	34.7
11	PMT TEMP	7 ± 2 °C	7.5
12	MOLY TEMP	315 ± 5 °C	313.9
13	RX CELL PRESSURE	<10 in - Hg-A	9.6
14	SAMPLE PRESSURE	25 - 35 in - Hg-A	28.3
15	NOX SLOPE	1.0 ± 0.3	1.519
16	NOX OFFSET	-40 To 150	250.5
17	NO SLOPE	1.0 ± 0.3	1.320
18	NO OFFSET	-30 To 150	257.0
19	NO SAMPLE READING	PPB	156.0
20	NO2 SAMPLE READING	PPB	47.1
21	NOX SAMPLE READING	PPB	202.4
22	OPTIC TEST	2000 ± 1000 nV	1680.4
23	ELECTRICAL TEST	2000 ± 1000 nV	2096.6
24	VOLTAGE TEST	+5 V +12 V +5 V -15 V	5.28 / 12.21 / 15.73 / -15.17
25	ZERO GAS NO/NOx	0.00% / 0.00 PPB	134.2 / 153.1
26	SPAN GAS NO/NOx	400.00 / 400.00 PPM	652.5 / 739.8

หมายเหตุ

- ทำการเปลี่ยน Sintered Filter 1 ชิ้น, O-ring 2 ชิ้น, Spring 1 ชิ้น
- ตรวจเช็คพบว่า A ZERC WARNING เนื่องจากหลอด PMT เสื่อมสภาพ ที่มีการเปลี่ยน หลอด CD PMT 1 หลอด

VERIFIED

DATE Jun 30, 2021

ลงนามเจ้าหน้าที่ (Signature)

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ

เลขที่ 368 ถนนศรีนครินทร์ แขวงจันทรมงคล เขตคลองจั่น กรุงเทพมหานคร 10110 โทรศัพท์ : 0-2615-8999 โทรสาร : 0-2615-8988 E-Mail : info@kinetics.co.th

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd

EQUIPMENT NAME : NO_x Analyzer

MANUFACTURER : Teledyne - API MODEL : T200

SERIAL NO : 2975

STANDARD GAS CONCENTRATION (PPM) : 53.40

CYLINDER NO : CC745169

CYLINDER PRESSURE (psig) : 1100

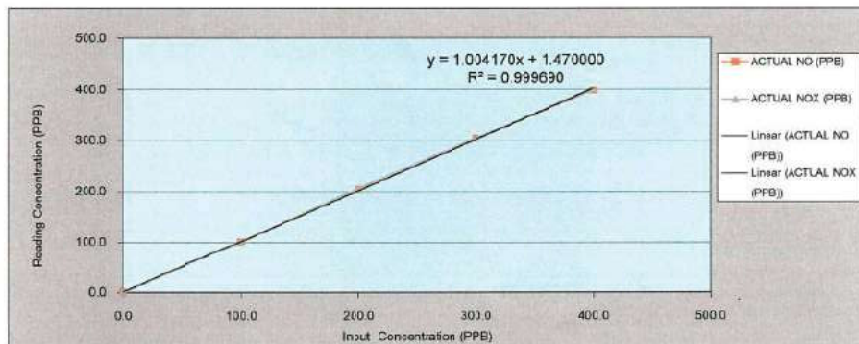
CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRE DATE : Mar 10, 2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS						
	IDEAL (PPB)	ACTUAL NO (PPB)	ERROR NO (PPB)	% ERROR NO	ACTUAL NO _x (PPB)	ERROR NO _x (PPB)	% ERROR NO _x
ZERO	0.0	0.1	0.1	-	0.1	0.1	-
1	100.0	100.5	0.5	0.5	107.5	0.5	0.5
2	200.0	204.2	4.2	2.1	203.2	6.2	3.1
3	300.0	304.1	4.1	1.4	304.6	4.6	1.5
4	400.0	399.1	-0.86	-0.1	403.1	0.1	0.0
AVERAGE (%)				1.0			1.3



CALIBRATED BY:

Signature of Calibration Technician

เลขที่ 385 ถนนรัชดาภิเษก แขวงจันทราภิรม เขตจตุจักร กรุงเทพฯ 10300 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : info@kinetics.co.th

KINETICS
Environmental Science Business Unit

Customer service report

บริษัท เคส จี เอส (ประเทศไทย) จำกัด

Manufacturer

Equipment

Model

Teledyne API

NO_x Analyzer

T200

S/N

Quotation

2975

Q-B2-2023-125-SV

• Checking Date •

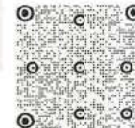
29/6/2023

• Problem

- ตรวจเช็คพบว่าเครื่องมีอาการ A ZERO WARNING เนื่องจากหลอด CD PMT เสื่อมสภาพ



B2



contact us



• Correlation working / Remark

1. ทำการเปลี่ยน หลอด CD PMT
2. ทำการเปลี่ยนวัสดุชิ้นปะเก็น Sintered Filter , O-ring , Spring
3. จากการทดสอบการลองใช้งานเครื่อง *เครื่องสามารถทำงานปกติ

• Repair parts •

Sintered Filter 1 ชิ้น , O-ring 2 ชิ้น , Spring 1 ชิ้น

ASSY, PMT, LOW DARK CURR/HI GAIN, NO_x Ultra / FN:022890030 จำนวน 1 ชิ้น

Technician / Engineer

Signature of Technician / Engineer

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04NI69E15A0622 Reference Number: 160-402045691-1
Cylinder Number: CC745169 Cylinder Volume: 144.4 CF
Laboratory: 124 - Plumsteadville - PA Cylinder Pressure: 2015 PSIG
PGVP Number: A12021 Valve Outlet: 660
Gas Code: CO,NO,NOX,SO2,BALN Certification Date: Mar 10, 2021
Expiration Date: Mar 10 2029

Certification performed in accordance with EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (Mar 2012) document EPA 800/R-11/331, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of the calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.
Do Not Use This Cylinder below 100 psig, i.e. 6.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	03/03/2021, 03/10/2021
NITRIC OXIDE	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable	03/03/2021, 03/10/2021
SULFUR DIOXIDE	53.00 PPM	53.79 PPM	G1	+/- 0.9% NIST Traceable	03/03/2021, 03/10/2021
CARBON MONOXIDE	4500 PPM	4512 PPM	G1	+/- 0.5% NIST Traceable	03/04/2021
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	07060227	EB00791-6	100.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Jul 23, 2023
PRM	12386	D685026	9.91 PPM AIR/NITROGEN DIOXIDE	2.0%	Feb 20, 2020
GMIS	124208886	CC32370*	4.023 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Aug 15, 2021
NTRM	16010203	KAL033047	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Dec 23, 2021
NTRM	08012341	KAL04716	4857 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 27, 2024

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 NIKD679	NDIR	Feb 26, 2021
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Feb 11, 2021
Nicolet iS50 FTIR AUP2010245 NO2	FTIR	Feb 22, 2021
Nicolet iS50 FTIR AUP2010245 SO2	FTIR	Feb 18, 2021

Trace Data Available Upon Request

NOTES:

Gross Weight: 28.1 Kg
Net Weight: 46 Kg



Approved for Release

Page 1 of 160-402045691-1

รายงานผลการสอบและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd.

วันที่ : 27 กุมภาพันธ์ 2566

รายชื่ออุปกรณ์ / เครื่องมือ : NOx Analyzer

บริษัทผู้ผลิต : Teledyne API

รุ่นของอุปกรณ์ / เครื่องมือ : T200

หมายเลขอุปกรณ์ / เครื่องมือ : 7533

TEST VALUES			
API MODEL T200		BEFORE	AFTER
1	RANGE	50 - 20,000 PPF	500.0
2	STABILITY	≤ 1 PPF	0.04
3	SAMPLE FLOW	500 ± 10% cc/min	498
4	QZDNEFLOW	80 ± 10% cc/min	89
5	PMT	mV	27.0
6	NORM PMT	mV	0.8
7	A ZERO	-20 To 150 mV	28.0
8	HPVS	400 - 900 V	660
9	RXCCEL TEMP	50 ± 1 °C	48.3
10	BOX TEMP	AMBIENT ± 5 °C	32.3
11	PMT TEMP	7 ± 2 °C	6.8
12	MOLY TEMP	315 ± 5 °C	315.2
13	RXCCEL PRESSURE	<10 in - Hg-A	7.7
14	SAMPLE PRESSURE	25 - 35 in - Hg-A	28.9
15	NOK SLOPE	1.0 ± 0.3	1.295
16	NOK OFFSET	-50 To 150	6.0
17	NOSLOPE	1.0 ± 0.3	1.503
18	NOOFFSET	-50 To 150	-1.2
19	NO SAMPLE READING	PPFB	15.5
20	NO2 SAMPLE READING	PPFB	25.5
21	NOK SAMPLE READING	PPFB	42.5
22	OPTIC TEST	2000 ± 1000 mV	1769.2
23	ELECTRICAL TEST	2000 ± 1000 mV	2040.1
24	VOLTAGE TEST	+5 V +12 V +15 V -15V	5.12/12.13/15.10/-15.32
25	ZERO GAS NO/NOx	0.00/0.00 PPF	-6.9/-7.7
26	SPAN GAS NO/NOx	400.00/400.00 PPF	394.8/393.0

หมายเหตุ

- ทำการเปลี่ยน Solenoid Filter 3 ชิ้น Spring 3 ชิ้น O-ring 5 ชิ้น

VERIFIED

DATE Mar 07 2023

ลงนามเจ้าหน้าที่ (Signature)

ต้องการข้อมูลเพิ่มเติมทางเทคนิค กรุณาติดต่อ :

เจ้าหน้าที่ 302 ณรงค์วิเศษ แสงวงษ์กรเกษม เขตอุตสาหกรรม กรุงเทพฯ 10900 โทรศัพท์ : 0-26 5-8999 โทรสาร : 0-2615-8189 E-Mail : info@kinetics.co.th

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd.

EQUIPMENT NAME : NO_x Analyzer

MANUFACTURER : Teledyne - API

MODEL : T200

SERIAL NO : 7533

STANDARD GAS CONCENTRATION (PPM) : 5340

CYLINDER NO : C0745169

CYLINDER PRESSURE (psig) : 1550

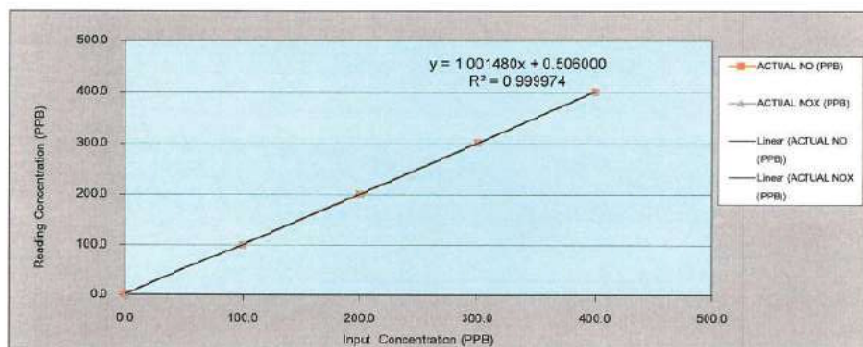
CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10, 2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS						
	IDEAL (PPB)	ACTUAL NO (PPB)	ERROR NO (PPB)	% ERROR NO	ACTUAL NO _x (PPB)	ERROR NO _x (PPB)	% ERROR NO _x
ZERO	0.0	1.0	0.0	0.0	0.0	0.1	0.0
1	100.0	99.8	-0.2	-0.2	100.3	0.3	0.3
2	200.0	200.0	-0.7	0.3	201.0	1.0	0.5
3	300.0	311.1	1.1	0.4	302.1	2.1	0.7
4	400.0	399.9	-0.1	0.0	400.1	0.1	0.0
AVERAGE (%)				0.0			0.0



CALIBRATED BY :

ชื่อการอนุมัติทางตัว

เลขที่ 335 ถนนศรีนครินทร์ แขวงจันทราภิบาล เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8900 โทรสาร : 0-2515-3686 E-Mail : info@kinetics.co.th

Airgas
an Air Liquide companyAirgas Specialty Gases
Airgas USA, LLC
6141 Easton Road
31dgt
Plumsteadville, PA 18949
airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04N09E15A0622

Cylinder Number: C0745169

Laboratory: 124 - Plumsteadville - PA

PGVP Number: A12021

Gas Code: CO,NO,NO_x,SO₂,BALN

Reference Number: 160-402045691-1

Cylinder Volume: 144.4 CF

Cylinder Pressure: 2015 PSIG

Valve Outlet: 660

Certification Date: Mar 10, 2021

Expiration Date: Mar 10, 2026

Certification performed in accordance with EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012) document EPA 800/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig i.e. 6.7 megapascals.

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
NO _x	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable
NITRIC OXIDE	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable
SULFUR DIOXIDE	53.00 PPM	53.79 PPM	G1	+/- 0.9% NIST Traceable
CARBON MONOXIDE	4800 PPM	4512 PPM	G1	+/- 0.6% NIST Traceable
NITROGEN	Balance			03/04/2021

CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Uncertainty
NTRM	07060227	EB070116	100.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%
PRM	12386	D615025	9.51 PPM AIR/NITROGEN DIOXIDE	2.0%
GMIS	124206889	CC123707	4.028 PPM NITROGEN DIOXIDE/NITROGEN	2.1%
NTRM	16010203	KAL003267	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%
NTRM	08012341	KAL004716	4857 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%

The SRM, PRM or RGM noted above is only in reference to the GMIS used in the assay and not part of the analysis.

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1KD579	NDIR	Feb 26, 2021
Nicolet S50 FTIR ALP2010245 NO	FTIR	Feb 11, 2021
Nicolet S50 FTIR ALP2010245 NO ₂	FTIR	Feb 12, 2021
Nicolet S50 FTIR ALP2010245 SO ₂	FTIR	Feb 18, 2021

Tried Data Available Upon Request

NOTES:

Gross Weight: 25.1 Kg

Net Weight: 4.5 Kg



Approved for Release

Page 1 of 160-402045691-1



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.



รายงานผลการสอบและเปรียบเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd

วันที่ : 7 กุมภาพันธ์ 2565

รายชื่ออุปกรณ์ / เครื่องมือ : NO_x Analyzer

บริษัทผู้ผลิต : Teledyne API

รุ่นของอุปกรณ์ / เครื่องมือ : T200

หมายเลขอุปกรณ์ / เครื่องมือ : 7533

TEST VALUE3			
API MODEL T200		BEFORE	AFTER
1	RANGE	50 - 21,000 PPB	500
2	STABILITY	≤ 1 PPB	0.12
3	SAMPLE FLOW	500 ± 10% cc/min	496
4	OZONE FLOW	80 ± 10% cc/min	81
5	PMT	mV	9.8
6	NORM PMT	mV	-33.4
7	A ZERO	-10 To 150 MV	45.2
8	HFVS	400 - 300 V	660
9	RX CELL TEMP	50 ± 1 °C	50.3
10	BOX TEMP	AMBIENT ± 5 °C	33.4
11	PMT TEMP	7 ± 2 °C	6.8
12	MOLY TEMP	315 ± 5 °C	313.9
13	RX CELL PRESSURE	<10 in - Hg-A	4.1
14	SAMPLE PRESSURE	25 - 35 in - Hg-A	28.6
15	NOX SLOPE	1.0 ± 0.3	0.992
16	NOX OFFSET	-50 To 150	-5.4
17	NO SLOPE	1.0 ± 0.3	0.966
18	NO OFFSET	-50 To 150	-6.4
19	NO SAMPLE READING	PPB	-12.7
20	NO2 SAMPLE READING	PPB	6.8
21	NOX SAMPLE READING	PPB	-3.8
22	OPTIC TEST	2000 ± 1000 mV	2249
23	ELECTRICAL TEST	2000 ± 1000 mV	2039
24	VOLTAGE TEST	+5 V +12 V +15 V -15 V	-
25	ZERO GAS NO/NO _x	0.00/0.00 PPB	-9.1/-7.1
26	SPAN GAS NO/NO _x	400.0/400.00 PPB	378.5 / 326.6

หมายเหตุ



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด



ลงนามเจ้าหน้าที่ (Signature)

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ

เลขที่ 388 ถนนวิภาวดีเอก แขวงจันทเขมา เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8888 E-Mail : info@kinetics.co.th



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2894, 0-2399-0469

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 29 June, 2023

Certification No. 245/23

Page : 1 of 6

Object : Precision Weather Station

Manufacturer : Davis Instruments

Type : Vantage Pro 2 Model No. : 6152C

Mfg Code : Display AZ170619022 Transmitter AZ170619022

Customer : SGS (Thailand) Limited.
100 Nanglinchee Road, Chongnonsi,
Yarnawa, Bangkok 10120.

VERIFIED

DATE: 29 Jun, 2023

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1008.7 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90A+)
Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

STANDARD THERMOMETER : Theodor Friedrich : Dry No. 8390/94 Wet No. 8389/94
: Thermoschneider No. 9186 : testco, testco 645 Serial No. 02642057

STANDARD BAROMETER : Digital Type PTB220 No. A1220015

(Authorized Signatory)

for the Chief

Sub-Standard Instrument

Mechanical Engineer



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2894, 0-2399-0469

The Result of Calibration

Certification No. 245/23

29 June, 2023

Page : 2 of 6

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H2O	Vacuum inches H2O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	0.9	0.10
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.9	0.10
7.00	-	-	-	6.7	0.30
9.02	-	-	-	8.9	0.12
11.01	-	-	-	10.7	0.31
13.01	-	-	-	13.0	0.01
15.01	-	-	-	14.7	0.31
17.02	-	-	-	17.0	0.02
20.02	-	-	-	19.3	0.72

Wind Aloft Plotting Board.

U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU

WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibration & Test Section

Meteorological Instruments Bureau

Mechanical Engineer



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 0-2395-0156,0-2399-0469

The Result of Calibration

Certification No. 245/23

29 June, 2023

Page : 3 of 6

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
759.94	751.3	-1.35
760.13	751.6	-1.47
760.67	752.1	-1.43
760.73	762.2	-1.47
757.28	756.6	-1.32
757.34	756.7	-1.35
757.52	756.0	-1.48
757.79	756.1	-1.31
758.13	756.4	-1.30
758.15	756.5	-1.34
758.63	760.0	-1.34
758.47	756.9	-1.43
758.55	760.0	-1.44
758.75	760.2	-1.45
758.98	760.4	-1.42
759.35	760.7	-1.34
759.54	757.9	-1.35
756.63	756.0	-1.34
757.00	756.4	-1.40
757.15	756.5	-1.35

Average



Mechanical Engineer



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804,0-2399-0469

The Result of Calibration

Certification No. 245/23

29 June, 2023

Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.5	45.5	0.0
30.2	30.1	0.1
15.2	15.4	-0.2

Mechanical Engineer





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. (81-454-2804,0-2399-0469

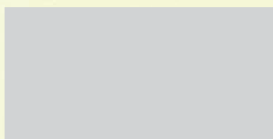
The Result of Calibration

29 June, 2023

Certification No. 245/23

Page : 5 of 5

Standard Humidity % R.H.	Relative Humidity Sensor - Reading	
	Reading % R.H.	Correction % R.H.
82.45	84	-1.55
63.66	63	0.66
46.32	45	1.32



Mechanical Engineer



Date of Issue 29 June, 2023

Certification No. 245/23

Page : 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ชื่อ Davis Instruments แบบ TIPPING
BUCKET Product No. 6152 C Mfg. Code. AZ170619022 ทำการสอบเทียบกับแก้ว
ฝนแบบแก้วดวง GAUGE DIAMETER 8.0 INCHES , NEGRETTI & ZAMBRA
LONDON No 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของ
เครื่องมือ (0.01 in/ TIP)



วิศวกรชำนาญการ

ENG 1916



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2359-0469

Calibration Certificate

Issued by: Calibration & Test Section: Meteorological Instruments Bureau

Date of Issue: 1 February, 2023

Certification No. 044/23

Page: 1 of 6

Object: Precision Weather Station

Manufacturer: Davis Instruments

Type: Vantage Pro 2 Model No.: 61520

Mfg Code: Display AZ170819046 Transmitter: AZ170819046

Customer: SGS (Thailand) Limited,
100 Nanglinchee Road, Chongnonsi,
Yarnawa, Bangkok 10120.

VERIFIED

DATE Feb 02, 2023

Calibration Condition: Temperature 25.1 °C Barometric Pressure 1014.2 hPa

NATIONAL STANDARD WIND TUNNEL: Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90A1-)
Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

STANDARD THERMOMETER: Theodor Friedrich: Dry No. 8390/94 Wet No. 8389/94

: ThermoSchneider No. 9156 : test, test 645 Serial No. 02642057

STANDARD BAROMETER: Di : Type PTB220 No. V1220015

Mechanical Engineer

(Authorized Signatory)
for the Chief
Sub-Standard Instrument



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2359-0469

The Result of Calibration

Certification No. 044/23

1 February, 2023

Page: 2 of 6

Standard	HOOK GAGE NO. 425			TESTED ANEMOMETER	
Ultrasonic Anemometer	Pressure	Vacuum	Velocity	Velocity	Correction
m/sec	inches H2O	inches H2O	m/sec	m/sec	m/sec
1.00	-	-	-	0.9	0.10
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.9	0.10
7.00	-	-	-	6.8	0.20
9.02	-	-	-	9.0	0.02
11.01	-	-	-	10.8	0.21
13.01	-	-	-	13.0	0.01
15.01	-	-	-	14.8	0.21
17.02	-	-	-	17.1	-0.08
20.02	-	-	-	19.8	0.22

Wind Aloft Plotting Board.

U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU

WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 0-2395-0156,0-2399-0469

The Result of Calibration

Certification No. 044/23

1 February, 2023

Page : 3 of 6

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
757.81	756.5	-0.69
757.15	757.9	-0.75
757.04	756.4	-0.75
756.27	756.1	-0.83
756.66	759.4	-0.74
756.94	758.8	-0.86
759.11	760.0	-0.89
759.84	760.7	-0.86
759.95	760.8	-0.85
759.73	760.6	-0.87
759.90	760.6	-0.84
760.14	760.8	-0.66
760.42	761.2	-0.78
760.70	761.4	-0.70
762.03	762.6	-0.77
762.24	763.0	-0.76
761.79	762.5	-0.71
761.48	762.2	-0.72
759.71	760.5	-0.79
760.28	761.0	-0.72

Average

-0.78

Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804,0-2399-0469

The Result of Calibration

Certification No. 044/23

1 February, 2023

Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.1	45.4	-0.3
30.6	30.7	-0.2
15.2	15.3	-0.1

Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. (81-454-2804, 0-2399-0465

The Result of Calibration

Certification No. 044/23

1 February, 2023

Page : 5 of 5

Standard Humidity %R.H.	Relative Humidity Sensor Reading	
	Reading % R.H.	Correction % R.H.
86.52	83	3.52
02.14	56	3.14
46.25	44	2.25



Mechanical Engineer



Date of Issue 1 February, 2023

Certification No. 044/23

Page : 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ชื่อ Davis Instruments แบบ TIPPING
BUCKET Product No. 6152 C Mfg No. AZ170619046 ทำการสอบเทียบกับแก้ว
ฝนแบบแก้วตวง GAUGE DIAMETER 8.0 INCHES , NEGRETTI & ZAMBRA
LONDON No 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของ
เครื่องมือ (0.01 in/ TIP)



วิศวกรชำนาญการ


THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 29 June, 2023

Certification No. 248/23

Page : 1 of 6

Object : Precision Weather Station

Manufacturer : Davis Instruments

Type : Vantage Pro 2 Model No. : 6152C

Mfg Code : Display BD190415078 Transmitter BD190415078

 Customer : SGS (Thailand) Limited,
100 Nanglnchee Road, Chongnorsri,
Yamawa, Bangkok 10120.


Calibration Condition : Temperature 25.1 °C Barometric Pressure 1007.1 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

N.I.S.T. Test Reference Number 73-241460 : Standard Velocity at 20 - 30 m/sec

 : Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)
Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

STANDARD THERMOMETER : Theodor Friedrich : Dry No. 8390/94 Wet No. 6389/94

: Thermoschneider No. 9188 : testo, testo 643 Serial No. 02848057

STANDARD BAROMETER : Digit : Type PTB220 No. V122C015

Mechanical Engineer

(Authorized Signatory)

for the Chief

Sub-Standard Instrument


THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469

The Result of Calibration

Certification No. 248/23

29 June, 2023

Page : 2 of 6

Standard Ultrasonic Anemometer	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Velocity	Velocity	Correction
	m/sec	inches (H2O)	m/sec	m/sec	m/sec
1.00	-	-	-	0.9	0.10
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.9	0.10
7.00	-	-	-	6.7	0.30
9.02	-	-	-	8.9	0.12
11.01	-	-	-	10.7	0.31
13.01	-	-	-	13.0	0.01
15.01	-	-	-	14.7	0.31
17.02	-	-	-	17.0	0.02
20.02	-	-	-	19.3	0.72

Wind Aloft Plotting Board.

U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU

WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Mechanical Engineer

Calibration & Test Section

Meteorological Instruments Bureau



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 0-2395-0156,0-2399-0469

The Result of Calibration

Certification No. 248/23

29 June, 2023

Page : 3 of 6

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
759.94	761.0	-1.06
790.13	761.3	-1.17
780.67	761.7	-1.03
780.73	761.8	-1.07
757.28	756.2	-0.92
757.34	756.4	-1.06
757.52	756.6	-1.08
757.79	756.8	-1.01
758.10	759.2	-1.10
758.16	759.4	-1.24
758.66	759.8	-1.14
758.47	759.5	-1.03
758.55	759.6	-1.04
756.75	759.8	-1.05
756.98	760.1	-1.12
759.35	760.4	-1.04
756.54	757.5	-0.96
756.66	757.8	-1.14
757.00	758.1	-1.10
757.15	758.3	-1.15

Average

-1.07

Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804,0-2399-0465

The Result of Calibration

Certification No. 248/23

29 June, 2023

Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.5	45.7	-0.2
30.2	30.1	0.1
15.2	15.3	-0.1

Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. (81-454-2804, 0-2399-0465

The Result of Calibration

Certification No. 248/23

29 June, 2023

Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading % R.H.	Correction % R.H.
82.45	84	-1.55
63.65	64	-0.45
46.32	46	0.32

Mechanical Engineer



Date of issue 29 June, 2023

Certification No. 248/23

Page : 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ชีห้อ Davis Instruments แบบ TIPPING
BUCKET Product No. 6152 C Mfg. Code. BD190415078 ทำการสอบเทียบกับแก้ว
ฝนแบบแก้วตวง GAUGE DIAMETER 8.0 INCHES , NEGRETTI & ZAMBRA
LONDON No 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของ
เครื่องมือ (0.01 in / TIP)



วิศวกรชำนาญการ

คุณภาพน้ำ

Mettler-Toledo (Thailand) Ltd.
846/4 - 846/5 Lasalle Rd., Bangna Tai Sub-District
Bangna District, Bangkok 10260
+66 2723 0382
MT-TH.ServiceSupport@mt.com



Accuracy Calibration Certificate

Customer

Company: SGS (Thailand) Co., Ltd.
Address: 1/209, 1/211 Moo 1, Ban Chang
City: Ban Chang Contact:
Zip / Postal: 21130
State / Province: Rayong
Order Number:

Weighing Device

Manufacturer: Mettler Toledo Instrument Type: Weighing Instrument
Model: XS205DU Asset Number: N/A
Serial No.: B036065880 Terminal Model: SAT
Building: LABORATORY Terminal Serial No.: B036065880
Floor: 1 Terminal Asset No.: N/A
Room: Balance Lab

Range	Max. Capacity	Readability (d)
1	81 g	0.00001 g
2	220 g	0.0001 g

Procedure

Calibration Guideline: EURAMET cg-18 v. 4.0 (11/2015)
METTLER TOLEDO Work Instruction: CP/W002/20

This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found.

The sensitivity/span of the weighing instrument was adjusted before calibration with a built-in weight.

In accordance with EURAMET cg-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

	Temperature		Humidity	
As Found	Start: 21.0 °C	End: 20.7 °C	Start: 43.7 %	End: 46.0 %

As Found Calibration Date: 14-Mar-2024 Calibrator:
As Left Calibration Date: N/A
Issue Date: 14-Mar-2024
Approved Signatory:
Technical Manager / Head of Calibration Center

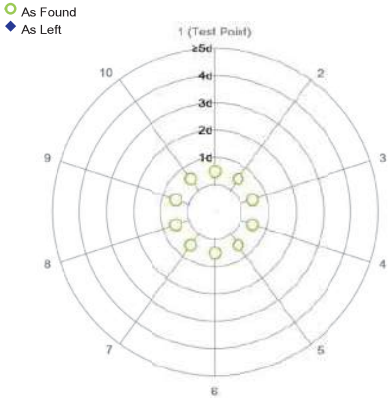
Measurement Results

Repeatability

Test Load: 70 g

	As Found	As Left
1	69.99997 g	N/A
2	69.99996 g	N/A
3	69.99996 g	N/A
4	69.99997 g	N/A
5	69.99996 g	N/A
6	69.99996 g	N/A
7	69.99996 g	N/A
8	69.99997 g	N/A
9	69.99997 g	N/A
10	69.99997 g	N/A

Standard Deviation	0.000005 g	N/A
--------------------	------------	-----



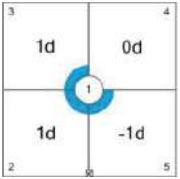
The "d" in the graph represents the readability of the range/interval in which the test was performed.
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	100.0000 g	N/A
2	100.0001 g	N/A
3	100.0001 g	N/A
4	100.0000 g	N/A
5	99.9999 g	N/A

Maximum Deviation	0.0001 g	N/A
-------------------	----------	-----



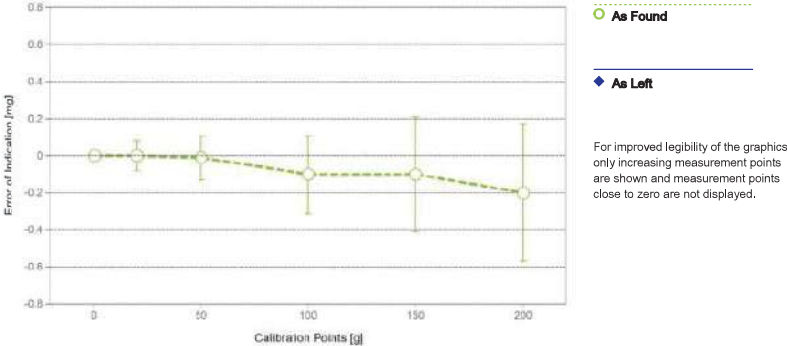
The "d" in the graph represents the readability of the range/interval in which the test was performed.

Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.00000 g	0.00000 g	0.00000 g	0.012 mg	2
2	0.01000 g	0.01001 g	0.00001 g	0.015 mg	2
3	0.10000 g	0.10002 g	0.00002 g	0.020 mg	2
4	0.99999 g	0.99998 g	-0.00001 g	0.030 mg	2
5	4.99997 g	4.99997 g	0.00000 g	0.046 mg	2
6	10.00000 g	10.00000 g	0.00000 g	0.060 mg	2
7	20.00001 g	20.00001 g	0.00000 g	0.081 mg	2
8 ¹	49.99996 g	49.99995 g	-0.00001 g	0.12 mg	2
9	100.00001 g	100.0000 g	-0.0001 g	0.21 mg	2
10 ¹	150.0000 g	149.9999 g	-0.0001 g	0.31 mg	2
11	200.00001 g	199.9999 g	-0.0002 g	0.37 mg	2

¹The calculated uncertainty was replaced by the CMC (Calibration and Measurement Capabilities) value because the calculated uncertainty was smaller than the CMC value.



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k – which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated. The results of this calibration certificate relate only to the calibrated item.

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2

Weight Set No.: WS32 Date of Issue: 25-Sep-2023
Certificate Number: 188109 Calibration Due Date: 25-Mar-2025

Weight Set 2: OIML E2

Weight Set No.: WS32-1 Date of Issue: 13-Dec-2023
Certificate Number: C350273142 Calibration Due Date: 20-May-2025

Weight Set 3: OIML E2

Weight Set No.: WS32-2 Date of Issue: 07-Nov-2023
Certificate Number: C350273111 Calibration Due Date: 06-May-2025

Thermo Hygrometer

Equipment No.: IN325 Date of Issue: 20-Feb-2024
Certificate Number: SG-H-00231/67 Calibration Due Date: 19-Feb-2025

Remarks

FACT adjustment functionality activated
Equipment condition: Good
Next calibration according to customer's procedure
Calibration data not decide by calibration laboratory

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with $k=2$ in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: $1,5 \cdot 10^{-6} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use: 4 K

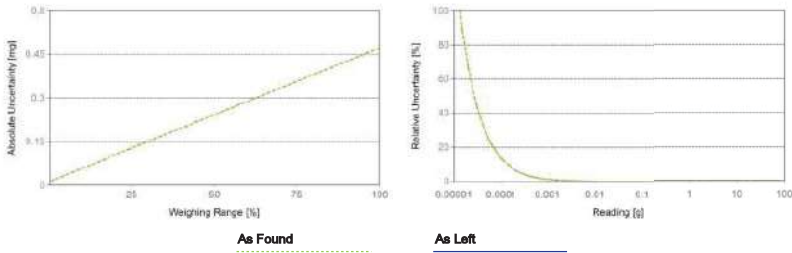
Linearization of Uncertainty Equation

Range			As Found	As Left
	d	Max		
1	0,00001 g	81 g	$U_1 = 0,013 \text{ mg} + 0,00567 \text{ mg/g} \cdot R$	N/A
2	0,0001 g	220 g	$U_2 = 0,06 \text{ mg} + 0,00557 \text{ mg/g} \cdot R$	N/A

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found		As Left	
0.00220 g	0.013 mg	0.59%	N/A	N/A
0.02200 g	0.013 mg	0.060%	N/A	N/A
0.22000 g	0.014 mg	0.0065%	N/A	N/A
2.20000 g	0.025 mg	0.0012%	N/A	N/A
220.0000 g	1.3 mg	0.00058%	N/A	N/A



The weighing range shown in the absolute uncertainty graph refers to the first interval/range of the device.

GWP®
Certificate



As Found



As Left



The weighing device meets the given process requirements.

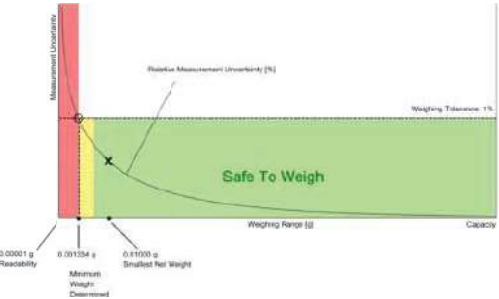
The weighing device meets the given process requirements.

Tests Performed: ☒ As Found ☐ As Left ☒ No adjustments/modifications made. As Left results correspond to As Found.

Process Requirements

Weighing Tolerance: 1% | Smallest Net Weight: 0.01000 g | Safety Factor: 2

Safe Weighing Range



While the values in this graph reflect the actual calibration results, the measurement uncertainty curves are simply a visual representation. This graph reflects As Left testing, unless only As Found was performed.

Minimum Weight

As Found Minimum Weight Table

Range 1

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0,013409 g	0,026973 g	0,040692 g	0,068612 g	0,141349 g
0.2%	0,006686 g	0,013409 g	0,020172 g	0,033813 g	0,068612 g
0.5%	0,002670 g	0,005345 g	0,008027 g	0,013409 g	0,026973 g
1%	0,001334 g	0,002670 g	0,004007 g	0,006686 g	0,013409 g
2%	0,000667 g	0,001334 g	0,002002 g	0,003338 g	0,006686 g
5%	0,000267 g	0,000533 g	0,000800 g	0,001334 g	0,002670 g

The minimum weight table applies to the fine range of the weighing device.

✓ Pass: The determined minimum weight meets the requirement for the smallest net weight.

As Left Minimum Weight Table

Range 1

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0,013409 g	0,026973 g	0,040692 g	0,068612 g	0,141349 g
0.2%	0,006686 g	0,013409 g	0,020172 g	0,033813 g	0,068612 g
0.5%	0,002670 g	0,005345 g	0,008027 g	0,013409 g	0,026973 g
1%	0,001334 g	0,002670 g	0,004007 g	0,006686 g	0,013409 g
2%	0,000667 g	0,001334 g	0,002002 g	0,003338 g	0,006686 g
5%	0,000267 g	0,000533 g	0,000800 g	0,001334 g	0,002670 g

The minimum weight table applies to the fine range of the weighing device.

✓ Pass: The determined minimum weight meets the requirement for the smallest net weight.

At these net minimum weight values, the measurement uncertainty of the weighing device is equal to or less than 1/1 (no safety factor), 1/2, 1/3, 1/5, or 1/10 of the required tolerance. The values are calculated with k = 2 and based on the linear formula of the measurement uncertainty of the weighing device in use.

The safety factor for As Found is always 1. This implies no safety factor, As Found testing looks at the behavior of the instrument from the past until test occurred. For the past, it is necessary to know that the tolerance was met, but not the safety factor. The safety factor is a proactive measure to apply for future measurements.

Notes on minimum weight values in above table:

- If "N/A" is shown above, no appropriate value could be calculated.
- METTLER TOLEDO is not responsible for the definition of the process requirements.

Measurement Results

Results Summary

	Repeatability	Eccentricity	Error of Indication
As Found	✓	✓	✓
As Left	✓	✓	✓

✓ = Passed
✗ = Failed
⚠ = Safety Factor not met

Repeatability

Test Load: 70 g

Tolerance	Control Limit	As Found		As Left	
		Std. Deviation	Result	Std. Deviation	Result
0,1%	0,000005 g	0,000005 g	✓	0,000005 g	⚠
0,2%	0,000010 g		✓		✓
0,5%	0,000025 g		✓		✓
1%	0,000050 g		✓		✓
2%	0,000100 g		✓		✓
5%	0,000250 g		✓		✓

The weighing tolerance is met if the standard deviation is less than or equal to the corresponding control limit.

Eccentricity

Test Load: 100 g

Tolerance	Control Limit	As Found		As Left	
		Deviation	Result	Deviation	Result
0,1%	0,0500 g	0,0001 g	✓	0,0001 g	✓
0,2%	0,1000 g		✓		✓
0,5%	0,2500 g		✓		✓
1%	0,5000 g		✓		✓
2%	1,0000 g		✓		✓
5%	2,5000 g		✓		✓

The weighing tolerance is met if the deviation is less than or equal to the corresponding control limit.

Attachment to Calibration Certificate:

TH4004-023-031424-ACC-TH

GWP® Certificate

METTLER TOLEDO Service

Error of Indication

As Found

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A	N/A
20.00001 g	0.00000 g	0.01000 g	0.02000 g	0.05000 g	0.10000 g	0.20000 g	0.50000 g
49.99996 g	-0.00001 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g
100.0001 g	-0.0001 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
150.0000 g	-0.0001 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
200.0001 g	-0.0002 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓	✓

As Left

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A	N/A
20.00001 g	0.00000 g	0.01000 g	0.02000 g	0.05000 g	0.10000 g	0.20000 g	0.50000 g
49.99996 g	-0.00001 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g
100.0001 g	-0.0001 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
150.0000 g	-0.0001 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
200.0001 g	-0.0002 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓	✓

The weighing tolerance is met if the error (of indication) for each test point is less than or equal to the corresponding control limit for that particular weighing tolerance. Results at or close to the zero point cannot be assessed.



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Bangkok 10500 Thailand

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Fax: +662 632 4334
Email: ccc-smt@agilent.com
Website: www.agilent.com/chem

Service Confirmation Number: 6904997715

Service Confirmation Date: 28.06.2023

Customer Contact:

SGS (Thailand) Limited
Branch 00003
1/209 1/211 Moo 1 T Bangchang
A Banchang
RAYONG 21130
TAX ID : 0105532106079
Saijai.Ruangsaawat@sgs.com
038-685 260-4

Invoice To:

SGS (Thailand) Limited
Branch 00003
1/209 1/211 Moo 1 T Bangchang A
Banchang RAYONG 21130

Delivery Site:

SGS (Thailand) Limited
Branch 00003
1/209 1/211 Moo 1 T Bangchang
A Banchang
RAYONG 21130

Location:

Room
Bldg
Lab
Dept

SERVICE REPORT

Customer Purchase Order Number:	Customer Number: 70205138
Service Request:	Service Request Date:
Service Order: 6006193099	Service Confirmation: 6904997715

Direct Inquiries to:

Contact Name: Customer Contact Center
Contact E-mail: ccc-smt@agilent.com
Contact Telephone: +662 637 6363
Contact Fax: +662 632 4334

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Acc. No: 012-4452-007 .
THB:Krung Thai Bank PCL
Siam Square Br.,416/1-2 Rama I Rd.,Pathumwan, BKK 10330
Thailand

ORIGINAL

Service Instrument:

Model Number	Model Description	Serial Number	System Handle	Parent Asset
SYS-GM-5973T	GCMS 5973 Turbo System			
G2579A	5973 Inert MSD Perform Turbo EI Mainfrm	US30965023		SYS-GM-5973T
G1530N	6890N Network GC System	CN10305014	G2004002	SYS-GM-5973T

Service Items:

Item	Service/Part #	Description	Qty	Entitlement	Service Start	Service End
1000	PM	Preventive Maintenance	1.00	Agreement Entitlement - 100 % covered	27.06.2023	27.06.2023
1010	5188-6496	QuickPick Split Vent + Inlet PM Kit	1.00	Agreement Entitlement - 100 % covered		
1020	5188-6497	QuickPick Splitless Inlet/Vent PM Kit	1.00	Agreement Entitlement - 100 % covered		
1030	5191-5851	Agilent Vacuum Fluid 45 Platinum, 1Qt	1.00	Agreement Entitlement - 100 % covered		
1050	G1099-80039	Oil Mist Filter, 3/8 BSP Male Threads	1.00	Agreement Entitlement - 100 % covered		

Additional Information:

Service Confirmation Number: 6904997715

Service Confirmation Date: 28.06.2023

Service Information:

Problem Description: NR-C-PM-GM5973-5001151743		
Service Provided: PM 6890N/5973 MSD. Clean source and replace all consumable parts.		
Service Overview Code: Reason Code: Scheduled Service Diagnosis Code: Scheduled Service Resolution Code: Scheduled Service		
Reported Hours: 5.0	Travel Hours: 2.0	
Customer Field Service Representative Name: [REDACTED]	Customer Field Service Representative Signature: [REDACTED]	Date: 28 Jun 2023
Customer Name: [REDACTED]	Customer Signature: [REDACTED]	Date: 28 Jun 2023
Additional Comments:		



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-29 FAX. 0-2719-9484



Cert.No.: 23CH1117

Page.: 1 of 3

Certificate of Calibration

Equipment : pH Meter
Manufacturer : Mettler Toledo
Model : Seven Easy S20
Serial No. : 1231235141
ID No. : P2010024
Condition As-Received: Used Item
Received Date : 07 September 2023
Calibration Date : 08 September 2023
Reference : 2309-0247WSC-4
Submitted by : SGS (Thailand) Limited
1/209, 1/211 Moo 1, Ban Chang,
Ban Chang, Rayong 21130
Ambient Temperature : (25 ± 2.5) °C
Relative Humidity : (50 ± 15) %
Calibration Procedure : In - house method :
- CP-CH5 by direct measurement with standard
voltage calibrator and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with standard thermometer

Calibrated by :

Approved by :

Issue Date :

12 September 2023

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full, except with the prior written
Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

A 0058173



Cert.No.: 23CH1117

Page.: 2 of 3

Condition of this calibration result

1. Reference Standard Instrument : -

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	23E2802	27 Aug 2024
2) Ref. Standard Thermometer	4982054	110RC044	23I908	26 Jul 2024

This certification is traceable to the International System of Unit maintained through:-

- Technology Promotion Association (Thailand-Japan)

2. Certified Reference Materials : The measurement results are traceable to SI through CPA chem Ltd.,
ANSI-ASQ National Accreditation Board, Accredited No. AR-1835

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 1.679	CPA chem	794119	25 Feb 2024
pH 4.008	CPA chem	863832	28 Dec 2024
pH 6.986	CPA chem	863833	28 Dec 2023
pH 9.997	CPA chem	913600	14 July 2024

3. This certificate is valid only to the item calibrated on date and place of calibration.

Calibration Results

Function : mV Measurement

Performing standard curve by Fluke at pH (4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement (±mV)	Coverage factor k
			mV	pH		
pH Meter S/N.: 1231235141	1.680	314.73	314.9	1.680	0.058	2.00
	4.000	177.48	177.7	4.000	0.058	2.00
	7.000	0.00	0.2	7.000	0.058	2.00
	10.000	-177.48	-177.2	10.000	0.058	2.00

a 1179502



Cert.No.: 23CH1117

Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing three buffers standard curve by using buffer nominal pH (4,7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH measurement (\pm)	Coverage factor k
pH Electrode S/N.: 9448396	1.679	1.709	300.9	0.0052	2.05
	4.008	4.011	167.3	0.0045	2.00
	6.986	6.991	-5.5	0.0084	2.00
	9.997	10.000	-183.8	0.0068	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : InLab®Expert Pro

- Serial No. : 9448396

Dimension of probe;

- Length : 120 mm

- Diameter : 12 mm

- Immersion Depth : 100 mm

Calibration Point (°C)	Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of measurement (\pm °C)	Coverage factor k
25.0	25.002	24.9	-0.102	0.13	2.00

Remark : - UUC* = Unit Under Calibration

The reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor k , providing a level of confidence of approximately 95 %.

-o0o-

Verification COD Reactor

Equipment Name: DriBlock Heater Digital
 Serial No.: C00827/A
 Reference Standard: Thermocouple Type K
 Calibration Date: 01/03/2024

Temperature Ver: 150±2 °C
 Model: CB 200/3
 Certificate No.: 21/4272
 Next Cal. Date: 01/03/25

Right

Hole 1				Hole 2				Hole 3			
NO.	Result			NO.	Result			NO.	Result		
	temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.
1	149.5	-0.26	149.2	1	149.0	-0.26	148.7	1	149.0	-0.26	148.7
2	150.2	-0.26	149.9	2	150.2	-0.26	149.9	2	150.2	-0.26	149.9
3	150.3	-0.26	150.0	3	150.3	-0.26	150.0	3	150.1	-0.26	149.8
Mean			149.94	Mean			149.57	Mean			149.51
SD			0.700	SD			0.723	SD			0.666
%RSD			0.467	%RSD			0.484	%RSD			0.445

Hole 4				Hole 5				Hole 6			
NO.	Result			NO.	Result			NO.	Result		
	temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.
1	149.0	-0.26	148.7	1	148.5	-0.26	148.2	1	143.3	-0.26	143.0
2	149.9	-0.26	149.6	2	148.9	-0.26	148.6	2	143.9	-0.26	143.6
3	150.3	-0.26	150.0	3	148.2	-0.26	147.9	3	143.2	-0.26	142.9
Mean			149.47	Mean			148.27	Mean			143.21
SD			0.366	SD			0.351	SD			0.379
%RSD			0.445	%RSD			0.237	%RSD			0.255

Hole 7				Hole 8				Hole 9			
NO.	Result			NO.	Result			NO.	Result		
	temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.
1	150.2	-0.26	149.9	1	149.5	-0.26	149.2	1	148.4	-0.26	148.1
2	150.9	-0.26	150.6	2	150.9	-0.26	150.6	2	148.9	-0.26	148.6
3	151.0	-0.26	150.7	3	149.9	-0.26	149.6	3	148.4	-0.26	148.1
Mean			150.44	Mean			149.84	Mean			148.31
SD			0.436	SD			0.721	SD			0.289
%RSD			0.290	%RSD			0.481	%RSD			0.195

Hole 10				Hole 11				Hole 12			
NO.	Result			NO.	Result			NO.	Result		
	temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.
1	149.4	-0.26	149.1	1	148.9	-0.26	148.6	1	148.4	-0.26	148.1
2	148.5	-0.26	148.2	2	148.9	-0.26	148.6	2	148.9	-0.26	148.6
3	148.4	-0.26	148.1	3	148.4	-0.26	148.1	3	148.4	-0.26	148.1
Mean			148.64	Mean			148.47	Mean			148.31
SD			0.500	SD			0.289	SD			0.289
%RSD			0.336	%RSD			0.194	%RSD			0.195

Verified By

Approved By

Confidential - Not to be photocopied except by permission of the Laboratory Quality Manager or nominee.

Verification COD Reactor

Equipment Name: DriBlock Heater Digital
 Serial No.: 000827-A
 Reference Standard: Thermocouple Type K
 Calibration Date: 01/03/2024

Temperature Ver: 150±2 °C
 Model: DB 200/3
 Certificate No.: 21/4272
 Next Cal. Date: 01/03/25

Middle

Hole 1				Hole 2				Hole 3			
NO.	Result			NO.	Result			NO.	Result		
	temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.
1	149.0	-0.26	148.7	1	150.0	-0.26	149.7	1	150.2	-0.26	149.9
2	149.1	-0.26	148.8	2	150.7	-0.26	150.4	2	150.7	-0.26	150.4
3	149.1	-0.26	148.8	3	150.8	-0.26	150.5	3	150.3	-0.26	150.0
Mean			148.81	Mean			150.24	Mean			150.14
SD			0.058	SD			0.436	SD			0.265
%RSD			0.039	%RSD			0.290	%RSD			0.176

Hole 4				Hole 5				Hole 6			
NO.	Result			NO.	Result			NO.	Result		
	temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.
1	148.6	-0.26	148.3	1	148.6	-0.26	148.3	1	148.7	-0.26	148.4
2	149.1	-0.26	148.8	2	149.1	-0.26	148.8	2	148.6	-0.26	148.3
3	149.1	-0.26	148.8	3	149.2	-0.26	148.9	3	148.6	-0.26	148.3
Mean			148.67	Mean			148.71	Mean			148.37
SD			0.289	SD			0.321	SD			0.068
%RSD			0.194	%RSD			0.216	%RSD			0.039

Hole 7				Hole 8				Hole 9			
NO.	Result			NO.	Result			NO.	Result		
	temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.
1	148.8	-0.26	148.5	1	148.7	-0.26	148.4	1	148.6	-0.26	148.3
2	148.6	-0.26	148.3	2	148.6	-0.26	148.3	2	148.9	-0.26	148.6
3	148.6	-0.26	148.3	3	148.9	-0.26	148.6	3	148.6	-0.26	148.3
Mean			148.41	Mean			148.47	Mean			148.44
SD			0.115	SD			0.133	SD			0.173
%RSD			0.078	%RSD			0.133	%RSD			0.117

Hole 10				Hole 11				Hole 12			
NO.	Result			NO.	Result			NO.	Result		
	temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.
1	150.1	-0.26	149.8	1	150.0	-0.26	149.7	1	149.9	-0.26	149.6
2	150.6	-0.26	150.3	2	150.6	-0.26	150.3	2	150.5	-0.26	150.2
3	151.5	-0.26	151.2	3	151.0	-0.26	150.7	3	150.9	-0.26	150.6
Mean			150.47	Mean			150.27	Mean			150.17
SD			0.709	SD			0.503	SD			0.503
%RSD			0.471	%RSD			0.335	%RSD			0.335

Verified By

Approved By

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Verification CCD Reactor

Equipment Name In-Blick Heater-Digital
 Serial No. 030627-A
 Reference Standard Thermocouple Type K
 Calibration Date 01/03/2024

Temperature Ver 150±2 °C
 Model D3 200/3
 Certificate No. 21/4272
 Next Cal. Date 01/03/25

Left											
Hole 1				Hole 2				Hole 3			
NO.	Result			NO.	Result			NO.	Result		
	temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.
1	148.6	-0.26	148.3	1	148.8	-0.26	148.5	1	149.0	-0.26	148.7
2	148.7	-0.26	148.4	2	148.7	-0.26	148.4	2	148.8	-0.26	148.5
3	148.6	-0.26	148.3	3	148.6	-0.26	148.3	3	148.9	-0.26	148.6
	Mean		148.37		Mean		148.44		Mean		148.64
	SD		0.058		SD		0.100		SD		0.100
	%RSD		0.039		%RSD		0.067		%RSD		0.067
Hole 4				Hole 5				Hole 6			
NO.	Result			NO.	Result			NO.	Result		
	temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.
1	148.3	-0.26	148.0	1	148.4	-0.26	148.1	1	148.4	-0.26	148.1
2	148.3	-0.26	148.0	2	148.3	-0.26	148.0	2	148.4	-0.26	148.1
3	148.3	-0.26	148.0	3	148.3	-0.26	148.0	3	148.3	-0.26	148.0
	Mean		148.04		Mean		148.07		Mean		148.11
	SD		0.000		SD		0.058		SD		0.058
	%RSD		0.000		%RSD		0.039		%RSD		0.039
Hole 7				Hole 8				Hole 9			
NO.	Result			NO.	Result			NO.	Result		
	temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.
1	148.4	-0.26	148.1	1	148.3	-0.26	148.0	1	148.5	-0.26	148.2
2	148.3	-0.26	148.0	2	148.3	-0.26	148.0	2	148.3	-0.26	148.0
3	148.3	-0.26	148.0	3	148.3	-0.26	148.0	3	148.3	-0.26	148.0
	Mean		148.07		Mean		148.04		Mean		148.11
	SD		0.058		SD		0.000		SD		0.115
	%RSD		0.039		%RSD		0.000		%RSD		0.078
Hole 10				Hole 11				Hole 12			
NO.	Result			NO.	Result			NO.	Result		
	temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.
1	148.4	-0.26	148.1	1	148.5	-0.26	148.2	1	148.5	-0.26	148.2
2	148.3	-0.26	148.0	2	148.4	-0.26	148.1	2	148.4	-0.26	148.1
3	148.3	-0.26	148.0	3	148.3	-0.26	148.0	3	148.3	-0.26	148.0
	Mean		148.07		Mean		148.14		Mean		148.14
	SD		0.058		SD		0.100		SD		0.100
	%RSD		0.039		%RSD		0.068		%RSD		0.068

Verified By

Approved By

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อุปกรณ์ Verify

Set Temp ที่ 156.5 องศาเซลเซียส ทั่วไป Temp. อุปกรณ์ 148 - 150 องศาเซลเซียส

Verified By

Approved By

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ระดับเสียง

Certificate of Calibration

Customer

Name : SGS (Thailand) Limited.
 Address : 100 Nanglinchue Road, Chongnorsri, Yannawa Bangkok 10120

Certificate No : 23-SLM-022
 Request No : Rec-2023-0115

Unit Under Calibration Details

Measurement item : Sound Level Meter
 Manufacturer : EION
 Model : NL-21
 Serial Number : 00243242
 ID : ENSL 013
 Resolution : 0.1 dB
 Microphone Class : 2
 Microphone Model : UC-52
 Microphone S/N : 118917
 Preamplifier Model : NH-21
 Preamplifier S/N : 2684
 Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C
 Humidity : 50 %RH ± 20 %RH
 Barometric Pressure : 1013 hPa ± 10hPa
 Received Date : 12 January 2023
 Calibrated Date : 26 January 2023
 Calibration Procedure : In-house method CF-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
 Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Standard Microphone	GRAS	40AN	88273	5 October 2023	GRAS
Multi-frequency Calibrator	Quest	Quest-cal	EFA00234	29 June 2023	TSI
Audio Generator	Svantek	Sva401	131	12 October 2023	WEL Electric

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Calibrated By :

Calibration Officer

Approved By :

Calibration Engineer Supervisor

Issue Date : 26 January 2023

VERIFIED

DATE *Feb 02, 2023*

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

ISM708-SLM-01 Rev.0 Issue Date 01/07/19

Certificate No : 23-SLM-022

Request No : Rec-2023-0115

1. Indication at the calibration check frequency

UUC Setting	Nominal Level	Before Adjust		Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC	ERR	UUC	ERR		
FAST / A / 30-120	(dB)	(dB)	(dB)	(dB)	(dB)		
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		
1000 Hz 94.00 dB	94.0	94.3	+0.29	94.0	-0.01	0.20	0.3

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand Cirrus, Model CR-515, SN. 89411

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 20-80		
UUC Weighting	(dB)	(± dB)
A	17.4	0.16

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 20-80		
UUC Weighting	(dB)	(± dB)
A	14.2	0.16
C	17.4	0.16
Z	22.4	0.16

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)
	A	C	Z		
FAST / 30-120	(dB)	(dB)	(dB)		
STD Setting	(dB)	(dB)	(dB)		
125 Hz	0.0	0.3	0.2	0.50	1.5
1000 Hz	0.0	0.0	0.0	0.60	1.0
4000 Hz	0.2	0.2	0.3	0.60	3.0
8000 Hz	-0.8	-0.8	-0.8	0.70	5.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

ISM708-SLM-01 Rev.0 Issue Date 01/07/19

Certificate No : 23-SLM-022
 Request No : Rec-2023-0115

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting		Deviation from various Frequency			UNCERTAINTY	Acceptance
FAST/ 30-120		Weighting Resonse curve				
STD Setting		A (dB)	C (dB)	Z (dB)	(± dB)	Limit (± dB)
63 Hz		-0.1	-0.1	-1.1	0.2	2.0
125 Hz		-0.1	0.0	-1.1		1.5
250 Hz		-0.1	0.0	0.0		1.5
500 Hz		0.0	0.0	0.0		1.5
1000 Hz		0.0	0.0	0.1		1.0
2000 Hz		0.1	0.1	0.1		2.0
4000 Hz		0.1	0.1	0.1		3.0
8000 Hz		0.2	0.1	0.1		5
16000 Hz		-1.8	-1.8	-2.4		+5 -1NF.

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / 30-120	REF	UUC	ERR		
UUC Weighting	(dB)	(dB)	(dB)	0.2	0.2
A	114.00	114.0	0.0		
C	114.00	114.0	0.0		
Z	114.00	114.0	0.0		

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
30-120 / A	REF	UUC	ERR		
UUC Time Response	(dB)	(dB)	(dB)	0.2	0.1
Fast	114.00	114.0	0.0		
Slow	114.00	114.0	0.0		
Leq	114.00	114.0	0.0		

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM708-SLM-01 Rev.0 (issue date 01/07/19)

Certificate No : 23-SLM-022
 Request No : Rec-2023-0115

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 30-120	UUC		
STD Setting	(dB)	0.1	0.3
Initial	114.0		
Final	114.0		
Deviated	0.0		

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 30-120	REF	UUC	ERR		
STD dB	(dB)	(dB)	(dB)	0.3	1.1
120.00	120	120.0	0.0		
119.00	119	119.0	0.0		
114.00	114	114.0	0.0		
109.00	109	109.0	0.0		
104.00	104	104.0	0.0		
99.00	99	99.0	0.0		
94.00	94	94.0	0.0		
89.00	89	89.1	0.1		
84.00	84	84.1	0.1		
79.00	79	79.1	0.1		
74.00	74	74.1	0.1		
69.00	69	69.1	0.1		
64.00	64	64.0	0.0		
59.00	59	59.0	0.0		
54.00	54	54.1	0.1		
49.00	49	49.0	0.0		
44.00	44	44.1	0.1		
39.00	39	39.0	0.0		
34.00	34	33.9	-0.1		
29.00	29	28.7	-0.3		
24.00	24	23.5	-0.5		

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM708-SLM-01 Rev.0 (issue date 01/07/19)

Certificate No : 23-SLM-022

Request No : Req-2023-0115

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
FAST / A	REF	UUC	ERR	(\pm dB)	Limit
UUC Range	(dB)	(dB)	(dB)		(\pm dB)
30-120	32.50	32.7	0.2	0.3	1.1
	114	114.0	0.0		1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance
A / 30-120	Toneburst	Ref	UUC	ERR	(\pm dB)	Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)		(\pm dB)
Fast	200	116.0	115.0	0.0	0.3	1
	2	99.0	99.0	0.0		+1.0, -2.5
	0.25	90.0	89.9	-0.1		+1.5, -5.0
Slow	200	105.6	109.5	-0.1		1
	2	90.0	89.9	-0.1		+1.0, -5.0
SEL	200	116.0	113.0	0.0		1
	2	90.0	89.9	-0.1		+1.0, -2.5
	0.25	81.0	80.8	-0.2		+1.5, -5.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY	Acceptance
FAST / C / 55-140	REF	UUC	ERR	(\pm dB)	Limit
STD Setting	(dB)	(dB)	(dB)		(\pm dB)
Complete cycle	136.4	136.0	-0.40	0.2	3.0
Positive half cycle	135.4	132.1	-0.30		2.0
Negative half cycle	135.4	132.1	-0.30		2.0

Certificate No : 23-SLM-022

Request No : Req-2023-0115

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 40-130	UUC	(\pm dB)	Limit
STD Setting	(dB)		(\pm dB)
Positive one-half cycle	138.9		
Negative one-half cycle	138.8		
Deviated	6.1	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 40-130	UUC	(\pm dB)	Limit
STD Setting	(dB)		(\pm dB)
Initial	129.0		
Final	129.0		
Deviated	6.0	0.1	0.3

End of Certificate

Certificate of Calibration

Customer

Name : SGS (Thailand) Limited.
 Address : 100 Nangliachae Road, Chongnonsi, Yaenawa Bangkok 10120

Certificate No : 23-SLM-138
 Request No : Req-2023-0805

Unit Under Calibration Details

Measurement item : Sound Level Meter
 Manufacture : RION
 Model : NA-28
 Serial Number : 00570424
 ID : ENSL 030
 Resolution : 0.1 dB

Microphone Class : 1
 Microphone Model : UC-59
 Microphone S/N : B897
 Pre-amplifier Model : NH-23
 Pre-amplifier S/N : 70434
 Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C
 Humidity : 50 %RH ± 20 %RH
 Barometric Pressure : 1012 hPa ± 10 hPa
 Received Date : 20 April 2023
 Calibrated Date : 21 April 2023
 Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3: 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
 Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	46AN	188273	5 October 2023	GRAS
Multi-frequency Calibrator	Quest	Quest-cal	EFA000234	29 June 2023	TSI
Audio Generator	Svante	Svan40	131	12 October 2023	WK Electric

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Calibrated By :

Calibration Officer

Approved By :

Calibration Engineer Supervisor

Issue Date : 21 April 2023

VERIFIED

DATE Apr 25 2023

Certificate No : 23-SLM-138

Request No : Req-2023-0805

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY	Acceptance
FAST / A / 30-130	Level	UUC	ERR	UUC	ERR	(± dB)	Limit
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)	(± dB)	(± dB)
1000 Hz 114 dB	113.79	114.0	+0.21	113.8	+0.01	0.2	0.3

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand 3M, Model SV35, S/N 58079

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 20-80		
UUC Weighting	(dB)	(± dB)
A	15.1	0.1

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 20-80		
UUC Weighting	(dB)	(± dB)
A	8.1	0.1
C	11.3	0.1
Z	18.5	0.1

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance
FAST / 30-130	A	C	Z	(± dB)	Limit
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)
125 Hz	0.1	0.2	0.2	0.6	1.0
1000 Hz	0.0	0.0	0.0	0.6	0.7
4000 Hz	-0.1	-0.1	-0.1	0.6	1.0
8000 Hz	-0.5	-0.4	-0.4	0.7	+1.5 ~2.5

Certificate No : 23-SLM-138

Request No : Req2023-0865

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / 30-130	A (dB)	C (dB)	Z (dB)		
STD Setting				0.2	+1.5, -2.5 +2.5, -16.0
63 Hz	-0.2	-0.1	0.0		
125 Hz	-0.1	0.1	0.0		
250 Hz	-0.1	0.3	0.0		
500 Hz	0.0	0.1	0.0		
1000 Hz	0.0	0.3	0.0		
2000 Hz	0.0	0.1	0.0		
4000 Hz	0.0	0.1	0.0		
8000 Hz	0.1	0.1	0.0		
16000 Hz	-0.5	-0.6	0.0		

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / 30-130	REF	UUC	ERR		
UUC Weighting	(dB)	(dB)	(dB)	0.2	0.2
A	114.00	114.0	0.0		
C	114.00	114.0	0.0		
Z	114.00	114.0	0.0		

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
30-130 / A	REF	UUC	ERR		
UUC Time Response	(dB)	(dB)	(dB)	0.2	0.1
Fast	114.00	114.0	0.0		
Slow	114.00	114.0	0.0		
Leq	114.00	114.0	0.0		

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

FM-708-SLM-01 Rev0 Issue date 01/07/19

Certificate No : 23-SLM-138

Request No : Req2023-0865

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 50-140	UUC		
STD Setting	(dB)	0.1	0.1
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.1

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 50-140	REF	UUC	ERR		
STD dB	(dB)	(dB)	(dB)	0.3	0.5
130.00	130	130.0	0.0		
129.00	129	129.0	0.0		
124.00	124	124.0	0.0		
119.00	119	119.0	0.0		
114.00	114	114.0	0.0		
109.00	109	109.0	0.0		
104.00	104	104.0	0.0		
99.00	99	99.0	0.0		
94.00	94	94.0	0.0		
89.00	89	89.0	0.0		
84.00	84	84.0	0.0		
79.00	79	79.0	0.0		
74.00	74	74.0	0.0		
69.00	69	69.0	0.0		
64.00	64	64.0	0.0		
59.00	59	59.0	0.0		
54.00	54	54.0	0.0		
49.00	49	49.0	0.0		
44.00	44	44.0	0.0		
39.00	39	39.0	0.0		
34.00	34	34.0	0.0		
29.00	29	29.0	0.0		

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FM-708-SLM-01 Rev0 Issue date 01/07/19

Certificate No : 23-SLM-138

Request No : Req2023-0805

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A	REF	UUC	ERR		
UUC Range	(dB)	(dB)	(dB)		
20-120	30.1	30.1	0.0	0.3	0.8
	114	114.0	0.0		0.8

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
A / 30-130	Timeburst	Ref	UUC	ERR		
UUC Time Response	(ms)	(dB)	(dB)	(dB)		
Fast	200	126.0	126.0	0.0	0.2	0.5
	2	109.0	109.0	0.0		+1.0, -1.5
	0.25	100.0	99.9	-0.1		+1.0, -3.0
Slow	200	119.6	119.5	0.0		0.5
	2	106.0	106.0	0.0		+1.0, -3.0
SEL	200	120.0	120.0	0.0		0.5
	2	106.0	106.0	0.0		+1.0, -1.5
	0.25	91.0	90.9	-0.1		+1.0, -3.0

11. Peak CSound level

UUC Setting	Anticipated	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / C / 55-141	REF	UUC	ERR		
STD Setting	(dB)	(dB)	(dB)		
Complete cycle	136.4	136.0	-0.40	0.2	2.0
Positive half cycle	135.4	135.2	-0.20		1.0
Negative half cycle	135.4	135.2	-0.20		1.0

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FM-700-SLM-01 Rev0 Issue date 01/07/13

Certificate No : 23-SLM-138

Request No : Req2023-0805

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 30-130	UUC		
STD Setting	(dB)		
Positive one-half cycle	141.7		
Negative one-half cycle	141.6		
Deviated	0.1	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 30-130	UUC		
STD Setting	(dB)		
Initial	129.0		
Final	129.0		
Deviated	0.0	0.1	0.1

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-700-SLM-01 Rev0 Issue date 01/07/13

Certificate of Calibration

Customer

Name: SGS (Thailand) Limited.
 Address: 100 Nangliakae Road, Chongnonsi, Yanaawa Bangkok 10120

Certificate No: 23-SLM-139
 Request No: Req-2023-0804

Unit Under Calibration Details

Measurement item: Sound Level Meter
 Manufacturer: RION
 Model: NA-28
 Serial Number: 00510423
 ID: ENSL 040
 Resolution: 0.1 dB
 Microphone Class: 1
 Microphone Model: UC-59
 Microphone S/N: 22731
 Preamplifier Model: MH-23
 Preamplifier S/N: 70441
 Instrument Status: Used

Calibration Environment and Details

Temperature: 23 °C ± 2 °C
 Humidity: 50 %RH ± 20 %RH
 Barometric Pressure: 1013 hPa ± 10 hPa
 Received Date: 20 April 2023
 Calibrated Date: 21 April 2023
 Calibration Procedure: In-house method CP-SLM-01 based on IEC 61672-3: 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
 Location of Calibration: Lab Acoustic

Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	5 October 2023	GRAS
Multi-frequency Calibrator	Quest	Quest-cil	EFA000234	29 June 2023	TSI
Audio Generator	Svante	Svan40	131	12 October 2023	WK Electric

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Calibrated By:

Calibration Officer

Approved By:

Calibration Engineer Supervisor

Issue Date: 21 April 2023



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FM-708-SLM-01 Rev.0 Issue date 01/07/19

Certificate No: 23-SLM-139

Request No: Req-2023-0804

1. Indication at the calibration check frequency

UUC Setting	Nominal Level (dB)	Before Adjust		After Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)		
FAST / A / 30-130							
Calibrator Setting							
1000 Hz 114 dB	113.79	114.2	+0.41	113.8	+0.01	0.2	0.3

Note: Absolute sensitivity was established by the use of Sound Calibrator Brand 3M, Model SV-5, SN: 58079

2. Self-generated noise, Microphone installed

UUC Setting	Measured (dB)	UNCERTAINTY (± dB)
FAST / 20-80		
UUC Weighting		
A	14.7	0.1

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured (dB)	UNCERTAINTY (± dB)
FAST / 20-80		
UUC Weighting		
A	7.7	0.1
C	10.9	0.1
Z	17.5	0.1

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)
	A (dB)	C (dB)	Z (dB)		
FAST / 30-130					
STD Setting					
125 Hz	0.0	0.2	0.1	0.6	1.0
1000 Hz	0.0	0.0	0.0	0.6	0.7
4000 Hz	0.1	0.1	0.1	0.6	1.0
8000 Hz	-0.1	-0.1	-0.1	0.7	+1.5 ~ -2.5

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-SLM-01 Rev.0 Issue date 01/07/19

Certificate No : 23-SLM-139
 Request No : Req2022-0804

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (±dB)	Acceptance Limit (±dB)
FAST / 30-130	A (dB)	C (dB)	Z (dB)		
STD Setting				0.2	
63 Hz	-0.2	-0.1	0.0		1.0
125 Hz	-0.1	0.0	0.0		1.0
250 Hz	-0.1	0.0	0.0		1.0
500 Hz	0.0	0.1	0.0		1.0
1000 Hz	0.0	0.0	0.0		0.7
2000 Hz	0.0	0.1	0.0		1.0
4000 Hz	0.0	0.0	0.0		1.0
8000 Hz	0.1	0.1	0.0		+1.5, -2.5
16000 Hz	-0.5	-0.5	0.0		+2.5, -16.0

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (±dB)	Acceptance Limit (±dB)
FAST / 30-130	REF	UUC	ERR		
UUC Weighting	(dB)	(dB)	(dB)	0.2	0.2
A	114.00	114.0	0.0		
C	114.00	114.0	0.0		
Z	114.00	114.0	0.0		

UUC Setting	STD	Measured		UNCERTAINTY (±dB)	Acceptance Limit (±dB)
30-130 / A	REF	UUC	ERR		
UUC Time Response	(dB)	(dB)	(dB)	0.2	0.1
Fast	114.00	114.0	0.0		
Slow	114.00	114.0	0.0		
Leq	114.00	114.0	0.0		

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM 708-SLM-G1 Rev.0 Issue date 01/07/19

Certificate No : 23-SLM-139
 Request No : Req2022-0804

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (±dB)	Acceptance Limit (±dB)
FAST / A / 50-140	UUC		
STD Setting	(dB)	0.1	0.1
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.1

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (±dB)	Acceptance Limit (±dB)
FAST / A / 50-140	REF	UUC	ERR		
STD dB	(dB)	(dB)	(dB)	0.3	0.3
130.00	130	130.0	0.0		
129.00	129	129.0	0.0		
124.00	124	124.0	0.0		
119.00	119	119.0	0.0		
114.00	114	114.0	0.0		
109.00	109	109.0	0.0		
104.00	104	104.0	0.0		
99.00	99	99.0	0.0		
94.00	94	94.0	0.0		
89.00	89	89.0	0.0		
84.00	84	84.0	0.0		
79.00	79	79.0	0.0		
74.00	74	74.0	0.0		
69.00	69	69.0	0.0		
64.00	64	64.0	0.0		
59.00	59	59.0	0.0		
54.00	54	54.0	0.0		
49.00	49	49.0	0.0		
44.00	44	44.0	0.0		
39.00	39	39.0	0.0		
34.00	34	34.0	0.0		
29.00	29	29.0	0.0		

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM 708-SLM-G1 Rev.0 Issue date 01/07/19

Certificate No : 23-SLM-439
 Request No : Req2621-0804

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A	REF	UUC	ERR		
UUC Range	(dB)	(dB)	(dB)		
20-120	30.1	30.1	0.0	0.3	0.8
	114	114.0	0.0		0.8

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
A / 30-130	Toneburst	Ref	UUC	ERR		
UUC Time Response	(ms)	(dB)	(dB)	(dB)		
Fast	200	128.0	128.0	0.0	0.2	0.5
	2	109.0	108.9	-0.1		+1.0, -1.5
	0.25	108.0	99.8	-0.2		+1.0, -3.0
Slow	200	115.6	119.9	3.0		0.5
	2	108.0	103.9	3.0		+1.0, -3.0
	200	128.0	120.0	3.0		0.5
SEL	2	108.0	99.9	-0.1		+1.0, -1.5
	0.25	91.0	98.8	-0.2		+1.0, -3.0

11. Peak CSound level

UUC Setting	Anticipated	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / C / 55-111	REF	UUC	ERR		
STD Setting	(dB)	(dB)	(dB)		
Complete cycle	136.4	136.0	-0.40	0.2	2.0
Positive half cycle	135.4	135.2	-0.20		1.0
Negative half cycle	135.4	135.2	-0.20		1.0

Certificate No : 23-SLM-439
 Request No : Req2621-0804

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 30-130	UUC		
STD Setting	(dB)		
Positive one-half cycle	141.7		
Negative one-half cycle	141.7		
Deviated	9.0	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 30-130	UUC		
STD Setting	(dB)		
Initial	119.0		
Final	119.0		
Deviated	3.0	0.1	0.1

End of Certificate

Certificate of Calibration

Customer

Name: SGS (Thailand) Limited.
 Address: 100 Nanglinceer Road, Chongnonsi, Yanmava Bangkok 10120

Certificate No: 23-SLM-229
 Request No: Req-2023-1390

Unit Under Calibration Detail

Measurement item: Sound Level Meter
 Manufacturer: RION
 Model: NA-28
 Serial Number: 0057043
 ID: -
 Resolution: 0.1 dB

Microphone Class: 1
 Microphone Model: UC-59
 Microphone S/N: 01939
 Preamplifier Model: NH-25
 Preamplifier S/N: 01464
 Instrument Status: Used

Calibration Environment and Details

Temperature: 23.7°C ± 2.7°C
 Humidity: 50% RH ± 20% RH
 Barometric Pressure: 1013 hPa ± 14 hPa
 Received Date: 23 June 2023
 Calibrated Date: 29 June 2023
 Calibration Procedure: In-house method CP-SLM-01 based on IEC 61672-3: 2013 Electroacoustics - Sound level meters - Part 3: Periodic test
 Location of Calibration: Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	6 October 2023	GRAS
Multi-frequency Calibrator	Quest	Quest-cal	EFA000234	29 June 2023	TSI
Audio Generator	Svante	Svan401	131	12 October 2023	WK Electric

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %

Calibrated By:

Calibration Officer

Approved By:

Calibration Engineer Supervisor

Issue Date: 29 June 2023

VERIFIED

DATE 29/6/2023

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-706-SLM-01 Rev.0 Issue date 1/7/19

Certificate No: 23-SLM-229

Request No: Req-2023-1390

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY	Acceptance
FAST / A / 30-130	Level	UUC	ERR	UUC	ERR	(± dB)	Limit
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		
1000 Hz 114.4 dB	114.54	114.9	+0.36	114.5	-0.04	0.2	0.3

Note: Absolute sensitivity was established by the use of Sound Calibrator Brand 3M, Model AC-390, SN: AC-390001087

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 20-30	(dB)	(± dB)
UUC Weighting		
A	13.6	0.1

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 20-30	(dB)	(± dB)
UUC Weighting		
A	8.6	0.1
C	11.8	0.1
Z	19.1	0.1

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance
FAST / 30-110	A	C	Z	(± dB)	Limit
STD Setting	(dB)	(dB)	(dB)		
125 Hz	0.2	0.3	0.2	0.6	1.0
1000 Hz	0.0	0.0	0.0	0.6	0.7
4000 Hz	-0.7	-0.7	-0.7	0.6	1.0
8000 Hz	-1.6	-1.5	-1.6	0.7	+1.5 -2.5

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-706-SLM-01 Rev.0 Issue date 1/7/19

Certificate No : 23-SLM-229
 Request No : Req-2023-1399

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz:

UUC Setting	Deviation from various Frequency			UNCERTAINTY	Acceptance
FAST / 30-130	Weighting Response curve				
STD Setting	A (dB)	C (dB)	Z (dB)	(± dB)	Limit (± dB)
63 Hz	-0.2	-0.1	-0.1	0.2	1.0
125 Hz	-0.2	0.0	0.0		1.0
250 Hz	-0.1	-0.1	0.0		1.0
500 Hz	-0.1	0.0	0.0		1.0
1000 Hz	0.0	0.0	0.0		0.7
2000 Hz	0.0	0.0	0.0		1.0
4000 Hz	0.0	0.0	0.0		1.0
8000 Hz	0.0	0.0	0.0		-1.5,-2.5
16000 Hz	-0.6	-0.5	-0.1		+2.5,-16.0

6. Frequency and time weightings at 1kHz:

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / 30-130	REF	UUC	ERR		
UUC Weighting	(dB)	(dB)	(dB)	0.2	
A	114.00	114.0	0.0		
C	114.00	114.0	0.0		
Z	114.00	114.0	0.0		

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
30-130 / A	REF	UUC	ERR		
UUC Time Respon	(dB)	(dB)	(dB)	0.2	
Fast	114.00	114.0	0.0		
Slow	114.00	114.0	0.0		
Leq	114.00	114.0	0.0		

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FM-768-SLM-01 Rev:0 Issue date 1/7/19

Certificate No : 23-SLM-229
 Request No : Req-2023-1399

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 30-130	UUC		
STD Setting	(dB)		
Initial	114.0		
Final	114.0		
Deviated	0.0		

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 30-130	REF	UUC	ERR		
STD dB	(dB)	(dB)	(dB)	0.20	
130.00	130	130.0	0.0		
129.00	129	129.0	0.0		
124.00	124	124.0	0.0		
119.00	119	119.0	0.0		
114.00	114	114.0	0.0		
109.00	109	109.0	0.0		
104.00	104	104.0	0.0		
99.00	99	99.0	0.0		
94.00	94	94.0	0.0		
89.00	89	89.0	0.0		
84.00	84	84.0	0.0		
79.00	79	79.1	0.1		
74.00	74	74.0	0.0		
69.00	69	69.1	0.1		
64.00	64	64.1	0.1		
59.00	59	59.1	0.1		
54.00	54	54.1	0.1		
49.00	49	49.0	0.0		
44.00	44	44.2	0.2		
39.00	39	39.0	0.0		
34.00	34	34.1	0.1		
33.00	33	33.0	0.0		
32.00	32	32.0	0.0		
31.00	31	31.0	0.0		
30.00	30	30.0	0.0		

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the InnovativeInstrument Co., Ltd

FM-768-SLM-01 Rev:0 Issue date 1/7/19

Certificate No : 21-SLM-229

Request No : Req-2023-1396

9. Level linearity including the level range control

9. Level linearity including the level range control					
UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
FAST / A	REF	UUC	ERR		Limit
UUC Range	(dB)	(dB)	(dB)	(± dB)	(± dB)
30-130	35.00	34.9	-0.1	0.3	0.3
	114	114.0	0.0		0.3
20-120	30.00	30.0	0.0		0.3
	114	114.0	0.0		0.3

10. Tone burst response

UUC Setting		STD	Anticipated	Measured		UNCERTAINTY	Acceptance
A / 30-130		Toneburst	Ref	UUC	ERR		Limit
UUC Time Response		(ms)	(dB)	(dB)	(dB)	(± 4B)	(± 4B)
Fast	100	126.0	126.0	0.0	0.2	0.5	
	2	109.0	109.0	0.0		+1.0, -1.5	
	0.25	100.0	99.9	-0.1		+1.0, -3.0	
Slow	100	119.6	119.6	0.0		0.5	
	2	100.0	100.0	0.0		+1.0, -3.0	
SEL	100	120.0	120.1	+0.1		0.5	
	2	100.0	100.5	+0.5		+1.0, -1.5	
	0.25	91.0	90.9	-0.1		+1.0, -3.0	

11. Peak C Sound level

UUC Setting		Anticipated	Measured		UNCERTAINTY	Acceptance
FAST / C / 30-130			UUC	ERR		
STD Setting		REF	(dB)	(dB)	(± dB)	Limit (± dB)
Complete cycle		125.4	125.4	0.00	0.2	2.0
Positive half cycle		124.4	124.1	-0.30		1.0
Negative half cycle		124.4	124.2	-0.20		1.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

FM-798-SLM-91 Rev.0 Issue date 1/7/19

Certificate No : 21-SLM-229

Request No : Req-2023-1396

12. Overload indication

12. Overload indication		UNCERTAINTY (± dB)	Acceptance
UUC Setting	Measured		Limit
FAST / A / 30-130	UUC		(± dB)
STD Setting	(dB)		
Positive one-half cycle	141.4		
Negative one-half cycle	141.4		
Deviated	00	0.2	1.5

13. High Level Stability

13. High Level Stability			
U/C Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 30-130	U/C		Limit
STD Setting	(dB)	(± dB)	(± dB)
Initial	123.0		
Final	123.0		
Deviated	00		
		0.1	0.1

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

FM-798-SLM-91 Rev.0 Issue date 1/7/19

Certificate of Calibration

Customer

Name : SGS (Thailand) Limited
 Address : 100 Nanglinchee Road, Chongnonsi, *anniwa Bangkok 0120

Certificate No : 23-SLM-137
 Request No : Req-2023-0806

Unit Under Calibration Details

Measurement item : Sound Level Meter
 Manufacturer : RION
 Model : NA-28
 Serial Number : 00570431
 ID : ENSL 045
 Resolution : 0.1 dB
 Microphone Class : 1
 Microphone Model : UC-59
 Microphone S/N : B8902
 Pre-amplifier Model : MH-23
 Pre-amplifier S/N : 70443
 Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 1 °C
 Humidity : 50 %RH ± 20 %RH
 Barometric Pressure : 1011 hPa ± 10 hPa
 Received Date : 20 April 2023
 Calibrated Date : 21 April 2023
 Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3: 20 3 Electroacoustics - Sound level meters - Part 3: Periodic tests
 Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	5 October 2023	GRAS
Multi-frequency Calibrator	Quest	Quest-cd	EIA000234	29 June 2023	TSI
Audio Generator	Svante	Svan40	131	12 October 2023	WK Electric

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Calibrated By

Calibration Officer

Approved By

Issue Date: 21 April 2023

VERIFIED

DATE Apr 25, 2023

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

FM-708-SLM-01 Rev:0 Issue date 9/9/19

Certificate No : 23-SLM-137

Request No : Req-2023-0806

1. Indication at the calibration check frequency

UUC Setting	Nominal Level	Before Adjust		After Adjust		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
		UUC (dB)	EER (dB)	UUC (dB)	EER (dB)		
Calibrator Setting	(dB)						
1000 Hz 114 dB	113.79	113.9	+0.11	113.8	+0.0	0.2	0.3

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand Svante, Model SV35, SN. 58979

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 23-80		
UUC Weighting	(dB)	(\pm dB)
A	14.9	0.1

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 23-80		
UUC Weighting	(dB)	(\pm dB)
A	7.9	0.1
C	11.4	0.1
Z	18.2	0.1

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
	A	C	Z		
FAST / 36-130					
STD Setting	(dB)	(dB)	(dB)		
125 Hz	0.1	0.2	0.1	0.6	1.0
1600 Hz	0.0	0.0	0.0	0.6	0.7
4000 Hz	-0.2	-0.1	0.0	0.6	1.0
8000 Hz	-0.6	-0.6	-0.5	0.7	+1.5 -2.5

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

FM-708-SLM-01 Rev:0 Issue date 9/9/19

Certificate No : 23-SLM-137

Request No : Req-2022-0805

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance Limit
FAST / 30-130	A (dB)	C (dB)	Z (dB)	(\pm dB)	(\pm dB)
STD Setting					
63 Hz	-0.1	0.3	0.0	C.2	1.0
125 Hz	-0.1	0.1	0.0		1.0
250 Hz	-0.1	0.3	0.0		1.0
500 Hz	0.0	0.1	0.0		1.0
1000 Hz	0.0	0.3	0.0		3.7
2000 Hz	0.0	0.1	0.0		1.0
4000 Hz	0.0	0.1	0.0		1.0
8000 Hz	0.1	0.1	0.0		+1.5, -2.5
16000 Hz	-0.5	-0.5	0.0		+2.5, -16.0

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance Limit
FAST / 30-130	REF	UUC	ERR	(\pm dB)	(\pm dB)
UUC Weighting	(dB)	(dB)	(dB)		
A	114.00	114.0	0.0	C.2	3.2
C	114.00	114.0	0.0		3.2
Z	114.00	114.0	0.0		3.2

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance Limit
30-130 / A	REF	UUC	ERR	(\pm dB)	(\pm dB)
UUC Time Response	(dB)	(dB)	(dB)		
Fast	114.00	114.0	0.0	C.2	3.1
Slow	114.00	114.0	0.0		3.1
Leq	114.00	114.0	0.0		3.1

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-SLM-01 Rev03 Issue date 01/07/19

Certificate No : 23-SLM-137

Request No : Req-2022-0805

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance Limit
FAST / A / 30-140	UUC	(\pm dB)	(\pm dB)
STD Setting	(dB)		
Initial	114.0		
Final	114.0		
Deviated	0.0		

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY	Acceptance Limit
FAST / A / 30-140	REF	UUC	ERR	(\pm dB)	(\pm dB)
STD dB	(dB)	(dB)	(dB)		
130.00	130	130.0	0.0	C.3	0.3
129.00	129	129.0	0.0		0.3
128.00	128	128.0	0.0		0.3
127.00	127	127.0	0.0		0.3
126.00	126	126.0	0.0		0.3
125.00	125	125.0	0.0		0.3
124.00	124	124.0	0.0		0.3
123.00	123	123.0	0.0		0.3
122.00	122	122.0	0.0		0.3
121.00	121	121.0	0.0		0.3
120.00	120	120.0	0.0		0.3
119.00	119	119.0	0.0		0.3
118.00	118	118.0	0.0		0.3
117.00	117	117.0	0.0		0.3
116.00	116	116.0	0.0		0.3
115.00	115	115.0	0.0		0.3
114.00	114	114.0	0.0		0.3
113.00	113	113.0	0.0		0.3
112.00	112	112.0	0.0		0.3
111.00	111	111.0	0.0		0.3
110.00	110	110.0	0.0		0.3

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-SLM-01 Rev03 Issue date 01/07/19

Certificate No : 23-SLM-137

Request No : Req-2023-0805

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A	REF	UUC	ERR		
UUC Range	(dB)	(dB)	(dB)		
20-129	30.1	30.1	0.0	0.3	3.8
	114	114.0	0.0		3.8

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
A / 30-130	Timeburst	Ref	UUC	ERR		
UUC Time Response	(ms)	(dB)	(dB)	(dB)		
Fast	200	126.0	125.0	0.0	0.2	0.5
	2	109.0	109.0	0.0		+1.0, -4.3
	0.25	106.0	99.9	-0.1		+1.0, -9.0
Slow	200	115.6	117.6	0.0		0.5
	2	106.0	103.0	0.0		+1.0, -9.0
SEL	200	126.0	123.0	0.0		0.5
	2	106.0	103.0	0.0		+1.0, -4.3
	0.25	91.0	90.9	-0.1		+1.0, -9.0

11. Peak CSound level

UUC Setting	Anticipated	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / C / 55-141	REF	UUC	ERR		
STD Setting	(dB)	(dB)	(dB)		
Complete cycle	136.4	136.1	-0.30	0.2	2.0
Positive half cycle	135.4	135.2	-0.20		1.0
Negative half cycle	135.4	135.2	-0.20		1.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-SLM-01 Rev0 Issue date: 01/07/19

Certificate No : 23-SLM-137

Request No : Req-2023-0805

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 10-130	UUC		
STD Setting	(dB)		
Positive one-half cycle	141.7		
Negative one-half cycle	141.7		
Deviated	0.0	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 10-130	UUC		
STD Setting	(dB)		
Initial	119.0		
Final	119.0		
Deviated	0.0	0.1	0.1

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-SLM-01 Rev0 Issue date: 01/07/19

Certificate of Calibration

Customer

Name : SGS (Thailand) Limited.
Address : 100 Nanglinchue Road, Changnorsri, Yamaa Bangkok 10120

Certificate No : 23-SLM-085
Request No : Req-2023-0581

Unit Under Calibration Details

Measurement item : Sound Level Meter
Manufacturer : EION
Model : NL-21
Serial Number : 00393390
ID : ENSL 052
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : UC-S2
Microphone S/N : 145248
Preamplifier Model : NH-21
Preamplifier S/N : 2129
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C
Humidity : 50 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 7 March 2023
Calibrated Date : 13 March 2023
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3: 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	S/N	Date calibration	Traceability
Standard Microphone	GRAS	40AN	188273	6 October 2023	GRAS
Multifrequency Calibrator	Quest	Quest-ca	EFA000234	29 June 2023	TSI
Audio Generator	Svante	Svan401	131	12 October 2023	WK Electric

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Calibrated By :

Calibration Officer

Approved By :

Calibration Engineer Supervisor

Issue Date : 13 March 2023

VERIFIED

DATE 14/03/2023

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FW-788-SLM-01 Re: 0 Issue date: 01/07/19

Certificate No : 23-SLM-085

Request No : Req-2023-0581

1. Indication at the calibration check frequency

UUC Setting	Nominal Levl (dB)	Before Adjust		Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)		
1000 Hz: 94.30 dB	94.03	94.6	+0.57	94.0	-0.05	0.20	0.3

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand Cirrus, Model CR-315, S/N: 81400

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 20-80		
UUC Weighting	(dB)	(± dB)
A	20.9	0.14

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 20-80		
UUC Weighting	(dB)	(± dB)
A	11.9	0.14
C	14.8	0.14
Z	20.3	0.14

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Respose curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)
	A	C	Z		
FAST / 30-120	(dB)	(dB)	(dB)	0.50 0.60 0.60 0.70	1.5 1.0 3.0 5.0
125 Hz	0.7	0.8	0.8		
1000 Hz	0.0	0.0	0.0		
4000 Hz	-2.1	-2.3	-2.2		
8000 Hz	-2.9	-2.9	-2.9		

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FW-788-SLM-01 Re: 0 Issue date: 01/07/19

Certificate No : 23-SLM-085
Request No : Rec-2023-0581

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency			UNCERTAINTY	Acceptance Limit
FAST / 30-120	Weighting Response curve				
STD Setting	A (dB)	C (dB)	Z (dB)	(± dB)	(± dB)
63 Hz	-0.2	-0.1	-0.2	0.2	2.0
125 Hz	-0.1	0.0	-0.1		1.5
250 Hz	-0.1	-0.1	-0.1		1.5
500 Hz	-0.1	0.0	0.0		1.5
1000 Hz	0.0	0.0	0.0		1.0
2000 Hz	0.1	0.	0.1		2.0
4000 Hz	0.0	0.0	0.1		3.0
8000 Hz	0.1	0.	0.1		5
16000 Hz	-1.8	-1.8	-2.4		+5, -INF

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / 30-120	REF	UUC	ERR		
UUC Weighting	(dB)	(dB)	(dB)	0.2	
A	114.00	114.0	0.0		
C	114.00	114.0	0.0		
Z	114.00	114.0	0.0		

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
30-120 / A	REF	UUC	ERR		
UUC Time Response	(dB)	(dB)	(dB)	0.2	
Fast	114.00	114.0	0.0		
Slow	114.00	114.0	0.0		
Leq	114.00	114.0	0.0		

Certificate No : 23-SLM-085
Request No : Rec-2023-0581

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 30-120	UUC		
STD Setting	(dB)		
Initial	114.0		
Final	114.0		
Deviated	0.0		

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 30-120	REF	UUC	ERR		
STD dB	(dB)	(dB)	(dB)	0.3	
120.00	120	120.0	0.0		
119.00	119	119.0	0.0		
114.00	114	114.0	0.0		
109.00	109	109.0	0.0		
104.00	104	104.0	0.0		
99.00	99	99.0	0.0		
94.00	94	94.1	0.1		
89.00	89	89.1	0.1		
84.00	84	84.1	0.1		
79.00	79	79.1	0.1		
74.00	74	74.1	0.1		
69.00	69	69.1	0.1		
64.00	64	64.1	0.1		
59.00	59	59.1	0.1		
54.00	54	54.1	0.1		
49.00	49	49.1	0.1		
44.00	44	44.1	0.1		
39.00	39	39.1	0.1		
34.00	34	34.2	0.2		
29.00	29	29.4	0.4		
28.00	28	28.6	0.6		
27.00	27	27.6	0.6		

Certificate No : 23-SLM-085
 Request No : Rec-2023-0581

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A	REF	UUC	ERR		
UUC Range	(dB)	(dB)	(dB)		
30-120	12.40	12.5	0.1	0.3	1.1
	114	114.0	0.0		1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
A / 30-120	Toneburst	Ref	UUC	ERR		
UUC Time Response	(ms)	(dB)	(dB)	(dB)		
Fast	200	116.0	115.0	0.0	0.3	1
	2	99.0	99.0	0.0		-1.0, -2.5
	0.25	90.0	89.9	-0.1		-1.5, -5.0
Slow	200	105.6	109.6	0.0		1
	2	90.0	99.0	0.0		-1.0, -5.0
SEL	200	116.0	113.0	0.0		1
	2	90.0	99.0	0.0		-1.0, -2.5
	0.25	81.0	88.9	-0.1		-1.5, -5.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / C / 55-140	REF	UUC	ERR		
STD Setting	(dB)	(dB)	(dB)		
Complete cycle	136.4	136.0	-0.40	0.2	3.0
Positive half cycle	135.4	135.0	-0.40		2.0
Negative half cycle	135.4	135.0	-0.40		2.0

Certificate No : 23-SLM-085
 Request No : Rec-2023-0581

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 40-130	UUC		
STD Setting	(dB)		
Positive one-half cycle	129.2		
Negative one-half cycle	129.0		
Deviated	0.2	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 40-130	UUC		
STD Setting	(dB)		
Initial	129.0		
Final	129.0		
Deviated	0.0	0.1	0.3

End of Certificate

Certificate of Calibration

Customer

Name : SGS (Thailand) Limited.
Address : 100 Nanglinchee Road, Chongrosi Yarnawa Bangkok 10120

Certificate No : 23-SLM-376
Request No : Req-2023-2417

Unit Under Calibration Details

Measurement item : Sound Level Meter
Manufacturer : RICON
Model : NL-21
Serial Number : 00398352
ID : ENSL 034
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : UC-42
Microphone S/N : 00179
Preamplifier Model : NH-21
Preamplifier S/N : 22955
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C
Humidity : 50 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 13 November 2023
Calibrated Date : 15 November 2023
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic test
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN.	Due calibration	Traceability
Standard Microphone	GRAS	40AN	888273	21 August 2024	GRAS
Multi-frequency Calibrator	Quest	Questcal	EFA000234	26 July 2024	TSI
Audio Generator	SvanteK	Svan-01	131	9 October 2024	WK Electric

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Calibrated By :

Service Calibration Engineer

Approved By :

Calibration Engineer Supervisor

Issue Date : 15 November 2023

VERIFIED

DATE 15 Nov 2023

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-SLM-01 Rev. 02 Issue date: 7/11/23

Certificate No : 23-SLM-376

Request No : Req-2023-2417

1. Indication at the calibration check frequency

UUC Setting	Nominal Level (dB)	Before Adjust		After Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)		
Calibrator Setting	1000 Hz 94 dB	94.17	94.5	+0.33	94.2	0.03	0.30

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand CIRRUS, Model CR-515, SN. 81959

2. Self-generated noise, Microphone Installed

UUC Setting	Measured (dB)	UNCERTAINTY (± dB)
FAST / 20-80	16.1	0.10
UUC Weighting		
A		

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured (dB)	UNCERTAINTY (± dB)
FAST / 20-80	7.9	0.10
UUC Weighting		
A	7.9	0.10
C	7.3	0.10
Z	10.0	0.10

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)
	A	C	Z		
FAST / 20-120					
STD Setting (dB)					
125 Hz	0.1	0.2	0.	0.60	1.5
1000 Hz	0.0	0.0	0.0	0.60	1.0
4000 Hz	1.6	1.6	1.5	0.60	3.0
8000 Hz	-1.9	-1.9	-2.1	0.70	5.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-SLM-01 Rev. 02 Issue date: 7/11/23

Certificate No : 23-SLM-375
 Request No : Req-2023-2417

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency			UNCERTAINTY	Acceptance Limit
FAST / 30-120	Weighting Response curve				
STD Setting	A (dB)	C (dB)	Z (dB)	(\pm dB)	(\pm dB)
63 Hz	-0.2	-0.1	-0.1	0.20	2.0
125 Hz	-0.2	0.0	-0.1		1.5
250 Hz	-0.1	0.0	0.0		1.5
500 Hz	-0.1	0.0	0.0		1.5
1000 Hz	0.0	0.0	0.0		1.0
2000 Hz	0.1	0.1	0.0		2.0
4000 Hz	0.1	0.1	0.0		3.0
8000 Hz	0.2	0.2	0.0		5.0
16000 Hz	-1.7	-1.7	-2.4		+5, -INF.

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / 30-120	REF	UUC	ERR		
UUC Weighting	(dB)	(dB)	(dB)	0.20	0.20
A	114.00	114.0	0.0		
C	114.00	114.0	0.0		
Z	114.00	114.0	0.0		

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
30-120 / A	REF	UUC	ERR		
UUC Time Resonse	(dB)	(dB)	(dB)	0.20	0.10
Fast	114.00	114.0	0.0		
Slow	114.00	114.0	0.0		
Leq	114.00	114.0	0.0		

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FN-708-SLM-11 Rev. 02 Issue date: 7/11/23

Certificate No : 23-SLM-376
 Request No : Req-2023-2417

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 30-120	UUC		
STD Setting	(dB)	0.10	0.30
Initial	114.0		
Final	114.0		
Deviated	0.0		

8. Level linearity on the reference level range

UUC Setting	Antidpated	Deviation		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 30-120	REF	UUC	ERR		
STD dB	(dB)	(dB)	(dB)	3.40	1.1
126.00	126	126.0	0.0		
125.00	125	125.0	0.0		
124.00	124	124.0	0.0		
119.00	119	119.0	0.0		
114.00	114	114.0	0.0		
109.00	109	109.0	0.0		
104.00	104	104.0	0.0		
99.00	99	99.0	0.0		
94.00	94	94.1	0.1		
89.00	89	89.1	0.1		
84.00	84	84.1	0.1		
79.00	79	79.1	0.1		
74.00	74	74.1	0.1		
69.00	69	69.1	0.1		
64.00	64	64.1	0.1		
59.00	59	59.1	0.1		
54.00	54	54.1	0.1		
49.00	49	49.1	0.1		
44.00	44	44.1	0.1		
39.00	39	39.0	0.0		
34.00	34	34.0	0.0		
29.00	29	29.0	0.0		
28.00	28	27.5	-0.5		
27.00	27	26.9	-0.1		
26.00	26	25.9	-0.1		

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FN-708-SLM-01 Rev. 02 Issue date: 7/11/23

Certificate No : 23-SLM-376

Request No : Req-2023-2417

9. Level linearity including the level range control

9. Level linearity including the level range control					
UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance
FAST / A	REF	UUC	ERR		Limit
UUC Range	(dB)	(dB)	(dB)		(\pm dB)
10-120	32.50	32.7	0.2	0.30	1.1
	1.4	114.0	0.0		1.1

10. Tone burst response

UUC Setting		STD	Anticipated	Measured		UNCERTAINTY	Acceptance
A / 30-120		Toneburst (ms)	Ref (dB)	UUC	ERR		Limit
UUC Time Response						(dB)	(dB)
Fast		240	116.0	116.1	+0.1	0.20	10
		1	99.0	99.3	0.0		+1.0 -2.5
		0.25	90.0	89.9	-0.1		+1.5 -5.0
Slow		240	109.0	109.6	0.0		10
		1	90.0	90.3	0.0		+1.0 -5.0
SEL		240	110.0	110.0	0.0		10
		1	90.0	90.3	0.0		+1.0 -2.5
		0.25	81.0	80.9	-0.1		+1.5 -5.0

11. Peak C Sound level

11. Peak C Sound level					
UUC Setting	Anticipated	Measured		UNCERTAINTY (\pm dB)	Acceptance
FAST / C / 55-141	REF	UUC	ERR		Limit
STD Setting	(dB)	(dB)	(dB)		(\pm dB)
Complete cycle	135.4	35.5	-0.50	0.20	3.0
Positive half cycle	135.4	35.1	-0.30		2.0
Negative half cycle	135.4	35.1	-0.30		2.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-SLM-01 Rev.02 Issue date: 7/1/23

Certificate No : 23-SLM-376

Request No : Req-2023-2417

12. Overload indication

12. Overload indication			
UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 40-130	UUC		
STD Setting	(dB)		
Positive one-half cycle	139.3		
Negative one-half cycle	139.1		
Deviated	0.2	0.20	1.5

13. High Level Stability

13. High Level Stability			
UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 40-130	UUC		Limit
STD Setting	(dB)	(\pm dB)	(\pm dB)
Initial	129.0		
Final	129.0		
Deviated	0.0	0.10	0.30

Note :

Function	Maximum-permitted Uncertainty of measurement
1. Indication at the calibration check frequency	Not applicable
2. Self-generated noise, Microphone installed	Not applicable
3. Self-generated noise, Microphone replaced by the electrical input signal device	Not applicable
4. Acoustic signal test of frequency weightings at 10 Hz to 4 kHz	0.60 dB
4. Acoustic signal test of frequency weightings at >4 kHz to 10 kHz	0.70 dB
5. Electrical signal test of frequency weightings. Weighting network response with relative to 1 kHz	0.20 dB
6. Frequency and time weightings at 1 kHz	0.30 dB
7. Long Term Stability	0.10 dB
8. Level linearity on the reference level range	0.30 dB
9. Level linearity including the level range control	0.30 dB
10. Tone burst response	0.30 dB
11. Peak C Sound level	0.35 dB
12. Overload indication	0.25 dB
13. High Level Stability	0.10 dB

* Acceptance limit and Maximum-permitted Uncertainty was IEC 61672-1:2013

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-SLM-01 Rev.02 Issue date: 7/1/23

Certificate of Calibration

Customer

Name : S3S (Thailand) Limited.
Address : 100 Nanglinchee Road, Chongnonoi, Yannawa Bangkok 10120

Certificate No : 23-NDM-063
Request No : Rec-2023-0577

Unit Under Calibration Detail

Measurement item : Noise dosimeter
Manufacturer : CASELLA
Model : d3adge2
Serial Number : 1 67153
ID : ENSL 17141
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : -
Microphone S/N : 54251
Preamplifier Model : -
Preamplifier S/N : -
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C
Humidity : 50 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 7 March 2023
Calibrated Date : 24 March 2023
Calibration Procedure : In-house method CPNDM-01 based on IEC 61252 : 2017
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Multi-frequency Calibrator	Quest	Quest-cal	188272	29 June 2023	TS1
Standard Microphone	GRAS	40AN	188273	4 October 2023	GRAS
Sine Generator	Svante	Svan401	131	12 October 2023	WK Electric
Timer	EXTech	-	05-AC7	24 March 2023	TPA

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %

This Certificate was issued to replace to Calibration Certificate No. 22-AC7-202

Calibrated By :

Calibration Officer

Approved By :

Calibration Engineer Supervisor

Issue Date : 24 March 2023

VERIFIED

DATE for sign

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

FM-001-NDM-01 Rev.0 Issue date 01/07/19

Certificate No : 23-NDM-053

Request No : Req-2023-0577

1. Absolute acoustical sensitivity

UUC Setting	Time		Exposure Measurement			UNCERTAINTY (%)	Tolerances Limit (%)
	Ref	UUC	Ref (Pa ² ·h)	UUC (Pa ² ·h)	Error (%)		
FAST / A / 54-140	(s)	(s)					
Calibrator Setting	(s)	(s)					
1000 Hz 94 dB	120.00	120	0.03	0.03	0.00	3.0	-21, +26

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand Cirrus, Model CR-3.5, SN. 80400

2. Frequency weightings

UUC Setting	Deviation from various Frequency Weighting		UNCERTAINTY (± dB)	Tolerances Limit (± dB)
	A (dB)	C (dB)		
FAST / 54-140				
STD Setting				
63 Hz	-0.5	-0.6	0.40	2.0
125 Hz	-0.7	-0.7	0.40	1.5
250 Hz	-0.7	-0.7	0.40	1.5
500 Hz	-0.2	-0.1	0.40	1.5
1000 Hz	0.0	0.0	0.40	-
2000 Hz	0.3	-0.2	0.40	2.0
4000 Hz	0.8	0.3	0.40	3.0
8000 Hz	-1.0	-1.0	0.40	5.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

FM-001-NDM-01 Rev.0 Issue date 01/07/19

Certificate No : 23-NDM-063
 Request No : Req-2023-6577

3. Linearity of response to steady signals

a. Sound exposure meter, linearity of response for changes of input sinusoidal signal level

UUC Setting		FAST / A / High									
1000 Hz	Ref	(dB)	54.0	80.0	90.0	100.0	110.0	114.0	120.0	130.0	140.0
	Level A	(dB)	54.2	80.1	90.0	100.0	110.0	114.0	120.0	129.9	139.9
	Error	(dB)	0.2	0.1	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
8000 Hz	Ref	(dB)			84.5	98.9	108.9	112.9	118.9	124.9	138.9
	Level A	(dB)			89.6	99.0	108.9	112.9	118.9	124.9	138.9
	Error	(dB)			0.1	0.1	0.0	0.0	0.0	0.0	0.0
63 Hz	Ref	(dB)						87.8	93.8	101.8	113.8
	Level A	(dB)						87.8	93.8	101.8	113.8
	Error	(dB)						0.0	0.0	0.0	0.0
Tolerances Limit:		(±dB)	1.0								
UNCERTAINTY		(±dB)	0.27								

b. Sound exposure meter linearity of error

UUC Setting		Time		Exposure Measurement			UNCERTAINTY	Tolerances Limit
FAST / A / 54-140		Ref	UUC	Ref	UUC	Error		
Calibrator Setting		(s)	(s)	(Pa ² h)	(Pa ² h)	(%)	(%)	(%)
1000 Hz 110 dB		27	27	0.30	0.30	0.08	4.0	-21, +26
1000 Hz 110 dB		45	45	0.50	0.50	0.08		
1000 Hz 110 dB		90	90	1.00	0.99	-1.00		
1000 Hz 110 dB		180	180	2.00	1.98	-1.00		
1000 Hz 120 dB		36	36	4.00	3.98	-0.50		
1000 Hz 120 dB		72	72	8.00	7.93	-0.88	3.3	
1000 Hz 120 dB		90	90	0.00	9.90	-1.00		
1000 Hz 120 dB		180	180	20.00	19.83	-0.85		
1000 Hz 120 dB		360	360	40.00	39.63	-0.92		
1000 Hz 120 dB		720	720	80.00	79.24	-0.95		

Certificate No : 23-NDM-063
 Request No : Req-2023-0577

4. Response to short duration

a. Response for sinusoidal signals - reference level

UUC Setting		Time		Exposure Measurement			UNCERTAINTY	Tolerances Limit
FAST / A / 54-140		Ref	UUC	Ref	UUC	Error		
Calibrator Setting		(s)	(s)	(Pa ² h)	(Pa ² h)	(Pa ² h)	(Pa ² h)	(Pa ² h)
4000 Hz 95 dB		2846	2846	1.00	0.99	-0.01	6.01	-0.29 - 6.41

b. Sound exposure meter response for series of toneburst impulses

UUC Setting		Time		Exposure Measurement			UNCERTAINTY	Tolerances Limit
FAST / A / 54-140		Ref	UUC	Ref	UUC	Error		
Calibrator Setting		(s)	(s)	(Pa ² h)	(Pa ² h)	(%)	(%)	(%)
Burst 1 ms, 91 dB		2846	2846	1.00	0.99	-1.00	3.0	-21 - +26
Burst 1 ms, 100 dB		900	900	1.00	0.99	-1.00		-21 - +41
Burst 1 ms, 108 dB		143	143	1.00	1.00	0.00		-21 - +41

5. Response to unipolar pulse

UUC Setting		Time		Exposure Measurement		UNCERTAINTY	Tolerances Limit
FAST / A / 54-140		UUC		UUC	Different		
Calibrator Setting		(s)		(Pa ² h)	(%)	(%)	(%)
Continuous Rectangle +		19		13.13	+0.30	2.4	-21 - +26
Continuous Rectangle -				13.17			

* Indicates non accredited

End of Certificate

Certificate of Calibration

Customer

Name : Clirion Asia (Thailand) Co., Ltd.
 Address : 504/39 Moo 3 WHA Eastern Seaboard Industrial Estate 1, Tassih,
 Phakdaeng, Rayong 21140, Thailand.

Certificate No : 23-APC-034

Request No : Req-2023-0611

Unit Under Calibration Details

Measurement Item : Particle counter
 Manufacturer : CEM
 Model : DT-9820
 Serial Number : 19 202797
 ID : -
 Calibration Procedure : In-house method CP-APC-01 based on ISO 21501-4
 Location of Calibration : Particle Counter Laboratory

Environment Condition

Temperature : 23 °C ± 3 °C
 Humidity : 55 %RH ± 15 %RH
 Received Date : 13 March 2023
 Calibration result : As Left

Aerotrak Calibration Kit				
Reference Standard	Model	Serial Number	Traceable	Due Calibration
Particle counter	9316-02	93161140006	WK Electric	14 May 2023
Air flow meter	Gilibrator 3 High Flow	18501012012	Sensidyne	14 June 2023

Particle Standard				
Particle Size (µm)	Standard Uncertainty (µm)	Lot No.	Traceable	Due Calibration
0.303	0.003	231958	NIST	1 October 2023
0.508	0.003	221485	NIST	1 May 2024
1.036	0.006	231965	NIST	1 October 2023
5.400	0.15	230231	NIST	1 August 2023
9.700	0.25	223900	NIST	1 September 2024

Traceability : This Certificate is traceable to SI Unit through VK Electric Co., Ltd. and Mirac International Technology Co., Ltd. and Sensidyne

Note : The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k=2$, providing a level of confidence approximately 95 %.

Calibration By :

[Signature]
 Service Calibration Engineer

Approved By :

[Signature]
 Calibration Engineer Supervisor

Issue Date : 24 March 2023

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-APC-01 Rev.00 Issue date 01/07/15

Certificate No : 23-APC-034

Request No : Req-2023-0611

Counting Efficiency			
Particle Size (µm)	Deviation %	**Allowable Range %	Uncertainty %
0.3	-93.6	± 20	13
0.5	-49.9	± 10	15
1.4	-10.9	± 10	5.9
5.0	-64.3	± 10	5.8
10.0	-71.3	± 10	6.2

* False Count Rate					
Sample Time (min)	Sampled (L)	Measured Counts (#)	Concentration (#/M ³)	95% UCL (#/M ³)	**Allowable Range (#/M ³)
14	740	0	0.00	70.0	≤ 70.0

Sampling Flow Rate						
Temperature (°C)	Pressure (kPa)	UUC (Fixed Flow) (l/min)	STD (l/min)	Error %	**Allowable Range %	Uncertainty (L/min)
25.32	100.17	283	2.775	±1.9	± 5	0.064

Note : - UUC Reference Condition : At atmospheric and room temperature condition

- Flow Rate was corrected for non-standard operating condition by using equation :

$$Q_{meas} = Q_{ref} \times \frac{P_{ref}}{P_{meas}} \times \frac{T_{meas}}{T_{ref}}$$

where Q = Flow Rate P = Absolute Pressure T = Absolute Temperature
 Meas = Measurement Condition ref = Standard Condition

* Calibration Interval	
Calibration Date	**Expiration Date
24 March 2023	<= 1 Year

* Indicates non accredited

** Specified in ISO 21501-4

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-704-APC-01 Rev.00 Issue date 01/07/15

Certificate of Calibration

Customer

Name : SGS (Thailand) Limited,
Address : 10 Nangliachet Road, Chongnonit, Yinnawa Eanglok 10120

Certificate No : 21-NDM-152
Request No : Req-2023-1377

Unit Under Calibration Details

Measurement Item : Noise Dosimeter
Manufacturer : CASELLA
Model : dEdge2
Serial Number : 1157278
ID : ENSL 17146
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : -
Microphone SN : 59434
Preamplifier Model : -
Preamplifier SN : -
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C
Humidity : 50%RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 20 June 2023
Calibrated Date : 23 June 2023
Calibration Procedure : In-house method CP-NDM-01 based on IEC 61252 : 2017
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN.	Due calibration	Traceability
Multifrequency Calibrator	Quest	Quest-cal	118272	29 June 2023	TSI
Standard Microphone	GRAS	40AN	118273	6 October 2023	GRAS
Sine Generator	Svantek	Svan401	131	12 October 2023	WK Electric
Timer	EXTech	-	02-ACT	20 March 2024	TPA

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95%.

Calibrated By :

Calibration Officer

Approved By :

Calibration Engineer Supervisor

Issue Date : 23 June 2023

VERIFIED

DATE Jun 30, 2023

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-NDM-01 Rev.0 Issue date 01/08/21

Certificate No : 21-NDM-162

Request No : Req-2023-1377

1. Absolute acoustical sensitivity

UUC Setting	Time		Exposure Measurement			UNCERTAINTY	Tolerance Limit
FAST / A / 54-40	Ref	UUC	Ref	UUC	Error	(%)	(%)
Calibrator Setting	(s)	(s)	(Pa ² h)	(Pa ² h)	(%)		
1000 Hz 94 dB	120	120	0.03	0.03	0.00	3.1	-21, +26

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand Cirrus, Model CR-515, SN. 88372

2. Frequency weightings

UUC Setting	Deviation from various Frequency Weighting		UNCERTAINTY	Tolerances Limit
FAST / 54-140	A	C	(± dB)	(± dB)
STD Setting	(dB)	(dB)		
*63 Hz	-0.1	0.0	0.40	2.0
125 Hz	-0.8	-0.3	0.40	1.5
250 Hz	-0.6	-0.1	0.40	1.5
500 Hz	-0.3	0.1	0.40	1.5
1000 Hz	0.0	0.0	0.40	-
2000 Hz	0.1	0.5	0.40	2.0
4000 Hz	2.3	2.4	0.40	3.0
8000 Hz	-3.3	-3.3	0.40	5.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-708-NDM-01 Rev.0 Issue date 01/08/21

CertificateNo : 23-NDM-162
 RequestNo : Req-2023-1377

3. Linearity of response to steady signals

a. Sound exposure meter, linearity of response for changes of input sinusoidal signal level

UIC Setting		FAST / A / High									
1000 Hz	Ref	(dB)	55.0	80.0	90.0	100.0	110.0	114.0	120.0	130.0	140.0
	Level A	(dB)	54.5	80.0	90.0	99.9	109.9	114.0	119.9	129.9	139.9
	Error	(dB)	-0.5	0.0	0.0	-0.1	-0.1	0.0	-0.1	0.1	-0.1
8000 Hz	Ref	(dB)			84.5	98.9	108.9	112.5	118.9	128.9	138.9
	Level A	(dB)			89.0	98.9	108.9	112.5	118.9	128.9	138.8
	Error	(dB)			0.1	0.0	0.0	0.0	0.0	0.0	-0.1
63 Hz	Ref	(dB)						87.8	93.8	103.8	113.8
	Level A	(dB)						87.8	93.7	103.7	113.7
	Error	(dB)						0.0	-0.1	0.1	-0.1
Tolerances Limit		(±dB)	1.0								
UNCERTAINTY		(±dB)	0.3								

b. Sound exposure meter linearity of error

UIC Setting		Time		Exposure Measurement			UNCERTAINTY	Tolerance Limit
FAST / A / 54-140		Ref	UUC	Ref	UUC	Error		
Calibrator Setting		(s)	(s)	(Pa ² h)	(Pa ² h)	(%)	(%)	(%)
1000 Hz 110 dB		27	27	0.30	0.30	0.00	5.6	-21, +26
1000 Hz 110 dB		45	45	0.50	0.50	0.00		
1000 Hz 110 dB		90	90	1.00	0.99	-1.00		
1000 Hz 110 dB		180	180	2.00	1.98	-1.00		
1000 Hz 120 dB		36	36	4.00	3.98	-0.50		
1000 Hz 120 dB		72	72	8.00	7.98	-0.25	5.6	
1000 Hz 120 dB		90	90	10.00	9.98	-0.30		
1000 Hz 120 dB		180	180	20.00	19.95	-0.25		
1000 Hz 120 dB		360	360	40.00	39.92	-0.20		
1000 Hz 120 dB		720	720	80.00	79.84	-0.20		

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the innovative instrument Co., Ltd.

FM-501-NDM-41 Rev.0 Issue date 01/08/21

CertificateNo : 23-NDM-162
 RequestNo : Req-2023-1377

4. Response to short duration

a. Response for sinusoidal signals - reference level

UIC Setting		Time		Exposure Measurement			UNCERTAINTY	Tolerances Limit
FAST / A / 54-140		Ref	UUC	Ref	UUC	Error		
Calibrator Setting		(s)	(s)	(Pa ² h)	(Pa ² h)	(Pa ² h)	(Pa ² h)	(Pa ² h)
4000 Hz 95 dB		2846	2846	1.00	0.98	-0.02	0.652	-0.29 - +0.41

b. Sound exposure meter response for series of toneburst impulses

UIC Setting		Time		Exposure Measurement			UNCERTAINTY	Tolerances Limit
FAST / A / 54-140		Ref	UUC	Ref	UUC	Error		
Calibrator Setting		(s)	(s)	(Pa ² h)	(Pa ² h)	(%)	(%)	(%)
Burst 1 ms, 95 dB		2846	2846	1.00	0.98	-2.00	5.6	-21 - +26
Burst 1 ms, 106 dB		900	900	1.00	0.98	-2.00		-29 - +41
Burst 1 ms, 108 dB		143	143	1.00	0.99	-1.00		-29 - +41

5. Response to unipolar pulse

UIC Setting	Time	Exposure Measurement		UNCERTAINTY	Tolerances
FAST / A / 55-140	UUC	UUC	Different		Limit
Calibrator Setting	(s)	(Pa.h)	(%)	(%)	(%)
Continuous Rectangle +	28	10.37	+0.39	3.7	-21 - +26
Continuous Rectangle -		10.33			

* Indicates non accredited

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the innovative instrument Co., Ltd.

FM-501-NDM-41 Rev.0 Issue date 01/08/21

Certificate of Calibration

Customer

Name : SGS (Thailand) Limited.
 Address : 100 Nanglincher Road, Chongnonsi, Vinnava Bangkok 10120

Certificate No : 23-NDM-066
 Request No : Req/2023-0598

Unit Under Calibration Details

Measurement Item : Noise dosimeter
 Manufacturer : CASELLA
 Model : dBadge2
 Serial Number : 1167282
 ID : ENSL 17147
 Resolution : 0.1 dB
 Microphone Class : 2
 Microphone Model : -
 Microphone S/N : 59286
 Preamplifier Model : -
 Preamplifier S/N : -
 Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C
 Humidity : 56 %RH ± 20 %RH
 Barometric Pressure : 1013 hPa ± 10 hPa
 Received Date : 7 March 2023
 Calibrated Date : 24 March 2023
 Calibration Procedure : In-house method CPNDM-01 based on IEC 61252 : 2017
 Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Multi-frequency Calibrator	Quest	Quest-cal	188272	29 June 2023	TSI
Standard Microphone	GRAS	40AN	188273	6 October 2023	GRAS
Sine Generator	Svantek	Sva401	31	12 October 2023	W.K. Electric
Tuner	EXTECH	-	05-AC7	24 March 2023	TPA

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %

This Certificate was issued to replace to Calibration Certificate No. 22-AC7-202

Calibrated By :

Calibration Officer

Approved By :

Calibration Engineer Supervisor

Issue Date : 24 March 2023

VERIFIED

DATE 7/8/30/2023

*The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

FM-206-NDM-01 Rev.0 Issue date 01/07/19

Certificate No : 23-NDM-066

Request No : Req/2023-0598

1. Absolute acoustical sensitivity

UUC Setting	Time		Exposure Measurement			UNCERTAINTY	Tolerances
FAST / A / 54-140	Ref	UUC	Ref	UUC	Error		Limit
Calibrator Setting	(s)	(s)	(Pa ² h)	(Pa ² h)	(%)	(%)	(%)
1000 Hz 94 dB	120.00	120	0.03	0.03	0.00	3.0	-21, +26

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand Cirrus, Model CR-5 / 5, SN: 89400

2. Frequency weightings

UUC Setting	Deviation from various Frequency Weighting		UNCERTAINTY	Tolerances
FAST / 54-140	A	C		Limit
STD Setting	(dB)	(dB)	(± dB)	(± dB)
63 Hz	0.1	0.0	0.40	2.0
125 Hz	-0.7	-0.7	0.40	1.5
250 Hz	-0.8	-0.8	0.40	1.5
500 Hz	-0.4	-0.3	0.40	1.5
1000 Hz	0.0	0.0	0.40	-
2000 Hz	0.2	0.3	0.40	2.0
4000 Hz	2.3	2.3	0.40	3.0
8000 Hz	-2.5	-2.5	0.40	5.0

*The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

FM-206-NDM-01 Rev.0 Issue date 01/07/19

Certificate No : 23-NDM-046
 Request No : Req-2023-0598

3. Linearity of response to steady signals

a. Sound exposure meter, linearity of response for changes of input sinusoidal signal level

UUC Setting		FAST / A / High									
1000 Hz	Ref	(dB)	54.0	80.0	90.0	100.0	110.0	124.0	130.0	140.0	
	Level A	(dB)	54.5	80.2	90.2	100.1	110.0	124.0	130.0	140.0	
	Error	(dB)	0.5	0.2	0.2	0.1	0.0	0.0	0.0	0.0	
8000 Hz	Ref	(dB)			88.9	98.9	108.9	112.9	128.9	138.9	
	Level A	(dB)			89.0	99.0	109.0	112.9	128.9	138.9	
	Error	(dB)			0.1	0.1	0.1	0.0	0.0	0.0	
63 Hz	Ref	(dB)					87.8	93.8	103.8	113.8	
	Level A	(dB)					87.8	93.8	103.8	113.8	
	Error	(dB)					0.0	0.0	0.0	0.0	
Tolerances Limit:		(dB)	±0								
UNCERTAINTY		(dB)	0.27								

b. Sound exposure meter linearity of error

UUC Setting		Time		Exposure Measurement			UNCERTAINTY	Tolerances
FAST / A / 54-140		Ref	UUC	Ref	UUC	Error		Limit
Calibrator Setting		(s)	(s)	(Pa ² h)	(Pa ² h)	(%)	(%)	(%)
1000 Hz 110 dB		27	27	0.30	0.30	0.00	4.1	-21, +26
1000 Hz 110 dB		45	45	0.50	0.50	0.00		
1000 Hz 110 dB		90	90	1.00	0.90	-1.00		
1000 Hz 110 dB		180	180	2.00	1.98	-1.00		
1000 Hz 120 dB		36	36	4.00	3.94	-1.50		
1000 Hz 120 dB		72	72	8.00	7.87	-1.68	3.3	
1000 Hz 120 dB		90	90	0.00	9.90	-1.00		
1000 Hz 120 dB		180	180	20.00	19.76	-1.20		
1000 Hz 120 dB		360	360	40.00	39.48	-1.30		
1000 Hz 120 dB		720	720	80.00	78.66	-1.68		

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-206-NDM-01 Rev.0 Issue Date: 01/07/19

Certificate No : 23-NDM-056
 Request No : Req-2023-0598

4. Response to short duration

a. Response for sinusoidal signals - reference level

UUC Setting		Time		Exposure Measurement			UNCERTAINTY	Tolerances Limit
FAST / A / 54-140		Ref	UUC	Ref	UUC	Error		
Calibrator Setting		(s)	(s)	(Pa ² h)	(Pa ² h)	(Pa ² h)	(Pa ² h)	(Pa ² h)
4000 Hz 95 dB		2846	2846	1.00	0.99	-0.01	0.01	-0.29 ~ 0.41

b. Sound exposure meter response for series of toneburst impulses

UUC Setting		Time		Exposure Measurement			UNCERTAINTY	Tolerances Limit
FAST / A / 54-140		Ref	UUC	Ref	UUC	Error		
Calibrator Setting		(s)	(s)	(Pa ² h)	(Pa ² h)	(%)	(%)	(%)
Burst 1 ms, 95 dB		2846	2846	1.00	0.99	-1.00	3.0	-21 ~ +26
Burst 1 ms, 100 dB		900	900	1.00	0.99	-1.00		-21 ~ +41
Burst 1 ms, 108 dB		143	143	1.00	1.00	0.00		-21 ~ +41

5. Response to unipolar pulse

UUC Setting		Time		Exposure Measurement		UNCERTAINTY	Tolerances Limit
FAST / A / 54-140		UUC		UUC	Different		
Calibrator Setting		(s)		(Pa ² h)	(%)	(%)	(%)
Continuous Rectangle +		29		19.28	+0.08	2.4	-21 ~ +26
Continuous Rectangle -				19.25			

* indicates non accredited

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-206-NDM-01 Rev.0 Issue Date: 01/07/19

ENSL 17149

Certificate of Calibration

Customer

Name : SGS (Thailand) Limited.
 Address : 100 Nanglinchee Road, Chongronsi, Yannewa Bangkok
 10120

Certificate No : 23-ACT-016
 Request No : Req-2023-0-10

Unit Under Calibration Details

Measurement Item : Acoustic Calibrator
 Manufacturer : Cirras
 Model : CR-515
 Serial Number : 80411
 ID : ENSL 17149
 Class : 1
 Range : 94 dB / 1000 Hz
 Instrument Status : Used

Calibration Environment and Details

Temperature : (23 ±2 °C)
 Humidity : (50 ± 20 %RH)
 Barometric Pressure : (1013 ±10.0 hPa)
 Received Date : 12 January 2023
 Calibration Date : 26 January 2023
 Location of Calibration : LAB 1 Acoustic
 Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators



Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEL	31 May 2023
THD Multimeter	2015	1047755	NIMT	2 February 2023

Traceability : This certificate provides traceability of measurement to recognized national standard, and to the realization of the international System of Units (SI).

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k=2, providing a level of confidence approximately 95 %.

Calibrated By :

Service Calibration Engineer

Approved By :

Calibration Engineer Supervisor

Issue Date : 25 January 2023

Certificate No : 23-ACT-016

Request No : Req-2023-0110

Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)	Acceptance limit Class 1 (± dB)
	Measured	Error	Measured	Error		
94 dB / 1000 Hz	94.01	0.01	-	-	0.13	0.25

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 1 (± %)
	Measured (Hz)	Error (%)	Measured (Hz)	Error (%)		
94 dB / 1000 Hz	1000.00	0.00	-	-	0.10	0.70

Total Harmonic Distortion plus Noise of Sound pressure level (THD+N %)

Calibration Range (Hz)	Without Adjustment	Adjustment	Uncertainty (± %)	Acceptance limit Class 1 (± %)
	Measured (%)	Measured (%)		
94 dB / 1000 Hz	0.09	-	0.40	2.5

Note :

- Acceptance limit was IEC 60942:2017 Class 1
- The calibration results exclude the calibrator pressure correction
- The calibration results exclude the microphone volume correction

End of Calibration

Certificate of Calibration

Customer

Name : SGS (Thailand) Limited.
 Address : 100 Nangirtee Road, Chongronsi, Yannawa Bangkok
 10120

Certificate No : 23-ACT-015
 Request No : Req-2023-0109

Unit Under Calibration Details

Measurement Item : Acoustic Calibrator
 Manufacturer : CASELLA
 Model : CEL-120/2
 Serial Number : 3864875
 ID : ENSL 17150

Class : 2
 Range : 114 dB / 1000 Hz
 Instrument Status : Used

Calibration Environment and Details

Temperature : (23 ± 2 °C)
 Humidity : (50 ± 20 %RH)
 Barometric Pressure : (1013 ± 10.0 hPa)
 Received Date : 12 January 2023
 Calibration Date : 26 January 2023
 Location of Calibration : LAB 1 Acoustic
 Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators



Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	53079	EEL	31 May 2023
THD Multimeter	2015	1047765	NIMT	2 February 2023

Traceability : This certificate provides traceability of measurement to recognized national standard, and to the realization of the international System of Units (SI).

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor k=2, providing a level of confidence approximately 95 %.

Calibrated By :

Service Calibration Engineer

Approved By :

Calibration Engineer Supervisor

Issue Date : 25 January 2023

Certificate No : 23-ACT-015

Request No : Req-2023-0109

Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)	Acceptance limit Class 2 (± dB)
	Measured	Error	Measured	Error		
114 dB / 1000 Hz	114.07	0.07	-	-	0.11	0.40

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 2 (± %)
	Measured (Hz)	Error (%)	Measured (Hz)	Error (%)		
114 dB / 1000 Hz	1000.00	0.00	-	-	0.10	1.7

Total Harmonic Distortion plus Noise of Sound pressure level (THD+N %)

Calibration Range (Hz)	Without Adjustment	Adjustment	Uncertainty (± %)	Acceptance limit Class 2 (± %)
	Measured (%)	Measured (%)		
114 dB / 1000 Hz	0.17	-	0.40	3.0

Note :

- Acceptance limit was IEC 60942:2017 Class 1
- The calibration results exclude the calibrator pressure correction
- The calibration results exclude the microphone volume correction

End of Calibration

Certificate of Calibration

Customer

Name : SGS (Thailand) Limited.
 Address : 100 Nanglinsee Road, Chongnongs, Yannava Bangkok 10120

Certificate No : 23-NDM-213

Request No : Req-2023-1729

Unit Under Calibration Details

Measurement item : Noise Dosimeter
 Manufacturer : CASELLA
 Model : dBudget2
 Serial Number : 2311490
 ID : ENSL 21175
 Resolution : 0.1 dB

Microphone Class : 1
 Microphone Model : -
 Microphone S/N : 90981
 Preamplifier Model : -
 Preamplifier S/N : -
 Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C
 Humidity : 50 %RH ± 20 %RH
 Barometric Pressure : 1013 hPa ± 10 hPa
 Received Date : 15 August 2023
 Calibrated Date : 23 August 2023
 Calibration Procedure : In-house method CP-NDM-01 based on IEC 61252 : 2017
 Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	S/N	Date calibration	Traceability
Multifrequency Calibrator	Quest	Quest-cal	188272	25 July 2024	TSI
Standard Microphone	GRAS	40AN	188273	6 October 2023	GRAS
Sine Generator	Svantek	Svar401	131	12 October 2023	WK Electric
Timer	EXTECH	-	05-ACT	20 March 2024	TPA

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95%.

Calibrated By :

Calibration Officer

Approved By :

Calibration Engineer Supervisor

Issue Date : 23 August 2023

VERIFIED

DATE Aug 27, 2023

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM708-NDM-01 Rev: 0 Issue date 01/08/21

Certificate No : 23-NDM-213

Request No : Req-2023-1729

1. Absolute acoustical sensitivity

UUC Setting	Time		Exposure Measurement			UNCERTAINTY	Tolerance
FAST / A / 54-140	Ref	UUC	Ref	UUC	Error		
Calibrator Setting	(s)	(s)	(Pa ² h)	(Pa ² h)	(%)	(%)	(%)
1000 Hz 94 dB	120	120	0.03	0.03	0.00	3.1	-21, +26

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN. 58079

2. Frequency weightings

UUC Setting	Deviation from various Frequency Weighting		UNCERTAINTY	Tolerance
FAST / 54-140	A	C	(± dB)	(± dB)
STD Setting	(dB)	(dB)		
63 Hz	0.3	0.4	0.40	2.0
125 Hz	-1.1	-0.8	0.40	1.5
250 Hz	-0.5	-0.4	0.40	1.5
500 Hz	-0.1	0.3	0.40	1.5
1000 Hz	0.0	0.0	0.40	-
2000 Hz	0.7	0.7	0.40	2.0
4000 Hz	2.3	2.3	0.40	3.0
8000 Hz	-2.9	-2.9	0.40	5.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM708-NDM-01 Rev: 0 Issue date 01/08/21

Certificate No : 23-NDM-213
 Request No : Req-2023-1729

3. Linearity of response to steady signals

a. Sound exposure meter, linearity of response for changes of input sinusoidal signal level

UUC Setting		FAST / A / High										
1000 Hz	Ref	(dB)	54.0	80.0	90.0	100.0	110.0	114.0	120.0	130.0	140.0	
	Level A	(dB)	54.5	80.1	90.1	100.0	110.0	114.0	120.0	130.0	140.0	
	Error	(dB)	0.5	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8000 Hz	Ref	(dB)				85.9	98.9	108.9	112.9	118.9	128.9	138.9
	Level A	(dB)				85.0	98.9	108.9	112.9	118.9	128.8	138.7
	Error	(dB)				0.1	0.0	0.0	0.0	0.0	-0.1	-0.2
53 Hz	Ref	(dB)							87.8	93.8	103.8	113.8
	Level A	(dB)							87.8	93.8	103.8	113.8
	Error	(dB)							0.0	0.0	0.0	0.0
Tolerances Limit		(dB)	1.0									
UNCERTAINTY		(dB)	0.3									

b. Sound exposure meter linearity of error

UUC Setting		Time		Exposure Measurement			UNCERTAINTY	Tolerances
FAST / A / 54-140		Ref	UUC	Ref	UUC	Error		
Calibrator Setting		(s)	(s)	(Pa ² h)	(Pa ² h)	(%)	(%)	(%)
1000 Hz / 10 dB		27	27	0.30	0.30	0.00	5.6	-21, +26
1000 Hz / 10 dB		45	45	0.50	0.50	0.00		
1000 Hz / 10 dB		90	90	1.00	0.99	-1.00		
1000 Hz / 10 dB		180	180	2.00	1.98	-1.00		
1000 Hz / 20 dB		36	36	4.00	3.98	-0.50		
1000 Hz / 20 dB		72	72	8.00	7.98	-0.25	81.7	
1000 Hz / 20 dB		90	90	0.00	9.95	-0.50		
1000 Hz / 20 dB		180	180	20.00	19.92	-0.40		
1000 Hz / 20 dB		360	360	40.00	39.84	-0.40		
1000 Hz / 20 dB		720	720	80.00	79.78	-0.27		

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

FM-708-NDM-01 Rev.0 Issue date: 01/08/21

Certificate No : 23-NDM-213
 Request No : Req-2023-1729

4. Response to short duration

a. Response for sinusoidal signals - reference level

UUC Setting		Time		Exposure Measurement			UNCERTAINTY	Tolerance Limit
FAST / A / 54-140		Ref	UUC	Ref	UUC	Error		
Calibrator Setting		(s)	(s)	(Pa ² h)	(Pa ² h)	(Pa ² h)	(Pa ² h)	(Pa ² h)
1000 Hz 95 dB		2846	2846	1.00	0.99	-0.01	0.052	-0.29 ~ +0.41

b. Sound exposure meter response for series of toneburst impulses

UUC Setting		Time		Exposure Measurement			UNCERTAINTY	Tolerance Limit
FAST / A / 54-140		Ref	UUC	Ref	UUC	Error		
Calibrator Setting		(s)	(s)	(Pa ² h)	(Pa ² h)	(%)	(%)	(%)
Burst 1 ms, 95 dB		2846	2846	1.00	0.99	-1.00	5.6	-21 ~ +26
Burst 1 ms, 100 dB		900	900	1.00	0.99	-1.00		-29 ~ +41
Burst 1 ms, 108 dB		143	143	1.00	1.00	0.00		-29 ~ +41

5. Response to unipolar pulse

UUC Setting		Time	Exposure Measurement		UNCERTAINTY	Tolerance Limit
FAST / A / 55-140		UTC	UUC	Different		
Calibrator Setting		(s)	(Pa·h)	(%)	(%)	(%)
Continuous Rectangle +		29	10.18	+0.49	3.7	-21 ~ +26
Continuous Rectangle -			10.23			

* Indicates non accredited

End of Certificate

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

FM-708-NDM-01 Rev.0 Issue date: 01/08/21

Certificate of Calibration

Customer

Name : SGS (Thailand) Limited.
 Address : 100 Nanglinsee Road, Chongnons, Yannava Bangkok 10120

Certificate No : 23-NDM-213
 Request No : Req-2023-1729

Unit Under Calibration Details

Measurement item : Noise Dosimeter
 Manufacturer : CASELLA
 Model : dBudget2
 Serial Number : 2311490
 ID : ENSL 21175
 Resolution : 0.1 dB
 Microphone Class : 2
 Microphone Model : -
 Microphone S/N : 90981
 Pre-amplifier Model : -
 Pre-amplifier S/N : -
 Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C
 Humidity : 50 %RH ± 20 %RH
 Barometric Pressure : 1013 hPa ± 10 hPa
 Received Date : 15 August 2023
 Calibrated Date : 23 August 2023
 Calibration Procedure : In-house method CP-NDM-01 based on IEC 61252 : 2017
 Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Multifrequency Calibrator	Quest	Quest-cal	188272	25 July 2024	TSI
Standard Microphone	GRAS	40AN	188273	6 October 2023	GRAS
Sine Generator	Svantek	Svar401	131	12 October 2023	WK Electric
Timer	EXTECH	-	05-ACT	20 March 2024	TPA

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95%.

Calibrated By :

Calibration Officer

Approved By :

Calibration Engineer Supervisor

Issue Date : 23 August 2023

VERIFIED

DATE Aug 27, 2023

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM708-NDM-01 Rev: 0 Issue date 01/08/21

Certificate No : 23-NDM-213

Request No : Req-2023-1729

1. Absolute acoustical sensitivity

UUC Setting	Time		Exposure Measurement			UNCERTAINTY	Tolerance
FAST / A / 54-140	Ref	UUC	Ref	UUC	Error	(%)	Limit
Calibrator Setting	(s)	(s)	(Pa ² h)	(Pa ² h)	(%)		(%)
1000 Hz 94 dB	120	120	0.03	0.03	0.00	3.1	-21, +26

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN. 58079

2. Frequency weightings

UUC Setting	Deviation from various Frequency Weighting		UNCERTAINTY	Tolerance
FAST / 54-140	A	C	(± dB)	(± dB)
STD Setting	(dB)	(dB)		
*63 Hz	0.3	0.4	0.40	2.0
125 Hz	-1.1	-0.8	0.40	1.5
250 Hz	-0.5	-0.4	0.40	1.5
500 Hz	-0.1	0.3	0.40	1.5
1000 Hz	0.0	0.0	0.40	-
2000 Hz	0.7	0.7	0.40	2.0
4000 Hz	2.3	2.3	0.40	3.0
8000 Hz	-2.9	-2.9	0.40	5.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM708-NDM-01 Rev: 0 Issue date 01/08/21

Certificate No : 23-NDM-213
 Request No : Req-2023-1729

3. Linearity of response to steady signals

a. Sound exposure meter, linearity of response for changes of input sinusoidal signal level

UUC Setting		FAST / A / High										
1000 Hz	Ref	(dB)	54.0	80.0	90.0	100.0	110.0	114.0	120.0	130.0	140.0	
	Level A	(dB)	54.5	80.1	90.1	100.0	110.0	114.0	120.0	130.0	140.0	
	Error	(dB)	0.5	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8000 Hz	Ref	(dB)				85.9	98.9	108.9	112.9	118.9	128.9	138.9
	Level A	(dB)				85.0	98.9	108.9	112.9	118.9	128.8	138.7
	Error	(dB)				0.1	0.0	0.0	0.0	0.0	-0.1	-0.2
53 Hz	Ref	(dB)							87.8	93.8	103.8	113.8
	Level A	(dB)							87.8	93.8	103.8	113.8
	Error	(dB)							0.0	0.0	0.0	0.0
Tolerances Limit		(dB)	1.0									
UNCERTAINTY		(dB)	0.3									

b. Sound exposure meter linearity of error

UUC Setting		Time		Exposure Measurement			UNCERTAINTY	Tolerances
FAST / A / 54-140		Ref	UUC	Ref	UUC	Error		
Calibrator Setting		(s)	(s)	(Pa ² h)	(Pa ² h)	(%)	(%)	(%)
1000 Hz / 10 dB		27	27	0.30	0.30	0.00	5.6	-21, +26
1000 Hz / 10 dB		45	45	0.50	0.50	0.00		
1000 Hz / 10 dB		90	90	1.00	0.99	-1.00		
1000 Hz / 10 dB		180	180	2.00	1.98	-1.00		
1000 Hz / 20 dB		36	36	4.00	3.98	-0.50		
1000 Hz / 20 dB		72	72	8.00	7.98	-0.25	81.7	
1000 Hz / 20 dB		90	90	0.00	9.95	-0.50		
1000 Hz / 20 dB		180	180	20.00	19.92	-0.40		
1000 Hz / 20 dB		360	360	40.00	39.84	-0.40		
1000 Hz / 20 dB		720	720	80.00	79.78	-0.27		

Certificate No : 23-NDM-213
 Request No : Req-2023-1729

4. Response to short duration

a. Response for sinusoidal signals - reference level

UUC Setting		Time		Exposure Measurement			UNCERTAINTY	Tolerance Limit
FAST / A / 54-140		Ref	UUC	Ref	UUC	Error		
Calibrator Setting		(s)	(s)	(Pa ² h)	(Pa ² h)	(Pa ² h)	(Pa ² h)	(Pa ² h)
1000 Hz 95 dB		2846	2846	1.00	0.99	-0.01	0.052	-0.29 ~ +0.41

b. Sound exposure meter response for series of toneburst impulses

UUC Setting		Time		Exposure Measurement			UNCERTAINTY	Tolerance Limit
FAST / A / 54-140		Ref	UUC	Ref	UUC	Error		
Calibrator Setting		(s)	(s)	(Pa ² h)	(Pa ² h)	(%)	(%)	(%)
Burst 1 ms, 95 dB		2846	2846	1.00	0.99	-1.00	5.6	-21 ~ +26
Burst 1 ms, 100 dB		900	900	1.00	0.99	-1.00		-29 ~ +41
Burst 1 ms, 108 dB		143	143	1.00	1.00	0.00		-29 ~ +41

5. Response to unipolar pulse

UUC Setting		Time	Exposure Measurement		UNCERTAINTY	Tolerance Limit
FAST / A / 55-140		UTC	UUC	Different		
Calibrator Setting		(s)	(Pa·h)	(%)	(%)	(%)
Continuous Rectangle +		29	10.18	+0.49	3.7	-21 ~ +26
Continuous Rectangle -			10.23			

* Indicates non accredited

End of Certificate

Certificate of Calibration

Customer

Name : SGS (Thailand) Limited
Address : 100 Nanglinchee Road, Chongasri, Yamaa Bangkok 10120

Certificate No : 23-NDM-214
Request No : Req-2023-1730

Unit Under Calibration Details

Measurement item : Noise Dosimeter
Manufacturer : CASELLA
Model : dBadge2
Serial Number : 2311550
IE : ENSL 21176
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model :
Microphone S/N : 91204
Preamplifier Model :
Preamplifier S/N :
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C
Humidity : 50 %RH ± 20 %RH
Barometric Pressure : 1013 hPa ± 10 hPa
Received Date : 15 August 2023
Calibrated Date : 23 August 2023
Calibration Procedure : In-house method CP-NDM-01 based on IEC 61252 : 2017
Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN	Date calibration	Traceability
Multi-frequency Calibrator	Quest	Ques-cal	188272	25 July 2024	TS1
Standard Microphone	GRAS	40AN	188273	5 October 2023	CRA3
Sine Generator	Svantek	Svan401	31	12 October 2023	WKElectric
Timer	EXTECH	-	95-AC7	20 March 2024	TPA

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %.

Calibrated By :

Calibration Officer

Approved By :

Calibration Engineer Supervisor

Issue Date : 13 August 2023



The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-206-NDM-01 Rev.0 Issue date: 01/08/21

Certificate No : 23-NDM-214

Request No : Req-2023-1730

1. Absolute acoustical sensitivity

UUC Setting	Time		Exposure Measurement			UNCERTAINTY	Tolerance Limit
	Ref	UUC	Ref	UUC	Error		
Calibrator Setting	(s)	(s)	(Pa ² ·h)	(Pa ² ·h)	(%)	(%)	(%)
1000 Hz 94 dB	120	120	0.03	0.03	0.00	3.1	-21, +26

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SVANTEK, Model SV 35A, SN. 58079

2. Frequency weightings

UUC Setting	Deviation from various Frequency Weighting		UNCERTAINTY	Tolerance Limit
	A	C		
FAST / 54-140	(dB)	(dB)	(± dB)	(± dB)
STD Setting	(dB)	(dB)		
*63 Hz	0.2	0.3	0.40	2.0
125 Hz	-0.5	-0.5	0.40	1.5
250 Hz	-0.4	-0.3	0.40	1.5
500 Hz	-0.1	0.1	0.40	1.5
1000 Hz	0.0	0.0	0.40	-
2000 Hz	0.2	0.2	0.40	2.0
4000 Hz	2.3	2.3	0.40	3.0
8000 Hz	-3.0	-3.0	0.40	5.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd.

FM-206-NDM-01 Rev.0 Issue date: 01/08/21

Certificate No : 23-NDM-214
 Request No : Req-2023-1730

3. Linearity of response to steady signals

a. Sound exposure meter, linearity of response for changes of input sinusoidal signal level

UUC Setting		FAST / A / High										
1000 Hz	Ref	(dB)	54.0	80.0	90.0	100.0	110.0	124.0	120.0	130.0	140.0	
	Level A	(dB)	54.4	80.1	90.1	100.0	110.8	114.0	120.0	129.9	139.8	
	Error	(dB)	0.4	0.1	0.1	0.0	0.8	0.0	0.0	-0.1	-0.2	
8000 Hz	Ref	(dB)				88.9	98.9	108.9	112.9	118.9	128.9	138.9
	Level A	(dB)				89.0	99.0	108.9	112.9	118.9	128.8	138.7
	Error	(dB)				0.1	0.1	0.0	0.0	0.0	-0.1	-0.2
63 Hz	Ref	(dB)							87.8	93.8	103.8	113.8
	Level A	(dB)							87.8	93.8	103.8	113.8
	Error	(dB)							0.0	0.0	0.0	0.0
Tolerances Limit		(±dB)	1.0									
UNCERTAINTY		(±dB)	0.3									

a. Sound exposure meter linearity of error

UUC Setting		Time		Exposure Measurement			UNCERTAINTY	Tolerances
FAST A / 54-140		Ref	UUC	Ref	UUC	Error		
Calibrator Setting		(s)	(s)	(Pa ² h)	(Pa ² h)	(%)	(%)	(%)
000Hz / 110 dB		27	27	0.30	0.30	0.00	5.6	-21, +26
000Hz / 110 dB		45	45	0.50	0.50	0.00		
000Hz / 110 dB		80	90	1.00	0.99	-1.00		
000Hz / 110 dB		180	180	2.00	1.99	-0.50		
000Hz / 120 dB		36	36	4.00	3.99	-0.25		
000Hz / 120 dB		72	72	8.00	7.98	-0.25	5.6	
000Hz / 120 dB		90	90	0.00	9.98	-0.20		
000Hz / 120 dB		180	180	20.00	19.95	-0.25		
000Hz / 120 dB		360	360	40.00	39.88	-0.30		
000Hz / 120 dB		720	720	80.00	79.74	-0.33		

Certificate No : 23-NDM-214
 Request No : Req-2023-1730

4. Response to short duration

a. Response for sinusoidal signals - reference level

UUC Setting		Time		Exposure Measurement			UNCERTAINTY	Tolerances Limit
FAST / A / 54-140		Ref	UUC	Ref	UUC	Error		
Calibrator Setting		(s)	(s)	(Pa ² h)	(Pa ² h)	(Pa ² h)	(Pa ² h)	(Pa ² h)
4000 Hz 95 dB		2846	2846	1.00	0.99	-0.01	0.052	-0.29 - +0.41

b. Sound exposure meter response for series of toneburst impulses

UUC Setting		Time		Exposure Measurement			UNCERTAINTY	Tolerances Limit
FAST / A / 54-140		Ref	UUC	Ref	UUC	Error		
Calibrator Setting		(s)	(s)	(Pa ² h)	(Pa ² h)	(%)	(%)	(%)
Burst 1 ms, 95 dB		2846	2846	1.00	0.99	-1.00	5.6	-21 - +26
Burst 1 ms, 100 dB		900	900	1.00	0.99	-1.00		-29 - +41
Burst 1 ms, 108 dB		143	143	1.00	1.00	0.00		-29 - +41

5. Response to unipolar pulse

5. Response to unipolar pulse								
UUC Setting		Time		Exposure Measurement		UNCERTAINTY		Tolerance
FAST / A / 55- 40		UUC		UUC	Different			Limit
Calibrator Setting		(s)		(Pa·h)		(%)	(%)	(%)
Continuous Rectangle +		29		10.28		+0.29	3.7	-21 - +26
Continuous Rectangle -				10.31				

* Indicates non accredited

End of Certificate

Certificate of Calibration

Customer

Name : SGS (Thailand) Limited
 Address : 100 Nanglinchee Road, Chongnonsi, Yannawa Bangkok 10120

Certificate No : 23-SLM-071
 Request No : Req-2023-0426

Unit Under Calibration Detail

Measurement Item : Sound Level Meter
 Manufacturer : RION
 Model : NL-52
 Serial Number : 00710417
 ID : ENSL21179
 Resolution : 0.1 dB
 Microphone Class : 1
 Microphone Model : UC-19
 Microphone S/N : 18897
 Preamplifier Model : NH-15
 Preamplifier S/N : 10960
 Instrument Status : Used

Calibration Environment and Details

Temperature : 13 °C ± 2 °C
 Humidity : 30 %RH ± 20 %RH
 Barometric Pressure : 1013 hPa ± 16 hPa
 Received Date : 16 February 2023
 Calibrated Date : 1 March 2023
 Calibration Procedure : In-house method C9-SLM-01 based on IEC 61672-3:2013 Electroacoustics - Sound level meters - Part 3: Periodic test
 Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	6 October 2023	GRAS
Multi frequency Calibrator	Quest	Quest-cd	EFA000234	29 June 2023	TSI
Audio Generator	Svante	Sva401	131	12 October 2023	WK Electric

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %

Calibrated By :

Calibration Officer

Approved By :

Calibration Engineer/Supervisor

Issue Date : 1 March 2023



The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

FIN: 738 SLM 01 Rev.0 Issued date 01/07/19

Certificate No : 23-SLM-071

Request No : Req-2023-0426

1. Indication at the calibration check frequency

UUC Setting	Nominal Level	Before Adjust		Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)		
FAST / A / 10-130 Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)	(± dB)	(± dB)
1000 Hz 114.00 dB	113.79	113.8	+0.01	113.8	+0.01	0.20	0.3

Note : Absolute sensitivity was established by the use of Sound Calibrator Band SVANTEK, Model SV 35A, SN.58079

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 30-130		
UUC Weighting	(dB)	(± dB)
A	14.2	0.10

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 30-130		
UUC Weighting	(dB)	(± dB)
A	9.9	0.10
C	12.9	0.10
Z	17.1	0.10

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)
	A	C	Z		
FAST / 30-130				(± dB)	(± dB)
STE Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)
125 Hz	0.1	0.2	0.2	0.50	1.0
1000 Hz	0.0	0.0	0.0	0.60	0.7
4000 Hz	-0.3	-0.3	-0.3	0.60	1.0
8000 Hz	-0.3	-0.8	-0.8	0.70	+1.3 -1.3

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

FIN: 738 SLM 01 Rev.0 Issued date 01/07/19

Certificate No : 23-SLM-072
 Request No : Req-2023-0426

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency			UNCERTAINTY	Acceptance Limit
FAST / 30-130	Weighting Response curve				
STD Setting	A (dB)	C (dB)	Z (dB)	(\pm dB)	(\pm dB)
63 Hz	-0.2	-0.2	-0.1	3.2	1.0
125 Hz	-0.1	0.0	0.0		1.0
250 Hz	-0.1	-0.1	0.0		1.0
500 Hz	-0.1	0.0	0.0		1.0
1000 Hz	0.0	0.0	0.0		0.7
2000 Hz	-0.1	0.0	0.0		1.0
4000 Hz	-0.1	0.0	0.0		1.0
8000 Hz	0.0	0.0	0.0		+1.5, -2.5
16000 Hz	-1.4	-1.4	0.0		+25, -16.0

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / 30-130	REF	UUC	ERR		
UUC Weighting	(dB)	(dB)	(dB)	3.2	0.2
A	114.00	114.0	0.0		
C	114.00	114.0	0.0		
Z	114.00	114.0	0.0		

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
30-130 / A	REF	UUC	ERR		
UUC Time Response	(dB)	(dB)	(dB)	3.2	0.1
Fast	114.00	114.0	0.0		
Slow	114.00	114.0	0.0		
Leq	114.00	114.0	0.0		

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

FIN-708-SLM-01 Rev.0 Issued date 01/07/19

Certificate No : 23-SLM-072
 Request No : Req-2023-0426

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 30-130	UUC		
STD Setting	(dB)	0.1	0.1
Initial	114.0		
Final	114.0		
Deviated	0.0		

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 30-130	REF	UUC	ERR		
STD dB	(dB)	(dB)	(dB)	3.3	0.8
130.00	130	130.0	0.0		
129.00	129	129.0	0.0		
124.00	124	124.0	0.0		
119.00	119	119.0	0.0		
114.00	114	114.0	0.0		
109.00	109	109.0	0.0		
104.00	104	104.0	0.0		
99.00	99	99.0	0.0		
94.00	94	94.0	0.0		
89.00	89	89.0	0.0		
84.00	84	84.0	0.0		
79.00	79	79.1	0.1		
74.00	74	74.1	0.1		
69.00	69	69.1	0.1		
64.00	64	64.1	0.1		
59.00	59	59.1	0.1		
54.00	54	54.1	0.1		
49.00	49	49.1	0.1		
44.00	44	44.1	0.1		
39.00	39	39.1	0.1		
34.00	34	34.1	0.1		
29.00	29	29.1	0.1		
24.00	24	23.8	-0.2		

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

FIN-708-SLM-01 Rev.0 Issued date 01/07/19

Certificate No : 23-SLM-072
 Request No : Req-2023-0426

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
FAST / A	REF	UUC	ERR		Limit
UUC Range	(dB)	(dB)	(dB)	(± dB)	(± dB)
30-130	29.2	29.5	0.3	0.3	0.8
	114	114.0	0.0		0.8

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance
A / 30-130	Toneburst	R/f	UUC	ERR		Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(± dB)	(± dB)
Fast	200	126.0	126.0	0.0	0.3	0.5
	2	109.0	109.0	0.0		-1.0, -1.5
	0.25	106.0	99.8	-0.2		-1.0, -2.0
Slow	200	119.6	119.5	-0.1		0.5
	2	108.0	99.9	-0.1		-1.0, -3.0
SEL	200	120.0	120.0	0.0		0.5
	2	108.0	99.9	-0.1		-1.0, -1.5
	0.25	91.0	90.9	-0.1		-1.0, -3.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY	Acceptance
FAST / C / 55-141	REF	UUC	ERR		Limit
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)
Complete cycle	135.4	136.1	-0.30	0.2	2.0
Positive half cycle	135.4	135.1	-0.30		1.0
Negative half cycle	135.4	135.1	-0.30		1.0

Certificate No : 23-SLM-072
 Request No : Req-2023-0426

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 30-130	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Positive one-half cycle	119.8		
Negative one-half cycle	110.1		
Deviated	-0.3	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 30-130	UUC		Limit
STD Setting	(dB)	(± dB)	(± dB)
Initial	119.0		
Final	119.0		
Deviated	0.0	0.1	0.1

End of Certificate

Certificate of Calibration

Customer

Name : SGS (Thailand) Limited.
 Address : 100 Nanglinchee Road, Chongnonsi, Yannaawa Bangkok 10120

Certificate No : 23-SLM-169
 Request No : Rec-2023-1077

Unit Under Calibration Detail

Measurement Item : Sound Level Meter
 Manufacture : SCARLET
 Model : ST-21D
 Serial Number : 820702
 ID : ENSL 22174
 Resolution : 0.1 dB
 Microphone Class : 2
 Microphone Model : AWA1421
 Microphone S/N : A-004202
 Preamplifier Model : -
 Preamplifier S/N : -
 Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C
 Humidity : 50 %RH ± 20 %RH
 Barometric Pressure : 1013 hPa ± 16 hPa
 Received Date : 19 May 2023
 Calibrated Date : 23 May 2023
 Calibration Procedure : In-house method CP-SLM-01, based on IEC 61672-3: 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
 Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	6 October 2023	GRAS
Multi-frequency Calibrator	Quest	Quest-cal	EFA000234	29 June 2023	TSI
Audio Generator	Svanfel	Svan401	13	12 October 2023	WK Electric

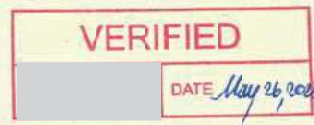
Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %

Calibrated By : 
 Calibration Officer

Approved By : 
 Calibration Engineer Supervisor

Issue Date: 23 May 2023



The results related only to the items calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

FN-708SLM-01 Rev.0 Issue date 01/07/19

Certificate No : 23-SLM-169

Request No : Rec-2023-1077

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY	Acceptance
FAST / A / 28-133	Level	UUC	ERR	UUC	ERR	(± dB)	Limit
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		
090 Hz 94 dB	93.81	93.6	-0.21	93.8	-0.01	0.1	0.3

Note: Absolute sensitivity was established by the use of Sound Calibrator Brand SOUNDTEK, Model ST-120, SN: 211203780

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 28-133	(dB)	(± dB)
UUC Weighting		
A	24.5	0.2

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 28-133	(dB)	(± dB)
UUC Weighting		
A	23.1	0.1
C	24.4	0.1
Z	28.3	0.1

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance
FAST / 28-133	A	C	Z	(± dB)	Limit
STE Setting	(dB)	(dB)	(dB)		
125 Hz	0.0	0.1	0.1	0.6	2.0
1000 Hz	0.0	0.0	0.0	0.6	1.0
4000 Hz	0.3	0.2	0.1	0.6	3.0
8000 Hz	0.0	0.0	0.2	0.7	5.0

The results related only to the items calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

FN-708SLM-01 Rev.0 Issue date 01/07/19

Certificate No : 23-SLM-169
 Request No : Req2023-1077

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency			UNCERTAINTY	Acceptance Limit
FAST / 28-133	Weighting Respon curve				
STD Setting	A (dB)	C (dB)	Z (dB)	(±dB)	(±dB)
63 Hz	-0.1	-0.1	0.0	0.2	2.0
125 Hz	-0.1	0.0	0.0		1.5
250 Hz	-0.1	0.0	0.0		1.5
500 Hz	0.0	0.0	0.0		1.5
1000 Hz	0.0	0.0	0.0		1.0
2000 Hz	0.1	0.1	0.0		2.0
4000 Hz	0.2	0.2	0.0		3.0
8000 Hz	-0.1	-0.2	0.0		5

5. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / 28-133	REF	UUC	ERR		
UUC Weighting	(dB)	(dB)	(dB)	0.2	0.2
A	114.00	114.0	0.0		
C	114.00	113.9	-0.1		
Z	114.00	113.9	-0.1		

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
28-133 / A	REF	UUC	ERR		
UUC Time Response	(dB)	(dB)	(dB)	0.2	0.1
Fast	114.00	114.0	0.0		
Slow	114.00	114.0	0.0		
Leq	114.00	114.0	0.0		

Certificate No : 23-SLM-169
 Request No : Req-2023-1077

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 28-133	LUC		
STD Setting	(dB)	0.1	0.3
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.3

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 28-133	REF	UUC	ERR		
STD dB	(dB)	(dB)	(dB)	0.3	0.3
137.00	137	137.0	0.0		
136.00	136	136.0	0.0		
135.00	135	135.0	0.0		
134.00	134	134.0	0.0		
129.00	129	129.0	0.0		
124.00	124	124.0	0.0		
119.00	119	119.0	0.0		
114.00	114	114.0	0.0		
109.00	109	109.0	0.0		
104.00	104	104.1	0.1		
99.00	99	99.1	0.1		
94.00	94	94.1	0.1		
89.00	89	89.1	0.1		
84.00	84	84.1	0.1		
79.00	79	79.1	0.1		
74.00	74	74.1	0.1		
69.00	69	69.1	0.1		
64.00	64	64.1	0.1		
59.00	59	59.1	0.1		
54.00	54	54.1	0.1		
49.00	49	49.1	0.1		
44.00	44	44.1	0.1		
39.00	39	39.0	0.0		
38.00	38	38.0	0.0		
37.00	37	36.9	-0.1		
36.00	36	35.7	-0.3		

Certificate No : 23-SLM-169
 Request No : Req2023-1077

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A	REF	UUC	ERR		
UUC Range	(dB)	(dB)	(dB)		
28-133	41.7	41.9	0.2	0.3	1.1
	114	114.0	0.0		1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
A / 28-133	Toneburst	Ref	UUC	ERR		
UUC Time Response	(ms)	(dB)	(dB)	(dB)		
Fast	200	129.0	129.1	+0.1	0.2	1
	2	112.0	112.0	0.0		+1.0, 2.5
	0.25	102.0	102.7	-0.3		+1.5, 5.0
Slow	200	122.6	122.7	+0.1		1
	2	105.0	105.1	+0.1		+1.0, 5.0
SEL	200	125.0	125.1	+0.1		1
	2	105.0	105.1	+0.1		+1.0, 2.5
	0.25	94.0	93.9	-0.1		+1.5, 5.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / C / 28-133	REF	UUC	ERR		
STD Setting	(dB)	(dB)	(dB)		
Complete cycle	128.4	127.1	-1.30	0.2	3.0
Positive half cycle	127.4	127.3	-0.10		2.0
Negative half cycle	127.4	127.3	-0.10		2.0

Certificate No : 23-SLM-169
 Request No : Req2023-1077

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 28-133	UUC		
STD Setting	(dB)		
Positive one-half cycle	139.7		
Negative one-half cycle	139.9		
Deviated	-0.2	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 28-133	UUC		
STD Setting	(dB)		
Initial	132.0		
Final	132.0		
Deviated	0.0	0.1	0.3

End of Certificate

Certificate of Calibration

Customer

Name : SGS (Thailand) Limited
 Address : 100 Nanginchee Road, Chongnonsi, Yannaia Bangkok 10120

Certificate No : 23-SLM-177
 Request No : Req-2023-1078

Unit Under Calibration Details

Measurement item : Sound Level Meter
 Manufacturer : SCARLET
 Model : ST-21D
 Serial Number : 320703
 ID : ENSL 22175
 Resolution : 0.1 dB
 Microphone Class : 2
 Microphone Model : JWA14421
 Microphone S/N : A-000219
 Preamplifier Model : -
 Preamplifier S/N : -
 Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 2 °C
 Humidity : 80 %RH ± 20 %RH
 Barometric Pressure : 1013 hPa ± 10 hPa
 Received Date : 19 May 2023
 Calibrated Date : 23 May 2023
 Calibration Procedure : In-house method C3-SLM-01 based on IEC 61672-3: 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests
 Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Standard Microphone	GRAS	40AN	88273	6 October 2023	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	29 June 2023	TSI
Audio Generator	Svantek	Svan401	131	12 October 2023	WK Electric

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %

Calibrated By :

Calibration Officer

Approved By :

Calibration Engineer Supervisor

Issue Date: 23 May 2023



The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

FM-108 SLM-01 Rev.0 Issue date 01/07/19

Certificate No : 23-SLM-177
 Request No : Req-2023-1078

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 28-133	Level	UUC	ERR	UUC	ERR		
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		
1000 Hz 94 dB	93.51	93.3	-0.51	93.8	-0.01	0.2	0.3

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SOUNDTEK, Model ST-120, SN 211203780

2. Self-generated noise, Microphone Installed

UUC Setting	Measured	UNCERTAINTY
FAST / 28-133	(dB)	(± dB)
A	24.1	0.1

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 28-133	(dB)	(± dB)
A	23.3	0.1
C	24.7	0.1
Z	28.6	0.1

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Respose curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / 28-133	A	C	Z		
STD Setting	(dB)	(dB)	(dB)		
125 Hz	0.1	0.2	0.2	0.6	2.0
1800 Hz	0.0	0.0	0.0	0.6	1.0
4000 Hz	-0.9	-0.8	-1.0	0.6	3.0
8000 Hz	-1.3	-1.3	-1.1	0.7	5.0

The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

FM-108 SLM-01 Rev.0 Issue date 01/07/19

Certificate No : 23-SLM-177
 Request No : Req-2023-1078

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency			UNCERTAINTY	Acceptance
FAST / 28-133	Weighting Respose curve				
STD Setting	A (dB)	C (dB)	Z (dB)	(± dB)	Limit (± dB)
63 Hz	-0.1	-0.1	0.0	0.2	2.0
125 Hz	-0.2	-0.1	0.0		1.5
250 Hz	-0.2	0.0	0.0		1.5
500 Hz	-0.1	0.0	0.0		1.5
1000 Hz	0.0	0.0	0.0		1.0
2000 Hz	0.1	0.0	0.0		2.0
4000 Hz	0.1	0.2	0.0		3.0
8000 Hz	-0.1	-0.2	0.0		5

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / 28-133	REF	UUC	ERR		
UUC Weighting	(dB)	(dB)	(dB)	0.2	
A	114.00	114.0	0.0		
C	114.00	113.9	-0.1		
Z	114.00	113.9	-0.1		

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
28-133 / A	REF	UUC	ERR		
UUC Time Response	(dB)	(dB)	(dB)	0.2	
Fast	114.00	114.0	0.0		
Slow	114.00	114.0	0.0		
Leq	114.00	114.0	0.0		

Certificate No : 23-SLM-177
 Request No : Req-2023-1078

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 18-133	UUC		
STD Setting	(dB)		
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.3

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 18-133	REF	UUC	ERR		
STD dB	(dB)	(dB)	(dB)	0.3	
137.00	137	137.0	0.0		
136.00	136	136.0	0.0		
135.00	135	135.0	0.0		
134.00	134	134.0	0.0		
129.00	129	129.1	0.1		
124.00	124	124.1	0.1		
119.00	119	119.1	0.1		
114.00	114	114.0	0.0		
109.00	109	109.1	0.1		
104.00	104	104.1	0.1		
99.00	99	99.1	0.1		
94.00	94	94.1	0.1		
89.00	89	89.0	0.0		
84.00	84	84.0	0.0		
79.00	79	79.0	0.0		
74.00	74	74.0	0.0		
69.00	69	69.0	0.0		
64.00	64	64.0	0.0		
59.00	59	59.1	0.1		
54.00	54	54.1	0.1		
49.00	49	49.1	0.1		
44.00	44	44.1	0.1		
39.00	39	38.8	-0.2		
38.00	38	37.8	-0.2		
37.00	37	36.6	-0.4		
36.00	36	35.6	-0.4		

Certificate No : 23-SLM-177
 Request No : Req-2023-1078

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
FAST / A	REF	UUC	ERR	(\pm dB)	Limit
UUC Range	(dB)	(dB)	(dB)		(\pm dB)
28-133	42.2	42.4	0.1	0.3	1.1
	114	114.0	0.0		1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance
A / 28-133	Toneburst	Ref	UUC	ERR	(\pm dB)	Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)		(\pm dB)
Fast	200	125.0	129.1	+0.1	0.2	1
	2	112.0	111.8	-0.2		+1.0, -2.5
	0.25	102.0	102.7	+0.3		+1.5, -5.0
Slow	200	122.6	122.5	-0.1		1
	2	102.0	102.9	+0.1		+1.0, -5.0
SEL	200	122.0	123.1	+0.1		1
	2	102.0	102.9	+0.1		+1.0, -2.5
	0.25	94.0	92.8	-0.2		+1.5, -5.0

11. Peak C sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY	Acceptance
FAST / C / 28-133	REF	UUC	ERR	(\pm dB)	Limit
STD Setting	(dB)	(dB)	(dB)		(\pm dB)
Complete cycle	128.4	128.1	-0.30	0.2	3.0
Positive half cycle	127.4	127.3	-0.10		2.0
Negative half cycle	127.4	127.3	-0.10		2.0

Certificate No : 23-SLM-177
 Request No : Req-2023-1078

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 28-133	UUC		Limit
STD Setting	(dB)	(\pm dB)	(\pm dB)
Positive one-half cycle	139.7		
Negative one-half cycle	140.4		
Deviated	-0.7	0.1	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 28-133	UUC		Limit
STD Setting	(dB)	(\pm dB)	(\pm dB)
Initial	132.0		
Final	132.0		
Deviated	3.0	0.1	0.3

End of Certificate

ENSL 22176



Certificate of Calibration

NO. 20220516162

Name of Product: Sound Level Meter
 Model: ST-21D
 Manufacturer: Scarlet Tech Co., Ltd.
 Serial Number: 823704
 Specification: Class 2
 Conclusion: Pass
 Date of calibration: 2022-06-15
 Due Date: 2023-06-15



Calibrated by:

- I. This report certifies that all calibration equipment used in the test is traceable with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpasses them and applies only to the unit identified above.
- II. This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
- III. This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlet Tech.

Scarlet Tech Co., Ltd.
 4F-3, No. 347, HePing E Rd, 2nd Sec, DaAn District, Taipei City 106, Taiwan
 info@scarlet.com.tw / www.scarlet-tech.com



1. Preliminary inspection: OK
2. Type & serial No. of Microphone: AWA14421-A300271
3. Adjustments to indicated sound levels:
 Type of Calibrator B&K 4231
 Sound Pressure Level 94.0 dB
 Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB.
4. Measuring up limit: 138 dBA.
5. Frequency weighting (Acoustic signal tests for Z weighting, other electric signal tests)

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
20	-50.4	-6.1	-0.1	1000	0.0	0.0	0.0
31.5	-39.3	-3.1	0.0	2000	1.2	-0.1	0.0
63	-26.3	-0.8	-0.2	4000	1.1	-0.8	0.1
125	-16.1	-0.1	0.1	8000	-1.0	-2.9	0.0
250	-8.6	0.0	0.1	12500	-11.1	-13.1	0.0
500	-3.3	0.1	0.2	/	/	/	/

6. Self-generated noise

Microphone installed: 33.2 d3A

Microphone replaced by electrical input signal device

23.0 dB (A)	28.5 dB (C)	36.0 dB (Z)
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7. F&S Weighting

Rate of the F weighting decrease (dB/s)	34.4
Rate of the S weighting decrease (dB/s)	4.2
Deviation of F&S	-0.1

8. Level Linearity (A-weighting at frequency 1 kHz)

(Total measuring range: 38 dBA - 133 dBA, frequency 1 kHz);

Reference level range (frequency 1 kHz):

① 10 dB interval

Scarlet Tech Co., Ltd.
 4F-3, No. 347, HePing E Rd, 2nd Sec, DaAn District, Taipei City 106, Taiwan
 info@scarlet.com.tw / www.scarlet-tech.com

Signal	42.0	44.0	54.0	54.0	74.0	84.0	94.0	104.0	114.0	124.0	134.0
Indicating value dB(A)	42.0	44.0	54.1	54.1	74.1	84.1	94.0	103.9	114.1	124.1	134.1
Full scale deviation (dB)	0.0	0.0	0.1	0.1	0.1	0.1	0.0	-0.1	0.1	0.1	0.1

Max error at 10 dB Interval 0.2 dB

② 1 dB Interval

Upper Limit	134.0	135.0	136.0	137.0	138.0
Indicating value dB(A)	134.1	135.0	136.1	137.1	138.0
Full scale deviation (dB)	0.1	0.0	0.1	0.1	0.0
Lower Limit	38.0	39.0	40.0	41.0	42.0
Indicating value dB(A)	38.2	39.2	40.0	41.0	42.0
Full scale deviation (dB)	0.2	0.2	0.0	0.0	0.0

Max error at 1 dB-10 dB Interval 0.2 dB

9. Tone burst response (A Weighting)

Single Toneburst duration /ms	Toneburst response /dE			
	$L_{AFmax}-L_A$	$L_{ASmax}-L_A$	$L_{AE}-L_A$	$L_{AeqT}-L_A$
500	-0.1	-4.1	-3.1	-7.1
200	-1.0	-7.1	-7.1	-7.0
2	-18.0	-27.0	-27.0	-7.0
0.25	-27.0	-	-36.0	-7.1

10. Overload indication: Pass

11. C-weighting peak sound level

Number of cycles in test signals	Nominal frequency of test signal/Hz	(LCpeak-LC)/dB		tolerance limits : class 2/dB
		Reference level range	Reference difference	
		4dE low of upper limit		
one	31.5	2.8	2.5	±3.0
one	500	3.4	3.4	±2.0
one	8000	3.3	3.3	±3.0
Positive half cycle	500	2.3	2.4	±2.0
negative half cycle	500	2.3	2.4	±2.0

12. Statistical analysis function

Indicated sound level of sweep signal maximum: 123 dB

Sweep amplitude: 40 dB

Measurement period: 60 s; Measurement duration: 180 s

Index	(dB)		
	SLM Reading	Expected Reading	Deviation
LAeq	113.3	113.4	-0.1
L5	121.1	121.0	0.1
L10	119.0	119.0	0.0
L50	103.0	103.0	0.0
L90	87.1	87.0	0.1
L95	85.0	85.0	0.0



References:

IEC 61672-1:2013 Electroacoustics-Sound Level Meters - Part 1: Specifications

Environment conditions:

Air temperature: 25 °C Relative humidity: 55 % Static pressure: 101.2 kPa

ENSL 22179



Certificate of Calibration

NO. 20220516165

Name of Product:	Sound Level Meter
Model:	ST-21D
Manufacturer:	Scarlet Tech Co., Ltd.
Serial Number:	820707
Specification:	Class 2
Conclusion:	Pass
Date of calibration:	2022-06-16
Due Date:	2023-06-15

Calibrated by:



- I. This report certifies that all calibration equipment used in the test is traceable with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpass them, and applies only to the unit identified above.
- II. This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
- III. This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlet Tech.

1. Preliminary inspection: OK

2. Type & serial No. of Microphone: AWA14421 - A000201

3. Adjustments to indicated sound levels:

Type of Calibrator B&K 4231

Sound Pressure Level 94.0 dB

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB.

4. Measuring up limit: 138 dBA.

5. Frequency weighting (Acoustic signal tests for Z weighting, other electric signal tests)

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
20	-50.4	-3.1	-0.1	1000	0.0	0.0	0.0
31.5	-39.3	-3.1	0.0	2000	1.2	-0.1	0.0
63	-26.3	-0.8	-0.1	4000	1.1	-0.8	0.1
125	-16.1	-0.1	0.1	8000	-1.0	-2.9	0.1
250	-8.6	0.0	0.1	12500	-11.1	-3.1	0.1
500	-3.3	0.1	0.1	/	/	/	/

6. Self-generated noise

Microphone installed: 32.1 dBA

Microphone replaced by electrical input signal device

25.0 dB (A)	25.8 dB (C)	36.3 dB (Z)
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7. F&S Weighting

Rate of the F weighting decrease (dB/s)	34.3
Rate of the S weighting decrease (dB/s)	4.2
Deviation of F&S	-0.1

8. Level Linearity (A-weighting at frequency 1 kHz)

(Total measuring range: 38 dBA - 138 dBA, frequency 1 kHz):

Reference level range (frequency 1 kHz):

① 10 dB Interval

Signal	42.0	44.0	54.0	64.0	74.0	84.0	94.0	104.0	114.0	124.0	134.0
Indicating value dB(A)	42.0	44.0	54.1	64.1	74.1	84.1	94.0	103.9	114.1	124.1	134.1
Full scale deviation (dB)	0.0	0.0	0.1	0.1	0.1	0.1	0.0	-0.1	0.1	0.1	0.1

Max error at 10 dB Interval 0.2 dB

② 1 dB Interval

Upper Limit	134.0	135.0	136.0	137.0	138.0
Indicating value dB(A)	134.1	135.0	136.1	137.1	138.0
Full scale deviation (dB)	0.1	0.0	0.1	0.1	0.0
Lower Limit	38.0	39.0	40.0	41.0	42.0
Indicating value dB(A)	38.2	39.1	40.1	41.0	42.0
Full scale deviation (dB)	0.2	0.1	0.1	0.0	0.0

Max error at 1 dB- 10 dB Interval 0.2 dB

9. Tone burst response (A Weighting)

Single Toneburst duration /ms	Toneburst response /dB			
	$L_{AFmax}-L_A$	$L_{ASmax}-L_A$	$L_{AE}-L_A$	$L_{AeqT}-L_A$
500	-0.1	-4.1	-3.1	-7.1
200	-1.0	-7.1	-7.1	-7.0
2	-18.0	-27.0	-27.0	-7.0
0.25	-27.0	/	-36.0	-7.1

10. Overload indication: Pass

11. C-weighting peak sound level

Number of cycles in test signals	Nominal frequency of test signal/Hz	(LCpeak-LC)/cB		tolerance limits : class 2/dB
		Reference level range	Reference difference	
		4dB low of upper limit		
one	31.5	2.8	2.5	±3.0
one	500	3.4	3.4	±2.0
one	8000	3.3	3.3	±3.0
Positive half cycle	500	2.4	2.4	±2.0
negative half cycle	500	2.3	2.4	±2.0

12. Statistical analysis function

Indicated sound level of sweep signal maximum: 123 dB

Sweep amplitude: 40 dB

Measurement period: 50 s; Measurement duration: 180 s

Index	(dB)		
	SLM Reading	Expected Reading	Deviation
L _{Aeq}	113.3	113.4	-0.1
L _S	121.1	121.0	0.1
L ₁₀	119.0	119.0	0.0
L ₅₀	103.0	103.0	0.0
L ₉₀	87.1	87.0	0.1
L ₉₅	85.0	85.0	0.0

References:

IEC 61672-1:2013 Electroacoustics-Sound Level Meters - Part 1: Specifications

Environment conditions:

Air temperatura: 25 °C Relative humidity: 55 % Static pressure: 101.2 kPa

Certificate of Calibration

Customer

Name : SGS(Thailand) Limited
 Address : 100 Nanglinlee Road, Chongnonsi, Yanawa Bangkok 10120

Certificate No : 23-SLM-172
 Request No : Rec-2023-1082

Unit Under Calibration Detail

Measurement item : Sound Level Meter
 Manufacturer : SCARLET
 Model : ST-21D
 Serial Number : 820708
 ID : ENSL 22180
 Resolution : 0.1 dB
 Microphone Class : 1
 Microphone Model : AWA1421
 Microphone S/N : A-004225
 Preamplifier Model : -
 Preamplifier S/N : -
 Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C ± 1 °C
 Humidity : 50 %RH ± 10%RH
 Barometric Pressure : 1013 hPa ± 10 hPa
 Received Date : 19 May 2023
 Calibrated Date : 23 May 2023

Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3: 2013 Electroacoustics - Sound level meters - Part 3: Periodic test
 Location of Calibration : Lab Acoustic

Reference Standard

Instrument	Brand	Model	SN	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	6 October 2023	GRAS
Multi-frequency Calibrator	Quest	Quest-cal	EFA00234	29 June 2023	TSI
Audio Generator	Svanetel	Svan401	131	12 October 2023	WK Electric

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %

Calibrated By :

Calibration Officer

Approved By :

Calibration Engineer Supervisor

Issue Date: 23 May 2023



The results related only to the item calibrated. The certificate shall not be reproduced except in full, without written approval of the Innovative Instrument Co., Ltd

PIH-308SLM01 Rev.0 Issue date: 01/07/19

Certificate No : 23-SLM-172

Request No : Rec-2023-1082

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY	Acceptance Limit
FAST / A / 28-133	Level	UUC	ERR	LUC	ERR	(± dB)	(± dB)
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		
1000 Hz 94 dB	93.81	95.3	+1.49	93.8	-0.01	0.2	0.3

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand SOUNDTEK, Model ST-12C, SN 211203780

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 28-133		
LUC Weighting	(dB)	(± dB)
A	24.7	0.1

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 28-133		
LUC Weighting	(dB)	(± dB)
A	24.2	0.1
C	24.6	0.1
Z	28.8	0.1

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance Limit
FAST / 28-133	A	C	Z	(± dB)	(± dB)
STD Setting	(dB)	(dB)	(dB)		
125 Hz	0.0	0.0	0.1	0.6	2.0
1600 Hz	0.0	0.0	0.0	0.6	1.0
4000 Hz	0.0	-0.1	-0.2	0.6	3.0
8000 Hz	-0.2	-0.3	0.0	0.7	5.0

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PIH-308SLM01 Rev.0 Issue date: 01/07/19

Certificate No : 23-SLM-172

Request No : Req-2023-1082

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency			UNCERTAINTY	Acceptance
FAST / 28-133	Weighting Resonse curve				
STD Setting	A (dB)	C (dB)	Z (dB)	(±dB)	Limit (± dB)
63 Hz	-0.2	-0.1	-0.1	0.2	2.0
125 Hz	-0.1	-0.1	-0.1		1.5
250 Hz	-0.1	-0.1	0.0		1.5
500 Hz	-0.1	0.0	0.0		1.5
1000 Hz	0.0	-0.1	0.0		1.0
2000 Hz	0.1	0.0	0.0		2.0
4000 Hz	0.2	0.1	0.0		3.0
8000 Hz	-0.2	-0.2	0.0		5

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / 28-133	REF	UUC	ERR		
UUC Weighting	(dB)	(dB)	(dB)	0.2	0.2
A	114.00	114.0	0.0		
C	114.00	113.9	-0.1		
Z	114.00	113.9	-0.1		

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
28-133 / A	REF	UUC	ERR		
UUC Time Response	(dB)	(dB)	(dB)	0.2	0.1
Fast	114.00	114.0	0.0		
Slow	114.00	114.0	0.0		
Leq	114.00	114.0	0.0		

Certificate No : 23-SLM-172

Request No : Req-2023-1082

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 28-133	UUC		
STD Setting	(dB)	0.1	0.3
Initial	114.0		
Final	114.0		
Deviated	0.0		

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 28-133	REF	UUC	ERR		
STD dB	(dB)	(dB)	(dB)	0.3	1.1
137.00	137	137.0	0.0		
136.00	136	136.0	0.0		
135.00	135	135.0	0.0		
134.00	134	134.0	0.0		
129.00	129	129.0	0.0		
124.00	124	124.0	0.0		
119.00	119	119.0	0.0		
114.00	114	114.0	0.0		
109.00	109	109.0	0.0		
104.00	104	104.0	0.0		
99.00	99	99.0	0.0		
94.00	94	94.0	0.0		
89.00	89	89.0	0.0		
84.00	84	84.0	0.0		
79.00	79	79.0	0.0		
74.00	74	74.0	0.0		
69.00	69	69.1	0.1		
64.00	64	64.0	0.0		
59.00	59	59.1	0.1		
54.00	54	54.1	0.1		
49.00	49	49.1	0.1		
44.00	44	44.0	0.0		
39.00	39	38.9	-0.1		
34.00	34	33.9	-0.1		
29.00	29	28.9	-0.1		
24.00	24	23.9	-0.1		
19.00	19	18.9	-0.1		
14.00	14	13.9	-0.1		
9.00	9	8.9	-0.1		
4.00	4	3.9	-0.1		

Certificate No : 23-SLM-172
 Request No : Req-2023-1082

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
FAST / A	REF	UUC	ERR	(\pm dB)	Limit
UUC Range	(dB)	(dB)	(dB)	(\pm dB)	(\pm dB)
28-133	41.9	42.0	0.1	0.3	1.1
	114	114.0	0.0		1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance
A / 28-133	Toneburst	Ref	UUC	ERR	(\pm dB)	Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(\pm dB)	(\pm dB)
Fast	200	129.0	129.2	+0.2	0.2	1
	2	112.0	111.9	-0.1		+1.0, -2.5
	0.25	105.0	105.0	0.0		+1.5, -5.0
Slow	200	122.6	122.7	+0.1		1
	2	105.0	105.1	+0.1		+1.0, -5.0
SEL	200	121.0	121.2	+0.2		1
	2	105.0	105.2	+0.2		+1.0, -2.5
	0.25	94.0	94.0	0.0		+1.5, -5.0

11. Peak C sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY	Acceptance
FAST / C / 18-133	REF	UUC	ERR	(\pm dB)	Limit
STD Setting	(dB)	(dB)	(dB)	(\pm dB)	(\pm dB)
Complete cycle	128.4	128.2	-0.20	0.2	3.0
Positive half cycle	127.4	127.3	-0.10		2.0
Negative half cycle	127.4	127.3	-0.10		2.0

Certificate No : 23-SLM-172
 Request No : Req-2023-1082

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 18-133	UUC	(\pm dB)	Limit
STD Setting	(dB)	(\pm dB)	(\pm dB)
Positive one-half cycle	119.1		
Negative one-half cycle	119.4		
Deviated	-0.3	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 18-133	UUC	(\pm dB)	Limit
STD Setting	(dB)	(\pm dB)	(\pm dB)
Initial	112.0		
Final	112.0		
Deviated	0.0	0.1	0.3

End of Certificate

Certificate of Calibration

Customer

Name: SGS (Thailand) Limited
 Address: 100 Nanglinlee Road, Chongnonsi, Yanawa Bangkok 10120

Certificate No: 23-SLM-173
 Request No: Rec-2023-1083

Unit Under Calibration Details

Measurement item: Sound Level Meter
 Manufacture: SCARLET
 Model: ST-21D
 Serial Number: 820710
 ID: ENSL 22101
 Resolution: 0.1 dB
 Microphone Class: 1
 Microphone Model: AWA14421
 Microphone S/N: A-009223
 Preamplifier Model: -
 Preamplifier S/N: -
 Instrument Status: Used

Calibration Environment and Details

Temperature: 23 °C ± 2 °C
 Humidity: 50 %RH ± 20 %RH
 Barometric Pressure: 1013 hPa ± 16 hPa
 Received Date: 19 May 2023
 Calibrated Date: 23 May 2023
 Calibration Procedure: In-house method CP-SLM-01 based on IEC 61672-3: 2013 Electroacoustics - Sound level meters - Part 3: Periodic test
 Location of Calibration: Lab Acoustic

Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	6 October 2023	GRAS
Multi-frequency Calibrator	Quest	Quest-cal	EFA000234	29 June 2023	TSI
Audio Generator	Svante	Sva401	131	12 October 2023	WK Electric

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k = 2$, providing a level of confidence approximately 95 %

Calibrated By:

Calibration Officer

Approved By:

Calibration Engineer Supervisor

Issue Date: 23 May 2023



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FM-708SLM-01 Rev.0 Issue date: 01/07/19

Certificate No: 23-SLM-173

Request No: Rec-2023-1083

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY	Acceptance
FAST / A / 18-133	Level	UUC	ERR	UUC	ERR	(± dB)	Limit
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		(± dB)
1000 Hz 94 dB	93.81	95.3	+1.49	93.8	-0.01	0.1	0.3

Note: Absolute sensitivity was established by the use of Sound Calibrator Brand SOUNDTEK, Model ST-120, SN: 211203780

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 25-133	(dB)	(± dB)
A	24.0	0.1

3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	UNCERTAINTY
FAST / 25-133	(dB)	(± dB)
A	23.6	0.1
C	25.1	0.1
Z	29.4	0.1

4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance
FAST / 25-133	A	C	Z	(± dB)	Limit
STE Setting	(dB)	(dB)	(dB)		(± dB)
125 Hz	0.0	0.1	0.1	0.6	2.0
1000 Hz	0.0	0.0	0.0	0.6	1.0
4000 Hz	-0.2	-0.1	-0.3	0.6	3.0
8000 Hz	-0.4	-0.3	-0.1	0.7	5.0

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FM-708SLM-01 Rev.0 Issue date: 01/07/19

Certificate No : 23-SLM-173
 Request No : Req-2023-1083

5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from various Frequency			UNCERTAINTY	Acceptance
FAST / 28-133	Weighting Respose curve				
STD Setting	A (dB)	C (dB)	Z (dB)	(± dB)	Limit (± dB)
63 Hz	-0.2	-0.1	0.0	0.2	2.0
125 Hz	-0.1	0.0	0.0		1.5
250 Hz	-0.1	-0.1	0.0		1.5
500 Hz	-0.1	0.0	0.0		1.5
1000 Hz	0.0	-0.1	0.0		1.0
2000 Hz	0.1	0.0	0.0		2.0
4000 Hz	0.2	0.1	0.0		3.0
8000 Hz	-0.2	-0.2	0.0		5

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / 28-133	REF	UUC	ERR		
UUC Weighting	(dB)	(dB)	(dB)	0.2	0.2 0.2 0.2
A	114.00	114.0	0.0		
C	114.00	113.9	-0.1		
Z	114.00	113.9	-0.1		

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
28-133 / A	REF	UUC	ERR		
UUC Time Response	(dB)	(dB)	(dB)	0.2	0.1 0.1 0.1
Fast	114.00	114.0	0.0		
Slow	114.00	114.0	0.0		
Leq	114.00	114.0	0.0		

Certificate No : 23-SLM-173
 Request No : Req-2023-1083

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 28-133	UUC		
STD Setting	(dB)	0.1	0.3
Initial	114.0		
Final	114.0		
Deviated	0.0		

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 28-133	REF	UUC	ERR		
STD dB	(dB)	(dB)	(dB)	0.3	0.3 0.3 1.1 0.8 1.1
137.00	137	137.0	0.0		
136.00	136	136.0	0.0		
135.00	135	135.0	0.0		
134.00	134	134.0	0.0		
129.00	129	129.0	0.0		
124.00	124	124.0	0.0		
119.00	119	119.0	0.0		
114.00	114	114.0	0.0		
109.00	109	109.0	0.0		
104.00	104	104.0	0.0		
99.00	99	99.0	0.0		
94.00	94	94.0	0.0		
89.00	89	89.0	0.0		
84.00	84	84.1	0.1		
79.00	79	79.0	0.0		
74.00	74	74.1	0.1		
69.00	69	69.0	0.0		
64.00	64	64.0	0.0		
59.00	59	59.1	0.1		
54.00	54	54.0	0.0		
49.00	49	49.0	0.0		
44.00	44	44.1	0.1		
39.00	39	38.8	-0.2		
34.00	34	33.8	-0.2		
29.00	29	28.6	-0.4		
24.00	24	23.7	-0.3		

Certificate No : 23-SLM-173
 Request No : Req2021-1083

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
FAST / A	REF	UUC	ERR	(\pm dB)	Limit
UUC Range	(dB)	(dB)	(dB)		(\pm dB)
28-133	42.2	42.2	0.0	0.3	1.1
	114	114.0	0.0		1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance
A / 28-133	Timeburst	Ref	UUC	ERR	(\pm dB)	Limit
UUC Time Respnse	(ms)	(dB)	(dB)	(dB)		(\pm dB)
Fast	200	129.0	129.1	+0.1	0.2	1
	2	112.0	111.8	-0.2		+1.0, -2.5
	0.25	100.0	102.9	+0.1		+1.5, 5.0
Slow	200	122.6	122.7	+0.1		1
	2	105.0	108.1	+0.1		+1.0, 5.0
SEL	200	125.0	125.1	+0.1		1
	2	105.0	108.1	+0.1		+1.0, 2.5
	0.25	94.0	94.0	0.0		+1.5, 5.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY	Acceptance
FAST / C / 28-133	REF	UUC	ERR	(\pm dB)	Limit
STD Setting	(dB)	(dB)	(dB)		(\pm dB)
Complete cycle	128.4	124.2	-0.20	0.2	3.0
Positive half cycle	127.4	127.3	-0.10		2.0
Negative half cycle	127.4	127.3	-0.10		2.0

Certificate No : 23-SLM-173
 Request No : Req2021-1083

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 28-133	UUC	(\pm dB)	Limit
STD Setting	(dB)		(\pm dB)
Positive one-half cycle	110.5		
Negative one-half cycle	119.9		
Deviated	-0.4	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 28-133	UUC	(\pm dB)	Limit
STD Setting	(dB)		(\pm dB)
Initial	112.0		
Final	112.0		
Deviated	0.0	0.1	0.3

End of Certificate

Certificate of Calibration

Customer

Name : SGS (Thailand) Limited. Certificate No : 23-ACT-171
Address : 100 Nanglavivee Road, Chongnonsi, Yannawa Bangkok Request No : Req-2023-2415
10120

Unit Under Calibration Details

Measurement item : Acoustic Calibrator Class : 1
Manufacturer : TENMAERS Range: 94 , 114 dB / 1000 Hz
Model : ST-120 Instrument Status : Used
Serial Number : 211203780
ID : ENSL 22/91

Calibration Environment and Details

Temperature : (23 ±2 °C)
Humidity : (50 ± 20 %RH)
Barometric Pressure : (1013 ±10.0 hPa)
Received Date : 13 November 2023
Calibration Date : 15 November 2023
Location of Calibration : LAB 1 Acoustic
Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Electroacoustics - Sound calibrators



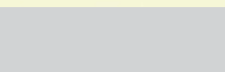
Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	54079	EEL	31 May 2024
THD Multimeter	2015	1047765	NIMT	31 January 2024

Traceability : This certificate provides traceability of measurement to recognized national standard, and to the realization of the international System of Units (SI).

Note

The reported uncertainty is based on standard uncertainty multiplied by the Coverage Factor $k=2$, providing a level of confidence approximately 95 %.

Calibrated By :



Service Calibration Engineer

Approved By :



Calibration Engineer Supervisor

Issue Date : 15 November 2023

Certificate No : 23-ACT-171

Request No : Req-2023-2415

Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)	Acceptance limit Class 1 (± dB)
	Measured	Deviated value	Measured	Deviated value		
94 dB / 1000 Hz	93.99	-0.01	-	-	0.13	0.25
114 dB / 1000 Hz	114.11	0.11	-	-	0.13	0.25

Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 1 (± %)
	Measured (Hz)	Deviated value	Measured (Hz)	Deviated value		
94 dB / 1000 Hz	1000.0	0.00	-	-	0.01	0.70
114 dB / 1000 Hz	1000.0	0.00	-	-	0.01	0.70

Total Harmonic Distortion plus Noise of Sound pressure level (THD+N %)

Calibration Range (Hz)	Without Adjustment	Adjustment	Uncertainty (± %)	Acceptance limit Class 1 (± %)
	Measured (%)	Measured (%)		
94 dB / 1000 Hz	0.04	-	0.40	2.5
114 dB / 1000 Hz	0.21	-	0.40	2.5

Note :

Function	Maximum-permitted Uncertainty of measurement
Sound pressure level	0.15 dB
Frequency	0.20%
Total distortion+noise	0.50%

- Acceptance limit was IEC60942:2017 Class 1

- The calibration results exclude the calibrator pressure correction

- The calibration results exclude the microphone volume correction

End of Calibration



CNSL 22792

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0017 MTC No. EEL.BP. 54/1066

CALIBRATION CERTIFICATE

Submitted by : SGS (Thailand) Limited.
Address : 100 Nanglinchee Road, Chongnensee, Yanaawa, Bangkok, 10120.
Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
 : Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :
 Description : Acoustic Calibrator
 Manufacturer : Criffer
 Model : CR2 Plus
 Serial No. : 37001125

Ambient Environment:
 Temperature : $(23 \pm 3) ^\circ\text{C}$
 Relative Humidity : $(50 \pm 15) \%$
 Ambient Pressure : $(101.325 \pm 1.500) \text{ kPa}$

Standards used :

1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
3. Programmable Attenuator Tamagawa TPA-303A S/N CF 2214.
4. Digital Multimeter Agilent 34401A S/N MY44005560.
5. Pressure Transmitter Vaisala PTB202AD S/N T0550001.
6. Audio Analyzer Panasonic VP-7722A S/N 041477D122.
7. Condenser Microphone B&K 4180 S/N 2633526.

Calibration Procedure: CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 10 Oct. 2023

Date of Calibration : 17 Oct. 2023



The results relate only to the items tested/calibrated or value assigned.
 Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BL.MTC.002 Rev.4

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 Fax. (66) 0 2323 9145
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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0017 MTC No. EEL.BP. 54/1066

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.

Nominal Output of Unit Under Test = 94 dB re 20 μ Pa at 1000 Hz

Acoustic Output in dB re 20 μ Pa, Corrected to Reference Conditions : 101.325 kPa, 23.0 $^\circ\text{C}$ and 50 %RH

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	94.00	0.00	± 0.10	$\pm 0.40 \text{ dB}$

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	999.5	-0.1	± 1.5	$\pm 1.0\%$

3. Total distortion

Standard Microphone Type	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1.80	± 0.50	$\pm 3.0\%$

Note :

1. No adjustment.
2. The calibrator pressure correction was not included.
3. The microphone volume correction was not included.

Date of Calibration : 17 Oct. 2023

2/3

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FM.BL.MTC.002 Rev.4

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-57/0017 MTC No. EEL. BP. 54/1066

Nominal Output of Unit Under Test = 114 dB re 20µPa at 1000 Hz

Acoustic Output in dB re 20µPa, Corrected to Reference Conditions : 101.325 kPa, 23.0 °C and 50 %RH

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	113.92	-0.07	± 0.10	± 0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1000.0	0.0	± 1.5	± 1.0%

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	3.89	± 0.50	± 3.0%

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

Approved by :

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Date of Calibration : 17 Oct. 2023

Date of Issue : 18 Oct. 2023

Ref : 2011265101004024001

End of Certificate

3 / 3

The results relate only to the items tested/calibrated or value assigned.

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FM.BL.MTC.002 Rev.4

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0017 MTC No. EEL. BP. 55/1066

CALIBRATION CERTIFICATE

Submitted by : SGS (Thailand) Limited.

Address : 100 Nanglinchee Road, Chongnonsee, Yanrawa, Bangkok, 10120.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.

: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Ambient Environment

Description : Acoustic Calibrator

Temperature : (23 ± 3) °C

Manufacturer : Ciffer

Relative Humidity : (50 ± 15) %

Model : CR2 Plus

Ambient Pressure : (101.325 ± 1.500) kPa

Serial No. : 37001157

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.

2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.

3. Programmable Attenuator Tamagawa GPA-303A S/N OF 2214.

4. Digital Multimeter Agilent 34401A S/N MY44005560.

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

6. Audio Analyzer Panasonic VP-7722A S/N 041477D.22.

7. Condenser Microphone B&K 4180 S/N 2633526.

Calibration Procedure: CP-102-04 based on IEC 60942-2003. The sound pressure level of instrument was measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

Date of Receipt : 10 Oct. 2023

Date of Calibration : 17 Oct. 2023

VERIFIED

DATE Nov 3, 2023

1 / 3

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Request No. 21-67/0017 MTC No. EEL. BP. 55/1065

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95%.

Nominal Output of Unit Under Test = 94 dB re 20 μ Pa at 1000 Hz

Acoustic Output in dB re 20 μ Pa, Corrected to Reference Conditions : 101.325 kPa, 23.0 °C and 50 %RH

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.99	-0.01	± 0.10	± 0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	999.9	-0.1	± 1.5	$\pm 1.0\%$

3. Total distortion

Standard Microphone Type	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1.80	± 0.50	$\pm 3.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Date of Calibration : 17 Oct. 2023

2/3

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Request No. 21-67/0017 MTC No. EEL. BP. 55/1066

Nominal Output of Unit Under Test = 114 dB re 20 μ Pa at 1000 Hz

Acoustic Output in dB re 20 μ Pa, Corrected to Reference Conditions : 101.325 kPa, 23.0 °C and 50 %RH

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	113.92	-0.07	± 0.10	± 0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1000.0	0.0	± 1.5	$\pm 1.0\%$

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	3.29	± 0.80	$\pm 3.0\%$

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

Approved by :

Date of Calibration : 17 Oct. 2023

Date of issue : 18 Oct. 2023

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Ref : 2011266101004024002

End of Certificate

3 / 3

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ENSL 22 194

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0017

MTC No. EEL. BP. 56/1066

CALIBRATION CERTIFICATE

Submitted by : SGS (Thailand) Limited.

Address : 100 Nanglinchee Rd., Chongronsee, Yannawa Bangkok 10120.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Ambient Environment

Description : Noise Dosimeter

Temperature : (23 ± 3) °C

Manufacturer : Criffer

Relative Humidity : (50 ± 15) %

Model : Sonus2plus

Ambient Pressure : (101.325 ± 1.5) kPa

Serial No. : 32005331

Standards used :

Multifunction Acoustic Calibrator Brüel&Kjær 4226 S/N 2810358 with Coupler UA09.5 S/N 2810358.

Calibration Procedure:

This instrument was calibrated by using calibration procedure no CP-102-31, which was based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2006). This calibration procedure was related to the acoustical signal test of frequency weightings using a multifunction acoustic calibrator.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%.

Date of Receipt : 10 Oct. 2023

Date of Calibration : 17 Oct. 2023

VERIFIED

DATE Nov 03 2023

1 / 2

G. Samy

The results relate only to the items tested/calibrated or value assigned.

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0017

MTC No. EEL. BP. 56/1066

Acoustic signal test of frequency weightings

Frequency (Hz)	Deviation from response curve		Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
	A-weighting (dB)	C-weighting (dB)		
125	2.0	1.7	0.25	2.0
1 000	0.6	0.5	0.25	1.4
4 000	-3.0	-2.9	0.25	2.6

- Note:
- 1) There was no adjustment.
 - 2) The calibration was performed at a sound pressure level of 114 dB.
 - 3) The measured values did not include the correction of microphone of UUT.
 - 4) The deviation was produced from the absolute difference between the measured values and the responding sound pressure levels in IEC 61672-1 (2002).

Calibrated by :

Approved by :

**Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre**

Ref: 2011266101004024003

Date of Calibration : 17 Oct. 2023

Date of Issue : 18 Oct. 2023

2 / 2

End of Certificate

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ENSL 22196

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0017

MTC No. EEL. BP. 57/1066

CALIBRATION CERTIFICATE

Submitted by : SGS (Thailand) Limited.

Address : 100 Nanglinchee Rd., Chongronsee, Yannawa, Bangkok 10120.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Ambient Environment

Description : Noise Dosimeter

Temperature : (23 ± 3) °C

Manufacturer : Criffer

Relative Humidity : (50 ± 15) %

Model : Sonus2plus

Ambient Pressure : (101.325 ± 1.5) kPa

Serial No. : 32006987

Standards used :

Multifunction Acoustic Calibrator Brüel&Kjær 4226 S/N 2810358 with Coupler UA09.5 S/N 2810358.

Calibration Procedure :

This instrument was calibrated by using calibration procedure no CP-102-01, which was based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2006). This calibration procedure was related to the acoustical signal test of frequency weightings using a multifunction acoustic calibrator.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%.

Date of Receipt : 10 Oct. 2023

Date of Calibration : 17 Oct. 2023

VERIFIEDDATE *Nov 23 2023*

1 / 2

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0017

MTC No. EEL. BP. 57/1066

Acoustic signal test of frequency weightings

Frequency (Hz)	Deviation from response curve		Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
	A-weighting (dB)	C-weighting (dB)		
125	0.3	0.4	0.25	2.0
1 000	0.4	0.4	0.25	1.4
4 000	1.8	1.9	0.25	3.6

Note : 1) There was no adjustment.

2) The calibration was performed at a sound pressure level of 114 dB.

3) The measured values did not include the correction of microphone of UUT.

4) The deviation was produced from the absolute difference between the measured values and the responding sound pressure levels in IEC 61672-1 (2002).

Calibrated by :

Approved by :

**Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre**

Ref : 2011265101004024004

Date of Calibration : 17 Oct. 2023

Date of Issue : 18 Oct. 2023

2 / 2

End of Certificate

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FM.BL.MTC.002 Rev.4

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ENSL23904

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0017

MTC No. EEL. BP. 63/1066

CALIBRATION CERTIFICATE

Submitted by : SGS (Thailand) Limited.

Address : 100 Nanglinchee Rd., Chongronsee, Yannawa, Bangkok 10120.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre,
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Ambient Environment

Description : Noise Dosimeter

Temperature : $(23 \pm 3) ^\circ\text{C}$

Manufacturer : Criffer

Relative Humidity : $(50 \pm 15) \%$

Model : Sonus2plus

Ambient Pressure : $(101.325 \pm 1.5) \text{ kPa}$

Serial No. : 32008075

Standards used :

Multifunction Acoustic Calibrator Brüel&Kjær 4226 S/N 2810358 with Coupler UA0915 S/N 2810358.

Calibration Procedure :

This instrument was calibrated by using calibration procedure no CP-102-01, which was based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2006). This calibration procedure was related to the acoustical signal test of frequency weightings using a multifunction acoustic calibrator.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%.

Date of Receipt : 10 Oct. 2023

Date of Calibration : 17 Oct. 2023



1 / 2

G. Samy

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0017

MTC No. EEL. BP. 63/1066

Acoustic signal test of frequency weightings

Frequency (Hz)	Deviation from response curve		Uncertainty (\pm dB)	Tolerance Limits Class 2 (\pm dB)
	A-weighting (dB)	C-weighting (dB)		
125	0.6	0.1	0.25	2.0
1000	0.5	0.5	0.25	1.4
4000	1.6	1.6	0.25	3.6

Note : 1) There was no adjustment.

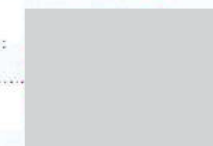
2) The calibration was performed at a sound pressure level of 114 dB.

3) The measured values did not include the correction of microphone of UUT.

4) The deviation was produced from the absolute difference between the measured values and the responding sound pressure levels in IEC 61672-1 (2002).

Calibrated by :

Approved by :

**Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre**

Ref : 2011266101004024010

Date of Calibration : 17 Oct. 2023

Date of Issue : 18 Oct. 2023

2 / 2

End of Certificate

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FM.BL.MTC.002 Rev4

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0017

MTC No. EEL. BP. 60/1066

CALIBRATION CERTIFICATE

Submitted by : SGS (Thailand) Limited.

Address : 100 Nanglinchee Rd., Chongnonsee, Yannawa, Bangkok 10120.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Noise Dosimeter

Manufacturer : Criffer

Model : Sonus2plus

Serial No. : 32008101

Standards used :

Multifunction Acoustic Calibrator Brüel&Kjær 4226 S/N 2810358 with Coupler UA0915 S/N 2810358.

Calibration Procedure :

This instrument was calibrated by using calibration procedure no CP-102-01, which was based on IEC 61672-3 Electroacoustics - Sound Level Meters - Part 3 : Periodic tests (2006). This calibration procedure was related to the acoustical signal test of frequency weightings using a multifunction acoustic calibrator.

This instrument has been calibrated against standards maintained at the Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%.

Date of Receipt : 10 Oct. 2023

Date of Calibration : 17 Oct. 2023



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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0017

MTC No. EEL. BP. 60/1066

Acoustic signal test of frequency weightings

Frequency (Hz)	Deviation from response curve		Uncertainty (±dB)	Tolerance Limits Class 2 (±dB)
	A-weighting (dB)	C-weighting (dB)		
125	0.8	0.6	0.25	2.0
1 000	0.6	0.6	0.25	1.4
4 000	3.5	3.5	0.25	3.6

Note : 1) There was no adjustment.

2) The calibration was performed at a sound pressure level of 114 dB.

3) The measured values did not include the correction of microphone of UUT.

4) The deviation was produced from the absolute difference between the measured values and the responding sound pressure levels in IEC 61672-1 (2002).

Calibrated by :

Approved by :

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Ref: 2011266101004024007

Date of Calibration : 17 Oct. 2023

Date of Issue : 18 Oct. 2023

2 / 2

End of Certificate

The results relate only to the items tested/calibrated or value assigned.

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คุณภาพอากาศในสถานที่ทำงาน



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

214 Bangvaek Rd. Bangpa Bangkac Bangkok 10150
Tel: 0-2865-4647-8 Fax: 0-2865-4649 http://www.mit.in.th



CALIBRATION CERTIFICATE

Certificate No. : L202401305-0002

Date Issued : 16-Feb-24

Customer : SGS (Thailand) Limited
100 Nanglinchee Road, Chongnonsi, Yannawa, Bangkok 10120

Equipment : Dry Cal (Low Flow)

Manufacturer : Bios
Model : Defender 530-L
Serial No. : 127509
ID No./Tag No. : ENWP 12228
Date Received : 25-Jan-24
Date Calibrated : 10-Feb-24

Calibrated by : [REDACTED]

Calibration Method or Calibration Procedure Used

In-house method : CP-34 by comparison against mass flow calibrator.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor $k = 2$, providing a level confidence approximately 95 percent.

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Approved by: [REDACTED]



Page 1 of 3

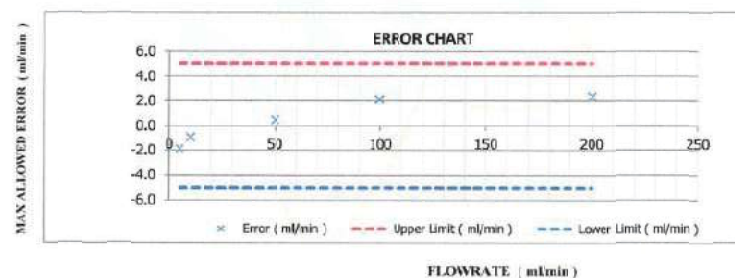
Certificate No. : L202401305-0002

Environment : Ambient temperature : (23 \pm 2) °C
Relative humidity : (50 \pm 15) % RH
Capacity Range : 100 ml/min
Calibration Media : Air
Type : Mass Flowmeter

Unit Under Calibration Reference Condition : At atmospheric pressure and room temperature condition

Temperature (° C)	Pressure (kPa)	UUC Reading (ml/min)	STD Reading (ml/min)	Error (ml/min)	Uncertainty (\pm ml/min)
22.87	101.25	5.0251	6.923	-1.8979	0.14
22.86	101.27	10.238	11.147	-0.909	0.13
22.88	101.41	50.237	49.77	0.467	1.7
22.72	101.55	99.69	97.55	2.14	1.5
22.72	101.87	200.27	197.62	2.65	1.6

Error = Unit Under Calibration - Standard



Page 2 of 3

Certificate No. : L202401305-0002

Note : The actual flow rate is determined by the equation :

$$Q_{Meas} = Q_{Ref} \times \frac{P_{Ref}}{P_{Meas}} \times \frac{T_{Meas}}{T_{Ref}}$$

: Q = Flow rate
: P = Absolute pressure
: T = Absolute temperature
: Subscript 'Meas' = Measurement condition
: Subscript 'Ref' = Reference condition

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Traceability of Certificate :

The International System of Units (SI) through

NIMT Calibration Certificate No. MW-0013-22 for Mass Flow Calibrator (20 SCCM) Serial No. G500971G20,

Due 22-Feb-24

MIT Calibration Certificate No. L202210258-007 for Mass Flow Calibrator (200 SCCM) Serial No. 96093001W,

Due 07-Nov-24

End of Certificate

Page 3 of 3

EN11515145



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214 Bangwadi Rd. Bangpa Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mit.ir.th>



CALIBRATION CERTIFICATE

Certificate No. : L202302025-001

Date Issued : 07-Feb-23

Customer : SGS (Thailand) Limited
100 Narglinchee Road, Chongnonsi, Yannawa, Bangkok 10120

Equipment : DryCal

Manufacturer : MESA LABS

Model : DEFENDER 530-L

Serial No. : 137751

ID No./Tag No. : ENWP 15145

Date Received : 02-Feb-23

Date Calibrated : 04-Feb-23

Calibrated by :

Calibration Method or Calibration Procedure Used

In-house method : CP-34 by comparison against mass flow calibrator.

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

Result of Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor $k = 2$, providing a level confidence approximately 95 percent.

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Approved by:



Page 1 of 3



Certificate No. : L202302025-001

Note : The actual flow rate is determined by the equation :

$$Q_{Meas} = Q_{Ref} \times \frac{P_{Ref}}{P_{Meas}} \times \frac{T_{Meas}}{T_{Ref}}$$

; Q = Flowrate
; P = Absolute pressure
; T = Absolute temperature
; Subscript "Meas" = Measurement condition
; Subscript "Ref" = Reference condition

Condition As-Received : Used Item

The measurement results and statements of conformity with specification only relate to the item calibrated.

Traceability of Certificate :

The International System of Units (SI) through

NIMT Calibration Certificate No. MW-0013-22 for Mass Flow Calibrator (20 SCCM) Serial No. G500971G20, Due 22-Feb-24

MIT Calibration Certificate No. L202210258-007 for Mass Flow Calibrator (200 SCCM) Serial No. 96053001W, Due 07-Nov-24

MIT Calibration Certificate No. AD2109-180-0901 for Mass Flow Calibrator (2000 SCCM) Serial No. 96093001W, Due 10-Sep-23

End of Certificate

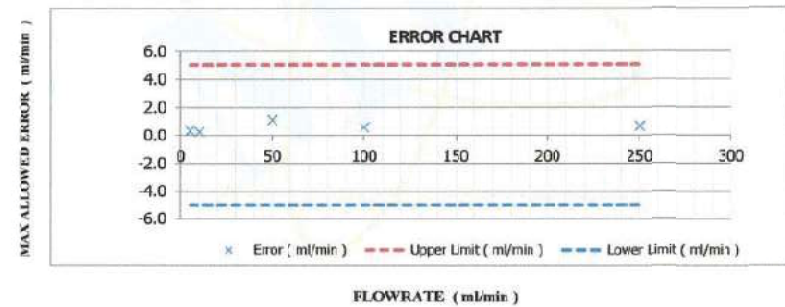
Certificate No. : L202302025-001

Environment : Ambient temperature : (23 ± 2) °C
Relative humidity : (50 ± 15) % RH
Capacity Range : 500 ml/min
Calibration Media : Air
Type : Volumetric Flowmeter

Unit Under Calibration Reference Condition : At atmospheric pressure and room temperature condition

Temperature (°C)	Pressure (kPa)	UUC Reading (ml/min)	STD Reading (ml/min)	Error (ml/min)	Uncertainty (± ml/min)
23.59	101.23	5.0667	4.716	0.3507	0.17
23.56	101.82	10.388	10.126	0.262	0.15
23.52	100.99	50.021	48.92	1.101	1.7
23.50	101.12	100.01	99.42	0.59	1.6
23.57	101.33	250.270	249.6	0.670	7.6

Error = Unit Under Calibration - Standard





Agilent Technologies (Thailand) Limited
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Tel. +662 637 6363
Fax: +662 632 4334
Email: ccc-smt@agilent.com
Website: www.agilent.com/chem

Service Confirmation Number: 6904997715

Service Confirmation Date: 28.06.2023

Customer Contact:

SGS (Thailand) Limited
Branch 00003
1/209 1/211 Moo 1 T Bangchang
A Banchang
RAYONG 21130
TAX ID : 0105532106079

SERVICE REPORT

Customer Purchase Order Number:	Customer Number: 70205138
Service Request:	Service Request Date:
Service Order: 6006193099	Service Confirmation: 6904997715

Invoice To:

SGS (Thailand) Limited
Branch 00003
1/209 1/211 Moo 1 T Bangchang A
Banchang RAYONG 21130

Delivery Site:

SGS (Thailand) Limited
Branch 00003
1/209 1/211 Moo 1 T Bangchang
A Banchang
RAYONG 21130

Location:

Room
Bldg
Lab
Dept

Direct Inquiries to:

Contact Name: Customer Contact Center
Contact E-mail: ccc-smt@agilent.com
Contact Telephone: +662 637 6363
Contact Fax: +662 632 4334

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Citibank N.A. Bangkok Branch
399 Interchange 21 Building, Sukhumvit Road, Klongtoey Nau
Sub-district, Wattana District, Bangkok 10110 Thailand
Acc. No: 012-4452-007 .
THB:Krung Thai Bank PCL
Siam Square Br.,416/1-2 Rama I Rd.,Pathumwan, BKK 10330
Thailand

ORIGINAL

Service Instrument:

Model Number	Model Description	Serial Number	System Handle	Parent Asset
SYS-GM-5973T	GCMS 5973 Turbo System			
G2579A	5973 Inert MSD Perform Turbo EI Mainfrm	US30965023		SYS-GM-5973T
G1530N	6890N Network GC System	CN10305014	G2004002	SYS-GM-5973T

Service Items:

Item	Service/Part #	Description	Qty	Entitlement	Service Start	Service End
1000	PM	Preventive Maintenance	1.00	Agreement Entitlement - 100 % covered	27.06.2023	27.06.2023
1010	5188-6496	QuickPick Split Vent + Inlet PM Kit	1.00	Agreement Entitlement - 100 % covered		
1020	5188-6497	QuickPick Splitless Inlet/Vent PM Kit	1.00	Agreement Entitlement - 100 % covered		
1030	5191-5851	Agilent Vacuum Fluid 45 Platinum, 1Qt	1.00	Agreement Entitlement - 100 % covered		
1050	G1099-80039	Oil Mist Filter, 3/8 BSP Male Threads	1.00	Agreement Entitlement - 100 % covered		

Additional Information:

Service Confirmation Number: 6904997715

Service Confirmation Date: 28.06.2023

Service Information:

Problem Description: NR-C-PM-GM5973-5001151743		
Service Provided: PM 6890N/5973 MSD. Clean source and replace all consumable parts.		
Service Overview Code: Reason Code: Scheduled Service Diagnosis Code: Scheduled Service Resolution Code: Scheduled Service		
Reported Hours: 5.0	Travel Hours: 2.0	
Customer Field Service Representative Name: [Redacted]	Customer Field Service Representative Signature: [Redacted]	Date: 28 Jun 2023
Customer Name: [Redacted]	Customer Signature: [Redacted]	Date: 28 Jun 2023
Additional Comments:		