
ภาคผนวก ข

สำเนาใบรับรองการสอบเทียบเครื่องมือตรวจวัด

คุณภาพอากาศจากปล่องระบาย

HORIBA**HORIBA (THAILAND) LIMITED**46/8 Rungrothanakul Bld., 1st, 2nd Fl., Ratchadapisek Rd., Hual Khwang, Hual Khwang, Bangkok 10310 THAILAND

Telephone: +66 (0) 2861 5955, +66 (0) 2734-4434 Facsimile: +66 (0) 2861 5200

Website : <http://www.horiba.com>**MULTI-POINT GAS TEST REPORT OF NITRIC OXIDE****Equipment Information**

Manufacturer	Horiba	Calibration Date	4-Dec-23
Model	HORIBA PG-350	Background	0
Serial Number	8SPNRVX4	Coefficient	1.1141
		Room Temperature	26.3 °C

Standard Gas Information

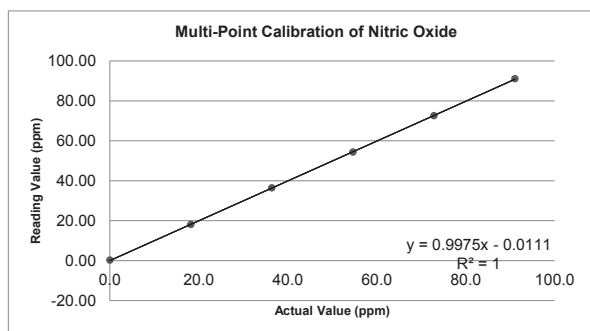
Zero Gas		Span Gas	
Cylinder Number	MLC89198	Cylinder Number	ND27163
Component	N2	Component	NO
Concentration	99.999 %	Concentration	91.06 ppm
Expiration Date	-	Expiration Date	25-Jan-30

Measurement Range	100
% Measurement Range	91.06

Multi-Point Gas Test Data

Level	Actual Value	Reading Value (ppm)				Difference	
		1	2	3	Average	ppm	%
0%	0.0	0.1	0.1	0.3	0.17	0.17	
20%	18.21	18.10	18.00	18.10	18.07	-0.15	0.80
40%	36.42	36.40	36.30	36.30	36.33	-0.09	0.25
60%	54.64	54.40	54.20	54.20	54.27	-0.37	0.68
80%	72.85	72.80	72.40	72.40	72.53	-0.31	0.43
100%	91.06	91.20	91.10	90.90	91.07	0.01	0.01
Average						0.43	
Result						PASS	

Slope	0.9975	Interception	-0.0111	Correlation Coefficient	1.0000
%Slope	-0.2489%	% Interception	-0.0111%	% Correlation Coefficient	-0.0014%
Result	PASS	Result	PASS	Result	PASS

Multi-Point Gas Test Chart

Test By

Date

6-Dec-23

Approve By

Date

6-Dec-23

HORIBA**HORIBA (THAILAND) LIMITED**46/8 Rungrothanakul Bld., 1st, 2nd Fl., Ratchadapisek Rd., Hual Khwang, Hual Khwang, Bangkok 10310 THAILAND

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Website : <http://www.horiba.com>**MULTI-POINT GAS TEST REPORT OF SULFUR DIOXIDE****Equipment Information**

Manufacturer	Horiba	Calibration Date	4-Dec-23
Model	HORIBA PG-350	Background	1
Serial Number	8SPNRVX4	Coefficient	1.1205
		Room Temperature	26.3 °C

Standard Gas Information

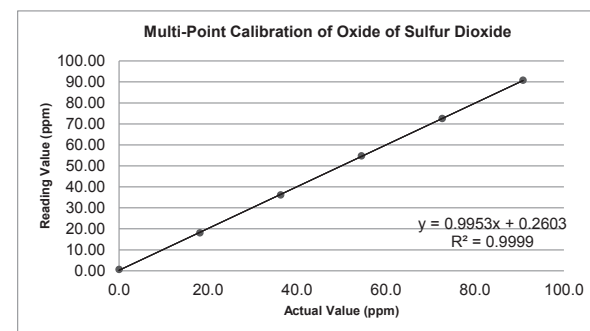
Zero Gas		Span Gas	
Cylinder Number	MLC89198	Cylinder Number	ND27163
Component	N2	Component	SO2
Concentration	99.999 %	Concentration	90.82 ppm
Expiration Date	-	Expiration Date	25-Jan-30

Measurement Range	200
% Measurement Range	45.41

Multi-Point Gas Test Data

Level	Actual Value	Reading Value (ppm)				Difference	
		1	2	3	Average	ppm	%
0%	0.0	0.5	0.6	0.6	0.57	0.57	
20%	18.16	18.10	18.10	18.00	18.07	-0.10	0.54
40%	36.33	35.50	36.60	36.30	36.13	-0.19	0.54
60%	54.49	54.80	54.90	54.50	54.73	0.24	0.44
80%	72.66	72.60	72.50	72.40	72.50	-0.16	0.21
100%	90.82	90.80	90.70	90.70	90.73	-0.09	0.10
Average						0.36	
Result						PASS	

Slope	0.9953	Interception	0.2603	Correlation Coefficient	1.0000
%Slope	-0.4729%	% Interception	0.1302%	% Correlation Coefficient	-0.0028%
Result	PASS	Result	PASS	Result	PASS

Multi-Point Gas Test Chart

Test By

Date

6-Dec-23

Approve By

Date

6-Dec-23



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MULTI-POINT GAS TEST REPORT OF CARBON MONOXIDE

Equipment Information

Manufacturer	Horiba	Calibration Date	4-Dec-23
Model	HORIBA PG-350	Background	0
Serial Number	8SPNRVX4	Coefficient	1.2638
		Room Temperature	26.3 °C

Standard Gas Information

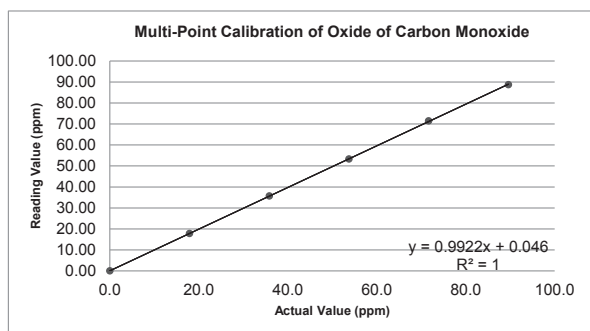
Zero Gas		Span Gas	
Cylinder Number	MLC89198	Cylinder Number	ND27163
Component	N2	Component	CO
Concentration	99.999 %	Concentration	89.58 ppm
Expiration Date	-	Expiration Date	25-Jan-30
		Measurement Range	200
		% Measurement Range	44.79

Multi-Point Gas Test Data

Level	Actual Value	Reading Value (ppm)				Difference	
		1	2	3	Average	ppm	%
0%	0.0	0.0	0.0	0.0	0.00	0.00	
20%	17.92	17.90	17.80	17.70	17.80	-0.12	0.65
40%	35.83	35.80	35.60	35.60	35.67	-0.17	0.46
60%	53.75	53.40	53.20	53.20	53.27	-0.48	0.90
80%	71.66	71.60	71.40	71.50	71.50	-0.16	0.23
100%	89.58	88.90	88.70	88.50	88.70	-0.88	0.98
						Average Result	0.64
							PASS

Slope	0.9922	Interception	0.0460	Correlation Coefficient	1.0000
%Slope	-0.7750%	% Interception	0.0230%	% Correlation Coefficient	-0.0017%
Result	PASS	Result	PASS	Result	PASS

Multi-Point Gas Test Chart



Test By

Date

6-Dec-23

Approve By

Date

6-Dec-23



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MULTI-POINT GAS TEST REPORT OF CARBON DIOXIDE

Equipment Information

Manufacturer	Horiba	Calibration Date	4-Dec-23
Model	HORIBA PG-350	Background	11
Serial Number	8SPNRVX4	Coefficient	0.9604
		Room Temperature	26.3 °C

Standard Gas Information

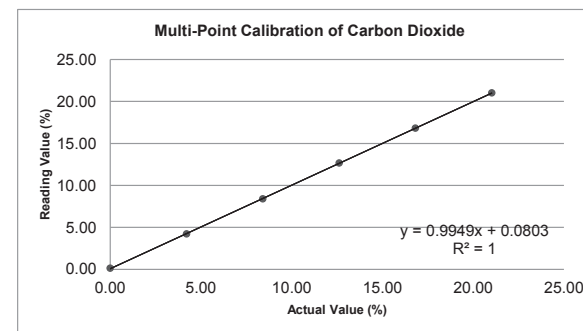
Zero Gas		Span Gas	
Cylinder Number	MLC89198	Cylinder Number	ND11246
Component	N2	Component	CO2
Concentration	99.999 %	Concentration	21.02 %
Expiration Date	-	Expiration Date	8-Aug-30
		Measurement Range	30
		% Measurement Range	70.07

Multi-Point Gas Test Data

Level	Actual Value	Reading Value (%)				Difference	
		1	2	3	Average	%	%
0%	0.00	0.10	0.10	0.20	0.13	0.13	
20%	4.20	4.20	4.22	4.24	4.22	0.02	0.38
40%	8.41	8.38	8.42	8.40	8.40	-0.01	0.10
60%	12.61	12.64	12.67	12.64	12.65	0.04	0.30
80%	16.82	16.80	16.83	16.81	16.81	0.00	0.02
100%	21.02	21.00	20.98	21.04	21.01	-0.01	0.06
						Average Result	0.17
							PASS

Slope	0.9949	Interception	0.0803	Correlation Coefficient	1.0000
%Slope	-0.5052%	% Interception	0.2677%	% Correlation Coefficient	-0.0012%
Result	PASS	Result	PASS	Result	PASS

Multi-Point Gas Test Chart



Test By

Date

6-Dec-23

Approve By

Date

6-Dec-23



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MULTI-POINT GAS TEST REPORT OF OXYGEN

Equipment Information

Manufacturer	Horiba	Calibration Date	4-Dec-23
Model	HORIBA PG-350	Background	4
Serial Number	8SPNRVX4	Coefficient	1.131
		Room Temperature	26.3 °C

Standard Gas Information

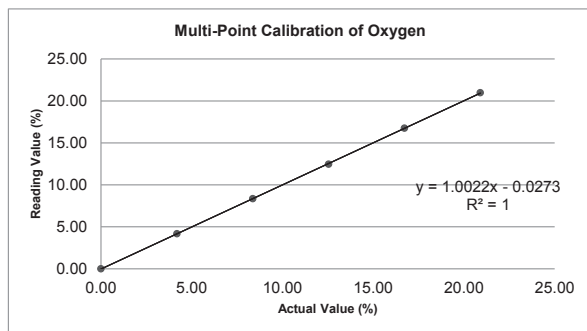
Zero Gas		Span Gas	
Cylinder Number	MLC89198	Cylinder Number	GN0018534
Component	N2	Component	O2
Concentration	99.999 %	Concentration	20.9 %
Expiration Date	-	Expiration Date	14-Feb-27
		Measurement Range	25
		% Measurement Range	83.6

Multi-Point Gas Test Data

Level	Actual Value	Reading Value (%)				Difference	
		1	2	3	Average	%	%
0%	0.00	0.00	0.00	0.00	0.00	0.00	
20%	4.18	4.18	4.17	4.17	4.17	-0.01	0.16
40%	8.36	8.36	8.35	8.33	8.35	-0.01	0.16
60%	12.54	12.41	12.46	12.49	12.45	-0.09	0.69
80%	16.72	16.70	16.74	16.76	16.73	0.01	0.08
100%	20.90	20.90	21.00	21.00	20.97	0.07	0.32
Average						0.28	
Result						PASS	

Slope	1.0022	Interception	-0.0273	Correlation Coefficient	1.0000
%Slope	0.2187%	% Interception	-0.1092%	% Correlation Coefficient	-0.0018%
Result	PASS	Result	PASS	Result	PASS

Multi-Point Gas Test Chart



Test By Approve By

Date 6-Dec-23 Date 6-Dec-23



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LOWER DETECTABLE LIMIT TESTING REPORT

Equipment Information

Manufacturer	Horiba	Calibration Date	4-Dec-23
Model	HORIBA PG-350	Room Temperature	26.3 °C
Serial Number	8SPNRVX4		

Standard Gas Information

Zero Gas		Component	N2
Cylinder Number	MLC89198	Concentration	99.999 %

Parameters	Measruement Range	Unit	Background	Coefficient
NO	100	ppm	0	1.1141
SO ₂	200	ppm	1	1.1205
CO	200	ppm	0	1.2638
CO ₂	30	%	11	0.9604
O ₂	25	%	4	1.131

TESTING REPORT RESULTS

Parameters	1 st	2 nd	3 rd	4 th	5 th	6 th	7 th	8 th	9 th	10 th	STDEV.
NO	0.10	0.00	-0.10	0.10	0.10	0.00	0.00	0.00	0.10	0.00	0.067
SO ₂	-0.20	-0.20	-0.20	-0.20	-0.10	-0.20	-0.20	-0.20	-0.20	-0.20	0.032
CO	0.10	0.20	0.20	0.40	0.20	0.10	0.20	0.20	0.20	0.20	0.082
CO ₂	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.004
O ₂	-0.20	-0.20	-0.20	-0.20	-0.10	0.00	0.00	0.00	0.00	0.00	0.099

Conclusion

NO Lower detectable limit (LDL) value is	0.067	ppm
SO ₂ Lower detectable limit (LDL) value is	0.032	ppm
CO Lower detectable limit (LDL) value is	0.082	ppm
CO ₂ Lower detectable limit (LDL) value is	0.004	% Vol.
O ₂ Lower detectable limit (LDL) value is	0.099	% Vol.

Test By Approve By

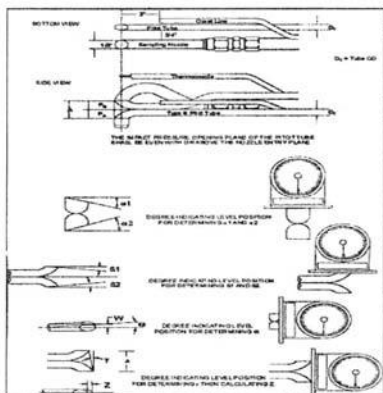
Date 6-Dec-23 Date 6-Dec-23



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.53/A4465

Parameter	Value	Allowable Range	Check
Assembly Level?	Y	Yes or y	PASS
Ports Damaged?	N	No or n	PASS
$\alpha 1$	-1.9	$-10^\circ < \alpha 1 < +10^\circ$	PASS
$\alpha 2$	-0.8	$-10^\circ < \alpha 1 < +10^\circ$	PASS
$\beta 1$	-0.3	$-5^\circ < \alpha 1 < +5^\circ$	PASS
$\beta 2$	-1.7	$-5^\circ < \alpha 1 < +5^\circ$	PASS
γ	1.8	N/A	-
θ	-1.3	N/A	-
D_t	0.375	0.188" to 0.375"	PASS
A	0.927559	$2.1D_t \leq A \leq 3.0D_t$	PASS
$A/2D_t$	1.236745	$1.05 \leq A/D_t \leq 1.5$	PASS
$Z = A \tan \gamma$	0.02915	$Z \leq 0.125"$	PASS
$W = A \tan \theta$	-0.02105	$W \leq 0.031"$	PASS

I certify that pitot tube/probe No.53/A4465 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 Pt. 60, App A, EPA Method 2

Standard Device

Device Name Digital Inclinometer
Manufacturer BASELINE
Model 12-1057
ID No. QC-1824

Expiration data 18-Dec-24
ENSS No. ENSS 22159

Certified by [Signature]

Approved by [Signature]

Date 8-Jan-24

Date 8 Jan 24



Meter Console Verification

Dry Gas Meter ID. : ENSS 046 Date of Calibration : 06/10/2024
Instrument Brand : Apex / Model 572 Calibrated By : CS

Wet gas meter Information

Wet gas Brand : Shinagawa Wet gas S/N : 544122
Wet gas Model : W-NK-2.5A Expire Date : 30/8/2025

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	139.76	25.5	140.0	24.5	12.01	0.9939	45.501
13	139.90	25.4	140.0	25.0	11.58	0.9969	44.928
26	138.20	25.3	140.0	25.0	8.31	0.9837	46.683
26	138.08	25.3	140.0	25.0	8.32	0.9830	46.931
40	277.66	25.3	280.0	25.0	14.01	0.9870	48.242
40	277.98	25.4	280.0	25.0	14.01	0.9878	48.163
50	275.84	25.4	280.0	25.0	12.19	0.9791	47.271
50	275.50	25.5	280.0	25.0	12.23	0.9777	47.918
70	274.28	25.5	280.0	25.0	10.13	0.9715	46.160
70	274.04	25.4	280.0	25.0	10.13	0.9708	46.225
90	274.32	25.4	280.0	25.0	9.00	0.9701	46.099
90	275.50	25.3	280.0	25.0	9.01	0.9746	45.844
Average						0.9813	46.664

Remark : $Y_i \leq \pm 0.02$ from average
 $Y_i = 1.00 \pm 0.05$
 $\Delta H@ \leq \pm 5.08$ mm.H₂O from average
 $\Delta H@ = 46.7 \pm 6.4$ mm.H₂O

Checked By : [Signature]

Approved By : [Signature]

Position : CEMS Manager
Date : 7/10/24

Position : Technical Manager
Date : 7/10/24

Temperature Display Verification

Dry Gas Meter ID.	: ENSS 046	Date of Calibration	: 6/10/2024
Instrument Brand	: Apex / Model 572	Calibrated By	: CS

Temperature Simulator Information

Simulator Brand	: Handy Cal	Simulator S/N	: T1L1015
Simulator Model	: CA11E	Expire Date	: 11/7/2025

Standard Value	Instrument Display				
	Stack	Probe	Filter	Aux	Exit
300	301	300	300	301	-
200	201	201	201	200	-
150	150	150	150	150	-
100	100	100	101	100	101
50	50	50	50	50	51
0	0	0	0	0	0
Difference	0.2 %	1.0	1.0	1.0	1.0

Remark :	Stack	$\leq \pm 1.5\%$ Absolute	Aux	$\leq \pm 3.0\text{ }^{\circ}\text{C}$
	Probe	$\leq \pm 3.0\text{ }^{\circ}\text{C}$	Exit	$\leq \pm 3.0\text{ }^{\circ}\text{C}$
	Filter	$\leq \pm 3.0\text{ }^{\circ}\text{C}$		

Checked By :

Approved By :

Position : CEMS Manager
Date : 7/10/20

Position : Technical Manager
Date : 9/10/24

คุณภาพอากาศในบรรยากาศ



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

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

วันที่ : 15 สิงหาคม 2567

รายชื่ออุปกรณ์ / เครื่องมือ : NO_x Analyzer

บริษัทผู้ผลิต : Teledyne API

รุ่นของอุปกรณ์ / เครื่องมือ : T200

หมายเลขอุปกรณ์ / เครื่องมือ : 1652

TEST VALUES			
API MODEL T200		BEFORE	AFTER
1	RANGE 50 - 20,000 PPB	500.0	500.0
2	STABILITY ≤ 1 PPB	0.3	0.2
3	SAMPLE FLOW 500 ± 10% cc/min	507	525
4	OZONE FLOW 80 ± 10% cc/min	72	76
5	PMT mV	101.8	123.8
6	NORM PMT mV	14.7	54.5
7	A ZERO -20 To 150 MV	83.4	68.7
8	HPVS 400 - 900 V	717	767
9	RX CELL TEMP 50 ± 1 °C	50.0	50.0
10	BOX TEMP AMBIENT ± 5 °C	29.6	32.2
11	PMT TEMP 7 ± 2 °C	7.2	7.4
12	MOLY TEMP 315 ± 5 °C	315.0	315.0
13	RX CELL PRESSURE <10 in - Hg-A	4.6	4.6
14	SAMPLE PRESSURE 25 - 35 in - Hg-A	30.1	31.1
15	NOX SLOPE 1.0 ± 0.3	1.234	1.078
16	NOX OFFSET -50 To 150	-1.4	-1.9
17	NO SLOPE 1.0 ± 0.3	1.207	1.053
18	NO OFFSET -50 To 150	-0.9	-2.9
19	NO SAMPLE READING PPB	14.2	27.8
20	NO ₂ SAMPLE READING PPB	9.7	6.2
21	NOX SAMPLE READING PPB	23.9	34.0
22	OPTIC TEST 2000 ± 1000 mV	1512.0	1507.0
23	ELECTRICAL TEST 2000 ± 1000 mV	2071.0	2075.0
24	VOLTAGE TEST +5 V +12 V +15 V -15 V	4.97 /12.35/ 15.90/ -15.63	4.97 /12.35/ 15.90/ -15.63
25	ZERO GAS NO/NO _x 0.00/0.00 PPB	0.2 / 0.7	0.1 / 0.2
26	SPAN GAS NO/NO _x 400.00/400.00 PPB	150.2 / 151.4	399.0 / 401.0

หมายเหตุ

- ทำการเปลี่ยน Sintered Filter 3 ชิ้น, Spring 3 ชิ้น, O-ring 6 ชิ้น

- ทำการ Calibrate Multi-Point

ลงนามเจ้าหน้าที่ (Signature)

ต้องการข้อมูลเพิ่มเติมทางเทคนิค กรุณาติดต่อ :

โทรศัพท์ :

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

HAQM 17001

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) : 1550

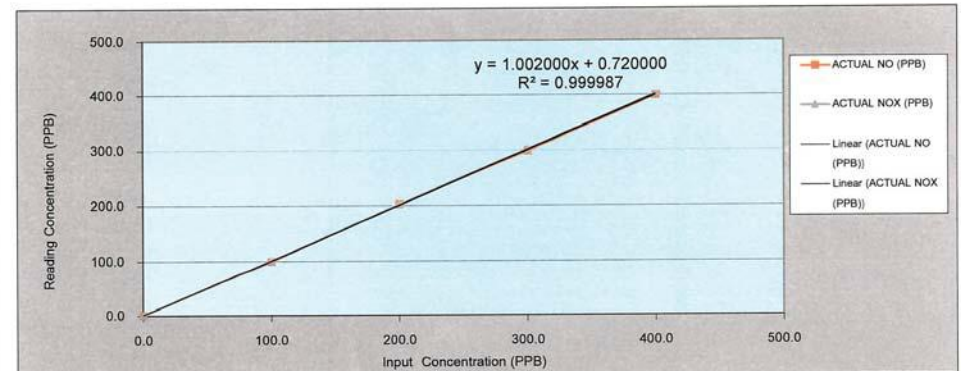
CERTIFIED DATE : Mar 10, 2021

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	0.1	0.1	-	0.2	0.2	-
1	100.0	99.9	-0.1	-0.1	101.0	1.0	1.0
2	200.0	202.4	-0.7	1.2	202.0	2.0	1.0
3	300.0	298.4	-1.6	-0.5	301.4	1.4	0.5
4	400.0	399.0	-1.0	-0.3	401.0	1.0	0.3
AVERAGE (%)				0.5			0.7



CALIBRATED BY : คุณธนาคม มหาอาจ

DATE : 15 /08 /2567

ต้องการข้อมูลเพิ่มเติมทางเทคนิคเพิ่มเติม :

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

Customer service report

บริษัท เอส จี เอส (ประเทศไทย) จำกัด

Manufacturer Teledyne API
Equipment NOx Analyzer
Model T200

S/N 1652
Quotation Q-B2-2024-149-SV Rev.02

● Checking Date ●

15/08/2567

● Problem

- Preventive Maintenance



B2



contact us

● Correlation working / Remark

1. ทำการเปลี่ยน Sintered Filter 3 ชิ้น , Spring 3 ชิ้น O-ring 6 ชิ้น
2. ทำการ Calibrate Multi-point

● Repair parts ●

1. Sintered Filter 3 ชิ้น
2. Spring 3 ชิ้น
3. O-ring 6 ชิ้น

Technician / Engineer

บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

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

วันที่ : 29 มีนาคม 2567

รายชื่ออุปกรณ์ / เครื่องมือ : NO_x Analyzer

บริษัทผู้ผลิต : Teledyne API

รุ่นของอุปกรณ์ / เครื่องมือ : T200

หมายเลขอุปกรณ์ / เครื่องมือ : 2199

TEST VALUES				
		API MODEL T200	BEFORE	AFTER
1	RANGE	50 - 20,000 PPB	500.0	500.0
2	STABILITY	≤ 1 PPB	0.4	0.1
3	SAMPLE FLOW	500 ± 10% cc/min	xxx	511
4	OZONE FLOW	80 ± 10% cc/min	86	85
5	PMT	mV	96.8	86.1
6	NORM PMT	mV	-0.6	0.2
7	A ZERO	-20 To 150 MV	99.4	85.5
8	HPVS	400 - 900 V	684	684
9	RX CELL TEMP	50 ± 1 °C	50.0	50.0
10	BOX TEMP	AMBIENT ± 5 °C	32.5	32.0
11	PMT TEMP	7 ± 2 °C	6.8	6.8
12	MOLY TEMP	315 ± 5 °C	314.0	315.0
13	RX CELL PRESSURE	<10 in - Hg-A	30.1	5.1
14	SAMPLE PRESSURE	25 - 35 in - Hg-A	30.1	28.6
15	NOX SLOPE	1.0 ± 0.3	2.494	1.047
16	NOX OFFSET	-50 To 150	11.9	1.4
17	NO SLOPE	1.0 ± 0.3	2.289	1.010
18	NO OFFSET	-50 To 150	-1.1	-0.2
19	NO SAMPLE READING	PPB	0.1	0.6
20	NO2 SAMPLE READING	PPB	11.2	6.3
21	NOX SAMPLE READING	PPB	11.3	6.9
22	OPTIC TEST	2000 ± 1000 mV	2309.0	2321.0
23	ELECTRICAL TEST	2000 ± 1000 mV	2639.0	2646.0
24	VOLTAGE TEST	+5 V +12 V +15 V -15 V	4.47 /12.10/ 15.45/-15.16	5.25 /12.10/ 15.65/-15.24
25	ZERO GAS NO/NOx	0.00/0.00 PPB	0.5 / -5.0	0.0/ 0.0
26	SPAN GAS NO/NOx	400.00/400.00 PPB	754.6 / 762.3	399.0 / 401.3

หมายเหตุ

- Sample Flow Warning ,RX Cell Warning

- ทำการเปลี่ยน PNEU SNSR 1 BD.

- ทำการเปลี่ยน Sintered Filter 3 ชิ้น, Spring 3 ชิ้น, O-ring 6 ชิ้น, Filter 47 mm.1แผ่น

- ทำการ Calibrate Multi-Point

ลงนามเจ้าหน้าที่ (Signature)

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ :

โทรศัพท์ :

เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทระเกษม 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 : 2199

STANDARD GAS CONCENTRATION (PPM) : 53.40

CYLINDER NO : CC745169

CYLINDER PRESSURE (psig) : 1550

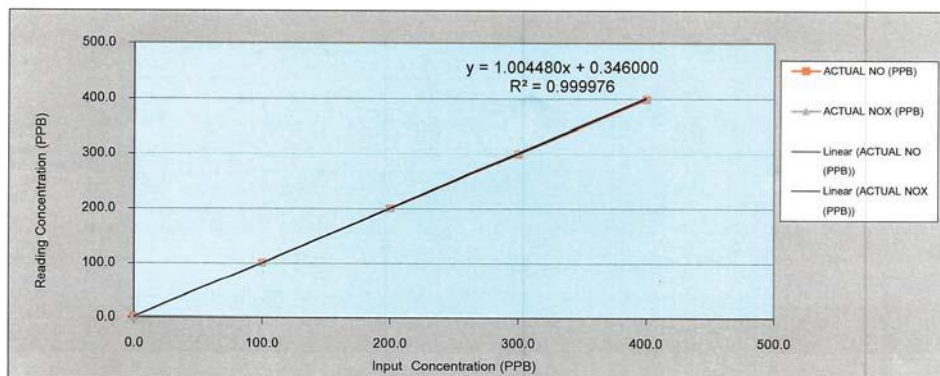
CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10, 2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS						
	IDEAL (PPB)	ACTUAL NO (PPB)	ERROR NO (PPB)	% ERROR NO	ACTUAL NO _x (PPB)	ERROR NO _x (PPB)	% ERROR NO _x
ZERO	0.0	0.0	0.0	0.0	0.0	0.1	0.0
1	100.0	100.8	0.8	0.8	101.0	1.0	1.0
2	200.0	200.6	-0.7	0.3	201.0	1.0	0.5
3	300.0	300.1	0.1	0.0	302.9	2.9	1.0
4	400.0	399.0	-1.0	-0.3	401.3	1.3	0.3
AVERAGE (%)				0.4			0.7



CALIBRATED BY : [Signature]

DATE : 29 /03 /2567

ต้องการข้อมูลเพิ่มเติมทางเทคนิคเพิ่มเติม :

เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทระเกษม 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 : 7 มีนาคม 2567

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		500.0	500.0
2	SO ₂ STABILITY	≤ 1 PPB		11.60	0.00
3	PRESSURE	25 - 35 in - Hg-A		28.4	27.7
4	SAMPLE FLOW	700 ± 10% cc/min		487.0	647
5	PMT	mV		78.3	19.1
6	NORM PMT	mV		87.7	24.0
7	UV LAMP	1000 - 4800 mV		3770.0	3613.0
8	LAMP RATIO	30 To 120 %		91.9	88.0
9	STRAY LIGHT	≤ 100 PPB		68.7	11.0
10	DARK PMT	-50 ± 200 % mV		9.7	21.7
11	DARK LAMP	-50 ± 200 % mV		-1.6	4.1
12	SO ₂ SLOPE	1.0 ± 0.3		2.199	0.939
13	SO ₂ OFFSET	< 250 mV		62.5	23.5
14	HVPS	400 - 900 V		578	578
15	RX CELL TEMP	50 ± 1 °C		50.0	50.0
16	BOX TEMP	AMBIENT ± 5 °C		31.5	34.3
17	PMT TEMP	7 ± 2 °C		8.4	8.4
18	SO ₂ SAMPLE READING	PPB		27.5	0.3
19	OPTIC TEST	2000 ± 1000 mV		1093.0	1090.0
20	ELECTRICAL TEST	2000 ± 1000 mV		1449.0	1456.0
21	VOLTAGE TEST	+5 V +12 V +15 V -15 V		5.28/ 11.98 /16.92 /-15.20	5.25/ 12.01 /16.90 /-15.18
22	ZERO GAS	0.00 PPB		18.3	0.1
23	SPAN GAS	400.00 PPB		873.8	400.1

หมายเหตุ

- Relay Board Warning ทำการเปลี่ยน Power Supply 12Vdc 1 ea, Relay DPDT 1ea.
- ทำการเปลี่ยน CD Filter 330NM 1 ea.
- ทำการเปลี่ยน Sintered Filter 1 ชิ้น, Spring 1 ชิ้น, O-ring 2 ชิ้น, Filter 47 mm.1ชิ้น
- ทำการ Calibrate Multi-Point

ลงนามเจ้าหน้าที่ (Signature)

ต้องการข้อมูลเพิ่มเติมทางเทคนิค กรุณาติดต่อ :

โทรศัพท์

เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทระเกษม 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 : 1771

STANDARD GAS CONCENTRATION (PPM) : 53.79

CYLINDER NO : CC745169

CYLINDER PRESSURE (PSIG) : 1550

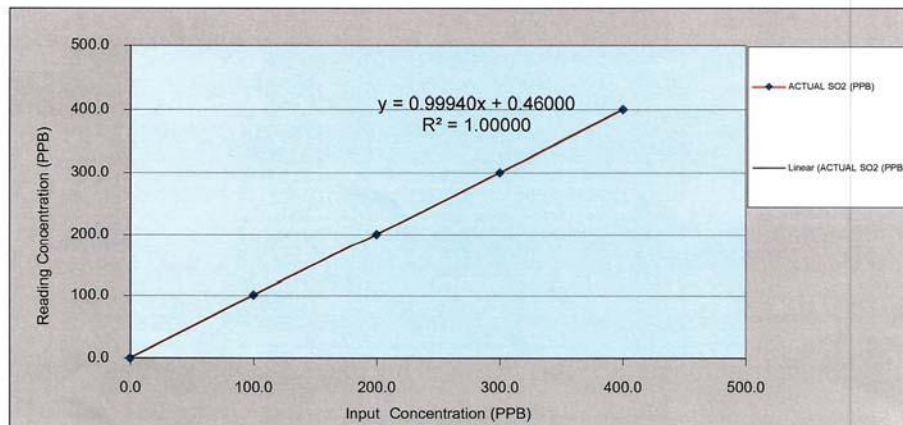
CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10, 2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	IDEAL (PPB)	ACTUAL SO ₂ (PPB)	ERROR SO ₂ (PPB)	% ERROR SO ₂
ZERO	0.0	0.1	0.1	-
1	100.0	100.8	0.8	0.8
2	200.0	200.5	0.5	0.3
3	300.0	300.2	0.2	0.1
4	400.0	400.1	0.1	0.0
AVERAGE (%)				0.3



CALIBRATED BY :

DATE : 7 /03 /2567

ต้องการข้อมูลเพิ่มเติมทางเทคนิคเพิ่มเติม :

เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทระเกษม 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 : 27 กุมภาพันธ์ 2566

รายชื่ออุปกรณ์ / เครื่องมือ : NO_x Analyzer

บริษัทผู้ผลิต : Teledyne API

รุ่นของอุปกรณ์ / เครื่องมือ : T200

หมายเลขอุปกรณ์ / เครื่องมือ : 7534

TEST VALUES			
API MODEL T200		BEFORE	AFTER
1	RANGE	50 - 20,000 PPB	500.0
2	STABILITY	≤ 1 PPB	0.43
3	SAMPLE FLOW	500 ± 10% cc/min	488
4	OZONE FLOW	80 ± 10% cc/min	79
5	PMT	mV	24.8
6	NORM PMT	mV	11.1
7	A ZERO	-20 To 150 MV	30.6
8	HPVS	400 - 900 V	650
9	RX CELL TEMP	50 ± 1 °C	50.0
10	BOX TEMP	AMBIENT ± 5 °C	30.9
11	PMT TEMP	7 ± 2 °C	7.0
12	MOLY TEMP	315 ± 5 °C	314.6
13	RX CELL PRESSURE	<10 in - Hg-A	7.4
14	SAMPLE PRESSURE	25 - 35 in - Hg-A	28.9
15	NOX SLOPE	1.0 ± 0.3	1.019
16	NOX OFFSET	-50 To 150	4.3
17	NO SLOPE	1.0 ± 0.3	1.023
18	NO OFFSET	-50 To 150	-0.30
19	NO SAMPLE READING	PPB	-5.4
20	NO2 SAMPLE READING	PPB	7.0
21	NOX SAMPLE READING	PPB	1.4
22	OPTIC TEST	2000 ± 1000 mV	2280.4
23	ELECTRICAL TEST	2000 ± 1000 mV	1762.9
24	VOLTAGE TEST	+5 V +12 V +15 V -15 V	5.48 /12.89 /15.61 /-15.38
25	ZERO GAS NO/NOx	0.00/0.00 PPB	-1.1 /- 2.4
26	SPAN GAS NO/NOx	400.00/400.00 PPB	424.1/ 425.5

หมายเหตุ

- ทำการเปลี่ยน Sintered Filter 3 ชิ้น, Spring 3 ชิ้น, O-ring 6 ชิ้น

VERIFIED

BY

DATE Mar 07, 2023

ลงนามเจ้าหน้าที่ (Signature)

ต้องการข้อมูลเพิ่มเติมทางเทคนิค กรุณาติดต่อ : คุณพรชัย ผาติวนารักษ์ โทรศัพท์ : 0-2515-8987

เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทระเกษม 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 : 7534

STANDARD GAS CONCENTRATION (PPM) : 53.4

CYLINDER NO : CC745169

CYLINDER PRESSURE (psig) : 1550

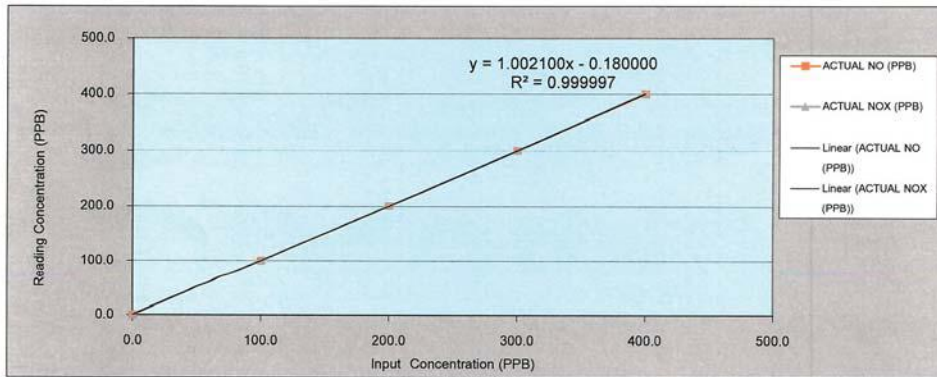
CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10, 2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS						
	IDEAL (PPB)	ACTUAL NO (PPB)	ERROR NO (PPB)	% ERROR NO	ACTUAL NO _x (PPB)	ERROR NO _x (PPB)	% ERROR NO _x
ZERO	0.0	0.0	0.0	0.0	0.0	0.1	0.0
1	100.0	99.9	-0.1	-0.1	100.0	0.0	0.0
2	200.0	199.9	-0.7	0.0	200.1	0.1	0.0
3	300.0	299.9	-0.1	-0.0	300.1	0.1	0.0
4	400.0	399.9	-0.1	0.0	401.0	1.0	0.3
AVERAGE (%)				0.0			0.0



CALIBRATED BY :

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม

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

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04NI99E15A0622

Cylinder Number: CC745169

Laboratory: 124 - Plumsteadville - PA

PGVP Number: A12021

Gas Code: CO,NO,NOX,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, 2029

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/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. 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	EB0079116	100.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Jul 23, 2023
PRM	12386	D685025	9.91 PPM AIR/NITROGEN DIOXIDE	2.0%	Feb 20, 2020
GMIS	124206889	CC323707	4.028 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Aug 15, 2021
NTRM	16010203	KAL003087	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/-0.8%	Dec 23, 2021
NTRM	08012341	KAL004716	4857 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 07, 2024

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1KD579	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

Triad Data Available Upon Request

NOTES:

Gross Weight: 28.1 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 : 7 กุมภาพันธ์ 2565

บริษัทผู้ผลิต : Teledyne API

หมายเลขอุปกรณ์ / เครื่องมือ : 7534

TEST VALUES			
API MODEL T200		BEFORE	AFTER
1	RANGE	50 - 20,000 PPB	500
2	STABILITY	≤ 1 PPB	0.15
3	SAMPLE FLOW	500 ± 10% cc/min	485
4	OZONE FLOW	80 ± 10% cc/min	86
5	PMT	mV	10.1
6	NORM PMT	mV	23.5
7	A ZERO	-20 To 150 MV	19.1
8	HPVS	400 - 900 V	650
9	RX CELL TEMP	50 ± 1 °C	50.0
10	BOX TEMP	AMBIENT ± 5 °C	32.7
11	PMT TEMP	7 ± 2 °C	7.0
12	MOLY TEMP	315 ± 5 °C	315.6
13	RX CELL PRESSURE	<10 in - Hg-A	4.6
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	-7.5
17	NO SLOPE	1.0 ± 0.3	0.983
18	NO OFFSET	-50 To 150	-8.1
19	NO SAMPLE READING	PPB	0.2
20	NO2 SAMPLE READING	PPB	15.2
21	NOX SAMPLE READING	PPB	15.4
22	OPTIC TEST	2000 ± 1000 mV	2304.7
23	ELECTRICAL TEST	2000 ± 1000 mV	2115.1
24	VOLTAGE TEST	+5 V +12 V +15 V -15 V	-
25	ZERO GAS NO/NO _x	0.00/0.00 PPB	1.0 / 1.3
26	SPAN GAS NO/NO _x	400.00/400.00 PPB	518 / 523.4

หมายเหตุ



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด



ลงนามเจ้าหน้าที่ (Signature)

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ

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



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 23 July, 2024

Certification No. 269/24

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,
Yannawa, Bangkok 10120.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1006.2 hPa

NATIONAL STANDARD WIND TUNNEL : Wind Aloft Plotting Board

: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119 : HOOK GAGE NO 1425

N.I.S.T. Test Reference Number 731/241460 : 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. 8389/94

: Thermoschneider No.9188 : testo, testo 645 Serial No. 02848057

STANDARD BAROMETER : Dig : PTB220 No. V1220015

Mechanical Engineer





THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 269/24

23 July, 2024

Page : 2 of 6

Standard Ultrasonic Anemometer	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacumm	Velocity	Velocity	Correction
	m/sec	inches H2O	inches H2O	m/sec	m/sec
1.00	-	-	-	0.9	0.10
3.02	-	-	-	3.0	0.02
5.00	-	-	-	4.9	0.10
7.00	-	-	-	7.0	
9.02	-	-	-	8.9	0.12
11.01	-	-	-	11.1	-0.09
13.01	-	-	-	13.0	0.01
15.01	-	-	-	15.1	-0.09
17.02	-	-	-	17.0	0.02
20.02	-	-	-	19.3	0.72

Wind Aloft Plotting Board.	
US.DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibrate

Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 0-2396-0156, 0-2399-0469

The Result of Calibration

Certification No. 269/24

23 July, 2024

Page : 3 of 6

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
756.02	757.1	-1.08
755.93	757.0	-1.07
755.81	757.1	-1.29
755.71	757.1	-1.39
755.46	757.0	-1.54
754.88	756.5	-1.62
754.59	756.3	-1.71
754.34	756.0	-1.66
754.10	755.9	-1.80
754.04	755.8	-1.76
754.00	755.7	-1.70
754.10	755.8	-1.70
754.31	755.9	-1.59
754.55	756.1	-1.55
754.82	756.4	-1.58
755.78	757.4	-1.62
756.39	758.0	-1.61
756.04	757.8	-1.76
755.59	757.2	-1.61
754.67	756.3	-1.63

Average

Calibra

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The Result of Calibration

Certification No. 269/24

23 July, 2024

Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading	Correction
	°C	°C
45.8	46.0	-0.2
30.2	30.3	-0.1
15.5	15.4	0.1

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The Result of Calibration

Certification No. 269/24

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Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading	Correction
	% R.H.	% R.H.
92.3	89	3.30
65.2	63	2.20
46.4	45	1.40

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Date of Issue 23 July, 2024

Certification No. 269/24

Page: 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis Instruments แบบ TIPPING
BUCKET Product No. 6152C Mfg. Code. AZ170619022 ทำการสอบเทียบกับแก้ววัดฝนแบบ
แก้วดวง GAUGE DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA LONDON No. 71082
และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (0.01 in./TIP)



ลงชื่อ..

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 31 May, 2024

Certification No. 221/24

Page : 1 of 6

Object : Precision Weather Station

Manufacturer : Davis Instruments

Type : Vantage Pro 2 Model No. : 6152C

Mfg Code : Display AZ170619045 Transmitter BD190415075

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

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1008.1 hPa

NATIONAL STANDARD WIND TUNNEL : Wind Aloft Plotting Board
: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119 : HOOK GAGE NO 1425

N.I.S.T. Test Reference Number 731/241460 : 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. 8389/94
: Thermoschneider No.9188 : testo, testo 645 Serial No. 02848057

STANDARD BAROMETER : Digi : Type PTB220 No. V1220015

Mechanical Engineer

(Authorised 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. 221/24

31 May, 2024

Page : 2 of 6

Standard Ultrasonic Anemometer	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacumm	Velocity	Velocity	Correction
	m/sec	inches H2O	inches H2O	m/sec	m/sec
1.00	-	-	-	0.9	0.10
3.02	-	-	-	3.0	0.02
5.00	-	-	-	4.9	0.10
7.00	-	-	-	7.0	0.00
9.02	-	-	-	8.9	0.12
11.01	-	-	-	11.0	0.01
13.01	-	-	-	13.0	0.01
15.01	-	-	-	15.0	0.01
17.02	-	-	-	17.0	0.02
20.02	-	-	-	19.3	0.02

Wind Aloft Plotting Board.	
US.DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibra

Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau



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4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 0-2396-0156,0-2399-0469

The Result of Calibration

Certification No. 221/24

31 May, 2024

Page : 3 of 6

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
753.68	754.6	-0.92
753.80	754.8	-1.00
753.92	754.9	-0.98
754.06	755.0	-0.94
754.69	755.6	-0.91
754.76	755.7	-0.94
755.17	756.1	-0.93
755.33	756.3	-0.97
755.45	756.4	-0.95
755.50	756.3	-0.80
754.28	755.2	-0.92
754.78	755.7	-0.92
753.98	755.0	-1.02
754.35	755.4	-1.05
754.69	755.7	-1.01
755.37	756.4	-1.03
755.70	756.7	-1.00
755.75	756.8	-1.05
755.90	756.9	-1.00
756.08	757.1	-1.02

Average

-0.97

Calibra

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. 221/24

31 May, 2024

Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading	Correction
	°C	°C
45.2	45.3	-0.1
30.5	30.5	0.0
15.6	15.7	-0.1

Calibrated by

Mechanical Engineer

Calibration & Test Section
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The Result of Calibration

Certification No. 221/24

31 May, 2024

Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading	Correction
	% R.H.	% R.H.
86.32	89	-2.68
67.54	69	-1.46
46.23	47	-0.77

Calibrated by

Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau





Date of Issue 31 May, 2024

Certification No. 221/24

Page: 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis Instruments แบบ TIPPING BUCKET Product No. 6152C Mfg. Code. BD190415075 ทำการสอบเทียบกับแก้ววัดฝนแบบ แก้วดวง GAUGE DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA LONDON No. 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (0.01 in./TIP)



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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 3 April, 2024

Certification No. 166/24

Page : 1 of 6

Object : Precision Weather Station

Manufacturer : Davis Instruments

Type : Vantage Pro 2 Model No. : 6152C

Mfg Code : Display BD190415073 Transmitter BD190415073

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

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1007.8 hPa

NATIONAL STANDARD WIND TUNNEL : Wind Aloft Plotting Board

: Micromanometer Theodor Friedrichs FC014 Serial No. 9310119 : HOOK GAGE NO 1425

N.I.S.T. Test Reference Number 731/241460 : 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. 8389/94

: Thermochocider No. 9199 : testo, testo 645 Serial No. 02848057

STANDARD BAROMETER : Digit type PTB220 No. V1220015

Mechanical Engineer





THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 166/24

3 April, 2024

Page : 2 of 6

Standard Ultrasonic Anemometer	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacumm	Velocity	Velocity	Correction
	m/sec	inches H2O	inches H2O	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	-	-	-	10.9	0.11
13.01	-	-	-	13.0	0.01
15.01	-	-	-	14.9	0.11
17.02	-	-	-	17.0	0.02
20.02	-	-	-	19.3	0.72

Wind Aloft Plotting Board.	
US.DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270

Calibrated

Mechanical Engineer

Calibration & Test Section
Meteorological Instruments Bureau



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 0-2396-0156,0-2399-0469

The Result of Calibration

Certification No. 166/24

3 April, 2024

Page : 3 of 6

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
757.81	758.9	-1.09
757.15	758.2	-1.05
757.64	758.6	-0.96
758.27	759.3	-1.03
758.66	759.7	-1.04
758.94	759.9	-0.96
759.11	760.1	-0.99
759.84	760.9	-1.06
759.95	760.9	-0.95
759.73	760.7	-0.97
759.96	760.9	-0.94
760.14	761.1	-0.96
760.42	761.5	-1.08
760.70	761.8	-1.10
762.03	763.1	-1.07
762.24	763.2	-0.96
761.79	762.8	-1.01
761.48	762.5	-1.02
759.71	760.7	-0.99
760.28	761.3	-1.02

Average

-1.01

Calibrated

Mechanical Engineer

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Meteorological Instruments Bureau





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

The Result of Calibration

Certification No. 166/24

3 April, 2024

Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.6	45.8	-0.2
30.4	30.5	-0.1
15.6	15.6	0.0

Calit

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The Result of Calibration

Certification No. 166/24

3 April, 2024

Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading % R.H.	Correction % R.H.
85.62	82	3.62
65.14	64	1.14
45.02	46	-0.98

Calibrated

Mechanical Engineer





Date of Issue 3 April, 2024

Certification No. 166/24

Page: 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ชีห้อ Davis Instruments แบบ TIPPING
BUCKET Product No. 6152C Mfg. Code. BD190415073 ทำการสอบเทียบกับแก้ววัดฝนแบบ
แก้วดวง GAUGE DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA LONDON No. 71082
และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (0.01 in./TIP)



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Agilent Technologies

6850 and 6890 GC Preventive Maintenance Checklist - Standard

Agilent Preventive Maintenance provides factory recommended service for your analytical systems to assure reliable operation and the accuracy of your results. Delivered by highly-trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides everything you need to reduce unplanned downtime and keep your systems operating at their peak.

For more information about Agilent Technologies services please visit our web site using the following URL <http://www.chem.agilent.com/en-us/products/services/pages/default.aspx>

Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures.
- Any parts, not included in the Parts Lists section of this document, are not part of the recommended Preventive Maintenance service, nor are they included in the price of this service.
- If a system requires the use of additional or special procedures and/or parts for the instrument service, then these must be ordered separately and charged as a repair, which may incur additional costs.

Service Engineer's Responsibilities

- Only complete/printout pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using a "X" or tick mark "✓" in the checkbox.
- Complete Not Applicable check boxes to indicate services not delivered, as needed.
- Complete the PM service in the order of the tasks listed.
- Complete the Service Review section together with the customer.

Additional Instruction Notes

- Check for any active service notes for this unit. If there are any applicable "Safety" or "Modification Recommended" Service notes, plan to implement the changes on this unit before doing any qualification service. Do not implement firmware updates, unless you get approval from the customer and are sure that they are compatible with the instrument control software.

6850 and 6890 GC
Preventive Maintenance Checklist – Standard



System Information

Guidance

- ☐ Check this box if an instrument configuration report is attached instead of completing the table.

Instrument system name and ID	CN10621014
Instrument system site and location	SGS, Bangkok
List system component product numbers	List the serial numbers of each component
1. G1530N	1. CN10621014
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10.

Preparation

- ☒ Discuss any specific issues with the customer prior to starting.
- ☒ Review the instrument logbook.
- ☒ Save instrument control settings before starting the procedure.
- ☒ Perform general inspection of system for cleanliness
- ☒ Check for proper installation of safety-related parts, assemblies, sensors etc
- ☒ Check for required firmware updates and verify with customers if they would like it installed.
- ☒ Before starting the following procedures, record the Detector Signal Output(s) in the results table. If the GC is turned OFF or in a service mode, comparing the detector outputs before and after the service is not possible.

6850 and 6890 GC
Preventive Maintenance Checklist – Standard



Clean and inspect GC

- ☒ Unplug power cord from the power source.
- ☒ Open GC covers and vacuum/remove any dust/debris. Pay particular attention to cooling fans.
- ☒ Inspect internal connectors for proper contact and placement.
- ☒ Reconnect Power to the GC. Power the GC on and verify the power on self-test passed.
- ☒ Verify oven motor spins freely and turns on with the oven door closed; off when the door is opened.
- ☒ Verify operation of all other fans - the inlet and EPC cooling fans.
- ☒ Verify oven intake/outlet flap assembly is operating smoothly while heating and cooling the oven

Inlet and detector consumable replacement

- ☒ For the inlets installed, perform inlet maintenance as defined in the 6850 or 6890 manual – "Maintaining Your GC" - for the inlet(s) installed.
- ☒ Replace the split vent trap on units with these inlets: Split/Splitless Capillary (SSL), Programmable Temperature Vaporization (PTV), Volatiles Interface (VI).
- ☐ If the GC includes a Flame Ionization Detector (FID), replace the jet. If the ignitor shows any build up of sample or corrosion, replace the ignitor. Examine the FID collector and castle assemblies for contamination – clean as necessary.

Zero Sensors and Leak test

- ☒ Zero all pressure sensors per the procedure in the 6890 Service Manual.
- ☒ Perform inlet pressure decay tests(s) as defined in the 6890 Service Manual. If the PM is done in preparation for an OQ/PV, then the pressure decay test defined within that protocol can be used for the PM.
- ☒ Record if test passed or failed in the results table.

ALS Maintenance

- ☒ Section NOT applicable
- ☐ Check all cabling and configuration settings between GC, tray, and injectors.
- ☐ Vacuum or removed any dust, especially around fans.
- ☐ Check operation of all fans.
- ☐ Check syringe for smooth plunger operation.
- ☐ Check for smooth operation of the needle support rod – clean if necessary
- ☐ Check for correct operation of syringe volume stops.

6850 and 6890 GC
Preventive Maintenance Checklist – Standard



Restore Instrument

- ✓ Restore the normal operating conditions using the Keyboard or Data System.
- ✓ Check and record detector offset. Results should be similar to offset test conducted prior to PM.
- ✓ Perform a chemical checkout. If this is a routine PM, inject the customer's sample using the ALS if applicable. This will act as a final checkout of both the ALS and the GC.

Guidance

If the PM service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.

6850 and 6890 GC
Preventive Maintenance Checklist – Standard



Service Review

- ✓ Attach available reports/printouts of all tests to this documentation.
- ✓ Record the PM service activity in the customer's instrument records/logbook
- ✓ Update/reset instrument maintenance counters as appropriate
- ✓ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ✓ Complete the Service Review Comments section below if there are additional comments
- ✓ Review the service and any test results with the customer.
- If the Instrument firmware was updated, record the details of the change in the Service Engineer's Comments box below or if necessary, in the customer's IQ records.

6850 and 6890 GC Test Results Table

Signal Output test	Before PM service	After PM service
Front detector output	N/A	N/A
Back detector output (6890 Only)	N/A	N/A
Pressure decay test	Expected result	Actual result or N/A
Front inlet pressure decay test	Pass	Pass
Back inlet pressure decay test (6890 Only)	Pass	N/A

6890 and 6850 GC Parts List Table

The following kits are recommended for capillary and purged packed inlets. If this is a general PM and the customer has a preferred set of consumables, you may use the customer's consumables.

Part Description	Part Number	Model# where used	Quantity Consumed
SSL Capillary Inlet PM kit, splitless	5188-6497	G1530/G1540/G2630	1
SSL Capillary Inlet PM kit, split	5188-6496	G1530/G1540/G2630	1
Larger O.D. Liner O-Rings for SS Flip Top - 10/pkg.	5188-5366	G1530/G1540/G2630	N/A
PP Inlet PM kit	5188-6498	G1530/G1540/G2630	N/A
Split vent trap PM kit, single cartridge (for PTV & VI)	5188-6495	G1530/G1540/G2630	N/A
Ignitor (glow plug) assembly with O-ring	19231-60680	G1530/G1540/G2630	N/A
.011-inch Jet for capillary FID base	G1531-80560*	G1530/G1540/G2630	N/A
.018-inch Jet for packed column with packed FID base	18710-20119*	G1530/G1540/G2630	N/A
.011-inch Jet for capillary column with packed FID base	19244-80560*	G1530/G1540/G2630	N/A

**6850 and 6890 GC
Preventive Maintenance Checklist – Standard**



* The jets (G1531-80560, 18710-20119 and 19244-80560) are recommended for 6850/6890 PM. Please refer to the service note "COLUMNS/SUPPLIES-197A" for detailed information.

Service Engineer Comments (optional)

If there are any specific points you wish to note as part of performing the service or other items of interest for the customer, please write in this box.

Other Important Customer Web Links

- ☐ How to get information on your product: Literature Library - <http://www.agilent.com/chem/library>
- ☐ Need to know more? - www.agilent.com/chem/education
- ☐ Need technical support, FAQs? - www.agilent.com/chem/techsupp
- ☐ Need supplies? - www.agilent.com/chem/supplies

Service Completion

Service request number 6006759346 Date service completed 5 Apr 2024

Agilent signature [Redacted] Customer signature [Redacted]

Document part number: G2630-90130

Agilent Preventive Maintenance Services

Agilent GCMS Preventive Maintenance

Agilent Preventive Maintenance provides factory recommended service for your analytical instruments to assure reliable operation and the accuracy of your results

Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides what you need to reduce unplanned downtime and keep your systems operating at their peak performance.

This checklist is used as a guide for completing the preventive maintenance tasks. A signed copy of this checklist is provided for your records.

Introduction

This checklist covers the following model(s):

Type	Model
SQ	5973 Series MSD
SQ	5975 Series MSD
SQ	5977 Series MSD
TQ	7000 Series MS/MS
TQ	7010 Series MS/MS
QTOF	7200 Series QTOF
QTOF	7250 Series QTOF

Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures. Customers are responsible for regular maintenance and are encouraged to observe the service representative.
- Any parts not included in the Parts Lists section of this document are not part of the recommended Preventive Maintenance service nor are they included in the price of this service.
- If a system requires the use of extra or special procedures and/or parts for the maintenance service, then these must be ordered separately and charged as a repair, which may incur additional costs.

Customer Responsibilities

Customers should ensure that all necessary operating supplies, consumables, and usage-dependent items such as gases, vials, syringes, calibrant solution and solvents required for successful preventive maintenance are available. A customer representative should be available while the preventive maintenance is being performed.

Important notice for customers

The customer should complete the following before the Support Provider arrives on site:

- ☐ Perform an autotune and retain the printed tune report just prior to the start of the PM to verify performance of the equipment.

Note: It is recommended to have the customer run the autotune and tune evaluation prior to the PM and then start the vent cycle so that the instrument will be ready for the service representative.

Important Customer Web Links

- To access Agilent training and education, visit <http://www.agilent.com/chem/training> to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.
- To access the **Agilent Resource Center** web page, visit <https://www.agilent.com/en-us/agilentresources>. The following information topics are available:
 - Sample Prep and Containment
 - Chemical Standards
 - Analysis
 - Service and Support
 - Application Workflows
- The **Agilent Community** is an excellent place to get answers, collaborate with others about applications and Agilent products, and find in-depth documents and videos relevant to Agilent technologies. Visit <https://community.agilent.com/welcome>
- Videos about specific preparation requirements for your instrument can be found by searching the **Agilent YouTube** channel at <https://www.youtube.com/user/agilent>
- Need to place a service call?** Flexible Repair Options | Agilent

Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.

- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check **"Service not applicable"** check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance services in order by sections: Review, System Checks, Pump maintenance, Cleaning System and Filters, then System Post Check.
 - The tasks in each section may be completed in the most logical order relevant to the system. Complete the **Service Review** section together with the customer.
- Complete the fields for page numbers at the foot of each selected page
- Add relevant page numbers to selected pages and complete the total number of pages field in the Service Verification section
- Complete Signature Page and attach Signature Page to Service Order.

Additional Instruction Notes

- Preventive maintenance is a factory recommended procedure designed to reduce the likelihood of electromechanical failures. Failure to perform preventive maintenance may reduce the long-term reliability of certain instruments and systems. **Two preventative maintenances (PMs) per year are recommended, the Major PM Service will be performed annually with an Interim PM performed 6 months after the Major PM.**

Definition of the Task/Recommended items within the document

Task		Recommended			
Yes	No	Interim	Major	As Needed	
✓					Yes selected means that the task was done or the part was required
	✓				No selected means that the task was not done or the part was not required.
		✓			Interim selected means that this task is recommended to be done at 6-month intervals.
			✓		Major selected means that this task is recommended to be done yearly; if the customer would like a service to be done at the 6-month interval then the service could be purchased
				✓	As needed selected means that the task was done, or the part was used as needed. For example, there could be two types of filters that could be used, and this was the one selected.

Instrument Maintenance

Select the appropriate service to be performed.

- ☐ Interim Preventive Maintenance (when available, is typically 6 months or at the request of the customer)
- ☐ Major Preventive Maintenance (Yearly)
- ☐ Enhanced Preventive Maintenance (when available, is provided "As needed")

System Information

- ☐ Check this box if an instrument configuration report is attached instead of completing the table.

Instrument System Name and ID	
Instrument System Site and Location	SGS, Bangkok

List System Component Product Numbers	List the Serial Numbers of each Component
1. G3172A	US61633132
2.	
3.	
4.	
5.	
6.	

Preparation

- ☒ Discuss any specific issues with the customer before starting.
- ☒ Review the instrument logbook for recorded problems and comments.
- ☒ Save instrument control settings before starting the procedure.
- ☒ Perform a general inspection of the system for cleanliness.
- ☒ Check for proper installation of parts, assemblies, sensors etc.
- ☒ Check system for required installation of components and implementation of Service Notes
- ☒ Check firmware version(s). Updating to the most current versions is strongly recommended. Verify with the customer before updating.

Preventive Maintenance Procedures

☐ Service Not Applicable

Interim / Major Preventive Maintenance – GCMS

Yes/No	Interim/Major	Description
<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		Perform general inspection of system for cleanliness
<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		Discuss any problems the customer is having with the instrument
<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		Review customer maintenance records and exclude maintenance on recently serviced items
<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		Review the most recent autotune report. This will give a starting point for evaluating spectral peaks, baseline noise, peak shape, mass assignments and resolution.

Interim / Major Preventive Maintenance – System Checks

☐ Service Not Applicable

Yes/No	Interim/Major	Description
<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		Verify that calibration peaks were seen prior to starting the PM
<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		Vent the instrument
<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		Inspect vacuum hoses, pump, exhaust tubing, and power cords for excessive wear.
<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		Visually inspect calibrant levels – PFTBA PFDT (if appl.), IRM (if appl.). Refill if available.
<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		Look for any obvious external damage or problems.
<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		Clean air intake(s). Cosmetic cover(s) may need to be removed.
<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		Verify system line voltage meets instrument specifications: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		For HydroInert systems, verify customer is running hydrogen: Yes <input type="checkbox"/> No <input type="checkbox"/>

Interim / Major Preventive Maintenance – Wet Mechanical vacuum pumps

☐ Service Not Applicable

Yes/No	Interim/Major	Description
<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		Check for evidence of oil leakage. Check pump gasket for leakage.
<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>		GC/MS SQ with diffusion pump; drain and replace diffusion pump oil.
<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		Drain and replace mechanical pump oil.
<input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		Replace Oil Mist Filter if applicable.

Yes/No	Interim/Major	Description
<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		Discuss with customer the need for more frequent oil changes if the oil is dirty
<input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		Don't use mist filters with Chemical Ionization.
<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		Perform anti-suckback valve test. Power on until side plate is held closed, power off and check that side plate holds closed. Visually confirm that no oil returns up vacuum hose.

Interim / Major Preventive Maintenance – Dry Mechanical vacuum pumps - Diaphragm

☒ Service Not Applicable

Yes/No	Interim/Major	Description
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		Check for evidence of poor vacuum – Turbo power demand, poor manifold vacuum, etc.
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		Clear air flow paths of dust.
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		If vacuum is poor, then replace the diaphragm pump.
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		Perform anti-suckback valve test. Power on until side plate is held closed, power off and check that side plate holds closed.

Interim / Major Preventive Maintenance – Dry Mechanical vacuum pumps - Scroll

☒ Service Not Applicable

Yes/No	Interim/Major	Description
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		Replace the tips seal on the IDP pump.
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		Check for evidence of poor vacuum – Rough vac pressure, turbo power demand, poor manifold vacuum, etc.
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		Replace the Exhaust Filter if required.
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		Discuss with customer the need for more frequent changes, if needed.
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		Inform customer that pump gas ballast should be installed all the time.
<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		Perform anti-suckback valve test. Power on until side plate is held closed, power off and check that side plate holds closed.

Interim / Major Preventive Maintenance – Cleaning System and Filters

☐ Service Not Applicable

				Cleaning System and Filters	
Yes/No Interim/Major				Description	
				Fans	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Remove dust from fans and vent covers.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		Verify fans are functional and that there is enough space around the instrument for proper cooling.
				Source cleaning (all sources except Hydrolert)	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		Open analyzer and remove the source.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		Disassemble, Clean, Re-assemble source. (7200, also, remove and clean entrance lens)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		Re-install source and close analyzer.
				Hydrolert Source	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Source NOT to be abrasively cleaned. No cleaning required at PM. If a decrease in performance is observed, recommend to the customer that filaments, insulators (repeller and extractor), extractor lens, and repeller lens may need to be replaced to restore performance. Hydrolert source should not be run with helium carrier.
				Filters	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		Replace RMSN-2 Helium gas filter (collision cell gas) – if applicable.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		Replace RMSN-2 Nitrogen gas filter (collision cell gas) – if applicable.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		Replace RMSHY-2 Hydrogen gas filter (Hydrolert and JetClean) – if applicable.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		CP17973 – Gas Clean GS/MS Filter (for He, N2 or H2 carrier) – if required
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>		5190-9071 – Methane Gas Filter (CI systems) – if applicable

Guidance: Gas filters need to be changed only if required (ie indicating traps show color change, or if Big Universal Trap are approaching saturation based on time installed or number of gas cylinders changed for that trap)

Interim / Major Preventive Maintenance – System Post Check

☐ Service Not Applicable

System post-check					
Yes/No	Interim/Major	Description			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Pump system back down. Wait until system stability has been achieved.	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Verify system vacuum reading(s) via the gauge controller.	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Leak Check	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Verify system in manual tune	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Compare against previous tune file report(s)	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Change to Tune and verify that all temperatures, pressures, and gas flows reach method set points	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Check manually that you have calibration peaks.	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	EI Autotune Performed	

Guidance: If the PM Service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument setup and checkout.

Service Review

- ☒ Attach available reports/printouts of all tests to this documentation.
- ☒ Record the Preventive Maintenance service activity in the customer's records/logbook.
- ☒ Record the PM event in the Smart Alerts logbook, if applicable.
- ☒ Update/reset instrument maintenance counters as appropriate.
- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Engineer Comments section if there are additional comments.
- ☒ Review this service, parts replaced, and test results obtained with the customer.
- ☒ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box. Systems in a compliant environment may need additional documentation.
- ☒ Complete Signature Page and attach Signature Page to Service Order.

Test Results

Test Description	Expected Test Result	Actual Test Result
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Signature Page

Service Engineer Comments (optional)

If there are any specific points you wish to note as part of performing the service review or other items of interest for the customer, please write in this box.

Service Verification

Service Request Number:

6006759346

Service Engineer Name:

Service Engineer Signature:

Date of Service Completion:

5 Apr 2024

Customer Name:

Total number of pages in this document:

Parts for consumption during PM

Common Oil and MS Gas Filters – 5973/5975/5977/7000/7010/7200/7250 Series

Part Description	Part Number	Interim	Major	As Needed
Agilent AVF Platinum, 1 quart	5191-5851	✓	✓	✓
Helium gas filter* (collision cell gas) – if required	RMSH-2		✓	✓
Nitrogen gas filter* (collision cell gas) – if required	RMSN-2		✓	✓
Hydrogen gas filter* ^ (HydroInert and JetClean) – if required	RMSHY-2		✓	✓
Chemical Ionization Gas Purifier (CI systems) (Methane) – if required	5190-9071		✓	✓
Gas Clean GS/MS Filter (for He, N2 or H2) – if required	CP17973		✓	✓
# Gas Clean Filter Kit GC/MS 1/8 in (complete replacement kit - bench mounted) – if required	CP17974			✓
# Gas Clean Carrier Gas Kit for 7890 for He, N2 or H2, Bracket, Mount and Filter – if required	CP17988			✓
# Gas Clean Carrier Gas Kit for 8890 & 8860 for He, N2 or H2, Bracket, Mount and Filter – if required	CP179880			✓

Gas filters need to be changed only if required (ie indicating traps show color change, or if Big Universal Trap are approaching saturation based on time installed or number of gas cylinders changed for that trap)

* Big Universal Trap (BUT), 1/8" fittings

^ HydroInert and JetClean Systems

Alternate Gas Clean kit part numbers. A Gas Clean filter is included in the kits. They are only necessary if replacing carrier gas Big Universal Traps with indicating traps

MS Maintenance Supplies for 5973/5975/5977 Series

Part Description	Part Number	Interim	Major	As Needed
Diffusion pump fluid (Diffusion Pump Models)	6040-0809		✓	✓
	Qty 2			
Exhaust oil mist trap (threaded) Edwards/Pfeiffer	G1099-80039	✓	✓	✓
DS42 Oil Mist Eliminator 3/4G & 3/8	SR03706556	✓	✓	✓
IDP-3 Tip Seal Replacement Kit (IDP-3 Dry Scroll Pump Models – Includes tip seal, 60mm filter element, tools, mask and cleaning supplies)	G7077-67018	✓	✓	✓
IDP-3 Tip Seal Replacement Kit (no tools – CSD P/N)	5190-9561	✓	✓	✓
IDP-3 Tip Seal Replacement Kit (no tools – VPD P/N)	IDP3TS	✓	✓	✓
Filter element for IDP-3 (diameter: 60mm)	REPLSLRFILTER2	✓	✓	✓

MS Maintenance Supplies for 7000/7010 Series

Part Description	Part Number	Interim	Major	As Needed
Oil Mist Filter RV5	G6600-80043	✓	✓	✓
IDP-10 Tip Seal Replacement Kit (IDP-10 Dry Scroll Pump Models – Includes tip seal, 102mm filter element, tools, mask and cleaning supplies)	G7004-67023	✓	✓	✓
IDP-10 Tip Seal Replacement Kit (no tools etc. – VPD P/N)	X3807-67000	✓	✓	✓
Filter element for IDP-10/IDP15 (diameter: 102mm)	REPLSLRFILTER	✓	✓	✓
Filter element for IDP-10/IDP15 (diameter: 79mm)	REPLSLRFILTER1	✓	✓	✓

MS Maintenance Supplies for 7200/7250 Series

Part Description	Part Number	Interim	Major	As Needed
RIS Probe Maintenance Kit (7200 Series only)	G7005-60170		✓	✓
DS202 Oil Mist Eliminator	SR03706800	✓	✓	✓
DS202 3/8" Magnetic Plug and Gasket	SR03701824	✓	✓	✓
IDP-15 Tip Seal Replacement Kit (IDP-15 Dry Scroll Pump Models – Includes tip seal, 102mm filter element, tools, mask and cleaning supplies)	5190-9613	✓	✓	✓
IDP-15 Tip Seal Replacement Kit (no tools etc. – VPD P/N)	X3815-67000	✓	✓	✓
Filter element for IDP-10/IDP15 (diameter: 102mm)	REPLSLRFILTER	✓	✓	✓
Filter element for IDP-10/IDP15 (diameter: 79mm)	REPLSLRFILTER1	✓	✓	✓

HydroInert Source Supplies

To determine if replacement of HydroInert parts is required, please review tune history and sample signal intensity performance. If performance is decreasing, the below parts may be used to restore performance as part of the PM.

One way to determine if the source performance on SQ is being affected is to review the gain factor history in autotune reports or tune history csv file. If the gain factor is increasing the source performance may be degrading.

Since TQ tunes to a fixed gain factor, review PFTBA abundance. If PFTBA abundance is decreasing over time, the source performance may be degrading.

Real sample/standard area counts are another way to determine the performance, there could also be other factors that affect compounds abundance such as inlet and column status.

Part Description	Part Number	Interim	Major	As Needed
Repeller Insulator (qty 2)	G1099-20133			✓
Lens insulator for Extractor (ring insulator)	G3870-20445			✓
HydroInert Extractor lens (9mm)	G7078-20909			✓
HydroInert Repeller	G7078-20902			✓

Common Parts Reference

(Purchased by customer, not included as part of PM)

Filaments and Calibrant Supplies 5973/5975/5977/7000/7010/7200/7250 Series

Part Description	Part Number	SQ	TQ	QTOF
El High Temperature Filaments	G7005-60061 Qty 2	597X	7000x	N/A
HES El Filaments	G7002-60001	5977B/C	7010x	N/A
LE-El Filaments (7250 QTOF)	G3850-60021	N/A	N/A	7250
CI High Temperature Filament – SQ, TQ, 7200 QTOF	G7005-60072	N/A	N/A	7200A/B
Axial CI Filament, W/Re Straight (7250 QTOF)	G7250-60095	N/A	N/A	7250
PFTBA GCMS Tuning Standard calibrant	05971-60571	597X	70X0	72X0
PFDTD calibrant, 1 mL	8500-8510	597X	70X0	72X0
PFET, IRM calibrant for GC QTOF 0.5 mL (7200)	5190-0531	N/A	N/A	7200A/B

Transfer line seals and springs 5973/5975/5977/7000/7010/7200/7250 Series

Part Description	Part Number	SQ	TQ	QTOF
CI Interface tip seal (ceramic tip and spring combo) (non-captured CI tip seal interface) (5973, 5975, 7000B)	G1999-60412	5973, 5975	7000B	N/A
CI Interface tip seal (ceramic tip and spring low/non-magnetic spring combo) (non-captured CI tip seal interface) (7010A)	G7002-60412	N/A	7010A	N/A
CI Interface tip seal spring (spring only)	G1999-20023	597X	70X0	72X0
CI Interface tip seal (tip only) (captured style)	G3870-20542	5977x	70X0	72X0
Transfer-Line Tip Base, Threaded (captured style)	G3870-20548	5977x	70X0	72X0
Transfer-Line Tip Cap, Threaded (captured style)	G3870-20547	5977x	70X0	72X0
RIS Xfer Tip (7200)	G7005-20542	N/A	N/A	7200A/B
RIS Xfer Tip Spring (7200)	G7005-20024	N/A	N/A	7200A/B

MS Maintenance Supplies for Intuvo 9000 MS Series

Part Description	Part Number	SQ	TQ	QTOF
Swaged MS Tail - Packaged	G4590-60009	5977x	7000	N/A
Swaged MS Tail (HES) - Packaged	G4590-60109	5977x	7010x	N/A

Ion source insulators for 5973/5975/5977/7000/7010/7200/7250 Series

Part Description	Part Number	SQ	TQ	QTOF
Repeller insulator (SQ, TQ)	G1099-20133 Qty 2	597X	7000x	N/A
Lens insulator for extractor lens (ceramic ring insulator) (Extractor source)	G3870-20445	5977x	7000C/D/E	N/A
Lens insulator for Extractor lens (Vespel ring insulator) (7000B extractor ion source)	G7000-20445	N/A	7000B only	N/A
Lens stack insulator for SS, Inert, Extractor sources (captures ion focus and entrance lens) (Vespel)	G3170-20530	597X	7000x	N/A
Lens insulator for Extractor lens for HES/LEEI (ceramic ring insulator)	G7002-20064	5977B/C	7010x	7250
Lens stack insulator/holder for HES/LEEI (Vespel)	G7002-20074	5977B/C	7010x	7250
CI Repeller Lens Insulator (SQ, TQ)	G1999-20433	597X	70X0x	N/A
CI Lens stack insulator (SQ, TQ) (Vespel)	G3170-20540	597X	70X0x	N/A
Repeller insulator (7200 RIS) (Ceramic)	G7005-20447	N/A	N/A	7200A/B
Extractor Lens Insulator (7200 RIS) (Vespel)	G7005-20133	N/A	N/A	7200A/B
Ion Focus Insulator (7200 RIS) (Vespel)	G7005-20442	N/A	N/A	7200A/B
CI Repeller Insulator/bushing (7200 RIS) (Ceramic)	G7005-20030	N/A	N/A	7200A/B

HydroInert coated lenses for 5977/7000 Series

Part Description	Part Number	SQ	TQ	QTOF
HydroInert Repeller	G7078-20902	5977x	7000C/D/E	N/A
Ext Source Body – HydroInert	G7078-20903	5977x	7000C/D/E	N/A
HydroInert Extractor lens (9mm)	G7078-20909	5977x	7000C/D/E	N/A
Ion Focus Lens – HydroInert	G7078-20905	5977x	7000C/D/E	N/A
Entrance Lens – HydroInert	G7078-20904	5977x	7000C/D/E	N/A

Heater/Sensor assemblies for 5973/5975/5977/7000/7010/7200/7250 Series

Part Description	Part Number	SQ	TQ	QTOF
Stainless Steel Heater/Sensor assembly (SST EI 350)	G3870-67180	597X	N/A	N/A
Inert Heater/Sensor assembly (inert EI 350)	G3870-67179	597X	7000A/B	N/A
Extractor Heater/Sensor assembly (Xtr EI 350)	G3870-67177	5977x	7000C/D/E	N/A
H2 EI Heater/Sensor Assembly – HydroInert (H2 EI 350)	G7078-67910	5977x	7000C/D/E	N/A
CI 350 Heater/Sensor Assembly (CI 350)	G3870-67415	597X	70X0x	N/A
Ring heater/sensor assembly (HES, RIS and LEEI) (ceramic ring)	G7002-60058	5977B/C	7010x	72X0

Rough pump hoses 5973/5975/5977/7000/7010/7200/7250 Series

Part Description	Part Number	SQ	TQ	QTOF
Foreline Hose - imbedded spring	G7077-60119	597X	70X0x	72X0

Common MS Maintenance Supplies

Part Description	Part Number	SQ	TQ	QTOF
Abrasive paper, 30 µm	5061-5896	597X	70X0	72X0
Alumina powder	393706201	597X	70X0	72X0
Cloths, clean (pkg of 15)	05980-60051	597X	70X0	72X0
Cloths, cleaning (pkg of 300)	9310-4828	597X	70X0	72X0
Cotton swabs (pkg of 100)	5080-5400	597X	70X0	72X0
Gloves, clean, large	8650-0030	597X	70X0	72X0
Gloves, clean, small	8650-0029	597X	70X0	72X0

Agilent CrossLab Start Up Services

Agilent G8160A Teledyne Tekmar Atomx XYZ Preventive Maintenance

Agilent Preventive Maintenance provides factory recommended service for your analytical instruments to assure reliable operation and the accuracy of your results

Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides what you need to reduce unplanned downtime and keep your systems operating at their peak performance.

This checklist is used as a guide for completing the preventive maintenance tasks. A signed copy of this checklist is provided for your records.

Introduction

Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures. Customers are responsible for regular maintenance and are encouraged to observe the service representative.
- Any parts not included in the Parts Lists section of this document are not part of the recommended Preventive Maintenance service nor are they included in the price of this service.
- If a system requires the use of extra or special procedures and/or parts for the maintenance service, then these must be ordered separately and charged as a repair, which may incur additional costs.

Important Customer Web Links

- To access **Agilent University**, visit <http://www.agilent.com/crosslab/university/> to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.
- To access the **Agilent Resource Center** web page, visit <https://www.agilent.com/en-us/agilentresources>. The following information topics are available:
 - Sample Prep and Containment
 - Chemical Standards
 - Analysis
 - Service and Support
 - Application Workflows
- The **Agilent Community** is an excellent place to get answers, collaborate with others about applications and Agilent products, and find in-depth documents and videos relevant to Agilent technologies. Visit <https://community.agilent.com/welcome>
- Videos about specific preparation requirements for your instrument can be found by searching the **Agilent YouTube** channel at <https://www.youtube.com/user/agilent>
- **Need to place a service call?** Flexible Repair Options | Agilent

Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check "**Service not applicable**" check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance services in the most logical order relevant to the individual system service in the order of the tasks listed.
- Complete the **Service Review** section together with the customer.
- Complete the fields for page numbers at the foot of each selected page.
- Add relevant page numbers to selected pages and complete the total number of pages field in the Service Completion section
- **Ask the customer to sign the Service Verification section including the customer's and your signature.**

Instrument Maintenance

Select the appropriate service to be performed.

- ☐ Interim Preventive Maintenance (when available, is typically 6 months or at the request of the customer)
- ☒ Major Preventive Maintenance (Yearly)
- ☐ Enhanced Preventive Maintenance (when available, is provided "As needed")

System Information

- ☐ Check this box if an instrument configuration report is attached instead of completing the table.

Instrument System Name and ID	
Instrument System Site and Location	SGS, Bangkok

List System Component Product Numbers	List the Serial Numbers of each Component
1. G8160A	US18005018
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	

Preparation

- ☒ Discuss any specific issues with the customer before starting.
- ☒ Review the instrument logbook for recorded problems and comments.
- ☒ Save instrument control settings before starting the procedure.
- ☒ Perform a general inspection of the system for cleanliness.
- ☒ Check for proper installation of parts, assemblies, sensors etc.
- ☒ Check system for required installation of components and implementation of Service Notes
- ☒ Check for required firmware updates and verify with customers if they would like them installed. Firmware update(s) are strongly recommended.

Preventive Maintenance Procedures

☐ *Service Not Applicable*

Preventive Maintenance Task Section #1 - Verify and adjust functionality of Atomx XYZ

- ☐ *Service Not Applicable.*
- ☒ Verify 5V and 24VDC supplies with multimeter and LEDs
- ☒ Verify electronic performance in diagnostics
- ☒ Ensure flow rate 10 ml/min
- ☒ Perform syringe initialization
- ☒ Adjust arm tilt and cantor, if needed
- ☒ Adjust gripper tilt and pads, if needed. Replace pads if needed.
- ☒ Verify unhindered movement of vial sensor flag
- ☒ Perform arm/origin alignment, if necessary
- ☒ Check IS pressure and adjust if necessary
- ☒ Check system history for proper purge and bake pressures
- ☒ Check system history for errors
- ☒ Leak check system
- ☐ Perform benchmark test

Interim Preventive Maintenance Task Section #2 – Clean Atomx XYZ

- ☐ *Service Not Applicable.*
- ☒ Clean system and fans
 - o Remove dust from electronics and boards
 - o Remove any dirt or dust that is present on fans
 - o Remove dust from sensors
- ☒ Remove front sparger and clean glassware. Inspect glassware, ferrule, 3-port valve. Replace if necessary.
- ☒ Clean tray of debris
- ☒ Clean sample cup of debris
- ☒ Clean waste container and water reservoir, and ensure no debris is clogging waste lines

Restore Instrument

- ☐ *Service Not Applicable.*
- ☒ Restore customer's method setpoints
- ☒ Run a standard to ensure functionality of Atomx XYZ

Service Review

- ☒ Attach available reports/printouts of all tests to this documentation.
- ☒ Record the Preventive Maintenance service activity in the customer's records/logbook.
- ☒ Record the PM event in the Smart Alerts logbook, if applicable.
- ☒ Update/reset instrument maintenance counters as appropriate.
- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Engineer Comments section if there are additional comments.
- ☒ Review this service, parts replaced, and test results obtained with the customer.
- ☒ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box. Systems in a compliant environment may need additional documentation.
- ☒ Complete the Signature Page with both Service Engineer and Customer signatures.

Test Results

Test Description	Expected Test Result	Actual Test Result
Leak Test	Less than 1 PSI	Fail, Call for Repair
Benchmark	All Pass	N/A

Consumed PM Parts

Part Description	Part Number	Product or Model# where used	Quantity consumed
Sparger, 5mL, fritted	5182-0852	P&T	N/A
Sparger, 25mL, fritted	5182-0851	P&T	1
Sparger, 5mL, fritless	5182-0850	P&T	N/A
Sparger, 25mL, fritless	5182-0849	P&T	N/A
Gripper Finger Caps	G8160-60089	G8160A	1

Signature Page**Service Engineer Comments (optional)**

If there are any specific points you wish to note as part of performing the installation or other items of interest for the customer, please write in this box.

Service VerificationService Request Number:
6006759346

Service Engineer Name:

Signature:

Total number of pages in this document:

Date Service Completed:
5 Apr 2024

Customer Name:

Signature:

คุณภาพน้ำ



Certificate of Calibration



Certificate No.: C01243462

Page: 2 of 5

Equipment: Balance
Model: CPA225D
Serial No. (or ID.): 28812504 (B2014002)
Manufacturer: Sartorius
Condition: In condition

Certificate No.: C01243462
Issued Date: 13 November 2024
Job No.: WO-00047988
Page: 1 of 5

Customer: SGS (THAILAND) CO., LTD.
1/209, 1/211 Moo 1, Tambol Banchang,
Amphur Banchang, Rayong 21130 Thailand

Environment Condition: Temperature 21 °C ± 0.9 °C
Humidity 72 %RH ± 1.6 %RH




Calibration Place: SGS (THAILAND) CO., LTD. (Balance Lab)
1/209, 1/211 Moo 1, Tambol Banchang,
Amphur Banchang, Rayong 21130 Thailand

Calibration By: [Redacted]
Calibration Date: 07 November 2024
The Method used: In-house method, CAL-WI-47, based on UKAS Lab 14
Traceability: This certificate is traceable to the SI Units maintained by National Institute of Metrology (NIMT), Thailand through DKSH Technology Co., Ltd. Certificate No. C02240400

Calibration Results:

Before Adjustment

Eccentric Error: Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.

									Nominal Test Value		110	(g)
Reference Points (g)												
A		B		C		D		E				
-		0.0000		-0.0001		-0.0003		0.0000				

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.00001 (g)

Nominal test value (g)	Standard Deviation
5	0.000005
50	0.000005

Error of indication from nominal or conventional mass value., Readability 0.00001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of indication (g)	Uncertainty (g)	k
0.01	0.010001	0.01001	0.00001	0.000011	2.03
0.05	0.049998	0.05001	0.00001	0.000012	2.02
0.1	0.100003	0.10002	0.00002	0.000013	2.01
0.5	0.500003	0.50000	0.00000	0.000016	2.01
1	1.000014	1.00001	0.00000	0.000018	2.00
5	5.000016	5.00003	0.00001	0.000027	2.00
10	10.000013	10.00005	0.00004	0.000034	2.00
20	20.000011	20.00006	0.00005	0.000048	2.00
50	50.000028	50.00008	0.00005	0.000080	2.00
70	70.000039	70.00012	0.00008	0.00013	2.00
90	90.000048	90.00013	0.00008	0.00016	2.00

[Redacted Signature]
Person in charge

[Redacted Signature]
Authorized signatory

This certificate is issued the units of measurement according to the International System of Units (SI). It provides traceability of measurement to international or national standard or other recognized national standard laboratories.
The measurement uncertainty stated is the expanded uncertainty which is obtained from the standard uncertainty multiplied by the coverage factor (k=2) to provide a level of confidence of approximately 95%. It is determined in accordance with the Guide to Expression of Uncertainty in Measurement (GUM).
These results may be affected by deviations from specified conditions. The results relate only to the items tested, calibrated or sampled. The report shall not be reproduced except in full without approval of DKSH Technology Limited.

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DKSH Technology Limited
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2533 Sukhumvit Road, Bangchak, Phrakhanong, Bangkok 10260
Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - in Asia and Beyond.

บริษัท ดีเคเอสเอช เทคโนโลยี จำกัด
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2533 ถนนสุขุมวิท แขวงบางจาก เขตพระโขนง กรุงเทพมหานคร 10260
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Phone: +66 2639 7000 Email: info.calibration@dksh.com Website: www.dksh.com/scientific-thailand

Delivering Growth - in Asia and Beyond.

Before Adjustment (Cont.)

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.0001 (g)

Nominal test value (g)	Standard Deviation
110	0.00005
200	0.00005

Error of indication from nominal or conventional mass value., Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of indication (g)	Uncertainty (g)	k
105	104.99998	105.0002	0.0002	0.00019	2.00
110	109.99997	110.0002	0.0002	0.00019	2.00
120	119.99997	120.0003	0.0003	0.00021	2.00
130	129.99998	130.0003	0.0003	0.00023	2.00
140	139.99998	140.0003	0.0003	0.00024	2.00
150	149.99999	150.0004	0.0004	0.00023	2.00
160	160.00000	160.0004	0.0004	0.00027	2.00
170	170.00000	170.0002	0.0002	0.00027	2.00
180	180.00001	180.0002	0.0002	0.00030	2.00
190	190.00001	190.0002	0.0002	0.00031	2.00
200	199.99996	200.0003	0.0003	0.00029	2.00

After Adjustment

Eccentric Error: Weight to be 1/3 or 1/2 of Maximum capacity, taken from the center of the pan as a zero reference.

Nominal Test Value		Reference Points (g)				
110 (g)		A	B	C	D	E
		-	0.0000	-0.0001	-0.0003	0.0000

Repeatability: Determination of the standard deviation of weighing balance., Readability 0.00001 (g)

Nominal test value (g)	Standard Deviation
5	0.000005
50	0.000005

Error of indication from nominal or conventional mass value., Readability 0.00001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of indication (g)	Uncertainty (g)	k
0.01	0.010001	0.01000	0.00000	0.000011	2.03
0.05	0.049998	0.05000	0.00000	0.000012	2.02
0.1	0.100003	0.09998	-0.00002	0.000013	2.01
0.5	0.500003	0.49998	-0.00002	0.000016	2.01
1	1.000014	1.00001	0.00000	0.000018	2.00
5	5.000016	5.00001	-0.00001	0.000027	2.00
10	10.000013	10.00000	-0.00001	0.000034	2.00
20	20.000011	20.00001	0.00000	0.000048	2.00
50	50.000028	50.00002	-0.00001	0.000080	2.00
70	70.000039	70.00003	-0.00001	0.00013	2.00
90	90.000048	90.00003	-0.00002	0.00016	2.00

After Adjustment (Cont.)

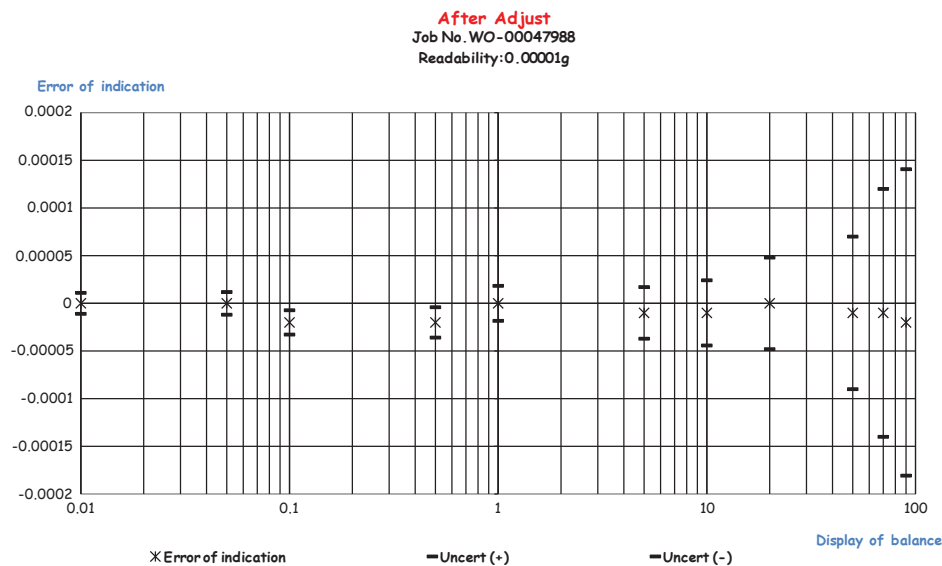
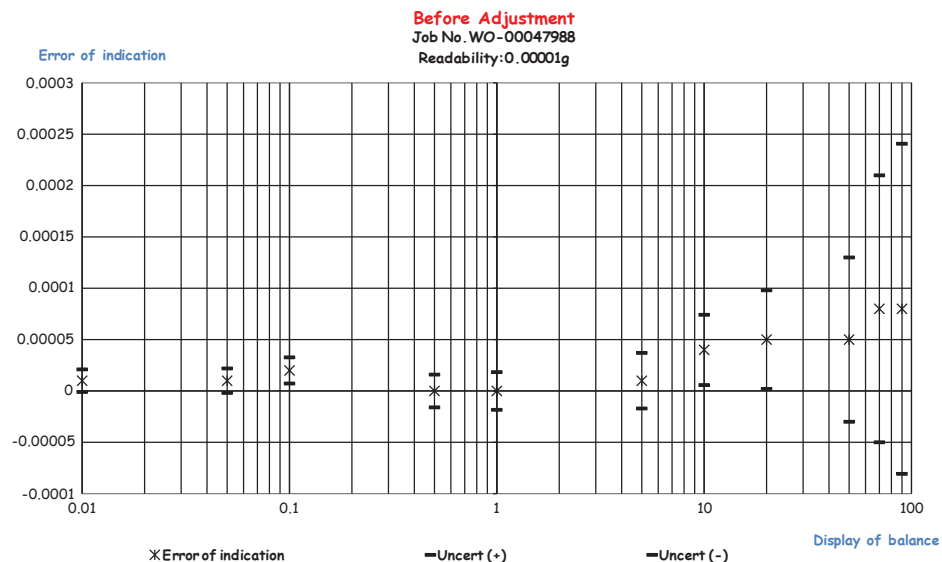
Repeatability: Determination of the standard deviation of weighing balance., Readability 0.0001 (g)

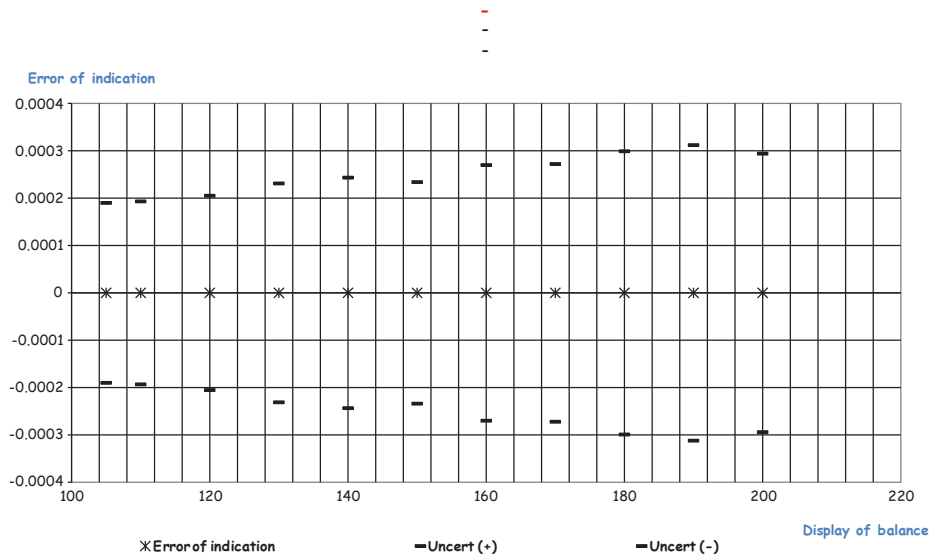
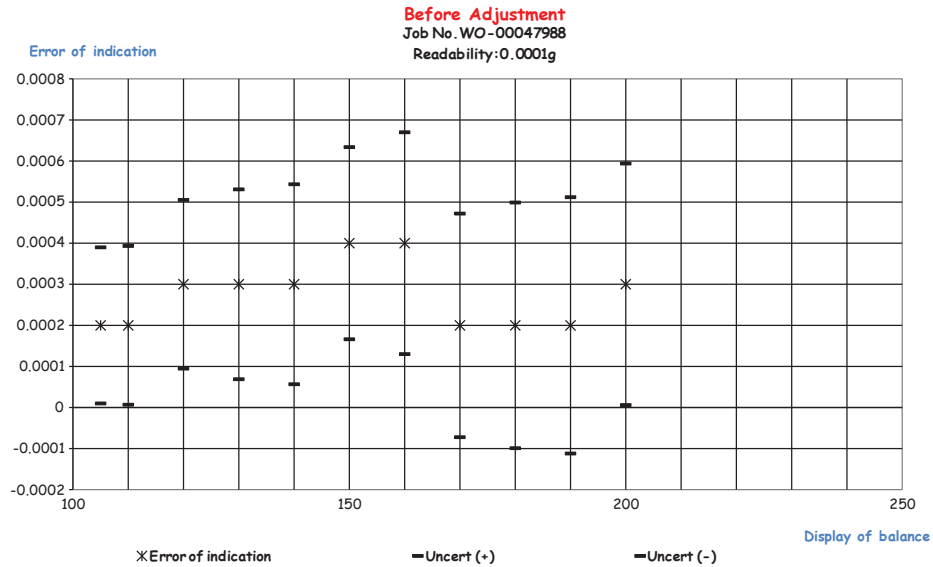
Nominal test value (g)	Standard Deviation
110	0.00005
200	0.00004

Error of indication from nominal or conventional mass value., Readability 0.0001 (g)

Nominal Value (g)	Conventional Mass (g)	Displayed Value (g)	Error of indication (g)	Uncertainty (g)	k
105	104.99998	105.0000	0.0000	0.00019	2.00
110	109.99997	110.0000	0.0000	0.00019	2.00
120	119.99997	120.0000	0.0000	0.00021	2.00
130	129.99998	130.0000	0.0000	0.00023	2.00
140	139.99998	140.0000	0.0000	0.00024	2.00
150	149.99999	150.0000	0.0000	0.00023	2.00
160	160.00000	160.0000	0.0000	0.00027	2.00
170	170.00000	170.0000	0.0000	0.00027	2.00
180	180.00001	180.0000	0.0000	0.00030	2.00
190	190.00001	190.0000	0.0000	0.00031	2.00
200	199.99996	200.0000	0.0000	0.00029	2.00

The End of Certificate





ใบตรวจสอบสภาพเครื่องชั่ง

เลขที่ใบงาน: WO-00047988

ชนิดเครื่องมือ: Balance

รุ่น: CPA225D

หมายเลขเครื่อง: 28812504

ตรวจสอบ (รับ)		รายการตรวจเช็ค	ตรวจสอบ (ส่ง)		หมายเหตุ
07 Nov 2024			07 Nov 2024		
ปกติ	ไม่ปกติ		ปกติ	ไม่ปกติ	
		General			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	1. สายไฟ/Adapter, power supply 220/110V	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	2. ความสมบูรณ์ชุดกระจกกันลม (Cover)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	3. ความสมบูรณ์ชุดของระดับน้ำ	<input type="checkbox"/>	<input checked="" type="checkbox"/>	เสื่อมสภาพ
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4. การปรับระดับของขาตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	5. การตอบสนองของปุ่มกด	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	6. ความสมบูรณ์ของ Display	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	7. การแสดงผลของ Display หลังวางน้ำหนัก	<input type="checkbox"/>	<input checked="" type="checkbox"/>	**
<input checked="" type="checkbox"/>	<input type="checkbox"/>	8. ชุดรองจานชั่ง (Stopper) / pan support	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	9. การทำงานของ Function Internal / External	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	10. ความสะอาดของตัวเครื่องภายนอกและแกน load cell	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	11. สภาวะแวดล้อม ณ สถานที่ตั้งเครื่อง	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

หมายเหตุเพิ่มเติม/ข้อแนะนำ :

** การแสดงผลของ Display หลังวางน้ำหนัก : มีค่าน้ำหนักติดไปถึงตำแหน่งที่ 3

แล้วค่าน้ำหนักก็จะค่อยๆลดลง ไปค่าที่ใกล้เคียงกับค่าตม้มน้ำหนักที่ใช้วาง Test

Service Engineer

6850 and 6890 GC Preventive Maintenance Checklist – Standard

**Agilent Technologies**

Agilent Preventive Maintenance provides factory recommended service for your analytical systems to assure reliable operation and the accuracy of your results. Delivered by highly-trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides everything you need to reduce unplanned downtime and keep your systems operating at their peak.

For more information about Agilent Technologies services please visit our web site using the following URL <http://www.chem.agilent.com/en-us/products/services/pages/default.aspx>

Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures.
- Any parts, not included in the Parts Lists section of this document, are not part of the recommended Preventive Maintenance service, nor are they included in the price of this service.
- If a system requires the use of additional or special procedures and/or parts for the instrument service, then these must be ordered separately and charged as a repair, which may incur additional costs.

Service Engineer's Responsibilities

- Only complete/printout pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using a "X" or tick mark "✓" in the checkbox.
- Complete Not Applicable check boxes to indicate services not delivered, as needed.
- Complete the PM service in the order of the tasks listed.
- Complete the Service Review section together with the customer.

Additional Instruction Notes

- Check for any active service notes for this unit. If there are any applicable "Safety" or "Modification Recommended" Service notes, plan to implement the changes on this unit before doing any qualification service. Do not implement firmware updates, unless you get approval from the customer and are sure that they are compatible with the instrument control software.

**Agilent Technologies**

6850 and 6890 GC Preventive Maintenance Checklist – Standard

System Information

Guidance

- ☐ Check this box if an instrument configuration report is attached instead of completing the table.

Instrument system name and ID	CN10621014
Instrument system site and location	SGS, Bangkok
List system component product numbers	List the serial numbers of each component
1. G1530N	1. CN10621014
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10.

Preparation

- ✓ Discuss any specific issues with the customer prior to starting.
- ✓ Review the instrument logbook.
- ✓ Save instrument control settings before starting the procedure.
- ✓ Perform general inspection of system for cleanliness
- ✓ Check for proper installation of safety-related parts, assemblies, sensors etc
- ✓ Check for required firmware updates and verify with customers if they would like it installed.
- ✓ Before starting the following procedures, record the Detector Signal Output(s) in the results table. If the GC is turned OFF or in a service mode, comparing the detector outputs before and after the service is not possible.

6850 and 6890 GC
Preventive Maintenance Checklist – Standard



Clean and inspect GC

- ☒ Unplug power cord from the power source.
- ☒ Open GC covers and vacuum/remove any dust/debris. Pay particular attention to cooling fans.
- ☒ Inspect internal connectors for proper contact and placement.
- ☒ Reconnect Power to the GC. Power the GC on and verify the power on self-test passed.
- ☒ Verify oven motor spins freely and turns on with the oven door closed; off when the door is opened.
- ☒ Verify operation of all other fans - the inlet and EPC cooling fans.
- ☒ Verify oven intake/outlet flap assembly is operating smoothly while heating and cooling the oven

Inlet and detector consumable replacement

- ☒ For the inlets installed, perform inlet maintenance as defined in the 6850 or 6890 manual – "Maintaining Your GC" - for the inlet(s) installed.
- ☒ Replace the split vent trap on units with these inlets: Split/Splitless Capillary (SSL), Programmable Temperature Vaporization (PTV), Volatiles Interface (VI).
- ☐ If the GC includes a Flame Ionization Detector (FID), replace the jet. If the ignitor shows any build up of sample or corrosion, replace the ignitor. Examine the FID collector and castle assemblies for contamination – clean as necessary.

Zero Sensors and Leak test

- ☒ Zero all pressure sensors per the procedure in the 6890 Service Manual.
- ☒ Perform inlet pressure decay tests(s) as defined in the 6890 Service Manual. If the PM is done in preparation for an OQ/PV, then the pressure decay test defined within that protocol can be used for the PM.
- ☒ Record if test passed or failed in the results table.

ALS Maintenance

- ☒ **Section NOT applicable**
- ☐ Check all cabling and configuration settings between GC, tray, and injectors.
- ☐ Vacuum or removed any dust, especially around fans.
- ☐ Check operation of all fans.
- ☐ Check syringe for smooth plunger operation.
- ☐ Check for smooth operation of the needle support rod – clean if necessary
- ☐ Check for correct operation of syringe volume stops.

6850 and 6890 GC
Preventive Maintenance Checklist – Standard



Restore Instrument

- ☒ Restore the normal operating conditions using the Keyboard or Data System.
- ☒ Check and record detector offset. Results should be similar to offset test conducted prior to PM.
- ☒ Perform a chemical checkout. If this is a routine PM, inject the customer's sample using the ALS if applicable. This will act as a final checkout of both the ALS and the GC.

Guidance

If the PM service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.

6850 and 6890 GC
Preventive Maintenance Checklist – Standard



Service Review

- ☒ Attach available reports/printouts of all tests to this documentation.
- ☒ Record the PM service activity in the customer's instrument records/logbook
- ☒ Update/reset instrument maintenance counters as appropriate
- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Review Comments section below if there are additional comments
- ☒ Review the service and any test results with the customer.
- ☐ If the Instrument firmware was updated, record the details of the change in the Service Engineer's Comments box below or if necessary, in the customer's IQ records.

6850 and 6890 GC Test Results Table

Signal Output test	Before PM service	After PM service
Front detector output	N/A	N/A
Back detector output (6890 Only)	N/A	N/A
Pressure decay test	Expected result	Actual result or N/A
Front inlet pressure decay test	Pass	Pass
Back inlet pressure decay test (6890 Only)	Pass	N/A

6890 and 6850 GC Parts List Table

The following kits are recommended for capillary and purged packed inlets. If this is a general PM and the customer has a preferred set of consumables, you may use the customer's consumables.

Part Description	Part Number	Model# where used	Quantity Consumed
SSL Capillary Inlet PM kit, splitless	5188-6497	G1530/G1540/G2630	1
SSL Capillary Inlet PM kit, split	5188-6496	G1530/G1540/G2630	1
Larger O.D. Liner O-Rings for SS Flip Top - 10/pkg.	5188-5366	G1530/G1540/G2630	N/A
PP Inlet PM kit	5188-6498	G1530/G1540/G2630	N/A
Split vent trap PM kit, single cartridge (for PTV & VI)	5188-6495	G1530/G1540/G2630	N/A
Ignitor (glow plug) assembly with O-ring	19231-60680	G1530/G1540/G2630	N/A
.011-inch Jet for capillary FID base	G1531-80560*	G1530/G1540/G2630	N/A
.018-inch Jet for packed column with packed FID base	18710-20119*	G1530/G1540/G2630	N/A
.011-inch Jet for capillary column with packed FID base	19244-80560*	G1530/G1540/G2630	N/A

6850 and 6890 GC
Preventive Maintenance Checklist – Standard



* The jets (G1531-80560, 18710-20119 and 19244-80560) are recommended for 6850/6890 PM. Please refer to the service note "COLUMNS/SUPPLIES-197A" for detailed information.

Service Engineer Comments (optional)

If there are any specific points you wish to note as part of performing the service or other items of interest for the customer, please write in this box.

Other Important Customer Web Links

- ☐ How to get information on your product: Literature Library - <http://www.agilent.com/chem/library>
- ☐ Need to know more? - www.agilent.com/chem/education
- ☐ Need technical support, FAQs? - www.agilent.com/chem/techsupp
- ☐ Need supplies? - www.agilent.com/chem/supplies

Service Completion

Service request number 6006759346 Date service completed 5 Apr 2024

Agilent signature [Signature] Customer signature [Signature]

Document part number: G2630-90130

Agilent Preventive Maintenance Services

Agilent GCMS Preventive Maintenance

Agilent Preventive Maintenance provides factory recommended service for your analytical instruments to assure reliable operation and the accuracy of your results

Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides what you need to reduce unplanned downtime and keep your systems operating at their peak performance.

This checklist is used as a guide for completing the preventive maintenance tasks. A signed copy of this checklist is provided for your records.

Agilent GCMS Preventive Maintenance Checklist

Introduction

This checklist covers the following model(s):

Type	Model
SQ	5973 Series MSD
SQ	5975 Series MSD
SQ	5977 Series MSD
TQ	7000 Series MS/MS
TQ	7010 Series MS/MS
QTOF	7200 Series QTOF
QTOF	7250 Series QTOF

Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures. Customers are responsible for regular maintenance and are encouraged to observe the service representative.
- Any parts not included in the Parts Lists section of this document are not part of the recommended Preventive Maintenance service nor are they included in the price of this service.
- If a system requires the use of extra or special procedures and/or parts for the maintenance service, then these must be ordered separately and charged as a repair, which may incur additional costs.

Customer Responsibilities

Customers should ensure that all necessary operating supplies, consumables, and usage-dependent items such as gases, vials, syringes, calibrant solution and solvents required for successful preventive maintenance are available. A customer representative should be available while the preventive maintenance is being performed.

Important notice for customers

The customer should complete the following before the Support Provider arrives on site:

- ☐ Perform an autotune and retain the printed tune report just prior to the start of the PM to verify performance of the equipment.

Note: it is recommended to have the customer run the autotune and tune evaluation prior to the PM and then start the vent cycle so that the instrument will be ready for the service representative.

Important Customer Web Links

- To access Agilent training and education, visit <http://www.agilent.com/chem/training> to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.
- To access the **Agilent Resource Center** web page, visit <https://www.agilent.com/en-us/agilentresources>. The following information topics are available:
 - Sample Prep and Containment
 - Chemical Standards
 - Analysis
 - Service and Support
 - Application Workflows
- The **Agilent Community** is an excellent place to get answers, collaborate with others about applications and Agilent products, and find in-depth documents and videos relevant to Agilent technologies. Visit <https://community.agilent.com/welcome>
- Videos about specific preparation requirements for your instrument can be found by searching the **Agilent YouTube** channel at <https://www.youtube.com/user/agilent>
- **Need to place a service call?** Flexible Repair Options | Agilent

Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.

- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check "**Service not applicable**" check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance services in order by sections: Review, System Checks, Pump maintenance, Cleaning System and Filters, then System Post Check.
 - The tasks in each section may be completed in the most logical order relevant to the system. Complete the **Service Review** section together with the customer.
- Complete the fields for page numbers at the foot of each selected page
- Add relevant page numbers to selected pages and complete the total number of pages field in the Service Verification section
- Complete Signature Page and attach Signature Page to Service Order.

Additional Instruction Notes

- Preventive maintenance is a factory recommended procedure designed to reduce the likelihood of electromechanical failures. Failure to perform preventive maintenance may reduce the long-term reliability of certain instruments and systems. **Two preventative maintenances (PMs) per year are recommended, the Major PM Service will be performed annually with an Interim PM performed 6 months after the Major PM.**

Definition of the Task/Recommended items within the document

Task		Recommended		
Yes	No	Interim	Major	As Needed
✓				Yes selected means that the task was done or the part was required
	✓			No selected means that the task was not done or the part was not required.
		✓		Interim selected means that this task is recommended to be done at 6-month intervals
			✓	Major selected means that this task is recommended to be done yearly; if the customer would like a service to be done at the 6-month interval then the service could be purchased
				As needed selected means that the task was done, or the part was used as needed. For example, there could be two types of filters that could be used, and this was the one selected.

Instrument Maintenance

Select the appropriate service to be performed.

- ☐ Interim Preventive Maintenance (when available, is typically 6 months or at the request of the customer)
☐ Major Preventive Maintenance (Yearly)
☐ Enhanced Preventive Maintenance (when available, is provided "As needed")

System Information

- ☐ Check this box if an instrument configuration report is attached instead of completing the table.

Instrument System Name and ID	
Instrument System Site and Location	SGS, Bangkok

List System Component Product Numbers	List the Serial Numbers of each Component
1. G3172A	US61633132
2.	
3.	
4.	
5.	
6.	

Preparation

- ☒ Discuss any specific issues with the customer before starting.
☒ Review the instrument logbook for recorded problems and comments.
☒ Save instrument control settings before starting the procedure.
☒ Perform a general inspection of the system for cleanliness.
☒ Check for proper installation of parts, assemblies, sensors etc.
☒ Check system for required installation of components and implementation of Service Notes
☒ Check firmware version(s). Updating to the most current versions is strongly recommended. Verify with the customer before updating.

Preventive Maintenance Procedures

- ☐ Service Not Applicable

Interim / Major Preventive Maintenance – GCMS

Yes/No	Interim/Major	Description
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Perform general inspection of system for cleanliness
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Discuss any problems the customer is having with the instrument
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Review customer maintenance records and exclude maintenance on recently serviced items
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Review the most recent autotune report. This will give a starting point for evaluating spectral peaks, baseline noise, peak shape, mass assignments and resolution.

Interim / Major Preventive Maintenance – System Checks

- ☐ Service Not Applicable

Yes/No	Interim/Major	System Checks
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Verify that calibration peaks were seen prior to starting the PM
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Vent the instrument
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Inspect vacuum hoses, pump, exhaust tubing, and power cords for excessive wear.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Visually inspect calibrant levels – PFTBA PFDTD (if appl.), IRM (if appl.). Refill if available.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Look for any obvious external damage or problems.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Clean air intake(s). Cosmetic cover(s) may need to be removed.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Verify system line voltage meets instrument specifications: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	For HydroInert systems, verify customer is running hydrogen: Yes <input type="checkbox"/> No <input type="checkbox"/>

Interim / Major Preventive Maintenance – Wet Mechanical vacuum pumps

- ☐ Service Not Applicable

Yes/No	Interim/Major	Wet Mechanical vacuum pumps
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Check for evidence of oil leakage. Check pump gasket for leakage.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	GC/MS SQ with diffusion pump; drain and replace diffusion pump oil.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Drain and replace mechanical pump oil.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Replace Oil Mist Filter if applicable.

Yes/No	<input type="checkbox"/>	<input type="checkbox"/>	Wet Mechanical vacuum pumps
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Discuss with customer the need for more frequent oil changes if the oil is dirty.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Don't use mist filters with Chemical Ionization.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Perform anti-suckback valve test. Power on until side plate is held closed, power off and check that side plate holds closed. Visually confirm that no oil returns up vacuum hose.

Interim / Major Preventive Maintenance – Dry Mechanical vacuum pumps - Diaphragm

☒ Service Not Applicable

Yes/No	<input type="checkbox"/>	<input type="checkbox"/>	Dry Mechanical vacuum pumps - Diaphragm	
Yes/No	Interim/Major		Description	
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Check for evidence of poor vacuum – Turbo power demand, poor manifold vacuum, etc.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Clear air flow paths of dust.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	If vacuum is poor, then replace the diaphragm pump.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Perform anti-suckback valve test. Power on until side plate is held closed, power off and check that side plate holds closed.

Interim / Major Preventive Maintenance – Dry Mechanical vacuum pumps - Scroll

☒ Service Not Applicable

Yes/No	<input type="checkbox"/>	<input type="checkbox"/>	Dry Mechanical vacuum pumps - Scroll	
Yes/No	Interim/Major	Description		
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Replace the tips seal on the IDP pump.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Check for evidence of poor vacuum – Rough vac pressure, turbo power demand, poor manifold vacuum, etc.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Replace the Exhaust Filter if required.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<div></div> Discuss with customer the need for more frequent changes, if needed.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<div></div> Inform customer that pump gas ballast should be installed all the time.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Perform anti-suckback valve test. Power on until side plate is held closed, power off and check that side plate holds closed.

Interim / Major Preventive Maintenance – Cleaning System and Filters

☐ Service Not Applicable

				Cleaning System and Filters	
Yes/No				Interim/Major	
				Description	
				Fans	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Remove dust from fans and vent covers.	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Verify fans are functional and that there is enough space around the instrument for proper cooling.	
				Source cleaning (all sources except Hydrolert)	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Open analyzer and remove the source.	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Disassemble, Clean, Re-assemble source. (7200, also, remove and clean entrance lens)	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Re-install source and close analyzer.	
				Hydrolert Source	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Source NOT to be abrasively cleaned. No cleaning required at PM. If a decrease in performance is observed, recommend to the customer that filaments, insulators (repeller and extractor), extractor lens, and repeller lens may need to be replaced to restore performance. Hydrolert source should not be run with helium carrier.	
				Filters	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Replace RMSH-2 Helium gas filter (collision cell gas) – if applicable.	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Replace RMSN-2 Nitrogen gas filter (collision cell gas) – if applicable.	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Replace RMSHY-2 Hydrogen gas filter (Hydrolert and JetClean) – if applicable.	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	CP17973 – Gas Clean GS/MS Filter (for He, N2 or H2 carrier) – if required	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	5190-9071 – Methane Gas Filter (CI systems) – if applicable	

Guidance: Gas filters need to be changed only if required (ie indicating traps show color change, or if Big Universal Trap are approaching saturation based on time installed or number of gas cylinders changed for that trap)

Interim / Major Preventive Maintenance – System Post Check

☐ Service Not Applicable

System post-check				
Yes/No	Interim/Major	Description		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Pump system back down. Wait until system stability has been achieved.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Verify system vacuum reading(s) via the gauge controller.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Leak Check
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Verify system in manual tune
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Compare against previous tune file report(s)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Change to Tune and verify that all temperatures, pressures, and gas flows reach method set points
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Check manually that you have calibration peaks.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	EI Autotune Performed

Guidance: If the PM Service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument setup and checkout.

Service Review

- ☒ Attach available reports/printouts of all tests to this documentation.
- ☒ Record the Preventive Maintenance service activity in the customer's records/logbook.
- ☒ Record the PM event in the Smart Alerts logbook, if applicable.
- ☒ Update/reset instrument maintenance counters as appropriate.
- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Engineer Comments section if there are additional comments.
- ☒ Review this service, parts replaced, and test results obtained with the customer.
- ☒ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box. Systems in a compliant environment may need additional documentation.
- ☒ Complete Signature Page and attach Signature Page to Service Order.

Test Results

Test Description	Expected Test Result	Actual Test Result
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Signature Page

Service Engineer Comments (optional)

If there are any specific points you wish to note as part of performing the service review or other items of interest for the customer, please write in this box.

Service Verification

Service Request Number:

6006759346

Service Engineer Name:

Date of Service Completion:

5 Apr 2024

Customer Name:

Total number of pages in this document:

Parts for consumption during PM

Common Oil and MS Gas Filters – 5973/5975/5977/7000/7010/7200/7250 Series

Part Description	Part Number	Interim	Major	As Needed
Agilent AVF Platinum, 1 quart	5191-5851	✓	✓	✓
Helium gas filter* (collision cell gas) – if required	RMSH-2		✓	✓
Nitrogen gas filter* (collision cell gas) – if required	RMSN-2		✓	✓
Hydrogen gas filter* (HydroInert and JetClean) – if required	RMSHY-2		✓	✓
Chemical Ionization Gas Purifier (CI systems) (Methane) – if required	5190-9071		✓	✓
Gas Clean GS/MS Filter (for He, N2 or H2) – if required	CP17973		✓	✓
# Gas Clean Filter Kit GC/MS 1/8 in (complete replacement kit - bench mounted) – if required	CP17974			✓
# Gas Clean Carrier Gas Kit for 7890 for He, N2 or H2; Bracket, Mount and Filter – if required	CP17988			✓
# Gas Clean Carrier Gas Kit for 8890 & 8960 for He, N2 or H2; Bracket, Mount and Filter – if required	CP179880			✓

Gas filters need to be changed only if required (ie indicating traps show color change, or if Big Universal Trap are approaching saturation based on time installed or number of gas cylinders changed for that trap)

* Big Universal Trap (BUT), 1/8" fittings

* HydroInert and JetClean Systems

Alternate Gas Clean kit part numbers. A Gas Clean filter is included in the kits. They are only necessary if replacing carrier gas Big Universal Traps with indicating traps

MS Maintenance Supplies for 5973/5975/5977 Series

Part Description	Part Number	Interim	Major	As Needed
Diffusion pump fluid (Diffusion Pump Models)	6040-0809		✓	✓
Qty 2				
Exhaust oil mist trap (threaded) Edwards/Pfeiffer	G1099-80039	✓	✓	✓
DS42 Oil Mist Eliminator 3/4G & 3/8	SR03706556	✓	✓	✓
IDP-3 Tip Seal Replacement Kit (IDP-3 Dry Scroll Pump Models – Includes tip seal, 60mm filter element, tools, mask and cleaning supplies)	G7077-67018	✓	✓	✓
IDP-3 Tip Seal Replacement Kit (no tools – CSD P/N)	5190-9561	✓	✓	✓
IDP-3 Tip Seal Replacement Kit (no tools – VPD P/N)	IDP3TS	✓	✓	✓
Filter element for IDP-3 (diameter: 60mm)	REPLSLRFILTER2	✓	✓	✓

MS Maintenance Supplies for 7000/7010 Series

Part Description	Part Number	Interim	Major	As Needed
Oil Mist Filter RV5	G6600-80043	✓	✓	✓
IDP-10 Tip Seal Replacement Kit (IDP-10 Dry Scroll Pump Models – Includes tip seal, 102mm filter element, tools, mask and cleaning supplies)	G7004-67023	✓	✓	✓
IDP-10 Tip Seal Replacement Kit (no tools etc. – VPD P/N)	X3807-67000	✓	✓	✓
Filter element for IDP-10/IDP15 (diameter: 102mm)	REPLSLRFILTER	✓	✓	✓
Filter element for IDP-10/IDP15 (diameter: 79mm)	REPLSLRFILTER1	✓	✓	✓

MS Maintenance Supplies for 7200/7250 Series

Part Description	Part Number	Interim	Major	As Needed
RIS Probe Maintenance Kit (7200 Series only)	G7005-60170		✓	✓
DS202 Oil Mist Eliminator	SR03706800	✓	✓	✓
DS202 3/8" Magnetic Plug and Gasket	SR03701824	✓	✓	✓
IDP-15 Tip Seal Replacement Kit (IDP-15 Dry Scroll Pump Models – Includes tip seal, 102mm filter element, tools, mask and cleaning supplies)	5190-9613	✓	✓	✓
IDP-15 Tip Seal Replacement Kit (no tools etc. – VPD P/N)	X3815-67000	✓	✓	✓
Filter element for IDP-10/IDP15 (diameter: 102mm)	REPLSLRFILTER	✓	✓	✓
Filter element for IDP-10/IDP15 (diameter: 79mm)	REPLSLRFILTER1	✓	✓	✓

HydroInert Source Supplies

To determine if replacement of HydroInert parts is required, please review tune history and sample signal intensity performance. If performance is decreasing, the below parts maybe use to restore performance as part of the PM.

One way to determine if the source performance on SQ is being affected is to review the gain factor history in autotune reports or tune history csv file. If the gain factor is increasing the source performance maybe degrading.

Since TQ tunes to a fixed gain factor, review PFTBA abundance. If PFTBA abundance is decreasing over time, the source performance maybe degrading.

Real sample/standard area counts are another way to determine the performance, there could also be other factors that affect compounds abundance such as inlet and column status.

Part Description	Part Number	Interim	Major	As Needed
Repeller Insulator (qty 2)	G1099-20133			✓
Lens insulator for Extractor (ring insulator)	G3870-20445			✓
HydroInert Extractor lens (9mm)	G7078-20909			✓
HydroInert Repeller	G7078-20902			✓

Common Parts Reference (Purchased by customer, not included as part of PM)

Filaments and Calibrant Supplies 5973/5975/5977/7000/7010/7200/7250 Series

Part Description	Part Number	SQ	TQ	QTOF
EI High Temperature Filaments	G7005-60061 Qty 2	597X	7000x	N/A
HES EI Filaments	G7002-60001	5977B/C	7010x	N/A
LE-EI Filaments (7250 QTOF)	G3850-60021	N/A	N/A	7250
CI High Temperature Filament – SQ, TQ, 7200 QTOF	G7005-60072	N/A	N/A	7200A/B
Axial CI Filament, W/Re Straight (7250 QTOF)	G7250-60095	N/A	N/A	7250
PFTBA GCMS Tuning Standard calibrant	05971-60571	597X	70X0	72X0
PFDTD calibrant, 1 mL	8500-8510	597X	70X0	72X0
PFET, IRM calibrant for GC QTOF 0.5 mL (7200)	5190-0531	N/A	N/A	7200A/B

Transfer line seals and springs 5973/5975/5977/7000/7010/7200/7250 Series

Part Description	Part Number	SQ	TQ	QTOF
CI Interface tip seal (ceramic tip and spring combo) (non-captured CI tip seal interface) (5973, 5975, 7000B)	G1999-60412	5973, 5975	7000B	N/A
CI Interface tip seal (ceramic tip and spring low/non-magnetic spring combo) (non-captured CI tip seal interface) (7010A)	G7002-60412	N/A	7010A	N/A
CI Interface tip seal spring (spring only)	G1999-20023	597X	70X0	72X0
CI Interface tip seal (tip only) (captured style)	G3870-20542	5977x	70X0	72X0
Transfer-Line Tip Base, Threaded (captured style)	G3870-20548	5977x	70X0	72X0
Transfer-Line Tip Cap, Threaded (captured style)	G3870-20547	5977x	70X0	72X0
RIS Xfer Tip (7200)	G7005-20542	N/A	N/A	7200A/B
RIS Xfer Tip Spring (7200)	G7005-20024	N/A	N/A	7200A/B

MS Maintenance Supplies for Intuvo 9000 MS Series

Part Description	Part Number	SQ	TQ	QTOF
Swaged MS Tail - Packaged	G4590-60009	5977x	7000	N/A
Swaged MS Tail (HES) - Packaged	G4590-60109	5977x	7010x	N/A

Ion source insulators for 5973/5975/5977/7000/7010/7200/7250 Series

Part Description	Part Number	SQ	TQ	QTOF
Repeller insulator (SQ, TQ)	G1099-20133 Qty 2	597X	7000x	N/A
Lens insulator for extractor lens (ceramic ring insulator) (Extractor source)	G3870-20445	5977x	7000C/D/E	N/A
Lens insulator for Extractor lens (Vespel ring insulator) (7000B extractor ion source)	G7000-20445	N/A	7000B only	N/A
Lens stack insulator for SS, Inert, Extractor sources (captures ion focus and entrance lens) (Vespel)	G3170-20530	597X	7000x	N/A
Lens insulator for Extractor lens for HES/LEEI (ceramic ring insulator)	G7002-20064	5977B/C	7010x	7250
Lens stack insulator/holder for HES/LEEI (Vespel)	G7002-20074	5977B/C	7010x	7250
CI Repeller Lens Insulator (SQ, TQ)	G1999-20433	597X	70X0x	N/A
CI Lens stack insulator (SQ, TQ) (Vespel)	G3170-20540	597X	70X0x	N/A
Repeller insulator (7200 RIS) (Ceramic)	G7005-20447	N/A	N/A	7200A/B
Extractor Lens Insulator (7200 RIS) (Vespel)	G7005-20133	N/A	N/A	7200A/B
Ion Focus Insulator (7200 RIS) (Vespel)	G7005-20442	N/A	N/A	7200A/B
CI Repeller Insulator/bushing (7200 RIS) (Ceramic)	G7005-20030	N/A	N/A	7200A/B

HydroInert coated lenses for 5977/7000 Series

Part Description	Part Number	SQ	TQ	QTOF
HydroInert Repeller	G7078-20902	5977x	7000C/D/E	N/A
Ext Source Body – HydroInert	G7078-20903	5977x	7000C/D/E	N/A
HydroInert Extractor lens (9mm)	G7078-20909	5977x	7000C/D/E	N/A
Ion Focus Lens – HydroInert	G7078-20905	5977x	7000C/D/E	N/A
Entrance Lens – HydroInert	G7078-20904	5977x	7000C/D/E	N/A

Heater/Sensor assemblies for 5973/5975/5977/7000/7010/7200/7250 Series

Part Description	Part Number	SQ	TQ	QTOF
Stainless Steel Heater/Sensor assembly (SST EI 350)	G3870-67180	597X	N/A	N/A
Inert Heater/Sensor assembly (inert EI 350)	G3870-67179	597X	7000A/B	N/A
Extractor Heater/Sensor assembly (Xtr EI 350)	G3870-67177	5977x	7000C/D/E	N/A
H2 EI Heater/Sensor Assembly – HydroInert (H2 EI 350)	G7078-67910	5977x	7000C/D/E	N/A
CI 350 Heater/Sensor Assembly (CI 350)	G3870-67415	597X	70X0x	N/A
Ring heater/sensor assembly (HES, RIS and LEEI) (ceramic ring)	G7002-60058	5977B/C	7010x	72X0

Rough pump hoses 5973/5975/5977/7000/7010/7200/7250 Series

Part Description	Part Number	SQ	TQ	QTOF
Foreline Hose - imbedded spring	G7077-60119	597X	70X0x	72X0

Common MS Maintenance Supplies

Part Description	Part Number	SQ	TQ	QTOF
Abrasive paper, 30 µm	5061-5896	597X	70X0	72X0
Alumina powder	393706201	597X	70X0	72X0
Cloths, clean (pkg of 15)	05980-60051	597X	70X0	72X0
Cloths, cleaning (pkg of 300)	9310-4828	597X	70X0	72X0
Cotton swabs (pkg of 100)	5080-5400	597X	70X0	72X0
Gloves, clean, large	8650-0030	597X	70X0	72X0
Gloves, clean, small	8650-0029	597X	70X0	72X0

Agilent CrossLab Start Up Services

Agilent G8160A Teledyne Tekmar Atomx XYZ Preventive Maintenance

Agilent Preventive Maintenance provides factory recommended service for your analytical instruments to assure reliable operation and the accuracy of your results

Delivered by highly trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides what you need to reduce unplanned downtime and keep your systems operating at their peak performance.

This checklist is used as a guide for completing the preventive maintenance tasks. A signed copy of this checklist is provided for your records.

Introduction

Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures. Customers are responsible for regular maintenance and are encouraged to observe the service representative.
- Any parts not included in the Parts Lists section of this document are not part of the recommended Preventive Maintenance service nor are they included in the price of this service.
- If a system requires the use of extra or special procedures and/or parts for the maintenance service, then these must be ordered separately and charged as a repair, which may incur additional costs.

Important Customer Web Links

- To access **Agilent University**, visit <http://www.agilent.com/crosslab/university/> to learn about training options, which include online, classroom and onsite delivery. A training specialist can work directly with you to help determine your best options.
- To access the **Agilent Resource Center** web page, visit <https://www.agilent.com/en-us/agilentresources>. The following information topics are available:
 - Sample Prep and Containment
 - Chemical Standards
 - Analysis
 - Service and Support
 - Application Workflows
- The **Agilent Community** is an excellent place to get answers, collaborate with others about applications and Agilent products, and find in-depth documents and videos relevant to Agilent technologies. Visit <https://community.agilent.com/welcome>
- Videos about specific preparation requirements for your instrument can be found by searching the **Agilent YouTube** channel at <https://www.youtube.com/user/agilent>
- **Need to place a service call?** Flexible Repair Options | Agilent

Service Engineer's Responsibilities

- Contact the customer and ensure that all necessary supplies are available before the preventive maintenance visit.
- Only select those pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using either a "X" or tick mark "✓".
- Check "**Service not applicable**" check boxes to indicate services/tasks not delivered, as appropriate.
- Complete the Preventive Maintenance services in the most logical order relevant to the individual system service in the order of the tasks listed.
- Complete the **Service Review** section together with the customer.
- Complete the fields for page numbers at the foot of each selected page.
- Add relevant page numbers to selected pages and complete the total number of pages field in the Service Completion section
- Ask the customer to sign the Service Verification section including the customer's and your signature.

Instrument Maintenance

Select the appropriate service to be performed.

- ☐ Interim Preventive Maintenance (when available, is typically 6 months or at the request of the customer)
- ☒ Major Preventive Maintenance (Yearly)
- ☐ Enhanced Preventive Maintenance (when available, is provided "As needed")

System Information

- ☐ Check this box if an instrument configuration report is attached instead of completing the table.

Instrument System Name and ID	
Instrument System Site and Location	SGS, Bangkok

List System Component Product Numbers	List the Serial Numbers of each Component
1. G8160A	US18005018
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	

Preparation

- ☒ Discuss any specific issues with the customer before starting.
- ☒ Review the instrument logbook for recorded problems and comments.
- ☒ Save instrument control settings before starting the procedure.
- ☒ Perform a general inspection of the system for cleanliness.
- ☒ Check for proper installation of parts, assemblies, sensors etc.
- ☒ Check system for required installation of components and implementation of Service Notes
- ☒ Check for required firmware updates and verify with customers if they would like them installed. Firmware update(s) are strongly recommended.

Preventive Maintenance Procedures

- ☐ *Service Not Applicable*

Preventive Maintenance Task Section #1 - Verify and adjust functionality of Atomx XYZ

- ☐ *Service Not Applicable.*
- ☒ Verify 5V and 24VDC supplies with multimeter and LEDs
- ☒ Verify electronic performance in diagnostics
- ☒ Ensure flow rate 10 ml/min
- ☒ Perform syringe initialization
- ☒ Adjust arm tilt and cantor, if needed
- ☒ Adjust gripper tilt and pads, if needed. Replace pads if needed.
- ☒ Verify unhindered movement of vial sensor flag
- ☒ Perform arm/origin alignment, if necessary
- ☒ Check IS pressure and adjust if necessary
- ☒ Check system history for proper purge and bake pressures
- ☒ Check system history for errors
- ☒ Leak check system
- ☐ Perform benchmark test

Interim Preventive Maintenance Task Section #2 – Clean Atomx XYZ

- ☐ *Service Not Applicable.*
- ☒ Clean system and fans
 - o Remove dust from electronics and boards
 - o Remove any dirt or dust that is present on fans
 - o Remove dust from sensors
- ☒ Remove front sparger and clean glassware. Inspect glassware, ferrule, 3-port valve. Replace if necessary.
- ☒ Clean tray of debris
- ☒ Clean sample cup of debris
- ☒ Clean waste container and water reservoir, and ensure no debris is clogging waste lines

Restore Instrument

- ☐ *Service Not Applicable.*
- ☒ Restore customer's method setpoints
- ☒ Run a standard to ensure functionality of Atomx XYZ

Service Review

- ☒ Attach available reports/printouts of all tests to this documentation.
- ☒ Record the Preventive Maintenance service activity in the customer's records/logbook.
- ☒ Record the PM event in the Smart Alerts logbook, if applicable.
- ☒ Update/reset instrument maintenance counters as appropriate.
- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Engineer Comments section if there are additional comments.
- ☒ Review this service, parts replaced, and test results obtained with the customer.
- ☒ If the instrument firmware was updated, record the details of the change in the Service Engineer's Comments box. Systems in a compliant environment may need additional documentation.
- ☒ Complete the Signature Page with both Service Engineer and Customer signatures.

Test Results

Test Description	Expected Test Result	Actual Test Result
Leak Test	Less than 1 PSI	Fail, Call for Repair
Benchmark	All Pass	N/A

Consumed PM Parts

Part Description	Part Number	Product or Model# where used	Quantity consumed
Sparger, 5mL, fritted	5182-0852	P&T	N/A
Sparger, 25mL, fritted	5182-0851	P&T	1
Sparger, 5mL, fritless	5182-0850	P&T	N/A
Sparger, 25mL, fritless	5182-0849	P&T	N/A
Gripper Finger Caps	G8160-60089	G8160A	1

Signature Page

Service Engineer Comments (optional)

If there are any specific points you wish to note as part of performing the installation or other items of interest for the customer, please write in this box.

Service Verification

Service Request Number:
6006759346

Service Engineer Name:

Total number of pages in this document:

Date Service Completed:
5 Apr 2024

Customer Name:



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



Certificate of Calibration

Cert.No.: 24CH568

Page.: 1 of 3

Equipment : pH / Conductivity Meter
Manufacturer : Mettler Toledo
Model : S213
Serial No. : B902060027
ID No. : P2019019
Condition As-Received: Used Item
Received Date : 14 May 2024
Calibration Date : 15 May 2024
Reference : 2405-0423WSC-1
Submitted by : SGS (Thailand) Limited
1/209, 1/211 Moo 1, T.Ban Chang,
A.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 DC voltage
standard and direct measurement with
certified reference material (CRM)
- CP-CH8 by comparison with temperature standard

Calibrated by :

Approved by :

Approved Signatory

()
()
(✓)

Issue Date :

17 May 2024

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.



Cert.No.: 24CH568
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 July 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	823319	20 Jun 2024
pH 4.008	CPA chem	970851	25 Apr 2026
pH 6.986	CPA chem	970852	25 Apr 2026
pH 9.997	CPA chem	970853	25 Apr 2025

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 Document Process Calibrator at pH (1.7,4,7,10)

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement	Coverage factor
	pH	mV	mV	pH	(±mV)	k
pH Meter S/N.: B902060027	1.680	314.73	314.6	1.680	0.058	2.00
	4.000	177.48	177.4	4.000	0.058	2.00
	7.000	0.00	0.0	7.000	0.058	2.00
	10.000	-177.48	-177.4	10.000	0.058	2.00



Cert.No.: 24CH568
Page.: 3 of 3

Calibration Results

Function : pH Measurement

Performing four buffers standard curve by using buffer nominal pH (1.7,4,7,10)

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading (mV)	Uncertainty of pH Measurement (±)	Coverage factor k
pH Electrode S/N.: 8512743	1.679	1.682	316.0	0.0050	2.05
	4.008	4.008	181.2	0.0048	2.05
	6.986	6.989	7.8	0.0084	2.00
	9.997	9.998	-166.0	0.0070	2.00

Function : Temperature Measurement

(*) Without adjustment

This equipment was connected with Temperature Probe;

- Model : InLab®Expert Pro-ISM

- Serial No. : 8512743

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 (± °C)	Coverage factor k
25.0	25.002	25.1	0.098	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 Dr-Block Heater Digital Temperature Ver 150±2 °C
 Serial No. 000827/A Model DB 200/3
 Reference Standard Thermocouple Type K Certificate No. 214272
 Calibration Date 01/03/2024 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	150.9	-0.26	150.6	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	148.3	-0.26	148.0
2	149.9	-0.26	149.6	2	148.9	-0.26	148.6	2	148.9	-0.26	148.6
3	150.3	-0.26	150.0	3	148.2	-0.26	147.9	3	148.2	-0.26	147.9
	Mean	149.47			Mean	148.27			Mean	148.21	
	SD	0.666			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	148.9	-0.26	148.6	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

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Verification COD Reactor

Equipment Name Dr-Block Heater Digital Temperature Ver 150±2 °C
 Serial No. 000827-A Model DB 200/3
 Reference Standard Thermocouple Type K Certificate No. 214272
 Calibration Date 01/03/2024 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	0.058	
	%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	0.153			SD	0.173	
	%RSD	0.078			%RSD	0.103			%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 COD Reactor

Equipment Name	On-Block Heater-Digital	Temperature Ver	150±2 °C
Serial No.	000827-A	Model	DB 200/3
Reference Standard	Thermocouple Type K	Certificate No.	21/4272
Calibration Date	01/03/2024	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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สรุปผลการ Verify

Set Temp. ที่ 156.5 องศาเซลเซียส ทำให้อุณหภูมิ Temp. อยู่ในช่วง 148 - 150 องศาเซลเซียส

Verified By _____ Approved By _____

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ระดับเสียง

Certificate of Calibration

Customer

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

Certificate No : 24-SLM-152
Request No : Req-2024-0857

Unit Under Calibration Details

Measurement item : Sound Level Meter
Manufacturer : RION
Model : NA-28
Serial Number : 00570424
ID : ENSL 030
Resolution : 0.1 dB
Microphone Class : 1
Microphone Model : UC-59
Microphone S/N : 22735
Preamplifier Model : NH-23
Preamplifier S/N : 70505
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 : 22 April 2024
Calibrated Date : 6 May 2024
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	21 August 2024	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	26 July 2024	TSI
Audio Generator	SvanteK	Svan401	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 : 6 May 2024

Certificate No : 24-SLM-152
Request No : Req-2024-0857

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 30-130	Level	UUC	ERR	UUC	ERR		
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		
1000 Hz 114 dB	113.78	113.7	-0.08	113.8	+0.02	0.20	0.30

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

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 20-80		
UUC Weighting	(dB)	(± dB)
A	15.5	0.10

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	0.10
C	9.8	0.10
Z	16.5	0.10

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

UUC Setting	Deviation from various Frequency Weighting Responce curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)
	A	C	Z		
FAST / 30-130	(dB)	(dB)	(dB)		
STD Setting	(dB)	(dB)	(dB)		
125 Hz	0.0	0.1	0.1	0.60	1.0
1000 Hz	0.0	0.0	0.0	0.60	0.7
4000 Hz	0.0	0.0	0.0	0.60	1.0
8000 Hz	-0.4	-0.4	-0.4	0.70	+1.5 -2.5

Certificate No : 24-SLM-152
Request No : Req-2024-0857

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				Limit
STD Setting	A (dB)	C (dB)	Z (dB)	(± dB)	(± dB)
63 Hz	UR	0.0	-0.1	0.20	1.0
125 Hz	-0.1	0.0	0.0		1.0
250 Hz	-0.1	0.0	0.0		1.0
500 Hz	-0.1	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	-0.6	-0.1		+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)	0.20	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 (± dB)	Acceptance Limit (± dB)
30-130 / A	REF	UUC	ERR		
UUC Time Response	(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		

Certificate No : 24-SLM-152
Request No : Req-2024-0857

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 30-130	UUC		
STD Setting	(dB)	0.10	0.10
Initial	114.0		
Final	114.0		
Deviated	0.0		

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 30-130	REF	UUC	ERR		
STD dB	(dB)	(dB)	(dB)	0.30	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	79.0	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	49.1	0.1		
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		

Certificate No : 24-SLM-152
Request No : Req-2024-0857

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
FAST / A	REF	UUC	ERR	(± dB)	Limit
UUC Range	(dB)	(dB)	(dB)		(± dB)
30-130	35.00	35.1	0.1		0.8
	114	114.0	0.0		0.8
20-120	30.10	30.1	0.0	0.30	0.8
	114	114.0	0.0		0.8

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance
A / 30-130	Toneburst	Ref	UUC	ERR	(± dB)	Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)		(± dB)
Fast	200	126.0	126.1	+0.1		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	119.6	0.0	0.20	0.5
	2	100.0	100.0	0.0		+1.0, -3.0
SEL	200	120.0	120.0	0.0		0.5
	2	100.0	100.0	0.0		+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 / 30-143	REF	UUC	ERR	(± dB)	Limit
STD Setting	(dB)	(dB)	(dB)		(± dB)
Complete cycle	138.4	138.3	-0.10		2.0
Positive half cycle	137.4	137.1	-0.30		1.0
Negative half cycle	137.4	137.1	-0.30	0.20	1.0

Certificate No : 24-SLM-152
Request No : Req-2024-0857

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 30-130	UUC	(± dB)	Limit
STD Setting	(dB)		(± dB)
Positive one-half cycle	141.9		
Negative one-half cycle	141.9		
Deviated	0.0	0.20	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 30-130	UUC	(± dB)	Limit
STD Setting	(dB)		(± dB)
Initial	129.0		
Final	129.0		
Deviated	0.0	0.10	0.10

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	0.20 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

Certificate of Calibration

Customer

Name : SGS (Thailand) Limited. Certificate No : 24-SLM-217
Address : 100 Nanglinchee Road, Chongnonsi, Yannawa Bangkok 10120 Request No : Req-2024-1404

Unit Under Calibration Details

Measurement item : Sound Level Meter Microphone Class : 2
Manufacturer : RION Microphone Model : UC-59
Model : NA-28 Microphone S/N : 18902
Serial Number : 00570431 Preamplifier Model : NH-23
ID : ENSL 043 Preamplifier S/N : 70448
Resolution : 0.1 dB 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 : 24 June 2024
Calibrated Date : 4 July 2024
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	20 August 2024	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	26 July 2024	TSI
Audio Generator	Svantek	Svan401	131	8 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 : 4 July 2024

Certificate No : 24-SLM-217
Request No : Req-2024-1404

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY	Acceptance	Result
FAST / A / 30-130	Level	UUC	ERR	UUC	ERR		Limit	
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		(± dB)	
1000 Hz 94 dB	93.79	94.5	+0.71	93.8	+0.01		0.20	

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand CIRRUS, Model CR-515, SN. 88373

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 20-80		
UUC Weighting	(dB)	(± dB)
A	15.2	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 20-80		
UUC Weighting	(dB)	(± dB)
A	8.0	0.10
C	10.3	0.10
Z	16.1	0.10

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

UUC Setting	Deviation from various Frequency Weighting Responce curve			UNCERTAINTY	Acceptance Limit	Result
	A	C	Z			
FAST / 30-130	(dB)	(dB)	(dB)	(± dB)	(± dB)	
STD Setting						
125 Hz	0.1	0.2	0.2	0.60	1.5	Pass
1000 Hz	0.0	0.0	0.0	0.60	1.0	Pass
4000 Hz	0.0	0.1	0.1	0.60	3.0	Pass
8000 Hz	0.0	0.0	0.0	0.70	5.0	Pass

Certificate No : 24-SLM-217
Request No : Req-2024-1404

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

U/C Setting	Deviation from various Frequency			UNCERTAINTY	Acceptance	Result
FAST / 30-130	Weighting Response curve				Limit	
STD Setting	A (dB)	C (dB)	Z (dB)	(± dB)	(± dB)	
63 Hz	-0.1	0.0	0.1	0.20	2.0	Pass
125 Hz	-0.1	0.1	0.0		1.5	Pass
250 Hz	-0.1	0.0	0.0		1.5	Pass
500 Hz	0.0	0.1	0.0		1.5	Pass
1000 Hz	0.0	0.0	0.0		1.0	Pass
2000 Hz	0.1	0.1	0.0		2.0	Pass
4000 Hz	0.0	0.1	0.0		3.0	Pass
8000 Hz	0.1	0.1	0.0		5.0	Pass
16000 Hz	-0.5	-0.5	0.0		+5, -INF.	Pass

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
		UUC	ERR			
FAST / 30-130	REF			0.20	0.20	Pass
UUC Weighting	(dB)	(dB)	(dB)			
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)	Result
		UUC	ERR			
30-130 / A	REF			0.20	0.10	Pass
UUC Time Response	(dB)	(dB)	(dB)			
Fast	114.00	114.0	0.0			
Slow	114.00	114.0	0.0			
Leq	114.00	114.0	0.0			

Certificate No : 24-SLM-217
Request No : Req-2024-1404

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 30-130	UUC			
STD Setting	(dB)	0.10	0.30	Pass
Initial	114.0			
Final	114.0			
Deviated	0.0			

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 30-130	REF	UUC	ERR			
STD dB	(dB)	(dB)	(dB)	0.30	1.1	Pass
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			

Certificate No : 24-SLM-217
Request No : Req-2024-1404

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance	Result
FAST / A	REF	UUC	ERR		Limit	
UUC Range	(dB)	(dB)	(dB)		(± dB)	
30-130	34.90	35.0	0.1	0.30	1.1	Pass
	114	114.0	0.0		1.1	Pass
20-120	30.20	30.2	0.0		1.1	Pass
	114	114.0	0.0		1.1	Pass

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance	Result
A / 30-130	Toneburst	Ref	UUC	ERR		Limit	
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(± dB)	(± dB)	
Fast	200	126.0	126.0	0.0	0.20	1.0	Pass
	2	109.0	109.0	0.0		+1.0, -2.5	Pass
	0.25	100.0	99.9	-0.1		+1.5, -5.0	Pass
Slow	200	119.6	119.6	0.0		1.0	Pass
	2	100.0	100.0	0.0		+1.0, -5.0	Pass
SEL	200	120.0	120.0	0.0		1.0	Pass
	2	100.0	100.0	0.0		+1.0, -2.5	Pass
	0.25	91.0	90.9	-0.1		+1.5, -5.0	Pass

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY (± dB)	Acceptance	Result
FAST / C / 30-143	REF	UUC	ERR		Limit (± dB)	
STD Setting	(dB)	(dB)	(dB)			
Complete cycle	138.4	137.8	-0.60	0.20	3.0	Pass
Positive half cycle	137.4	137.1	-0.30		2.0	Pass
Negative half cycle	137.4	137.1	-0.30		2.0	Pass

Certificate No : 24-SLM-217
Request No : Req-2024-1404

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance	Result
FAST / A / 30-130	UUC		Limit	
STD Setting	(dB)		(± dB)	
Positive one-half cycle	142.0			
Negative one-half cycle	142.0			
Deviated	0.0	0.20	1.5	Pass

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit	Result
FAST / A / 30-130	UUC		(± dB)	
STD Setting	(dB)			
Initial	129.0			
Final	129.0			
Deviated	0.0	0.10	0.30	Pass

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 1kHz	0.20 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



Certificate No : 24-SLM-217
Request No : Req-2024-1404

Decision Rule for Statements of Conformity

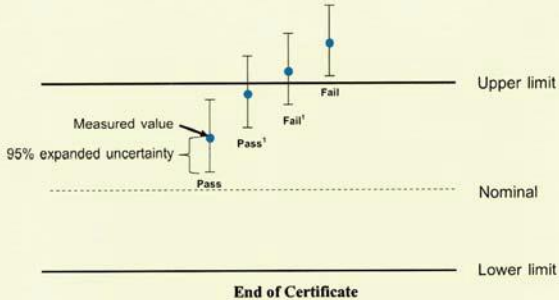
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019; Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



Certificate of Calibration

Customer

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

Certificate No : 24-SLM-151
Request No : Req-2024-0856

Unit Under Calibration Details

Measurement item : Sound Level Meter
Manufacturer : RION
Model : NA-28
Serial Number : 00570433
ID : ENSL 045
Resolution : 0.1 dB
Microphone Class : 1
Microphone Model : UC-59
Microphone S/N : 01939
Preamplifier Model : NH-23
Preamplifier S/N : 01469
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 : 22 April 2024
Calibrated Date : 6 May 2024
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	21 August 2024	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	26 July 2024	TSI
Audio Generator	Svantek	Svan401	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 :

[Signature]
Service Calibration Engineer

Approved By :

[Signature]
Calibration Engineer Supervisor

Issue Date : 6 May 2024

Certificate No : 24-SLM-151
Request No : Req-2024-0856

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 30-130	Level	UUC	ERR	UUC	ERR		
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		
1000 Hz 114 dB	113.78	114.1	+0.32	113.8	+0.02	0.20	0.30

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

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 20-80		
UUC Weighting	(dB)	(\pm dB)
A	14.2	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 20-80		
UUC Weighting	(dB)	(\pm dB)
A	8.6	0.10
C	10.8	0.10
Z	16.0	0.10

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

UUC Setting	Deviation from various Frequency Weighting Resone curve			UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
	A	C	Z		
FAST / 30-130	(dB)	(dB)	(dB)		
STD Setting	(dB)	(dB)	(dB)		
125 Hz	0.2	0.3	0.3	0.60	1.0
1000 Hz	0.0	0.0	0.0	0.60	0.7
4000 Hz	-0.8	-0.8	-0.7	0.60	1.0
8000 Hz	-1.6	-1.6	-1.5	0.70	+1.5 -2.5

Certificate No : 24-SLM-151
Request No : Req-2024-0856

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

UUC Setting	Deviation from various Frequency Weighting Resone curve			UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / 30-130	A (dB)	C (dB)	Z (dB)		
STD Setting	(dB)	(dB)	(dB)		
63 Hz	UR	0.0	0.0	0.20	1.0
125 Hz	-0.1	0.0	0.0		1.0
250 Hz	-0.1	0.0	0.0		1.0
500 Hz	-0.1	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	-0.5	-0.6	0.0		+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)		
A	114.00	114.0	0.0	0.20	0.20
C	114.00	114.0	0.0		0.20
Z	114.00	114.0	0.0		0.20

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
30-130 / A	REF	UUC	ERR		
UUC Time Resonse	(dB)	(dB)	(dB)		
Fast	114.00	114.0	0.0	0.20	0.10
Slow	114.00	114.0	0.0		0.10
Leq	114.00	114.0	0.0		0.10

Certificate No : 24-SLM-151
Request No : Req-2024-0856

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	0.10	0.10

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)		
130.00	130	130.0	0.0	0.30	0.8
129.00	129	129.0	0.0		0.8
124.00	124	124.0	0.0		0.8
119.00	119	119.0	0.0		0.8
114.00	114	114.0	0.0		0.8
109.00	109	109.0	0.0		0.8
104.00	104	104.0	0.0		0.8
99.00	99	99.0	0.0		0.8
94.00	94	94.0	0.0		0.8
89.00	89	89.0	0.0		0.8
84.00	84	84.0	0.0		0.8
79.00	79	79.0	0.0		0.8
74.00	74	74.0	0.0		0.8
69.00	69	69.0	0.0		0.8
64.00	64	64.0	0.0		0.8
59.00	59	59.0	0.0		0.8
54.00	54	54.0	0.0		0.8
49.00	49	49.0	0.0		0.8
44.00	44	44.0	0.0		0.8
39.00	39	39.0	0.0		0.8
34.00	34	34.0	0.0		0.8
29.00	29	29.0	0.0		0.8

Certificate No : 24-SLM-151
Request No : Req-2024-0856

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)		
30-130	35.00	35.1	0.1	0.30	0.8
	114	114.0	0.0		0.8
20-120	30.20	30.1	-0.1		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	126.0	126.0	0.0	0.20	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	119.6	0.0		0.5
	2	100.0	100.0	0.0		+1.0, -3.0
SEL	200	120.0	120.0	0.0		0.5
	2	100.0	100.0	0.0		+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 (\pm dB)	Acceptance Limit (\pm dB)
FAST / C / 30-143	REF	UUC	ERR		
STD Setting	(dB)	(dB)	(dB)		
Complete cycle	138.4	138.3	-0.10	0.20	2.0
Positive half cycle	137.4	137.2	-0.20		1.0
Negative half cycle	137.4	137.2	-0.20		1.0



Certificate No : 24-SLM-151
Request No : Req-2024-0856

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit
FAST / A / 30-130	UUC		(± dB)
STD Setting	(dB)		
Positive one-half cycle	141.6		
Negative one-half cycle	141.5		
Deviated	0.1	0.20	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit
FAST / A / 30-130	UUC		(± dB)
STD Setting	(dB)		
Initial	129.0		
Final	129.0		
Deviated	0.0	0.10	0.10

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 1kHz	0.20 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



Certificate of Calibration

Customer

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

Certificate No : 24-ACT-079
Request No : Req-2024-1163

Unit Under Calibration Details

Measurement item : Acoustic Calibrator Class : 1
Manufacturer : CIRRUS Range : 94 dB / 1000 Hz
Model : CR:515 Instrument Status : Used
Serial Number : 88346
ID : ENSL 19174

Calibration Environment and Details

Temperature : (23 ±2 °C)
Humidity : (50 ± 20 %RH)
Barometric Pressure : (1013 ±10.0 hPa)
Received Date : 31 May 2024
Calibration Date : 31 May 2024
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 2024
THD Multimeter	2015	1047765	NIMT	16 January 2025

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 : 3 June 2024

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.

Certificate No : 24-ACT-079

Request No : Req-2024-1163

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	93.94	-0.06	-	-	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	1000.00	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	0.09	-	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

Certificate of Calibration

Customer

Name : SGS (Thailand) Limited.

Certificate No : 24-SLM-128

Address : 100 Nanglinchee Road, Chongnonsi, Yannawa Bangkok 10120

Request No : Req-2024-0633

Unit Under Calibration Details

Measurement item : Sound Level Meter

Microphone Class : 1

Manufacturer : RION

Microphone Model : UC-59

Model : NL-52

Microphone S/N : 22736

Serial Number : 00710417

Preamplifier Model : NH-25

ID : ENSL 21179

Preamplifier S/N : 10960

Resolution : 0.1 dB

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 : 14 March 2024

Calibrated Date : 27 March 2024

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	21 August 2024	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	26 July 2024	TSI
Audio Generator	SvanteK	Svan401	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 : 27 March 2024

Certificate No : 24-SLM-128
Request No : Req-2024-0633

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 30-130	Level	UUC	ERR	UUC	ERR		
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		
1000 Hz 94 dB	94.01	94.5	+0.49	94.0	-0.01	0.20	0.30

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand CIRRUS, Model CR-515, SN. 80400

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY (\pm dB)
FAST / 30-130		
UUC Weighting	(dB)	(\pm dB)
A	14.0	0.10

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

UUC Setting	Measured	UNCERTAINTY (\pm dB)
FAST / 30-130		
UUC Weighting	(dB)	(\pm dB)
A	9.5	0.10
C	12.6	0.10
Z	17.1	0.10

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

UUC Setting	Deviation from various Frequency Weighting Responce curve			UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
	A	C	Z		
FAST / 30-130	(dB)	(dB)	(dB)		
STD Setting	(dB)	(dB)	(dB)		
125 Hz	-0.1	0.0	0.0	0.60	1.0
1000 Hz	0.0	0.0	0.0	0.60	0.7
4000 Hz	-0.9	-0.9	-1.0	0.60	1.0
8000 Hz	-2.2	-2.2	-2.2	0.70	+1.5 -2.5

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

Certificate No : 24-SLM-128
Request No : Req-2024-0633

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

UUC Setting	Deviation from various Frequency Weighting Responce curve			UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / 30-130	A (dB)	C (dB)	Z (dB)		
STD Setting	(dB)	(dB)	(dB)		
63 Hz	-0.3	-0.1	-0.1	0.20	1.0
125 Hz	-0.2	0.0	0.0		1.0
250 Hz	-0.1	0.0	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	-1.4	-1.4	0.0		+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		UUC	ERR		
UUC Weighting	(dB)	(dB)	(dB)		
A	114.00	114.0	0.0	0.20	0.20
C	114.00	114.0	0.0		0.20
Z	114.00	114.0	0.0		0.20

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
30-130 / A		UUC	ERR		
UUC Time Responce	(dB)	(dB)	(dB)		
Fast	114.00	114.0	0.0	0.20	0.10
Slow	114.00	114.0	0.0		0.10
Leq	114.00	114.0	0.0		0.10

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

Certificate No : 24-SLM-128
Request No : Req-2024-0633

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	0.10	0.10

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)		
138.00	138	138.0	0.0	0.30	0.8
134.00	134	134.0	0.0		0.8
129.00	129	129.0	0.0		0.8
124.00	124	124.0	0.0		0.8
119.00	119	119.0	0.0		0.8
114.00	114	114.0	0.0		0.8
109.00	109	109.0	0.0		0.8
104.00	104	104.0	0.0		0.8
99.00	99	99.0	0.0		0.8
94.00	94	94.0	0.0		0.8
89.00	89	89.0	0.0		0.8
84.00	84	84.0	0.0		0.8
79.00	79	79.0	0.0		0.8
74.00	74	74.0	0.0		0.8
69.00	69	69.0	0.0		0.8
64.00	64	64.0	0.0		0.8
59.00	59	59.0	0.0		0.8
54.00	54	54.0	0.0		0.8
49.00	49	49.0	0.0		0.8
44.00	44	44.0	0.0		0.8
39.00	39	39.0	0.0		0.8
34.00	34	34.0	0.0		0.8
29.00	29	29.0	0.0		0.8
24.00	24	23.9	-0.1		0.8

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

Certificate No : 24-SLM-128
Request No : Req-2024-0633

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)		
30-130	29.60	29.6	0.0	0.30	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	126.0	126.0	0.0	0.20	0.5
	2	109.0	108.9	-0.1		+1.0, -1.5
	0.25	100.0	99.9	-0.1		+1.0, -3.0
Slow	200	119.6	119.5	-0.1		0.5
	2	100.0	99.9	-0.1		+1.0, -3.0
SEL	200	120.0	120.0	0.0		0.5
	2	100.0	100.0	0.0		+1.0, -1.5
	0.25	91.0	90.8	-0.2		+1.0, -3.0

11. Peak C Sound 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	136.3	-0.10	0.20	2.0
Positive half cycle	135.4	135.1	-0.30		1.0
Negative half cycle	135.4	135.1	-0.30		1.0

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

Certificate No : 24-SLM-128
Request No : Req-2024-0633

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit
FAST / A / 30-130	UUC		(\pm dB)
STD Setting	(dB)	(\pm dB)	(\pm dB)
Positive one-half cycle	139.4		
Negative one-half cycle	139.4		
Deviated	0.0	0.20	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit
FAST / A / 30-130	UUC		(\pm dB)
STD Setting	(dB)	(\pm dB)	(\pm dB)
Initial	129.0		
Final	129.0		
Deviated	0.0	0.10	0.10

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 1kHz	0.20 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:7/11/23

Certificate of Calibration

Customer

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

Certificate No : 24-SLM-043
Request No : Req-2024-0229

Unit Under Calibration Details

Measurement item : Sound Level Meter
Manufacturer : RION
Model : NL-52
Serial Number : 00710418
ID : ENSL 21180
Resolution : 0.1 dB
Microphone Class : 1
Microphone Model : UC-59
Microphone S/N : 18935
Preamplifier Model : NH-25
Preamplifier S/N : 10961
Instrument Status : Used

Calibration Environment and Details

Temperature : 23 °C \pm 2 °C
Humidity : 50 %RH \pm 20 %RH
Barometric Pressure : 1013 hPa \pm 10 hPa
Received Date : 30 January 2024
Calibrated Date : 13 February 2024
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	21 August 2024	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	26 July 2024	TSI
Audio Generator	SvanteK	Svan401	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 : 13 February 2024

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 : 24-SLM-043
Request No : Req-2024-0229

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 30-130	Level	UUC	ERR	UUC	ERR		
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		
1000 Hz 94 dB	94.03	94.2	+0.17	94.0	-0.03	0.20	0.30

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand CIRRUS, Model CR-515, SN. 80411

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 30-130		
UUC Weighting	(dB)	(\pm dB)
A	14.6	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 30-130		
UUC Weighting	(dB)	(\pm dB)
A	10.7	0.10
C	13.5	0.10
Z	18.2	0.10

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

UUC Setting	Deviation from various Frequency Weighting Responce curve			UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
	A	C	Z		
FAST / 30-130	(dB)	(dB)	(dB)		
STD Setting	(dB)	(dB)	(dB)		
125 Hz	-0.1	0.0	0.0	0.60	1.0
1000 Hz	0.0	0.0	0.0	0.60	0.7
4000 Hz	-0.9	-0.8	-0.8	0.60	1.0
8000 Hz	-1.6	-1.7	-1.7	0.70	+1.5 -2.5

Certificate No : 24-SLM-043
Request No : Req-2024-0229

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

UUC Setting	Deviation from various Frequency Weighting Responce curve			UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / 30-130	A (dB)	C (dB)	Z (dB)		
STD Setting	(dB)	(dB)	(dB)		
63 Hz	-0.3	-0.2	0.0	0.20	1.0
125 Hz	-0.1	0.0	-0.1		1.0
250 Hz	-0.1	0.0	0.0		1.0
500 Hz	-0.1	0.0	-0.1		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		+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)		
A	114.00	114.0	0.0	0.20	0.20
C	114.00	114.0	0.0		0.20
Z	114.00	114.0	0.0		0.20

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
30-130 / A	REF	UUC	ERR		
UUC Time Responce	(dB)	(dB)	(dB)		
Fast	114.00	114.0	0.0	0.20	0.10
Slow	114.00	114.0	0.0		0.10
Leq	114.00	114.0	0.0		0.10

Certificate No : 24-SLM-043
Request No : Req-2024-0229

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	0.10	0.10

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)		
139.00	139	138.9	-0.1	0.30	0.8
134.00	134	134.0	0.0		0.8
129.00	129	128.9	-0.1		0.8
124.00	124	123.9	-0.1		0.8
119.00	119	119.0	0.0		0.8
114.00	114	114.0	0.0		0.8
109.00	109	108.9	-0.1		0.8
104.00	104	104.0	0.0		0.8
99.00	99	99.0	0.0		0.8
94.00	94	94.0	0.0		0.8
89.00	89	89.0	0.0		0.8
84.00	84	84.0	0.0		0.8
79.00	79	79.0	0.0		0.8
74.00	74	74.0	0.0		0.8
69.00	69	69.0	0.0		0.8
64.00	64	64.0	0.0		0.8
59.00	59	59.0	0.0		0.8
54.00	54	54.0	0.0		0.8
49.00	49	49.0	0.0		0.8
44.00	44	44.0	0.0		0.8
39.00	39	39.0	0.0		0.8
34.00	34	34.1	0.1		0.8
29.00	29	29.0	0.0		0.8
24.00	24	23.9	-0.1		0.8

Certificate No : 24-SLM-043
Request No : Req-2024-0229

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)		
30-130	29.70	29.7	0.0	0.30	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	126.0	126.0	0.0	0.20	0.5
	2	109.0	108.9	-0.1		+1.0, -1.5
	0.25	100.0	99.8	-0.2		+1.0, -3.0
Slow	200	119.6	119.5	-0.1		0.5
	2	100.0	99.9	-0.1		+1.0, -3.0
SEL	200	120.0	120.0	0.0		0.5
	2	100.0	99.9	-0.1		+1.0, -1.5
	0.25	91.0	90.8	-0.2		+1.0, -3.0

11. Peak C Sound 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	136.2	-0.20	0.20	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 : 24-SLM-043
Request No : Req-2024-0229

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit
FAST / A / 30-130	UUC		(± dB)
STD Setting	(dB)		
Positive one-half cycle	139.4		
Negative one-half cycle	139.5		
Deviated	-0.1	0.20	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit
FAST / A / 30-130	UUC		(± dB)
STD Setting	(dB)		
Initial	129.0		
Final	129.0		
Deviated	0.0	0.10	0.10

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 1kHz	0.20 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:7/11/23

Certificate of Calibration

Customer

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

Certificate No : 24-SLM-129
Request No : Req-2024-0634

Unit Under Calibration Details

Measurement item : Sound Level Meter
Manufacturer : RION
Model : NL-52
Serial Number : 00710419
ID : ENSL 21181
Resolution : 0.1 dB
Microphone Class : 1
Microphone Model : UC-59
Microphone S/N : 18897
Preamplifier Model : NH-25
Preamplifier S/N : 21971
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 : 14 March 2024
Calibrated Date : 27 March 2024
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	21 August 2024	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	26 July 2024	TSI
Audio Generator	Svantek	Svan401	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 : 27 March 2024

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 : 24-SLM-129
Request No : Req-2024-0634

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 30-130	Level	UUC	ERR	UUC	ERR		
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		
1000 Hz 94 dB	94.01	94.0	-0.01	94.0	-0.01	0.20	0.30

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand CIRRUS, Model CR:515, SN. 80400

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 30-130		
UUC Weighting	(dB)	(\pm dB)
A	14.3	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 30-130		
UUC Weighting	(dB)	(\pm dB)
A	10.5	0.10
C	13.8	0.10
Z	17.6	0.10

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

UUC Setting	Deviation from various Frequency Weighting Responce curve			UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
	A	C	Z		
FAST / 30-130	(dB)	(dB)	(dB)		
STD Setting	(dB)	(dB)	(dB)		
125 Hz	-0.1	0.0	-0.1	0.60	1.0
1000 Hz	0.0	0.0	0.0	0.60	0.7
4000 Hz	-1.0	-1.0	-0.9	0.60	1.0
8000 Hz	-1.9	-1.9	-1.9	0.70	+1.5 -2.5

Certificate No : 24-SLM-129
Request No : Req-2024-0634

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

UUC Setting	Deviation from various Frequency Weighting Responce curve			UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / 30-130	A (dB)	C (dB)	Z (dB)		
STD Setting	(dB)	(dB)	(dB)		
63 Hz	-0.3	-0.1	-0.1	0.20	1.0
125 Hz	-0.1	0.0	-0.1		1.0
250 Hz	-0.1	0.0	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	-1.4	-1.4	0.0		+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		UUC	ERR		
UUC Weighting	(dB)	(dB)	(dB)		
A	114.00	114.0	0.0	0.20	0.20
C	114.00	114.0	0.0		0.20
Z	114.00	114.0	0.0		0.20

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
30-130 / A		UUC	ERR		
UUC Time Responce	(dB)	(dB)	(dB)		
Fast	114.00	114.0	0.0	0.20	0.10
Slow	114.00	114.0	0.0		0.10
Leq	114.00	114.0	0.0		0.10

Certificate No : 24-SLM-129
Request No : Req-2024-0634

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	0.10	0.10

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)		
138.00	138	138.0	0.0	0.30	0.8
134.00	134	134.0	0.0		0.8
129.00	129	129.0	0.0		0.8
124.00	124	124.0	0.0		0.8
119.00	119	119.0	0.0		0.8
114.00	114	114.0	0.0		0.8
109.00	109	109.0	0.0		0.8
104.00	104	104.0	0.0		0.8
99.00	99	99.0	0.0		0.8
94.00	94	94.0	0.0		0.8
89.00	89	89.1	0.1		0.8
84.00	84	84.1	0.1		0.8
79.00	79	79.0	0.0		0.8
74.00	74	74.1	0.1		0.8
69.00	69	69.1	0.1		0.8
64.00	64	64.0	0.0		0.8
59.00	59	59.1	0.1		0.8
54.00	54	54.0	0.0		0.8
49.00	49	49.1	0.1		0.8
44.00	44	44.0	0.0		0.8
39.00	39	39.1	0.1		0.8
34.00	34	34.1	0.1		0.8
29.00	29	29.0	0.0		0.8
24.00	24	24.0	0.0		0.8

Certificate No : 24-SLM-129
Request No : Req-2024-0634

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)		
30-130	29.60	29.7	0.1	0.30	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	126.0	126.0	0.0	0.20	0.5
	2	109.0	108.9	-0.1		+1.0, -1.5
	0.25	100.0	99.9	-0.1		+1.0, -3.0
Slow	200	119.6	119.6	0.0		0.5
	2	100.0	100.0	0.0		+1.0, -3.0
SEL	200	120.0	120.0	0.0		0.5
	2	100.0	100.0	0.0		+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 (\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	0.20	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 : 24-SLM-129

Request No : Req-2024-0634

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit
FAST / A / 30-130	UUC		(± dB)
STD Setting	(dB)		
Positive one-half cycle	139.4		
Negative one-half cycle	139.4		
Deviated	0.0	0.20	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit
FAST / A / 30-130	UUC		(± dB)
STD Setting	(dB)		
Initial	129.0		
Final	129.0		
Deviated	0.0	0.10	0.10

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 1kHz	0.20 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



Certificate of Calibration

Customer

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

Certificate No : 24-SLM-218
Request No : Req-2024-1407

Unit Under Calibration Details

Measurement item : Sound Level Meter
Microphone Class : 2
Manufacturer : SCARLET
Microphone Model : AWA14421
Model : ST-21D
Microphone S/N : A-000219
Serial Number : 820703
Preamplifier Model : -
ID : ENSL 22175
Preamplifier S/N : -
Resolution : 0.1 dB
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 : 24 June 2024
Calibrated Date : 4 July 2024
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	20 August 2024	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	26 July 2024	TSI
Audio Generator	Svantek	Svan401	131	8 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 : 4 July 2024

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

Certificate No : 24-SLM-218
Request No : Req-2024-1407

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)	Result
FAST / A / 28-133	Level	UUC	ERR	UUC	ERR			
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)			
1000 Hz 114 dB	93.79	93.9	+0.11	93.8	+0.01	0.20	0.30	Pass

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand CIRRUS, Model CR-515, SN. 88737

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY (\pm dB)
FAST / 28-133		
UUC Weighting	(dB)	(\pm dB)
A	25.6	0.10

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

UUC Setting	Measured	UNCERTAINTY (\pm dB)
FAST / 28-133		
UUC Weighting	(dB)	(\pm dB)
A	24.6	0.10
C	26.1	0.10
Z	30.1	0.10

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)	Result
	A	C	Z			
FAST / 28-133	(dB)	(dB)	(dB)			
STD Setting	(dB)	(dB)	(dB)			
125 Hz	0.2	0.2	0.2	0.60	1.5	Pass
1000 Hz	0.0	0.0	0.0	0.60	1.0	Pass
4000 Hz	-0.8	-0.9	-1.1	0.60	3.0	Pass
8000 Hz	-1.4	-1.5	-1.3	0.70	5.0	Pass

Certificate No : 24-SLM-218
Request No : Req-2024-1407

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)	Result
FAST / 28-133	A (dB)	C (dB)	Z (dB)			
STD Setting	(dB)	(dB)	(dB)			
63 Hz	-0.2	-0.1	-0.1	0.20	2.0	Pass
125 Hz	-0.1	-0.1	-0.1		1.5	Pass
250 Hz	-0.1	-0.1	-0.1		1.5	Pass
500 Hz	-0.1	-0.1	-0.1		1.5	Pass
1000 Hz	0.0	-0.1	-0.1		1.0	Pass
2000 Hz	0.1	0.0	-0.1		2.0	Pass
4000 Hz	0.2	0.1	-0.1		3.0	Pass
8000 Hz	-0.2	-0.3	-0.1		5.0	Pass

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)	Result
FAST / 28-133	REF	UUC	ERR			
UUC Weighting	(dB)	(dB)	(dB)			
A	114.00	114.0	0.0	0.20	0.20	Pass
C	114.00	113.9	-0.1		0.20	Pass
Z	114.00	113.9	-0.1		0.20	Pass

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)	Result
28-133 / A	REF	UUC	ERR			
UUC Time Response	(dB)	(dB)	(dB)			
Fast	114.00	114.0	0.0	0.20	0.10	Pass
Slow	114.00	114.0	0.0		0.10	Pass
Leq	114.00	114.0	0.0		0.10	Pass

Certificate No : 24-SLM-218
Request No : Req-2024-1407

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance	Result
FAST / A / 28-133	UUC		Limit	
STD Setting	(dB)		(± dB)	
Initial	114.0			
Final	114.0			
Deviated	0.0	0.10	0.30	Pass

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY	Acceptance	Result
FAST / A / 28-133	REF	UUC	ERR		Limit	
STD dB	(dB)	(dB)	(dB)	(± dB)	(± dB)	
138.00	138	138.0	0.0	0.30	1.1	Pass
134.00	134	134.0	0.0		1.1	Pass
129.00	129	129.0	0.0		1.1	Pass
124.00	124	124.0	0.0		1.1	Pass
119.00	119	119.0	0.0		1.1	Pass
114.00	114	114.0	0.0		1.1	Pass
109.00	109	109.0	0.0		1.1	Pass
104.00	104	104.0	0.0		1.1	Pass
99.00	99	99.0	0.0		1.1	Pass
94.00	94	94.0	0.0		1.1	Pass
89.00	89	89.0	0.0		1.1	Pass
84.00	84	84.0	0.0		1.1	Pass
79.00	79	79.0	0.0		1.1	Pass
74.00	74	74.0	0.0		1.1	Pass
69.00	69	69.0	0.0		1.1	Pass
64.00	64	64.0	0.0		1.1	Pass
59.00	59	59.0	0.0		1.1	Pass
54.00	54	54.0	0.0		1.1	Pass
49.00	49	49.0	0.0		1.1	Pass
44.00	44	43.9	-0.1		1.1	Pass
39.00	39	38.8	-0.2		1.1	Pass
38.00	38	37.7	-0.3		1.1	Pass

Certificate No : 24-SLM-218
Request No : Req-2024-1407

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance	Result
FAST / A	REF	UUC	ERR		Limit	
UUC Range	(dB)	(dB)	(dB)		(± dB)	
28-133	43.50	43.5	0.0	0.30	1.1	Pass
	114	114.0	0.0		1.1	Pass

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance	Result
A / 28-133	Toneburst	Ref	UUC	ERR		Limit	
UUC Time Respo	(ms)	(dB)	(dB)	(dB)	(± dB)	(± dB)	
Fast	200	129.0	129.1	+0.1	0.20	1.0	Pass
	2	112.0	112.1	+0.1		+1.0, -2.5	Pass
	0.25	103.0	102.8	-0.2		+1.5, -5.0	Pass
Slow	200	122.6	122.7	+0.1		1.0	Pass
	2	103.0	103.1	+0.1		+1.0, -5.0	Pass
SEL	200	123.0	123.1	+0.1		1.0	Pass
	2	103.0	103.1	+0.1		+1.0, -2.5	Pass
	0.25	94.0	94.0	0.0		+1.5, -5.0	Pass

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY	Acceptance	Result
FAST / C / 28-133	REF	UUC	ERR		Limit	
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)	
Complete cycle	128.4	128.2	-0.20	0.20	3.0	Pass
Positive half cycle	127.4	127.3	-0.10		2.0	Pass
Negative half cycle	127.4	127.3	-0.10		2.0	Pass

Certificate No : 24-SLM-218
Request No : Req-2024-1407

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit	Result
FAST / A / 28-133	UUC			
STD Setting	(dB)		(± dB)	
Positive one-half cycle	140.4			
Negative one-half cycle	141.1			
Deviated	-0.7	0.20	1.5	Pass

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit	Result
FAST / A / 28-133	UUC			
STD Setting	(dB)		(± dB)	
Initial	132.0			
Final	132.0			
Deviated	0.0	0.10	0.30	Pass

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 1kHz	0.20 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

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.04 Issue date 5/6/24

Certificate No : 24-SLM-218
Request No : Req-2024-1407

Decision Rule for Statements of Conformity

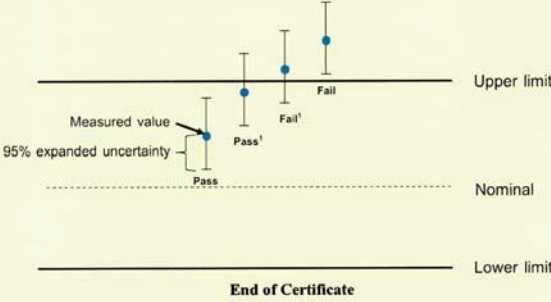
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019; Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



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.04 Issue date 5/6/24

Certificate of Calibration

Customer

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

Certificate No : 24-SLM-167
Request No : Req-2024-0998

Unit Under Calibration Details

Measurement item : Sound Level Meter
Manufacturer : SCARLET
Model : ST-21D
Serial Number : 820705
ID : ENSL 22177
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : AWA14421
Microphone S/N : A-000273
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 : 8 May 2024
Calibrated Date : 15 May 2024
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	21 August 2024	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	26 July 2024	TSI
Audio Generator	SvanteK	Svan401	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 May 2024

Certificate No : 24-SLM-167
Request No : Req-2024-0998

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 / 28-133 Calibrator Setting 1000 Hz 94 dB	93.80	93.6	-0.20	93.8	0.00	0.20	0.30

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

2. Self-generated noise, Microphone installed

UUC Setting	Measured (dB)	UNCERTAINTY (± dB)
FAST / 28-133		
UUC Weighting		
A	25.6	0.10

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

UUC Setting	Measured (dB)	UNCERTAINTY (± dB)
FAST / 28-133		
UUC Weighting		
A	24.7	0.10
C	24.6	0.10
Z	28.6	0.10

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

UUC Setting	Deviation from various Frequency Weighting Resonse curve			UNCERTAINTY (± dB)	Acceptance Limit (± dB)
	A (dB)	C (dB)	Z (dB)		
FAST / 28-133 STD Setting					
125 Hz	0.0	0.1	0.2	0.60	1.5
1000 Hz	0.0	0.0	0.0	0.60	1.0
4000 Hz	0.0	0.0	-0.1	0.60	3.0
8000 Hz	0.3	0.3	0.6	0.70	5.0

Certificate No : 24-SLM-167
Request No : Req-2024-0998

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 Response curve				
STD Setting	A (dB)	C (dB)	Z (dB)	(± dB)	(± dB)
63 Hz	-0.2	-0.1	-0.1	0.20	2.0
125 Hz	-0.1	-0.1	-0.1		1.5
250 Hz	-0.1	-0.1	-0.1		1.5
500 Hz	-0.1	-0.1	-0.1		1.5
1000 Hz	0.0	-0.1	-0.1		1.0
2000 Hz	0.1	0.0	-0.1		2.0
4000 Hz	0.2	0.1	-0.1		3.0
8000 Hz	-0.2	-0.2	-0.1		5.0

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)	0.20	
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)	0.20	
Fast	114.00	114.0	0.0		
Slow	114.00	114.0	0.0		
Lcq	114.00	114.0	0.0		

Certificate No : 24-SLM-167
Request No : Req-2024-0998

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 28-133	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	Anticipated	Deviation		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 28-133	REF	UUC	ERR		
STD dB	(dB)	(dB)	(dB)	0.30	
139.00	139	138.9	-0.1		
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	69.0	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	43.9	-0.1		
39.00	39	38.7	-0.3		
38.00	38	37.6	-0.4		

Certificate No : 24-SLM-167
Request No : Req-2024-0998

9. Level linearity including the level range control

UUC Setting	STD REF (dB)	Measured		UNCERTAINTY (± dB)	Acceptance
FAST / A		UUC	ERR		Limit
UUC Range		(dB)	(dB)		(dB)
28-133	43.90	43.8	-0.1	0.30	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		Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)	(± dB)	(± dB)
Fast	200	129.0	129.1	+0.1	0.20	1.0
	2	112.0	111.8	-0.2		+1.0, -2.5
	0.25	103.0	102.6	-0.4		+1.5, -5.0
Slow	200	122.6	122.7	+0.1		1.0
	2	103.0	103.0	0.0		+1.0, -5.0
SEL	200	123.0	123.1	+0.1		1.0
	2	103.0	103.1	+0.1		+1.0, -2.5
	0.25	94.0	93.9	-0.1		+1.5, -5.0

11. Peak C Sound level

11. FEAR C SOUND LEVEL					
UUC Setting	Anticipated REF (dB)	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / C / 28-133		UUC (dB)	ERR (dB)		
STD Setting					
Complete cycle	128.4	128.3	-0.10	0.20	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 : 24-SLM-167
Request No : Req-2024-0998

12. Overload indication

12. Overall Indication			
UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 28-133	UUC		
STD Setting	(dB)		
Positive one-half cycle	141.1		
Negative one-half cycle	141.4		
Deviated	-0.3	0.20	1.5

13. High Level Stability

15. High Level Stability			
UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 28-133	UUC		
STD Setting	(dB)		
Initial	132.0		
Final	132.0		
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 1kHz	0.20 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

Certificate of Calibration

Customer

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

Certificate No : 24-SLM-184
Request No : Req-2024-1110

Unit Under Calibration Details

Measurement item : Sound Level Meter
Manufacturer : SCARLET
Model : ST-21D
Serial Number : 820711
ID : ENSL 22182
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : AWA14421
Microphone S/N : A-000281
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 : 21 May 2024
Calibrated Date : 29 May 2024
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	21 August 2024	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	26 July 2024	TSI
Audio Generator	SvanteK	Svan401	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 : 29 May 2024

Certificate No : 24-SLM-184
Request No : Req-2024-1110

1. Indication at the calibration check frequency

UUC Setting	Nominal Level (dB)	Before Adjust		After Adjust		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 28-133		UUC	ERR	UUC	ERR		
Calibrator Setting		(dB)	(dB)	(dB)	(dB)		
1000 Hz 114 dB	114.18	113.8	-0.38	114.2	+0.02	0.20	0.30

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand CASELLA, Model CEL-120/2, SN. 3865016

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY (± dB)
FAST / 28-133		
UUC Weighting	(dB)	(± dB)
A	24.8	0.10

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

UUC Setting	Measured	UNCERTAINTY (± dB)
FAST / 28-133		
UUC Weighting	(dB)	(± dB)
A	24.0	0.10
C	25.3	0.10
Z	29.7	0.10

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

UUC Setting	Deviation from various Frequency Weighting Responce curve			UNCERTAINTY	Acceptance
	A	C	Z		Limit
FAST / 28-133				(± dB)	(± dB)
STD Setting	(dB)	(dB)	(dB)		
125 Hz	0.1	0.2	0.2	0.60	1.5
1000 Hz	0.0	0.0	0.0	0.60	1.0
4000 Hz	-0.9	-0.9	-1.0	0.60	3.0
8000 Hz	-1.2	-1.2	-0.9	0.70	5.0

Certificate No : 24-SLM-184
Request No : Req-2024-1110

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 Responce curve				
STD Setting	A (dB)	C (dB)	Z (dB)	(± dB)	(± dB)
63 Hz	-0.1	-0.1	0.0	0.20	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		5.0

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
FAST / 28-133	REF	UUC	ERR		
UUC Weighting	(dB)	(dB)	(dB)	(± dB)	Limit (± dB)
A	114.00	114.0	0.0	0.20	0.20
C	114.00	113.9	-0.1		0.20
Z	114.00	113.9	-0.1		0.20

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
28-133 / A	REF	UUC	ERR		
UUC Time Responce	(dB)	(dB)	(dB)	(± dB)	Limit (± dB)
Fast	114.00	114.0	0.0	0.20	0.10
Slow	114.00	114.0	0.0		0.10
Leq	114.00	114.0	0.0		0.10

Certificate No : 24-SLM-184
Request No : Req-2024-1110

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 28-133	UUC		
STD Setting	(dB)	(± dB)	Limit (± dB)
Initial	114.0		
Final	114.0		
Deviated	0.0	0.10	0.30

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY	Acceptance
FAST / A / 28-133	REF	UUC	ERR		
STD dB	(dB)	(dB)	(dB)	(± dB)	Limit (± dB)
137.00	137	136.9	-0.1	0.30	1.1
134.00	134	134.0	0.0		1.1
129.00	129	129.0	0.0		1.1
124.00	124	124.0	0.0		1.1
119.00	119	119.0	0.0		1.1
114.00	114	114.0	0.0		1.1
109.00	109	109.0	0.0		1.1
104.00	104	104.1	0.1		1.1
99.00	99	99.1	0.1		1.1
94.00	94	94.1	0.1		1.1
89.00	89	89.1	0.1		1.1
84.00	84	84.1	0.1		1.1
79.00	79	79.1	0.1		1.1
74.00	74	74.1	0.1		1.1
69.00	69	69.1	0.1		1.1
64.00	64	64.1	0.1		1.1
59.00	59	59.1	0.1		1.1
54.00	54	54.1	0.1		1.1
49.00	49	49.1	0.1		1.1
44.00	44	44.1	0.1		1.1
39.00	39	39.1	0.1		1.1
38.00	38	38.9	0.9		1.1
37.00	37	37.9	0.9		1.1
36.00	36	36.6	0.6		1.1

Certificate No : 24-SLM-184
Request No : Req-2024-1110

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
FAST / A	REF	UUC	ERR	(± dB)	Limit
UUC Range	(dB)	(dB)	(dB)		(± dB)
28-133	41.80	41.9	0.1		1.1
	114	114.0	0.0	0.30	1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance
A / 28-133	Toneburst	Ref	UUC	ERR	(± dB)	Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)		(± dB)
Fast	200	129.0	129.1	+0.1	0.20	1.0
	2	112.0	111.8	-0.2		+1.0, -2.5
	0.25	103.0	102.7	-0.3		+1.5, -5.0
Slow	200	122.6	122.7	+0.1		1.0
	2	103.0	103.1	+0.1		+1.0, -5.0
	200	123.0	123.2	+0.2		1.0
SEL	2	103.0	103.2	+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 / 28-133	REF	UUC	ERR	(± dB)	Limit
STD Setting	(dB)	(dB)	(dB)		(± dB)
Complete cycle	128.4	128.3	-0.10		3.0
Positive half cycle	127.4	127.3	-0.10	0.20	2.0
Negative half cycle	127.4	127.3	-0.10		2.0

Certificate No : 24-SLM-184
Request No : Req-2024-1110

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 28-133	UUC	(± dB)	Limit
STD Setting	(dB)		(± dB)
Positive one-half cycle	138.9		
Negative one-half cycle	139.3		
Deviated	-0.4	0.20	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 28-133	UUC	(± dB)	Limit
STD Setting	(dB)		(± dB)
Initial	132.0		
Final	132.0		
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 1kHz	0.20 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



Certificate of Calibration

Customer

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

Certificate No : 24-SLM-219
Request No : Req-2024-1503

Unit Under Calibration Details

Measurement item : Sound Level Meter
Manufacturer : SCARLET
Model : ST-21D
Serial Number : 820714
ID : ENSL 22185
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : AWA14421
Microphone S/N : A-000220
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 : 2 July 2024
Calibrated Date : 4 July 2024
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	20 August 2024	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	26 July 2024	TSI
Audio Generator	Svantek	Svan401	131	8 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 : 4 July 2024



Certificate No : 24-SLM-219
Request No : Req-2024-1503

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY	Acceptance	Result
FAST / A / 28-133	Level	UUC	ERR	UUC	ERR	(± dB)	Limit	
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		(± dB)	
1000 Hz 114 dB	93.84	93.7	-0.14	93.8	-0.04	0.20	0.30	Pass

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand CRIFFER, Model CR2 PLUS, SN. 37001157

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 28-133		
UUC Weighting	(dB)	(± dB)
A	24.4	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 28-133		
UUC Weighting	(dB)	(± dB)
A	23.9	0.10
C	25.1	0.10
Z	29.8	0.10

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance Limit	Result
	A	C	Z			
FAST / 28-133	(dB)	(dB)	(dB)	(± dB)	(± dB)	
STD Setting						
125 Hz	0.0	0.1	0.2	0.60	1.5	Pass
1000 Hz	0.0	0.0	0.0	0.60	1.0	Pass
4000 Hz	-0.1	0.0	-0.2	0.60	3.0	Pass
8000 Hz	-0.2	-0.2	0.1	0.70	5.0	Pass

Certificate No : 24-SLM-219
Request No : Req-2024-1503

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

UUC Setting	Deviation from various Frequency			UNCERTAINTY	Acceptance	Result
FAST / 28-133	Weighting Response curve				Limit	
STD Setting	A (dB)	C (dB)	Z (dB)	(± dB)	(± dB)	
63 Hz	-0.2	-0.1	-0.1	0.20	2.0	Pass
125 Hz	-0.1	-0.1	-0.1		1.5	Pass
250 Hz	-0.1	-0.1	-0.1		1.5	Pass
500 Hz	-0.1	-0.1	-0.1		1.5	Pass
1000 Hz	0.0	-0.1	-0.1		1.0	Pass
2000 Hz	0.1	0.0	-0.1		2.0	Pass
4000 Hz	0.2	0.1	-0.1		3.0	Pass
8000 Hz	-0.2	-0.2	-0.1		5.0	Pass

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
		UUC	ERR			
FAST / 28-133	REF	114.00	114.0	0.20	0.20	Pass
UUC Weighting	(dB)	114.00	113.9		0.20	Pass
A	(dB)	114.00	113.9		0.20	Pass
C	(dB)	114.00	113.9		0.20	Pass

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
		UUC	ERR			
28-133 / A	REF	114.00	114.0	0.20	0.10	Pass
UUC Time Response	(dB)	114.00	114.0		0.10	Pass
Fast	(dB)	114.00	114.0		0.10	Pass
Slow	(dB)	114.00	114.0		0.10	Pass

Certificate No : 24-SLM-219
Request No : Req-2024-1503

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 28-133	UUC			
STD Setting	(dB)	0.10	0.30	Pass
Initial	114.0			
Final	114.0			
Deviated	0.0	0.10	0.30	Pass

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (± dB)	Acceptance Limit (± dB)	Result
FAST / A / 28-133	REF	UUC	ERR			
STD dB	(dB)	(dB)	(dB)	0.30	1.1	Pass
138.00	138	137.9	-0.1			
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	44.0	0.0			
39.00	39	38.9	-0.1			
38.00	38	37.8	-0.2			

Certificate No : 24-SLM-219
Request No : Req-2024-1503

9. Level linearity including the level range control

9. Level linearity including the level range control						
UUC Setting	STD REF (dB)	Measured		UNCERTAINTY (± dB)	Acceptance	Result
FAST / A		UUC	ERR		Limit	
UUC Range		(dB)	(dB)		(dB)	
28-133	42.90	43.0	0.1	0.30	1.1	Pass
	114	114.0	0.0		1.1	Pass

10. Tone burst response

UUC Setting		STD	Anticipated	Measured		UNCERTAINTY	Acceptance	Result
A / 28-133		Toneburst	Ref	UUC	ERR		Limit	
UUC Time Response		(ms)	(dB)	(dB)	(dB)	(± dB)	(± dB)	
Fast	200	129.0	129.1	+0.1	0.20	1.0	Pass	
	2	112.0	111.9	-0.1		+1.0, -2.5	Pass	
	0.25	103.0	102.9	-0.1		+1.5, -5.0	Pass	
Slow	200	122.6	122.7	+0.1		1.0	Pass	
	2	103.0	103.1	+0.1		+1.0, -5.0	Pass	
SEL	200	123.0	123.2	+0.2		1.0	Pass	
	2	103.0	103.1	+0.1		+1.0, -2.5	Pass	
	0.25	94.0	94.0	0.0		+1.5, -5.0	Pass	

11. Peak C Sound level

11. Peak C sound level						
UUC Setting	Anticipated	Measured		UNCERTAINTY	Acceptance	Result
FAST / C / 28-133	REF	UUC	ERR		Limit	
STD Setting	(dB)	(dB)	(dB)	(± dB)	(± dB)	
Complete cycle	128.4	128.1	-0.30	0.20	3.0	Pass
Positive half cycle	127.4	127.3	-0.10		2.0	Pass
Negative half cycle	127.4	127.3	-0.10		2.0	Pass

Certificate No : 24-SLM-219
Request No : Req-2024-1503

12. Overload indication

12. Overload indication				
UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit	Result
FAST / A / 28-133	UUC		(± dB)	
STD Setting	(dB)		(± dB)	
Positive one-half cycle	140.4			
Negative one-half cycle	140.6			
Deviated	-0.2	0.20	1.5	Pass

13. High Level Stability

13. High Level Stability				
UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit	Result
FAST / A / 28-133	UUC		(± dB)	
STD Setting	(dB)		(± dB)	
Initial	132.0			
Final	132.0			
Deviated	0.0	0.10	0.30	Pass

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 1kHz	0.20 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

Certificate No : 24-SLM-219
Request No : Req-2024-1503

Decision Rule for Statements of Conformity

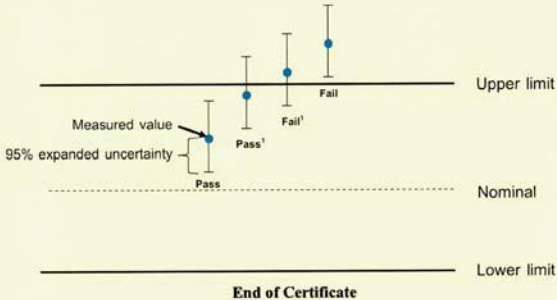
The standard decision rule employed for the statements of conformity to each calibration result will be applied using ILAC-G8:09/2019; Guidelines on the Reporting of Compliance with Specification as following Fig. and statements

Pass = The measurement result plus the expanded uncertainty with a 95% coverage probability were within the limit.

Pass¹ = The measurement result was within the limit. However, a portion of the expanded uncertainty of measurement at 95% exceeds the limit.

Fail¹ = The measurement result was out of the limit. However, a portion of the expanded uncertainty of measurement at 95% is within the limit.

Fail = The measurement result plus the expanded uncertainty with a 95% coverage probability were outside the limit.



Certificate of Calibration

Customer

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

Certificate No : 24-SLM-181
Request No : Req-2024-1106

Unit Under Calibration Details

Measurement item : Sound Level Meter
Manufacturer : SCARLET
Model : ST-21D
Serial Number : 820716
ID : ENSL 22187
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : AWA14421
Microphone S/N : A-000283
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 : 21 May 2024
Calibrated Date : 29 May 2024
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

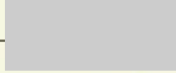
Reference Standard

Instrument	Brand	Model	SN.	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188273	21 August 2024	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	26 July 2024	TSI
Audio Generator	Svantek	Svan401	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 : 29 May 2024

Certificate No : 24-SLM-181
Request No : Req-2024-1106

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 28-133	Level	UUC	ERR	UUC	ERR		
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		
1000 Hz 114 dB	114.18	114.1	-0.08	114.2	+0.02	0.20	0.30

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand CASELLA, Model CEL-120/2, SN. 3865016

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY (\pm dB)
FAST / 28-133		
UUC Weighting	(dB)	(\pm dB)
A	25.5	0.10

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

UUC Setting	Measured	UNCERTAINTY (\pm dB)
FAST / 28-133		
UUC Weighting	(dB)	(\pm dB)
A	24.8	0.10
C	25.7	0.10
Z	30.6	0.10

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

UUC Setting	Deviation from various Frequency Weighting Responce curve			UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
	A	C	Z		
FAST / 28-133	(dB)	(dB)	(dB)		
STD Setting	(dB)	(dB)	(dB)		
125 Hz	0.0	0.1	0.1	0.60	1.5
1000 Hz	0.0	0.0	0.0	0.60	1.0
4000 Hz	-0.1	-0.1	-0.3	0.60	3.0
8000 Hz	-0.1	-0.2	0.0	0.70	5.0

Certificate No : 24-SLM-181
Request No : Req-2024-1106

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

UUC Setting	Deviation from various Frequency Weighting Responce curve			UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / 28-133	A (dB)	C (dB)	Z (dB)		
STD Setting	(dB)	(dB)	(dB)		
63 Hz	-0.2	-0.2	-0.1	0.20	2.0
125 Hz	-0.2	-0.1	-0.1		1.5
250 Hz	-0.2	-0.1	-0.1		1.5
500 Hz	-0.1	-0.1	-0.1		1.5
1000 Hz	0.0	-0.1	-0.1		1.0
2000 Hz	0.0	0.0	-0.1		2.0
4000 Hz	0.2	0.1	-0.1		3.0
8000 Hz	-0.2	-0.3	-0.1		5.0

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)		
A	114.00	114.0	0.0	0.20	0.20
C	114.00	113.9	-0.1		0.20
Z	114.00	113.9	-0.1		0.20

UUC Setting	STD	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
28-133 / A	REF	UUC	ERR		
UUC Time Responce	(dB)	(dB)	(dB)		
Fast	114.00	114.0	0.0	0.20	0.10
Slow	114.00	114.0	0.0		0.10
Leq	114.00	114.0	0.0		0.10

Certificate No : 24-SLM-181
Request No : Req-2024-1106

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 28-133	UUC		
STD Setting	(dB)		
Initial	114.0		
Final	114.0		
Deviated	0.0	0.10	0.30

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)		
138.00	138	138.0	0.0	0.30	1.1
134.00	134	134.0	0.0		1.1
129.00	129	129.0	0.0		1.1
124.00	124	124.0	0.0		1.1
119.00	119	119.0	0.0		1.1
114.00	114	114.0	0.0		1.1
109.00	109	109.1	0.1		1.1
104.00	104	104.2	0.2		1.1
99.00	99	99.2	0.2		1.1
94.00	94	94.2	0.2		1.1
89.00	89	89.2	0.2		1.1
84.00	84	84.2	0.2		1.1
79.00	79	79.2	0.2		1.1
74.00	74	74.2	0.2		1.1
69.00	69	69.2	0.2		1.1
64.00	64	64.2	0.2		1.1
59.00	59	59.2	0.2		1.1
54.00	54	54.2	0.2		1.1
49.00	49	49.2	0.2		1.1
44.00	44	44.1	0.1		1.1
39.00	39	38.9	-0.1		1.1
38.00	38	37.9	-0.1		1.1

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 Rev.02 Issue date:7/11/23

Certificate No : 24-SLM-181
Request No : Req-2024-1106

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	43.30	43.4	0.1	0.30	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	0.20	1.0
	2	112.0	111.8	-0.2		+1.0, -2.5
	0.25	103.0	102.9	-0.1		+1.5, -5.0
Slow	200	122.6	122.7	+0.1		1.0
	2	103.0	103.0	0.0		+1.0, -5.0
SEL	200	123.0	123.1	+0.1		1.0
	2	103.0	103.1	+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	128.1	-0.30	0.20	3.0
Positive half cycle	127.4	127.3	-0.10		2.0
Negative half cycle	127.4	127.3	-0.10		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:7/11/23

Certificate No : 24-SLM-181
Request No : Req-2024-1106

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit
FAST / A / 28-133	UUC		(± dB)
STD Setting	(dB)		
Positive one-half cycle	140.5		
Negative one-half cycle	140.8		
Deviated	-0.3	0.20	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit
FAST / A / 28-133	UUC		(± dB)
STD Setting	(dB)		
Initial	132.0		
Final	132.0		
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 1kHz	0.20 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

Certificate of Calibration

Customer

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

Certificate No : 24-SLM-182
Request No : Req-2024-1108

Unit Under Calibration Details

Measurement item : Sound Level Meter
Manufacturer : SCARLET
Model : ST-21D
Serial Number : 820717
ID : ENSL 22188
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : AWA14421
Microphone S/N : A-000225
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 : 21 May 2024
Calibrated Date : 29 May 2024
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	21 August 2024	GRAS
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	26 July 2024	TSI
Audio Generator	Svantek	Svan401	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 : 29 May 2024

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

Certificate No : 24-SLM-182
Request No : Req-2024-1108

1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		After Adjust		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / A / 28-133	Level	UUC	ERR	UUC	ERR		
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		
1000 Hz 114 dB	114.18	114.2	+0.02	114.2	+0.02	0.20	0.30

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand CASELLA, Model CEL-120/2, SN. 3865016

2. Self-generated noise, Microphone installed

UUC Setting	Measured (dB)	UNCERTAINTY (\pm dB)
FAST / 28-133		
UUC Weighting		
A	26.7	0.10

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

UUC Setting	Measured (dB)	UNCERTAINTY (\pm dB)
FAST / 28-133		
UUC Weighting		
A	26.4	0.10
C	26.8	0.10
Z	31.0	0.10

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		
STD Setting	(dB)	(dB)	(dB)		
125 Hz	0.0	0.1	0.1	0.60	1.5
1000 Hz	0.0	0.0	0.0	0.60	1.0
4000 Hz	-0.1	-0.1	-0.2	0.60	3.0
8000 Hz	-0.4	-0.3	0.0	0.70	5.0

Certificate No : 24-SLM-182
Request No : Req-2024-1108

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 Response curve				
STD Setting	A (dB)	C (dB)	Z (dB)	(\pm dB)	Limit (\pm dB)
63 Hz	-0.2	-0.2	-0.1	0.20	2.0
125 Hz	-0.2	-0.1	-0.1		1.5
250 Hz	-0.2	-0.1	-0.1		1.5
500 Hz	-0.1	-0.1	-0.1		1.5
1000 Hz	0.0	-0.1	-0.1		1.0
2000 Hz	0.0	0.0	-0.1		2.0
4000 Hz	0.2	0.1	-0.1		3.0
8000 Hz	-0.2	-0.3	-0.1		5.0

6. Frequency and time weightings at 1kHz

UUC Setting	STD REF (dB)	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
FAST / 28-133		UUC (dB)	ERR (dB)		
UUC Weighting					
A	114.00	114.0	0.0	0.20	0.20
C	114.00	113.9	-0.1		0.20
Z	114.00	113.9	-0.1		0.20

UUC Setting	STD REF (dB)	Measured		UNCERTAINTY (\pm dB)	Acceptance Limit (\pm dB)
28-133 / A		UUC (dB)	ERR (dB)		
UUC Time Response					
Fast	114.00	114.0	0.0	0.20	0.10
Slow	114.00	114.0	0.0		0.10
Leq	114.00	114.0	0.0		0.10

Certificate No : 24-SLM-182
Request No : Req-2024-1108

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 28-133	UUC		
STD Setting	(dB)		
Initial	114.0		
Final	114.0		
Deviated	0.0	0.10	0.30

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 28-133	REF	UUC	ERR		
STD dB	(dB)	(dB)	(dB)		
140.00	140	139.9	-0.1	0.30	1.1
139.00	139	139.0	0.0		1.1
134.00	134	134.0	0.0		1.1
129.00	129	129.0	0.0		1.1
124.00	124	124.0	0.0		1.1
119.00	119	119.0	0.0		1.1
114.00	114	114.0	0.0		1.1
109.00	109	109.0	0.0		1.1
104.00	104	104.0	0.0		1.1
99.00	99	99.0	0.0		1.1
94.00	94	94.0	0.0		1.1
89.00	89	89.0	0.0		1.1
84.00	84	84.0	0.0		1.1
79.00	79	79.0	0.0		1.1
74.00	74	74.0	0.0		1.1
69.00	69	69.0	0.0		1.1
64.00	64	64.0	0.0		1.1
59.00	59	59.0	0.0		1.1
54.00	54	54.0	0.0		1.1
49.00	49	49.0	0.0		1.1
44.00	44	43.9	-0.1		1.1
43.00	43	42.9	-0.1		1.1
42.00	42	41.8	-0.2		1.1
41.00	41	40.8	-0.2		1.1
40.00	40	39.7	-0.3		1.1

Certificate No : 24-SLM-182
Request No : Req-2024-1108

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A	REF	UUC	ERR		
UUC Range	(dB)	(dB)	(dB)		
28-133	45.10	45.1	0.0	0.30	1.1
	114	114.0	0.0		1.1

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
A / 28-133	Toneburst	Ref	UUC	ERR		
UUC Time Response	(ms)	(dB)	(dB)	(dB)		
Fast	200	129.0	129.1	+0.1	0.20	1.0
	2	112.0	111.9	-0.1		+1.0, -2.5
	0.25	103.0	102.8	-0.2		+1.5, -5.0
Slow	200	122.6	122.7	+0.1		1.0
	2	103.0	103.1	+0.1		+1.0, -5.0
SEL	200	123.0	123.2	+0.2		1.0
	2	103.0	103.2	+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 (± dB)	Acceptance Limit (± dB)
FAST / C / 28-133	REF	UUC	ERR		
STD Setting	(dB)	(dB)	(dB)		
Complete cycle	128.4	128.2	-0.20	0.20	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 : 24-SLM-182
Request No : Req-2024-1108

12. Overload indication

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 28-133	UUC		
STD Setting	(dB)		
Positive one-half cycle	142.0		
Negative one-half cycle	142.5		
Deviated	-0.5	0.20	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 28-133	UUC		
STD Setting	(dB)		
Initial	132.0		
Final	132.0		
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 1kHz	0.20 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:7/11/23

Certificate of Calibration

Customer

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

Certificate No : 23-ACT-171
Request No : Req-2023-2415

Unit Under Calibration Details

Measurement item : Acoustic Calibrator Class : I
Manufacturer : TENMARS Range : 94 , 114 dB / 1000 Hz
Model : ST-120 Instrument Status : Used
Serial Number : 211203780
ID : ENSL 22191

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	58079	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

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-ACT-02 Rev.01 Issue date:8/8/23



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

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-ACT-02 Rev.01 Issue date 8/8/23



CNSL 22/11/23

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, 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 : Acoustic Calibrator

Manufacturer : Criffer

Model : CR2 Plus

Serial No. : 37001125

Ambient Environment

Temperature : (23 ± 3) °C

Relative Humidity : (50 ± 15) %

Ambient Pressure : (101.325 ± 1.500) 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 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 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.BLMTC.002 Rev.4

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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°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	± 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

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FM.BLMTC.002 Rev.4

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Fax. (66) 0 2579 8592
E-mail : sumalee@tistr.or.th

Request No. 21-67/0017

MTC No. EEL. BP. 54/1066

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	113.93	-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	3.89	± 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.

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 : 2011266101004024001

End of Certificate

3 / 3

The results relate only to the items tested/calibrated or value assigned.

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FM.BLMTC.002 Rev.4

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Fax. (66) 0 2579 8592
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Certificate of Calibration

Customer

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

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

Unit Under Calibration Details

Measurement item : Acoustic Calibrator Class : 2
Manufacturer : CASELLA Range : 114 dB / 1000 Hz
Model : CEL-120/2 Instrument Status : Used
Serial Number : 3864875
ID : ENSL 17150

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	EEI	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 : 26 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 IEC60942:2017 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 Nanglinchee Road, Chongnonsi, Yannawa Bangkok 10120

Certificate No : 23-SLM-307
Request No : Req-2023-1891

Unit Under Calibration Details

Measurement item : Sound Level Meter
Manufacturer : SCARLET
Model : ST-21D
Serial Number : 820714
ID : ENSL 22185
Resolution : 0.1 dB
Microphone Class : 2
Microphone Model : AWA14421
Microphone S/N : A-000220
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 : 4 September 2023
Calibrated Date : 18 September 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
Multifrequency Calibrator	Quest	Quest-cal	EFA000234	25 July 2024	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 : 18 September 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 01/07/19

Certificate No : 23-SLM-307
Request No : Req-2023-1891

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	93.95	92.3	-1.65	94.0	+0.05	0.2	0.3

Note : Absolute sensitivity was established by the use of Sound Calibrator Brand Cirrus, Model CR:515, SN. 88350

2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY (± dB)
FAST / 28-133		
UUC Weighting	(dB)	(± dB)
A	24.8	0.1

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

UUC Setting	Measured	UNCERTAINTY (± dB)
FAST / 28-133		
UUC Weighting	(dB)	(± dB)
A	24.4	0.1
C	25.5	0.1
Z	30.7	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	C	Z		
FAST / 28-133	(dB)	(dB)	(dB)		
STD Setting	(dB)	(dB)	(dB)		
125 Hz	0.1	0.1	0.2	0.6	2.0
1000 Hz	0.0	0.0	0.0	0.6	1.0
4000 Hz	-0.1	-0.1	-0.2	0.6	3.0
8000 Hz	-0.3	-0.4	-0.1	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-708-SLM-01 Rev.0 Issue date 01/07/19

Certificate No : 23-SLM-307
 Request No : Req-2023-1891

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 Response 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	-0.1		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 (± dB)	Acceptance Limit (± 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 (± dB)	Acceptance Limit (± 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-307
 Request No : Req-2023-1891

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FAST / A / 28-133	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 (± dB)	Acceptance Limit (± dB)
FAST / A / 28-133	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	129.0	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	109.1	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	89.1	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	64.2	0.2		
59.00	59	59.2	0.2		
54.00	54	54.1	0.1		
49.00	49	49.1	0.1		
44.00	44	44.2	0.2		
39.00	39	38.7	-0.3		
38.00	38	37.8	-0.2		

Certificate No : 23-SLM-307
 Request No : Req-2023-1891

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	42.9	43.1	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 / 28-133	Toneburst	Ref	UUC	ERR	(\pm dB)	Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)		(\pm dB)
Fast	200	129.0	129.0	0.0	0.2	1
	2	112.0	111.7	-0.3		+1.0, -2.5
	0.25	103.0	102.7	-0.3		+1.5, -5.0
Slow	200	122.6	122.7	+0.1		1
	2	103.0	103.0	0.0		+1.0, -5.0
SEL	200	123.0	123.1	+0.1		1
	2	103.0	103.1	+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	Acceptance
FAST / C / 28-133	REF	UUC	ERR	(\pm dB)	Limit
STD Setting	(dB)	(dB)	(dB)		(\pm dB)
Complete cycle	128.4	128.0	-0.40	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-307
 Request No : Req-2023-1891

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	140.3		
Negative one-half cycle	140.7		
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	132.0		
Final	132.0		
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 Nanglinchee Road, Chongnonsi, Yannawa Bangkok Request No : Req-2023-2415
10120

Unit Under Calibration Details

Measurement item : Acoustic Calibrator Class : 1
Manufacturer : TENMARS Range : 94 , 114 dB / 1000 Hz
Model : ST-120 Instrument Status : Used
Serial Number : 211203780
ID : ENSL 22191

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	58079	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 IEC 60942:2017 Class 1

- The calibration results exclude the calibrator pressure correction

- The calibration results exclude the microphone volume correction

End of Calibration



ENSL 22195

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0017

MTC No. EEL. BP. 61/1066

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. : 32005864

Ambient Environment

Temperature : $(23 \pm 3) ^\circ\text{C}$ Relative Humidity : $(50 \pm 15) \%$ Ambient Pressure : $(101.325 \pm 1.5) \text{ kPa}$

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

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. 61/1066

Acoustic signal test of frequency weightings

Frequency (Hz)	Deviation from response curve		Uncertainty ($\pm\text{dB}$)	Tolerance Limits Class 2 ($\pm\text{dB}$)
	A-weighting (dB)	C-weighting (dB)		
125	0.6	0.2	0.25	2.0
1 000	0.4	0.4	0.25	1.4
4 000	3.2	3.2	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 : 2011266101004024008

Date of Calibration : 17 Oct. 2023

Date of Issue : 18 Oct. 2023

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End of Certificate

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ENSL 22 19.6

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., 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. : 32006987

Ambient Environment

Temperature : $(23 \pm 3) ^\circ\text{C}$ Relative Humidity : $(50 \pm 15) \%$ Ambient Pressure : $(101.325 \pm 1.5) \text{ kPa}$

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

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. 57/1066

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	0.3	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 :

Director
Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Ref : 2011266101004024004

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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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0576

MTC No. EEL. BP. 5/0766

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 : Sound2plus

Serial No. : 32007214

Ambient Environment

Temperature : (23 ± 3) °C

Relative Humidity : (50 ± 15) %

Ambient Pressure : (101.325 ± 1.5) kPa

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 : 5 Jul. 2023

Date of Calibration : 12 Jul. 2023

1/2

The results relate only to the items tested/calibrated or value assigned.

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FM.BLMTC.002 Rev.4

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-66/0576

MTC No. EEL. BP. 5/0766

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	0.5	-0.1	0.25	2.0
1 000	0.1	0.3	0.25	1.4
4 000	1.8	2.0	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 :

.....

.....

Director

Electrical and Electronic Standards Laboratory
Industrial Metrology and Testing Service Centre

Ref : 2011266070502617001

Date of Calibration : 12 Jul. 2023

Date of Issue : 13 Jul. 2023

2 / 2

End of Certificate

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.BLMTC.002 Rev.4

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ENSL 22700

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-67/0017

MTC No. EEL. BP. 62/1066

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. : 32008016

Ambient Environment

Temperature : $(23 \pm 3) ^\circ\text{C}$ Relative Humidity : $(50 \pm 15) \%$ Ambient Pressure : $(101.325 \pm 1.5) \text{ kPa}$

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

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. 62/1066

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	-0.9	0.25	2.0
1 000	-0.5	-0.5	0.25	1.4
4 000	1.7	1.7	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 : 2011266101004024009

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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FM.BL.MTC.002 Rev.4

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ENSL22901

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., 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. : 32008075

Ambient EnvironmentTemperature : $(23 \pm 3) ^\circ\text{C}$ Relative Humidity : $(50 \pm 15) \%$ Ambient Pressure : $(101.325 \pm 1.5) \text{ kPa}$ **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

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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. 63/1066

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	0.6	0.1	0.25	2.0
1 000	0.5	0.5	0.25	1.4
4 000	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 :



Director

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

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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Calibration Certificate

Certificate number: CRV4844/2022

Date of calibration: 01/11/2022

Issue date: 08/11/2022

CUSTOMER:

Name: SGS (THAILAND) CO., LTD.

Address: 100 NANGLINCHEE ROAD, CHONGNONSEE, YANNAWA 10120 BANGKOK THAILAND.

INSTRUMENT IDENTIFICATION:

Instrument type: Noise Dosimeter

Manufacturer: Criffer

Model: Sonus 2 Plus

Serial Number: 32007009

CALIBRATION PROCEDURE: PC EAC01 – Rev.: 01

METHOD(S): Direct comparison with the reference standard.

CALIBRATED IN COMPLIANCE TO: IEC 61252:2002 Specifications for personal sound exposure meters. Geneva, Switzerland.

REFERENCE STANDARDS:

- Stanford Research - DS-360 - Calibration certificate n° E1363/2021 from labelo - Valid until 08/2024
- GRAS - 42AG - Calibration certificate n° CBR2100585 e CBR2100586 from Spectris - Valid until 08/2023
- Testo - Testo 622 - Calibration certificate n° T0648/2020 from Labelo - Valid until 05/2023

ENVIRONMENT CONDITIONS:

Temperature: 23,0 °C ± 3,0 °C

Humidity: 70 % ± 25 %

Atmospheric pressure: 101,32 kPa ± 10 %

NOTES:

- The results of the calibration are contained in the attached tables, which relate the values indicated by the instrument under test. The measured values are obtained from the comparison with the reference standards and estimated uncertainties of the measurement.
- The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ providing a level of confidence of approximately 95 %, in accordance with the t-Student probability distribution, with effective degrees of freedom.
- The standard calibration uncertainty was determined according to the “guide for expression of measurement uncertainty”.
- This calibration does not replace or exempt minimal care from metrological control.
- This certificate refers exclusively to the calibrated item, and does not extend to any batch.
- The certificate must not be reproduced in whole or in part without prior authorization.
- Services performed at the calibration laboratory of CrifferLab, located at Avenida Theodomiro Porto da Fonseca, 3101, Unit 6, room 203, Cristo Rei, São Leopoldo - RS, with calibration standards, calibrated in accredited laboratories by the Brazilian Calibration Network (RBC / INMETRO), in accordance with the requirements of NBR-17025.
- This calibration certificate meets the requirements of ABNT NBR ISO IEC 17025.



Calibration Certificate

Certificate number: CRV4844/2022

Date of calibration: 01/11/2022

Issue date: 08/11/2022

Results:

Table 1 : Linearity of response to steady signals

Nominal Levels	Measured Level	Deviation Measured	Tolerance +/-	Minimum Limit	Maximum Limit	Coverage Factor	Expanded Uncertainty
dB	dB	dB	dB	dB	dB	k	(dB)
130	130	0	1	128,7	131,3	2	0,3
120	120	0	1	118,7	121,3	2	0,3
110	110	0	1	108,7	111,3	2	0,3
100	100	0	1	98,7	101,3	2	0,3
90	90	0	1	88,7	91,3	2	0,3
80	80	0	1	78,7	81,3	2	0,3
65	65	0	1	63,7	66,3	2	0,3

Table 2: Time weighting response test

Frequency	Expected Level	Measured Level	Calculated Deviation	-Tol - U	Tol + U	Coverage Factor	Expanded Uncertainty
Hz	dB	dB	dB	dB	dB	k	(dB)
63,1	98,7	98,8	± 2	96,5	101,1	2	0,3
125,89	108,9	108,9	± 1,5	107,1	110,7	2	0,3
251,19	116,4	116,3	± 1,5	114,6	118,2	2	0,3
501,19	121,8	121,7	± 1,5	120	123,6	2	0,3
1000	125	125	± 1,5	123,2	126,8	2	0,3
1995,26	126,2	126,1	± 2	123,9	128,5	2	0,3
3981,07	126	125,8	± 3	122,7	129,3	2	0,3
7943,28	123,8	123	± 5	118,6	129,2	2	0,3



Calibration Certificate

Certificate number: CRV4844/2022

Date of calibration: 01/11/2022

Issue date: 08/11/2022

Table 3: Response to short-duration signals.

Duration of Pulse	Pulse Ratio	Amplitude of Pulse	Measurement Time	Expected Dose	Measured Dose	Minimum Dose	Maximum Dose	Coverage Factor	Expanded Uncertainty
ms	-	dB	s	%	%	%	%	k	%
10	1:100	120	948,7	19,1	18,9	15,3	22,5	2	0,96
1	1:1000	130	948,7	19	18,6	15,3	22,5	2	0,95
1	1:1000	135	300	12	11,9	9,1	15,2	2	0,60
10	1:1000	135	300	4,9	4,9	3	5,2	2	0,25

Table 4: Response to unipolar pulses

Duration of Pulse	Pulse Ratio	Amplitude of Pulse	Measurement Time	Expected Dose	Measured Dose	Minimum Dose	Maximum Dose	Coverage Factor	Expanded Uncertainty
s	dB	ms	-	%	%	%	%	k	%
29	125	0,5	1:10	6,7	6,7	5,2	7,9	2	0,4

Calibration Certificate

Certificate number: CRV4844/2022

Date of calibration: 01/11/2022

Issue date: 08/11/2022

Attenuation for Octave-Band vs Center Frequency

One-third-octave-band					
Frequency (Hz)	Reference Level (dB)	Measured Level (dB)	Absolut Deviation (dB)	Total Deviation (dB)	Uncertainty of measurement (dB)
62,500	124,0	124,0	0	0,5	0,5
78,745	124,0	123,2	0,8	0,9	0,5
99,213	124,0	122,7	1,3	1,4	0,5
125,000	124,0	123,5	0,5	0,7	0,5
157,490	124,0	123,6	0,4	0,6	0,5
198,425	124,0	123,8	0,2	0,5	0,5
250,000	124,0	123,5	0,5	0,7	0,5
314,980	124,0	123,6	0,4	0,6	0,5
396,850	124,0	123,7	0,3	0,6	0,5
500,000	124,0	124,0	0,0	0,5	0,5
629,961	124,0	124,0	0	0,5	0,5
793,701	124,0	124,0	0,0	0,5	0,5
1000,000	124,0	124,0	0	0,5	0,5
1259,920	124,0	123,9	0,1	0,5	0,5
1587,400	124,0	124,0	0	0,5	0,5
2000,000	124,0	124,0	0,0	0,5	0,5
2519,840	124,0	124,0	0	0,5	0,5
3174,800	124,0	124,0	0,0	0,5	0,5
4000,000	124,0	124,0	0	0,5	0,5
5039,680	124,0	124,0	0,0	0,5	0,5
6349,600	124,0	123,9	0,1	0,5	0,5

*Instrument configured to linear frequency weighting and "fast" time weighting.

Calibration Certificate

Certificate number: CRV4844/2022

Date of calibration: 01/11/2022

Issue date: 08/11/2022

Attenuation for Octave-Band vs Center Frequency					
Octave-bands					
Frequency (Hz)	Reference Level (dB)	Measured Level (dB)	Absolut Deviation (dB)	Total Deviation (dB)	Uncertainty of measurement (dB)
62,500	124,0	123,9	0,1	0,5	0,5
125,000	124,0	123,9	0,1	0,5	0,5
250,000	124,0	123,9	0,1	0,5	0,5
500,000	124,0	123,9	0,1	0,5	0,5
1000,000	124,0	124,0	0,0	0,5	0,5
2000,000	124,0	124,0	0,0	0,5	0,5
4000,000	124,0	123,9	0,1	0,5	0,5
8000,000	124,0	123,9	0,1	0,5	0,5

**Instrument configured to linear frequency weighting and "Fast" time weighting.*



Authorized Signatory

คุณภาพอากาศในสถานที่ทำงาน



MIRACLE INTERNATIONAL TECHNOLOGY CO.,LTD

214 Bangwaek Rd. Bangpai Bangkoe Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 http://www.mit.in.th



CALIBRATION CERTIFICATE

Certificate No. : L202402217-0001

Date Issued : 04-Mar-24

Customer : SGS (Thailand) Limited
100 Nanglinchee 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 : 20-Feb-24

Date Calibrated : 01-Mar-24

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.

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.

Approved by



Page 1 of 3

Certificate No. : L202402217-0001

Note : The actual flow rate is determined by the equation :

; Q = Flow rate

; P = Absolute pressure

; T = Absolute temperature

; Subscript "Meas" = Measurement condition

; Subscript "Ref" = Reference condition

$$Q_{Meas} = Q_{Ref} \times \frac{P_{Ref}}{P_{Meas}} \times \frac{T_{Meas}}{T_{Ref}}$$

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

MIT Calibration Certificate No. L202210258-007 for Mass Flow Calibrator (200 SCCM) Serial No. 96093001W, Due 07-Nov-24

MIT Calibration Certificate No. L202309114-0011 for Mass Flow Calibrator (2000 SCCM) Serial No. 96093001W, Due 10-Sep-24

End of Certificate

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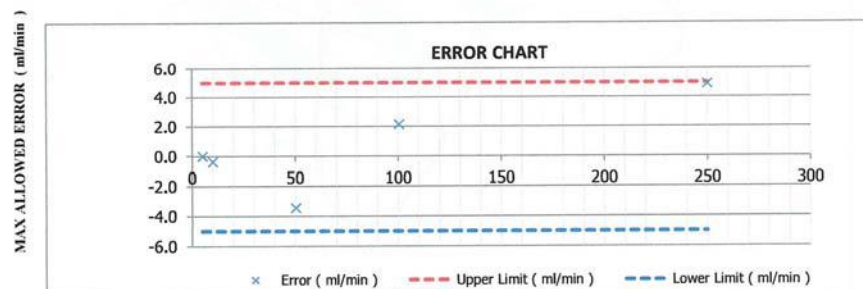
Certificate No. : L202402217-0001

Environment : Ambient temperature : (23 \pm 2) °C
Relative humidity : (50 \pm 15) % RH
Capacity Range : 500 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)
23.46	101.13	5.0737	5.079	-0.0053	0.18
23.22	101.08	10.006	10.385	-0.379	0.18
23.19	101.19	50.243	53.69	-3.447	1.7
23.31	101.32	100.39	98.24	2.15	1.4
23.41	101.11	250.01	245.1	4.91	2.6

Error = Unit Under Calibration - Standard



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CALIBRATION CERTIFICATE

Certificate No. : L202402217-0002

Date Issued : 04-Mar-24

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

Equipment : DryCal

Manufacturer : MESA LABS

Model : DEFENDER 530-L

Serial No. : 137758

ID No./Tag No. : ENWP 15147

Date Received : 20-Feb-24

Date Calibrated : 01-Mar-24

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.

This certificate may not be reproduced other than in full except with the prior written approval of the Miracle International Technology Company Limited.

Approved by



Page 1 of 3

Certificate No. : L202402217-0002

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 measurment results and statements of conformity with specification only relate to the item calibrated.

Traceability of Certificate :

The International System of Units (SI) through

MIT Calibration Certificate No. L202210258-007 for Mass Flow Calibrator (200 SCCM) Serial No. 96093001W, Due 07-Nov-24

MIT Calibration Certificate No. L202309114-0011 for Mass Flow Calibrator (2000 SCCM) Serial No. 96093001W, Due 10-Sep-24

End of Certificate

Certificate No. : L202402217-0002

Environment : Ambient temperature : (23 ± 2) °C
Relative humidity : (50 ± 15) % RH

Capacity Range : 500 ml/min

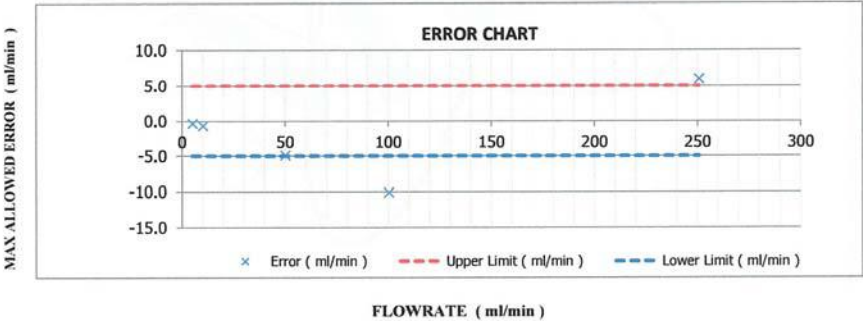
Calibration Media : Air

Type : Mass Flowmeter

Unit Under Calibration Reference Condition : At atmospheric pressure and room temperature condition

Temperature	Pressure	UUC Reading	STD Reading	Error	Uncertainty
(° C)	(kPa)	(ml/min)	(ml/min)	(ml/min)	(± ml/min)
23.37	101.02	5.1125	5.431	-0.3185	0.19
23.24	101.04	10.117	10.749	-0.632	0.18
23.17	101.14	50.153	55.04	-4.887	0.77
23.28	101.28	100.32	110.42	-10.10	0.91
23.19	101.08	250.78	244.8	5.98	2.6

Error = Unit Under Calibration - Standard



6850 and 6890 GC
Preventive Maintenance Checklist – Standard



Agilent Preventive Maintenance provides factory recommended service for your analytical systems to assure reliable operation and the accuracy of your results. Delivered by highly-trained and certified service engineers using genuine Agilent parts and supplies, Agilent Preventive Maintenance provides everything you need to reduce unplanned downtime and keep your systems operating at their peak.

For more information about Agilent Technologies services please visit our web site using the following URL <http://www.chem.agilent.com/en-us/products/services/pages/default.aspx>

Customer Information

- Customers should provide all necessary operating supplies upon request of the engineer.
- A customer representative should be available to the engineer while performing the preventive maintenance procedures.
- Any parts, not included in the Parts Lists section of this document, are not part of the recommended Preventive Maintenance service, nor are they included in the price of this service.
- If a system requires the use of additional or special procedures and/or parts for the instrument service, then these must be ordered separately and charged as a repair, which may incur additional costs.

Service Engineer's Responsibilities

- Only complete/printout pages that relate to the system or module being serviced.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using a "X" or tick mark "✓" in the checkbox.
- Complete Not Applicable check boxes to indicate services not delivered, as needed.
- Complete the PM service in the order of the tasks listed.
- Complete the Service Review section together with the customer.

Additional Instruction Notes

- Check for any active service notes for this unit. If there are any applicable "Safety" or "Modification Recommended" Service notes, plan to implement the changes on this unit before doing any qualification service. Do not implement firmware updates, unless you get approval from the customer and are sure that they are compatible with the instrument control software.

6850 and 6890 GC
Preventive Maintenance Checklist – Standard



System Information

Guidance

- ☐ Check this box if an instrument configuration report is attached instead of completing the table.

Instrument system name and ID	CN10305014
Instrument system site and location	Laboratory
List system component product numbers	List the serial numbers of each component
1. G1530N	1. CN10305014
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.
8.	8.
9.	9.
10.	10.

Preparation

- ✓ Discuss any specific issues with the customer prior to starting.
- ✓ Review the instrument logbook.
- ✓ Save instrument control settings before starting the procedure.
- ✓ Perform general inspection of system for cleanliness
- ✓ Check for proper installation of safety-related parts, assemblies , sensors etc
- ✓ Check for required firmware updates and verify with customers if they would like it installed.
- ☐ Before starting the following procedures, record the Detector Signal Output(s) in the results table. If the GC is turned OFF or in a service mode, comparing the detector outputs before and after the service is not possible.

6850 and 6890 GC
Preventive Maintenance Checklist – Standard



Clean and inspect GC

- ☒ Unplug power cord from the power source.
- ☒ Open GC covers and vacuum/remove any dust/debris. Pay particular attention to cooling fans.
- ☒ Inspect internal connectors for proper contact and placement.
- ☒ Reconnect Power to the GC. Power the GC on and verify the power on self-test passed.
- ☒ Verify oven motor spins freely and turns on with the oven door closed; off when the door is opened.
- ☒ Verify operation of all other fans - the inlet and EPC cooling fans.
- ☒ Verify oven intake/outlet flap assembly is operating smoothly while heating and cooling the oven

Inlet and detector consumable replacement

- ☒ For the inlets installed, perform inlet maintenance as defined in the 6850 or 6890 manual – “Maintaining Your GC” - for the inlet(s) installed.
- ☒ Replace the split vent trap on units with these inlets: Split/Splitless Capillary (SSL), Programmable Temperature Vaporization (PTV), Volatiles Interface (VI).
- ☐ If the GC includes a Flame Ionization Detector (FID), replace the jet. If the ignitor shows any build up of sample or corrosion, replace the ignitor. Examine the FID collector and castle assemblies for contamination – clean as necessary.

Zero Sensors and Leak test

- ☒ Zero all pressure sensors per the procedure in the 6890 Service Manual.
- ☒ Perform inlet pressure decay tests(s) as defined in the 6890 Service Manual. If the PM is done in preparation for an OQ/PV, then the pressure decay test defined within that protocol can be used for the PM.
- ☒ Record if test passed or failed in the results table.

ALS Maintenance

- ☒ **Section NOT applicable**
- ☐ Check all cabling and configuration settings between GC, tray, and injectors.
- ☐ Vacuum or removed any dust, especially around fans.
- ☐ Check operation of all fans.
- ☐ Check syringe for smooth plunger operation.
- ☐ Check for smooth operation of the needle support rod – clean if necessary
- ☐ Check for correct operation of syringe volume stops.

6850 and 6890 GC
Preventive Maintenance Checklist – Standard



Restore Instrument

- ☒ Restore the normal operating conditions using the Keyboard or Data System.
- ☒ Check and record detector offset. Results should be similar to offset test conducted prior to PM.
- ☐ Perform a chemical checkout. If this is a routine PM, inject the customer's sample using the ALS if applicable. This will act as a final checkout of both the ALS and the GC.

Guidance

If the PM service is performed prior to a qualification service, then use the qualification procedure as a guide for final instrument set up and checkout.

**6850 and 6890 GC
Preventive Maintenance Checklist – Standard**



Service Review

- ☒ Attach available reports/printouts of all tests to this documentation.
- ☒ Record the PM service activity in the customer's instrument records/logbook
- ☒ Update/reset instrument maintenance counters as appropriate
- ☒ Affix the PM sticker to the system or instrument logbook based on the customer's request.
- ☒ Complete the Service Review Comments section below if there are additional comments
- ☒ Review the service and any test results with the customer.
- ☐ If the Instrument firmware was updated, record the details of the change in the Service Engineer's Comments box below or if necessary, in the customer's IQ records.

6850 and 6890 GC Test Results Table

Signal Output test	Before PM service	After PM service
Front detector output		
Back detector output (6890 Only)		
Pressure decay test	Expected result	Actual result or N/A
Front inlet pressure decay test	Pass	Pass
Back inlet pressure decay test (6890 Only)	Pass	Pass

6890 and 6850 GC Parts List Table

The following kits are recommended for capillary and purged packed inlets. If this is a general PM and the customer has a preferred set of consumables, you may use the customer's consumables.

Part Description	Part Number	Model# where used	Quantity Consumed
SSL Capillary Inlet PM kit, splitless	5188-6497	G1530/G1540/G2630	1
SSL Capillary Inlet PM kit, split	5188-6496	G1530/G1540/G2630	1
Larger O.D. Liner O-Rings for SS Flip Top - 10/pkg.	5188-5366	G1530/G1540/G2630	
PP Inlet PM kit	5188-6498	G1530/G1540/G2630	
Split vent trap PM kit, single cartridge (for PTV & VI)	5188-6495	G1530/G1540/G2630	
Ignitor (glow plug) assembly with O-ring	19231-60680	G1530/G1540/G2630	
.011-inch Jet for capillary FID base	G1531-80560*	G1530/G1540/G2630	
.018-inch Jet for packed column with packed FID base	18710-20119*	G1530/G1540/G2630	
.011-inch Jet for capillary column with packed FID base	19244-80560*	G1530/G1540/G2630	

**6850 and 6890 GC
Preventive Maintenance Checklist – Standard**



* The jets (G1531-80560, 18710-20119 and 19244-80560) are recommended for 6850/6890 PM. Please refer to the service note "COLUMNS/SUPPLIES-197A" for detailed information.

Service Engineer Comments (optional)

If there are any specific points you wish to note as part of performing the service or other items of interest for the customer, please write in this box.

Other Important Customer Web Links

- ☐ How to get information on your product: Literature Library - <http://www.agilent.com/chem/library>
- ☐ Need to know more? - www.agilent.com/chem/education
- ☐ Need technical support, FAQs? - www.agilent.com/chem/techsupp
- ☐ Need supplies? - www.agilent.com/chem/supplies

Service Completion

Service request number 6007017096 Date service completed 26 June 2024

Agilent signature  Customer signature _____

Document part number: G2630-90130