

ภาคผนวก ง

สำเนาใบรับรองการสอบเทียบเครื่องมือ

ห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์ Blue Consultant Limited Partnership

32/751 ถนนประชาอุทิศ แขวงทุ่งครุ เขตทุ่งครุ กรุงเทพมหานคร 10140

โทร.0-2873-6045-6 โทรสาร 0-2873-6046

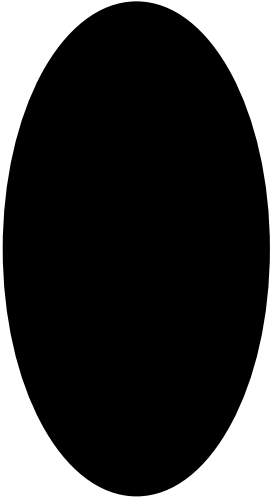
ห้องปฏิบัติการวิเคราะห์ออกซิเจนในอนุภาคลงวันที่ 14 สิงหาคม 2563

CALIBRATION REPORT

Equipment : NOx Analyzer Brand/Model: API/200A, Teledyne-API/T200, Thermo/17C
Serial No. : 875, 99, 17C-68152-359 Date of Calibrate : March 31, 2022

Reference Standard Cylinder No.: EB0128767
Certification Date: October 29, 2019 Expiry Date: October 29, 2027
Component: SO2: 55.62 ppm, NO: 57.21 ppm, CO : 4.551 ppm

Calibration Check (Before adjust)					
Serial No.	Zero		Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Drift (ppb)
875	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx
99	-1.5/-0.5/-2.0	0/0/0	-1.5/-0.5/-2.0	398.1/3.2/401.3	-1.9/3.2/1.3
17C-68152-359	4.7/2.3/7.0	0/0/0	4.7/2.3/7.0	395.8/4.3/400.1	-4.2/4.3/0.1
	3.9/1.5/5.4	0/0/0	3.9/1.5/5.4	401.6/4.4/406.0	1.6/4.4/6.0
Calibration Check (After adjust)					
Serial No.	Zero		Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Drift (ppb)
875	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx	NO/NO2/NOx
99	0/0/0	0/0/0	0/0/0	400/0/400	0/0/0
17C-68152-359	0/0/0	0/0/0	0/0/0	400/0/400	0/0/0



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โทร.0-2873-6045-6 โทรสาร 0-2873-6046

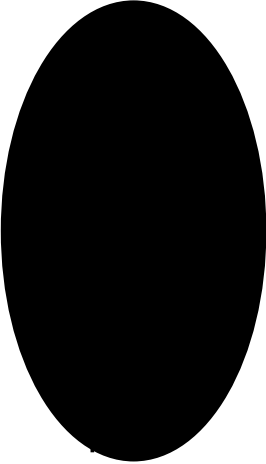
ห้องปฏิบัติการวิเคราะห์ออกซิเจนในอนุภาคลงวันที่ 14 สิงหาคม 2563

CALIBRATION REPORT

Equipment : CO Analyzer Brand/Model: API/300, Sablo/6050
Serial No.: 1069, 1119, 20300719 Date of Calibrate : March 31, 2022

Reference Standard Cylinder No.: EB0128767
Certification Date: October 29, 2019 Expiry Date: October 29, 2027
Component: SO2: 55.62 ppm, NO: 57.21 ppm, CO : 4.551 ppm

Calibration Check (Before adjust)					
Serial No.	Zero		Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (ppm)	Reading Value (ppm)	Drift (ppm)
1069	0.3	0	0.3	40.3	40
1119	0.2	0	0.2	39.6	40
20300719	0.3	0	0.3	40.1	40
Calibration Check (After adjust)					
Serial No.	Zero		Span		
	Reading Value (ppm)	Expected Value (ppm)	Drift (ppm)	Reading Value (ppm)	Drift (ppm)
1069	0	0	0	40	0
1119	0	0	0	40	0
20300719	0	0	0	40	0



3 Repeating of Dynamic Gas Dilutor Report

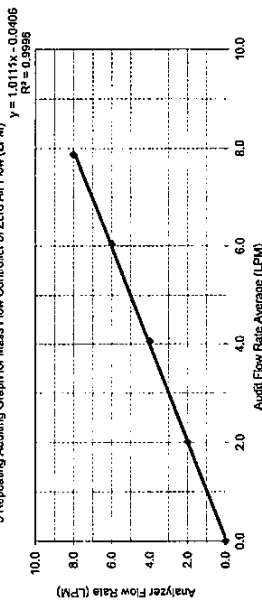
Instrument Brand SABIO Date May 05, 2021
Instrument Model 4010 Time 13:00-17:00
Instrument Serial No. 8500311 Calibrate by Winit K.

Max Range Unit Controlled Matter
10 LPM Air
100 CCPM Standard Gas

Result of Auditing (MFC of Zero Air)

POINT NO.	SETTING ANALYZER FLOW RATE (LPM)	AUDIT FLOW RATE			DIFFERENCE	
		1 (LPM)	2 (LPM)	3 (LPM)	AVERAGE (LPM)	PERCENT
ZERO	0.000	0.000	0.000	0.000	0.000	0.00
20%	2.000	2.012	2.015	2.013	2.013	0.66
40%	4.000	4.058	4.044	4.072	4.057	1.41
60%	6.000	6.038	6.027	6.042	6.035	0.58
80%	8.000	7.999	7.987	7.871	7.876	1.58
		AVERAGE DIFFERENCE (%)			RESULT	
		SLOPE = 1.0111			CORRELATION COEFFICIENT = 0.9998	
		% SLOPE = 1.1094%			% CORRELATION COEFFICIENT = -0.0191%	
		RESULT PASS			RESULT PASS	

3 Repeating Auditing Graph for Mass Flow Controller of Zero Air Flow (LPM)



Reference Standard Instrument

Instrument Model

Serial No.

Instrument Model

Serial No.

Reference Standard Instrument

Instrument Model

Serial No.

3 Repeating of Dynamic Gas Dilutor Report

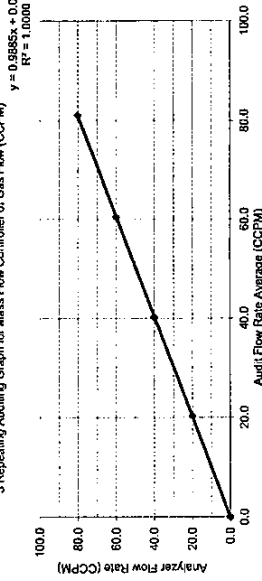
Instrument Brand SABIO Date May 05, 2021
Instrument Model 4010 Time 13:00-17:00
Instrument Serial No. 8500311 Calibrate by Winit K.

Max Range Unit Controlled Matter
10 LPM Air
100 CCPM Standard Gas

Result of Auditing (MFC of Gas)

POINT NO.	SETTING ANALYZER FLOW RATE (CCPM)	AUDIT FLOW RATE			DIFFERENCE	
		1 (CCPM)	2 (CCPM)	3 (CCPM)	AVERAGE (CCPM)	PERCENT
ZERO	0.000	0.000	0.000	0.000	0.000	0.00
20%	20.000	20.314	20.332	20.353	20.333	1.64
40%	40.000	40.219	40.237	40.242	40.233	0.58
60%	60.000	60.485	60.446	60.464	60.465	0.77
80%	80.000	81.076	81.101	81.095	81.091	1.34
		AVERAGE DIFFERENCE (%)			RESULT	
		SLOPE = 0.9885			CORRELATION COEFFICIENT = 1.0000	
		% SLOPE = -1.1467%			% CORRELATION COEFFICIENT = -0.0017%	
		RESULT PASS			RESULT PASS	

3 Repeating Auditing Graph for Mass Flow Controller of Gas Flow (CCPM)



Reference Standard Instrument

Instrument Model

Serial No.

Instrument Model

Serial No.

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04N98E80A0041
Cylinder Number: 124 - Plumsteadville - PA
PGVP Number: A12019
Gas Code: CO,NO,NOX,SO2,BALN
Reference Number: 180-401658125-1
Cylinder Volume: 83.4 CF
Valve Pressure: 2215 PSIG
Valve Outlet: 660
Certification Date: Dec 12, 2019
Expiration Date: Dec 12, 2022

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

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

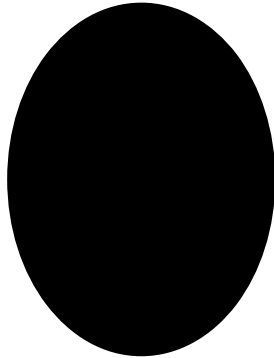
ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
NOX	45.00 PPM	44.57 PPM	G1	+/- 0.9% NIST Traceable
NITRIC OXIDE	45.00 PPM	44.57 PPM	G1	+/- 0.9% NIST Traceable
SULFUR DIOXIDE	45.00 PPM	45.33 PPM	G1	+/- 1.0% NIST Traceable
CARBON MONOXIDE	4500 PPM	4539 PPM	G1	+/- 0.8% NIST Traceable
NITROGEN	Balance			

CALIBRATION STANDARDS			
Type	Lot ID	Cylinder No	Expiration Date
NITRM	16060636	CC442637	50.42 PPM NITRIC OXIDE/NITROGEN
NITRM	16060636	CC442637	50.49 PPM NOX/NITROGEN
NITRM	04170911	KAL003197	49.67 PPM SULFUR DIOXIDE/NITROGEN
NITRM	10010804	KAL003088	49.67 PPM SULFUR DIOXIDE/NITROGEN
NITRM	08072318	KAL004620	4857 PPM CARBON MONOXIDE/NITROGEN

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
MKS FTIR - CO2 - 000928781	FTIR	Nov 08, 2019
MKS FTIR - NO - 000928781	FTIR	Dec 12, 2019
MKS FTIR - NOx - 000928781	FTIR	Dec 12, 2019
MKS FTIR - SO2 - 000928781	FTIR	Nov 27, 2019

Triad Data Available Upon Request

NOTES: Gross Weight: 17.9 Kg. Net Weight: 2.4 Kg. PO# 5219005460.

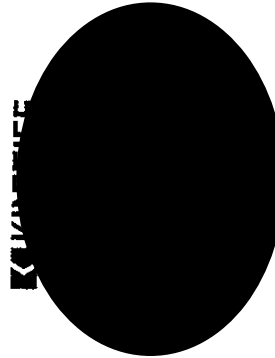


รายงานผลการวัดและเปรียบเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd
วันที่ : 7 กุมภาพันธ์ 2565
รายชื่ออุปกรณ์ / เครื่องมือ : SO₂ Analyzer
บริษัทผู้ผลิต : Teledyne API
หมายเลขอุปกรณ์ / เครื่องมือ : 6201

TEST VALUES			
API MODEL T100		BEFORE	AFTER
1	RANGE	50 - 20,000 PPB	500
2	STABILITY	≤ 1 PPB	0.02
3	PRESSURE	25 - 35 in - Hg-A	27.1
4	SAMPLE FLOW	650 ± 10% cc/min	708.0
5	PMT	mV	13.5
6	NORM PMT	mV	14.8
7	UV LAMP	1000 - 4800 mV	3967.0
8	LAMP RATIO	30 To 120 %	98.1
9	STRAY LIGHT	≤ 100 PPB	7.5
10	DARK PMT	-50 ± 200 % mV	1.9
11	DARK LAMP	-50 ± 200 % mV	3.0
12	SO2 SLOPE	1.0 ± 0.3	0.998
13	SO2 OFFSET	< 250 mV	0.068
14	HVPS	400 - 900 V	505
15	BOX CELL TEMP	50 ± 1 °C	50.0
16	BOX TEMP	AMBIENT ± 5 °C	34.4
17	PMT TEMP	7 ± 2 °C	8.4
18	SO2 SAMPLE READING	PPB	-1.115
19	OPTIC TEST	2000 ± 1000 mV	1866
20	ELECTRICAL TEST	2000 ± 1000 mV	1937.3
21	VOLTAGE TEST	+5 V +12 V +15 V -15 V	-
22	ZERO GAS	0.00 PPB	-1.436
23	SPAN GAS	400.00 PPB	418.243

หมายเหตุ





บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด
KINETICS CORPORATION LTD.

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ
ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd
วันที่ : 9 กุมภาพันธ์ 2565
รายชื่ออุปกรณ์ / เครื่องมือ : SO₂ Analyzer
รุ่นของอุปกรณ์ / เครื่องมือ : T100



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด
KINETICS CORPORATION LTD.

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ
ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd
วันที่ : 7 กุมภาพันธ์ 2565
รายชื่ออุปกรณ์ / เครื่องมือ : SO₂ Analyzer
รุ่นของอุปกรณ์ / เครื่องมือ : T100

TEST VALUES			
	API MODEL T100	BEFORE	AFTER
1	RANGE	50 - 20,000 PPB	500
2	STABILITY	≤ 1 PPB	0.0
3	PRESSURE	25 - 35 in - Hg-A	28.5
4	SAMPLE FLOW	650 ± 10% cc/min	623
5	PMT	mV	70.2
6	NORM PMT	mV	63.2
7	UV LAMP	1000 - 4900 mV	4135.2
8	LAMP RATIO	30 To 120 %	110.7
9	STRAY LIGHT	≤ 100 PPB	73.1
10	DARK PMT	-50 ± 200 % mV	47.5
11	DARK LAMP	-50 ± 200 % mV	4.6
12	SO2 SLOPE	1.0 ± 0.3	2.319
13	SO2 OFFSET	< 250 mV	63.1
14	HVPS	400 - 900 V	601
15	RX CELL TEMP	50 ± 1 °C	50.0
16	BOX TEMP	AMBIENT ± 5 °C	36.1
17	PMT TEMP	7 ± 2 °C	8.7
18	SO2 SAMPLE READING	PPB	0.1
19	OPTIC TEST	2000 ± 1000 mV	1123.8
20	ELECTRICAL TEST	2000 ± 1000 mV	1095.1
21	VOLTAGE TEST	+5 V +12 V -15 V	4.8 / 12.2 / 16.2 / -16.2
22	ZERO GAS	0.00 PPB	-55.8
23	SPAN GAS	400.00 PPB	1024.3

หมายเหตุ

- ทำการเปลี่ยน Sintered Filter 1 ชิ้น, O-ring 2 ชิ้น, Spring 1 ชิ้น
- ทำการเปลี่ยน เซลล์ CO, FILTER 330 NM 1 ชิ้น
- ทำการเปลี่ยน REBUILD KIT, PUMP 1 ชุด



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ : คุณพรชัย มาลีวนิช
เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทระเกษม เขตจตุจักร กรุงเทพฯ 10300 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : info@kinetics.co.th



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด
KINETICS CORPORATION LTD.

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ
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วันที่ : 7 กุมภาพันธ์ 2565
รายชื่ออุปกรณ์ / เครื่องมือ : SO₂ Analyzer
รุ่นของอุปกรณ์ / เครื่องมือ : T100

TEST VALUES			
	API MODEL T100	BEFORE	AFTER
1	RANGE	50 - 20,000 PPB	500
2	STABILITY	≤ 1 PPB	0.04
3	PRESSURE	25 - 35 in - Hg-A	27.3
4	SAMPLE FLOW	650 ± 10% cc/min	688.2
5	PMT	mV	12.8
6	NORM PMT	mV	16.2
7	UV LAMP	1000 - 4900 mV	3780
8	LAMP RATIO	30 To 120 %	93.5
9	STRAY LIGHT	≤ 100 PPB	7.4
10	DARK PMT	-50 ± 200 % mV	6.3
11	DARK LAMP	-50 ± 200 % mV	1.7
12	SO2 SLOPE	1.0 ± 0.3	0.993
13	SO2 OFFSET	< 250 mV	0.060
14	HVPS	400 - 900 V	511
15	RX CELL TEMP	50 ± 1 °C	50.0
16	BOX TEMP	AMBIENT ± 5 °C	35.7
17	PMT TEMP	7 ± 2 °C	8.3
18	SO2 SAMPLE READING	PPB	0.401
19	OPTIC TEST	2000 ± 1000 mV	2841.3
20	ELECTRICAL TEST	2000 ± 1000 mV	1992.3
21	VOLTAGE TEST	+5 V +12 V -15 V	-
22	ZERO GAS	0.00 PPB	0.253
23	SPAN GAS	400.00 PPB	412.846

หมายเหตุ



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ : คุณพรชัย มาลีวนิช
เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทระเกษม เขตจตุจักร กรุงเทพฯ 10300 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : info@kinetics.co.th



RECALIBRATION

DUE DATE:

January 24, 2023

Certificate of Calibration

ENV 012

Calibration Certification Information

Cal. Date:	January 24, 2022	Rootmeter S/N:	438320	Ta:	29.4 °K
Operator:	Jim Tisch			Pa:	741.17 mm Hg
Calibration Model #:	TE-5028A	Calibrator S/N:	1547		

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.2590	4.3	1.50
2	3	4	1	0.9730	7.2	2.50
3	5	6	1	0.8860	8.6	3.00
4	7	8	1	0.8180	10.1	3.50
5	9	10	1	0.6210	17.2	6.00

Data Tabulation

Vstd (m3)	Qstd (x-axis)	$\sqrt{\frac{Pa}{Pstd} \times \frac{Tstd}{Ta}}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\frac{\Delta H(Ta/Pa)}{\Delta H(Ta/Pstd)}}$ (y-axis)
0.9828	0.7806	1.2177	0.9942	0.7897	0.7714
0.9789	1.0061	1.5720	0.9903	1.0178	0.9958
0.9770	1.1027	1.7221	0.9884	1.1156	1.0909
0.9750	1.1920	1.8600	0.9864	1.2058	1.1783
0.9656	1.5548	2.4354	0.9768	1.5729	1.5427
QSTD	m=	1.57206		m=	0.98440
	b=	-0.01065	QA	b=	-0.00675
	r=	0.99999		r=	0.99999

Calculations

Vstd=ΔVol(Pa-AP)/Pstd(Tstd/Ta)	Va=ΔVol(Pa-AP)/Pa
Qstd=Vstd/ΔTime	Qa=Va/ΔTime
Qstd=1/m($\sqrt{\frac{Pa}{Pstd} \times \frac{Tstd}{Ta}}$)-b	Qa=1/m($\sqrt{\frac{\Delta H(Ta/Pa)}{\Delta H(Ta/Pstd)}}$)-b

Standard Conditions

Tstd:	298.15 °K
Pstd:	760 mm Hg
Key	
ΔH:	calibrator manometer reading (in H2O)
AP:	rootmeter manometer reading (mm Hg)
Ta:	actual absolute temperature (°K)
Pa:	actual barometric pressure (mm Hg)
b:	Intercept
m:	slope

RECALIBRATION

US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in Air, § 50.17, page 30.

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

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

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 : 4 March, 2022 Certification No. 038/22

Page : 1 of 6

Object : Precision Weather Station

Manufacturer : Davis Instruments

Type : Vanlago Pro 2 Model No. : 6152C

Mfg Code : Display AZ170619023 Transmitter : AZ170619023

Customer : SGS (Thailand) Limited.

100 Nanglinchee Road, Chongnonsi,

Yamnava, Bangkok 10120.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 760 mmHg

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 842 SIN 91563

: FLOK GAGE NO 1425 : Wind Anemometer Plotting Board

N.I.S.T. Test Reference Number (31/24146)

Ultrasonic Anemometer Model DA-650-31V (sensor IR 90A11)

Serial Number 110730029 (sensor 120628586)

JAPAN QUALITY ASSURANCE ORGANIZATION

STANDARD THERMOMETER : Theodore Friedrich : Dry No.839094 Wet No.839094

Standard Reference No.9188 : Test, type, range, and unit

STANDARD BAROMETER : Davis Instruments : Type PIB2000

Calibrated by : Mr. Watchara

Mechanical Engineer





THAI METEOROLOGICAL DEPARTMENT

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



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

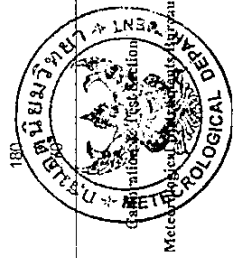
Certification No. 088/22

4 March, 2022

Page : 2 of 6

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H2O	Vacuum inches H2O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	0.4	0.60
3.02	-	-	-	2.7	0.37
5.00	-	-	-	4.5	0.50
7.00	-	-	-	6.7	0.30
9.02	-	-	-	8.5	0.57
11.01	-	-	-	10.7	0.31
13.01	-	-	-	13.0	0.01
15.01	-	-	-	14.8	0.21
17.02	-	-	-	17.0	0.02
20.02	-	-	-	19.3	0.72

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



1 March, 2022

Certification No. 088/22

Page : 3 of 6

The Result of Calibration

Standard Barometer Pressure	Tested Barometer Pressure	Correction
759.19	760.3	-1.11
758.63	759.7	-1.10
758.47	759.5	-1.12
758.35	759.5	1.15
758.08	759.2	-1.12
757.72	758.9	-1.18
757.35	758.7	-1.15
757.25	758.4	-1.15
757.07	758.2	1.13
756.92	758.1	-1.18
756.45	757.5	-1.05
756.28	757.4	-1.12
756.61	760.7	1.09
756.69	760.0	-1.11
756.75	760.3	1.14
756.52	760.5	-0.98
756.35	760.3	0.95
756.15	760.1	0.95
755.93	760.0	-1.01
755.90	759.9	-1.00

Average





The Result of Calibration

Certification No. 088/22

4 March, 2022

Page : 4 of 6

Standard Temp. °C	Temperature Sensor	
	Reading °C	Correction °C
45.4	45.3	0.1
30.2	30.1	0.1
15.3	15.3	0.0

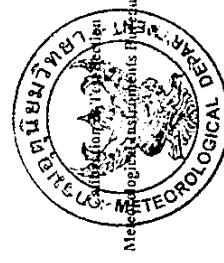
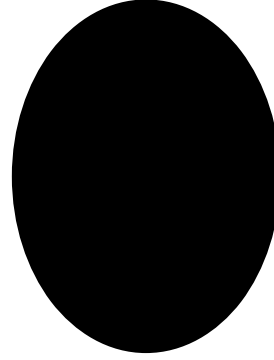
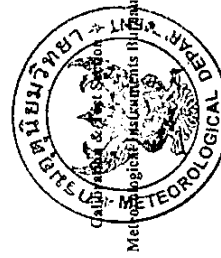
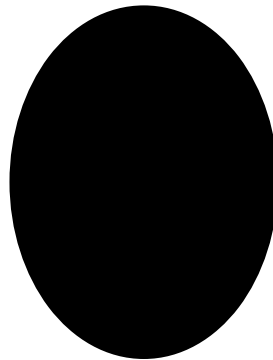
The Result of Calibration

Certification No. 088/22

4 March, 2022

Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor	
	Reading % R.H.	Correction % R.H.
83.53	83	0.53
62.12	63	-0.88
45.62	47	-1.38



ENG 1134



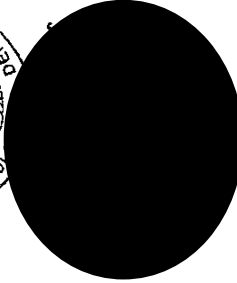
Date of Issue 4 March, 2022

Certification No. 088/22

Page : 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่าเครื่องวัดฝน ยี่ห้อ Davis Instruments แบบ TIPPING
BUCKET Product No. 6152 C Mfg No. AZ170619023 ที่การสอบเทียบกันแก้ว
ผ่านแบบวงวง GAUGE DIAMETER 8.0 INCHES, NEGRETTE & ZAMBRA
LONDON No 71082 และสามารถนำไปใช้ได้ไม่จำกัดครั้ง
เครื่องมือ (0.01 mm/TIP)



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 4 March, 2022 Certification No. 089/22

Page : 1 of 6

Object : Precision Weather Station

Manufacturer : Davis Instruments

Type : Vantage Pro 2 Model No. : 6152C

Mfg Code : Display BD190415074 Transmitter BD190415074

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

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1012.1 hPa

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

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

N.I.S.T. Test Reference Number 731/241460

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)

JAPAN QUALITY ASSURANCE ORGANIZATION

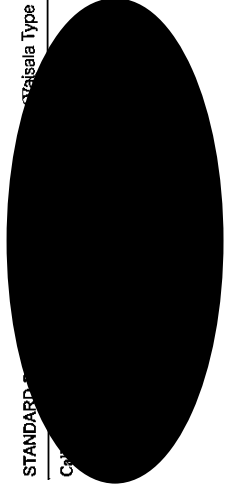
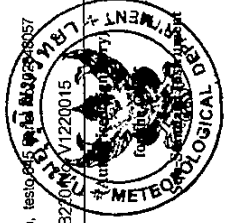
STANDARD THERMOMETER : Theodor Friedrich : Dry No.8390/94 Wet No. 8389/94

: Thermoschneider No.9188 : testo, testo 845

STANDARD

Stalsala Type PTB27000015

Cal





THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 0-2386-0156, 0-2399-0469

The Result of Calibration



THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-451-2804, 0-2399-0469

The Result of Calibration

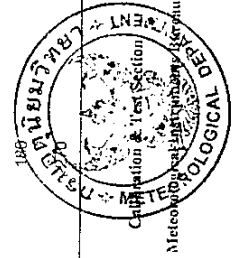
Certification No. 089/22

4 March, 2022

Page : 2 of 6

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER		
	Pressure inches H ₂ O	Vacuum inches H ₂ O	Velocity m/sec	Velocity m/sec	Correction m/sec	Correction m/sec
1.00	-	-	-	0.9	0.10	0.10
3.02	-	-	-	2.7	0.32	0.32
5.00	-	-	-	4.9	0.10	0.10
7.00	-	-	-	6.7	0.30	0.30
9.02	-	-	-	8.9	0.12	0.12
11.01	-	-	-	10.7	0.31	0.31
13.01	-	-	-	13.0	0.01	0.01
15.01	-	-	-	14.8	0.21	0.21
17.02	-	-	-	17.0	0.02	0.02
20.02	-	-	-	19.3	0.72	0.72

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

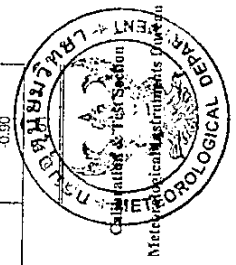


Certification No. 089/22

4 March, 2022

Page : 3 of 6

Standard Barometer Pressure	Tested Barometer Pressure	Correction
759.19	760.4	1.21
759.60	759.9	-1.32
758.47	759.6	-1.13
758.35	759.5	-1.15
758.03	759.2	-1.12
757.72	759.9	-1.18
757.55	759.6	-1.05
757.23	758.4	-1.15
757.07	758.1	-1.03
756.92	758.0	-1.08
756.45	757.4	-0.95
756.28	757.2	-0.92
753.01	763.4	-0.79
759.69	760.5	0.81
759.76	760.6	0.84
759.52	767.4	0.82
755.35	760.3	-0.95
759.15	760.0	-0.85
758.99	759.9	-0.91
758.90	759.8	-0.90
Average		





The Result of Calibration

Certification No. 089/22

4 March, 2022

Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.4	45.4	0.0
30.2	30.2	0.0
15.3	15.3	0.0

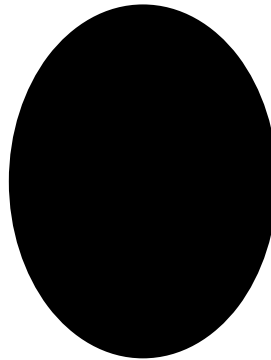
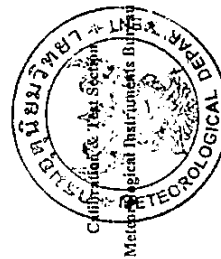
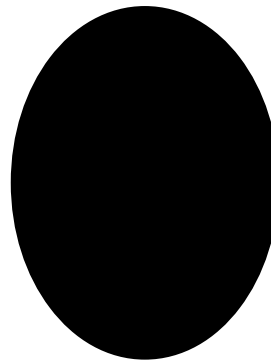
The Result of Calibration

Certification No. 089/22

4 March, 2022

Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading % R.H.	Correction % R.H.
83.53	81	2.53
62.12	61	1.12
43.69	45	0.69





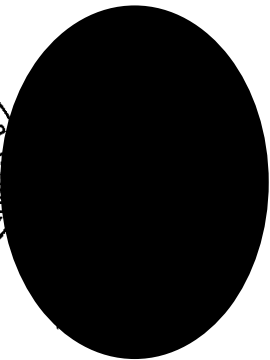
Date of Issue 4 March, 2022

Certification No. 089/22

Page : 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ชื่อ Davis Instruments แบบ TIPPING BUCKET Product No. 6152 C Mfg. Code. BD190415074 ทำการหอนเทียบกันแล้ว ผ่านเกณฑ์ดวง GAUGE DIAMETER 8.0 INCHES, NEGRETTO & ZAMBRA LONDON No 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามบรรทัดฐาน เครื่องมือ (0.01 in/ TIP)



THAI METEOROLOGICAL DEPARTMENT

Calibration Certificate



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

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 17 May, 2022 Certification No. 187/22

Page : 1 of 6

Object : Precision Weather Station

Manufacturer : Davis Instruments

Type : Vantage Pro 2 Model No. : 6152C

Mfg Code : Display AZ170619045 Transmitter

Customer : SGS (Thailand) Limited.

100 Manglinchee Road, Chongnonsi,
Yannawa, Bangkok 10120.

Calibration Condition : Temperature 25.1 ° C Barometric Pressure

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

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

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

: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

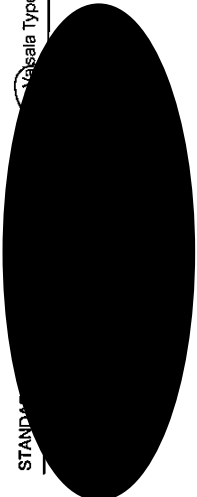
Serial Number 110730029 (sensor 120629586)

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

STANDARD THERMOMETER : Theodor Friedrich : Dry No.8390/94 Wet No. 8399/94

: Thermoschneider No.9188 : Iesio, Iesio 645-9911

STANDARD : Vaisala Type PTB220





THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

THAI METEOROLOGICAL DEPARTMENT

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



The Result of Calibration

Certification No. 187/22

17 May, 2022

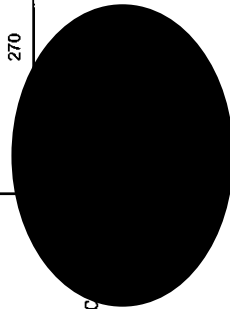
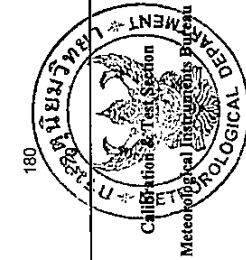
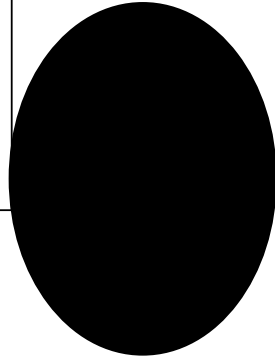
Page : 2 of 6

Standard	HOOK GAGE NO. 1425				TESTED ANEMOMETER	
	Pressure inches H ₂ O	Vacuum inches H ₂ O	Velocity m/sec	Velocity m/sec	Correction m/sec	Correction m/sec
Ultrasonic Anemometer						
m/sec						
1.00	-	-	-	0.9	0.10	0.01
3.02	-	-	-	2.7	0.32	-0.04
5.00	-	-	-	4.9	0.10	-0.18
7.00	-	-	-	6.7	0.30	-0.09
9.02	-	-	-	8.9	0.12	-0.13
11.01	-	-	-	10.7	0.31	-0.08
13.01	-	-	-	13.0	0.01	-0.14
15.01	-	-	-	14.7	0.31	-0.18
17.02	-	-	-	17.0	0.02	-0.07
20.02	-	-	-	19.3	0.72	-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



Average





THAI METEOROLOGICAL DEPARTMENT

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



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

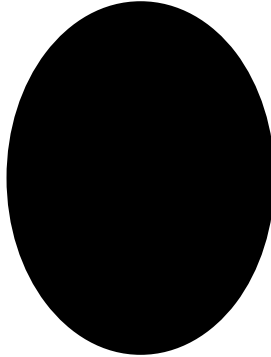
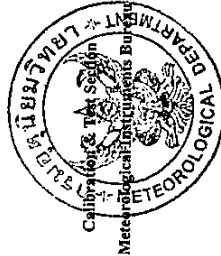
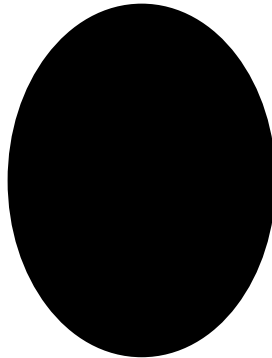
17 May, 2022
Certification No. 187/22
Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.2	45.3	-0.1
30.4	30.4	0.0
15.2	15.3	-0.1

The Result of Calibration

17 May, 2022
Certification No. 187/22
Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading % R.H.	Correction % R.H.
82.40	84	-1.60
61.62	62	-0.38
45.32	46	-0.68





Date of Issue 17 May, 2022

Certification No. 187/22

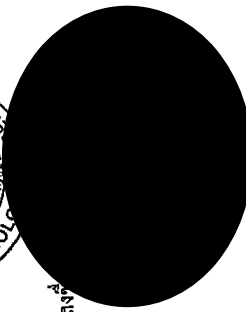
Page : 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ชื่อ Davis Instruments แบบ TIPPING BUCKET Product No. 6152 C Mfg. Code. AZ170619045 ที่การสอบเทียบกับแก้ว
ฝนแบบแก้วดวง GAUGE DIAMETER 8.0 INCHES, NEGRETTE & ZAMBRA
LONDON No 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของ
เครื่องมือ (0.01 mm/TIP)



ลง



ENSL 19176

INNOVATIVE INSTRUMENT CALIBRATION LAB
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE
7119 MOO 13, SOI SUTINAKORN 11 TAMBON BANG KAPO,
AMPHOE BANG PHU SAMUT PRAKAN PROVINCE 10540 THAILAND
TEL: (66)0-2116-5600-1 FAX: (66)0-2116-7140



ANAB
METRIC Accredited Body
ACCREDITED
CALIBRATION LABORATORY
AC3861

PAGE 1 of 2.

Certificate of Calibration

Customer

Name : SGS (Thailand) Limited.

Certificate No : 22-ACT-387

Address : 100 Nanglinchee Road, Chongnonsi, Yamaa Bangkok

Request No : Req-2022-1062

10120

Unit Under Calibration Details

Measurement item : Acoustic Calibrator

Class : 1

Manufacturer : Cirrus

Range : 94 dB / 1000 Hz

Model : CR315

Instrument Status : Used

Serial Number : 88373

ID : -

Calibration Environment and Details

Temperature : (23 ±2 °C)

Humidity : (50 ± 20 %RH)

Barometric Pressure : (1013 ±10.0 hPa)

Received Date : 9 June 2022

Calibration Date : 10 June 2022

Location of Calibration : LAB 1 Acoustic

Calibration Procedure : In-house method CP-ACT-02 based on IEC 60942:2017 Excepted Sound calibrators

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EI	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

Approved By

Issue Date :

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

FW-708-ACT-02 Rev.00 Issue date 01/07/19



Certificate No : 22-ACT-387

Request No : Req-2022-1062

Calibration Results : Without Adjustment

Sound pressure level

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty (± dB)	Acceptance limit Class 1 (± dB)
	Measured	Error	Measured	Error		
94 dB / 1000 Hz	93.76	-0.24	-	-	0.11	0.25

Frequency of Sound pressure level

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

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

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty (± %)	Acceptance limit Class 1 (± %)
	Measured (%)	Error (%)	Measured (%)	Error (%)		
94 dB / 1000 Hz	0.08	-	-	-	0.40	2.5

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

THAI HEART CALIBRATION CO., LTD.

112-1 Moo 5 Phraet S3 Muang Samut Prakan 10280
 Tel. 0-2884-2162, 0-2757-5435 0-2757-8486 Fax. 0-2757-8807

CERTIFICATE OF CALIBRATION

Certificate No.: CO-3107002/21 Page 1 of total 2 pages

Customer SGS (THAILAND) LIMITED

100 Nanglinchee Road, Chongnonsee,
 Yannaawa, Bangkok 10120 Thailand

Equipment pH Meter Model HI98195
 Manufacturer HANNA ID No. ENWA19104
 Serial No. 04260059101
 Description Range : 0 - 14 pH, Resolution : 0.01 pH

Environmental Conditions Ambient Temperature: (20 ± 2) °C
 Relative Humidity: (50 ± 10) %
 Atmospheric Pressure: -

Calibration Location Jayhawk Laboratory (CL&GL)

Received Date 31 July 2021

Calibration Date 2 August 2021

Date of Issue 2 August 2021

Checked by Approved

() (Krisyosol K.) () (Sakda Y.)
 () (Paiuphan K.) () (Onnapa P.)
 () (Pongsak H.) () (Nipphong K.)
 () (Kanung C.) () (Nonthachai K.)
 () (Pramong P.) () (Noppol P.)

VERIFIED

BY Wasee P. P. DATE Aug 1, 2021

Certificate No.: CO-3107002/21

Page 2 of total 2 pages

Reference Method:

- The calibration method used was CP-178 based on an in-house method.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard:

Type	pH Value	Lot No.	Due Date	Traceability
pH Standard Solution	4.01	081020	Dec. 13, 2021	NIMT
	7.01	020221	Dec. 25, 2021	
	10.00	091020	Jan. 19, 2022	

Type	Model	Serial No.	Certificate No.	Due Date	Traceability
Digital Thermometer with Sensor	1523 / 5622	1709138 / 4605984-005	10-1006001/21	Jun. 10, 2022	THC

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:

- NIMT, National Institute of Metrology (Thailand).
- THC, Thai Heart Calibration Co., Ltd.

Measurement Results:

Calibration of pH Electrode (Serial No.: N74281)

pH Standard Solution (pH)	Measured Value		Uncertainty (± pH)
	(pH)	(mV)	
4.01	4.06	158.8	0.013
7.01	7.09	-15.6	0.013
10.00	10.16	-179.8	0.013

Note: Adjust Curve to Buffer Solution pH (4.7,10)
 Temperature stability of micro bath : 25 ± 0.2°C

The above reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence and

CERTIFICATE OF CALIBRATION

Certificate No.: T0-3107005/21 Page 1 of total 2 pages

Customer
 SGS (THAILAND) LIMITED
 100 Nanglinchee Road, Chongnonsee,
 Yamnawa, Bangkok 10120 Thailand

Equipment
 Digital Thermometer with Probe
Manufacturer
 HANNA
Model
 I1198195
Serial No.
 04260059101
ID No.
 ENWA19104
Description
 Temperature range : 20 °C to 40 °C, Resolution of UUC : 0.01 °C

Environmental Conditions
 Ambient Temperature: (23 ± 3) °C
 Relative Humidity: (50 ± 15) %
 Atmospheric Pressure: -

Calibration Location
 Blue Devils Laboratory (TL)
Received Date
 31 July 2021
Calibration Date
 2 August 2021
Date of Issue
 2 August 2021

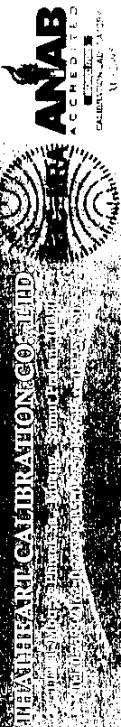
Checked by Approved by

() (Krisyosl K.)
 () (Patiphan K.)
 () (Pongsak H.)
 () (Kanung C.)
 () (Pramong P.)
 () (Noppol P.)

This calibration certificate shall not be reproduced other than in full except with the prior written approval of the Thai Heart Calibration Co., Ltd.

FE-169

REV.02 02/24/21



Certificate No.: TD-3107005/21

Page 2 of total 2 pages

Reference Method:

- The calibration method used was CP-096 based on an in-house method.
- The temperature scale used was an ITS-90.
- This certificate can be traceable to the national standards, which is realized the shown measurement units according to the International System of Units (SI Units).

Reference Standard Instruments:

Type	Model	Serial No.	Cert. No.	Due Date	Traceability
Thermometer Readout	1529-R	B7C853	20E3985	Nov. 9, 2021	TPA
Platinum Resistance Thermometer	5626	4853	C0A30046	Oct. 28, 2023	FLUKE
Liquid Bath	XORTS-40A	XO111019	10-0306002/21	Jun. 3, 2023	THC

Remark: This certificate is traceable to the International System of Unit (SI Unit) through:

- TPA, Technology Promotion Association (Thailand-Japan).
- FLUKE, Fluke Corporation, U.S.A.
- THC, Thai Heat Calibration Co., Ltd.

Measurement Results:

Dimension of probe : Diameter 3 mm. Sensor Type : RTD (PT100)

Immersion Depth (mm.)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
120	20.003	20.02	-0.017	0.0070
120	30.003	30.02	-0.017	0.0070
120	40.003	40.01	-0.007	0.0070

UUC : Unit Under Calibration

The above reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor $k = 2.00$, providing a level of confidence approximately 95 percent.

End of Certificate -



MIRACLE INTERNATIONAL TECHNOLOGY CO., LTD
214 Bangwaek Rd. Bangpai Bangkok 10160
Tel.: 0-2865-4647-8 Fax: 0-2865-4649 <http://www.mti.in.th>



CALIBRATION CERTIFICATE

Certificate No. : AD2201-040-0002

Date Issued : 13-Jan-22

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

Equipment : DryCal

Manufacturer : Mesa Labs
Model : Defender 530-L
Serial No. : 137751
ID No./Tag No. : ENWP15145
Date Received : 07-Jan-22
Date Calibrated : 12-Jan-22

Calibrated by : Mr. Jams Khaothong

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 Co., Ltd.

Approved

Certificate No. : AD2201-040-0002

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

Traceability of Certificate :

The International System of Units (SI) through

NIMT Calibration Certificate No. MW-0003-20 for Mass Flow Calibrator (20 SCCM) Serial No. G50971G20, Due 22-Jan-22

MIT Calibration Certificate No. AD2011-309-0001 for Mass Flow Calibrator (200 SCCM) Serial No. 96093001W, Due 22-Nov-22

MIT Calibration Certificate No. AD2109-180-0001 for Mass Flow Calibrator (2000 SCCM) Serial No. 96093001W, Due 10-Sep-23

End of Certificate

Page 3 of 3

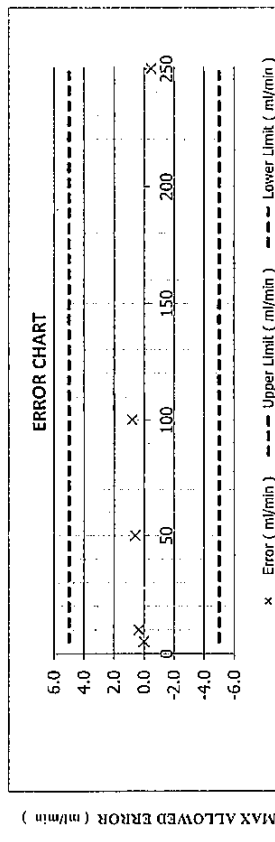
Certificate No. : AD2201-040-0002

Environment : Ambient temperature : (23 ± 2) °C
Relative humidity : (50 ± 15) % RH
Capacity Range : 500 ml/min
Calibration Media : Air
Type : Volumetric Flowmeter

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

Temperature (°C)	Pressure (kPa)	UUC Reading (ml/min)	STD Reading (ml/min)	Error (ml/min)	Uncertainty (± ml/min)
23.12	101.71	5.017	5.011	0.006	0.19
23.24	102.75	10.010	9.647	0.363	0.18
23.19	101.39	50.019	49.41	0.609	1.7
23.08	101.47	100.12	99.32	0.80	1.6
23.03	101.25	250.14	250.61	-0.47	7.7

Error = Unit Under Calibration - Standard



FLOWRATE (ml/min)

Page 2 of 3



Agilent GC/MS Preventive Maintenance Checklist

Agilent Preventive Maintenance provides factory recommended service for your analytical systems to ensure 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.

Select the appropriate PM to be done and then perform the checklist under that section.

- ☐ Interim Preventive Maintenance 6 months
☒ Major Preventive Maintenance Yearly

This checklist covers the following model(s):

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

Definition of the Task/Recommended Items within the document.

Task	Yes	No	Interim/Major/As needed	Recommended	Yes selected means that the task was done or the part was required.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

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>



Agilent GC/MS Preventive Maintenance Checklist

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 listed in the Parts Lists section of this document, are not 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 Responsibilities

- Print out all pages of the document and complete sections that relate to the system being installed.
- Complete empty fields with the relevant information.
- Complete the relevant checkboxes in the checklist using X or tick mark ✓ in the checkbox.
- Check the Not Applicable check boxes or specify N/A (where appropriate) to indicate optional services not delivered.
- Complete the Service Review and Service Completion sections together with the customer.

Additional Instruction Notes

Preventive maintenance is a factory recommended procedure designed to reduce the likelihood of electro-mechanical 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.**



Agilent GC/MS Preventive Maintenance Checklist

System Information

System Name and ID	System Site and Location
US1746M008	Laboratory

System Components

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

List system component product numbers	List the serial numbers of each component
1. G7077B	1. US1746M008
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.



Agilent GC/MS Preventive Maintenance Checklist

Preventive Maintenance for MSS

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 the successful preventive maintenance are available.
A customer representative should be available while the preventive maintenance procedure 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 the night prior to the PM and then start the vent cycle so that the instrument will be ready for the service representative.



Agilent GC/MS Preventive Maintenance Checklist

Parts – Included and as needed as part of the preventive maintenance

Common MS Maintenance Supplies

Parts Required			Description	Part number
Yes/No	Interim/Major/As needed			
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Abrasive paper, 30 µm	5661-5696
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Alumina powder	393706201
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Cloths, clean (package of 15)	05980-60061
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Cloths, cleaning (package of 300)	9310-4828
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Cotton swabs (package of 100)	5680-5400
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Gloves, clean, large	8850-0030
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Gloves, clean, small	8850-0029
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Grease, Apiezon L, high vacuum	6040-0289

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

Supplies			Description	Part number
Yes/No	Interim/Major/As needed			
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Helium gas filter – if required	RMSH-2
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Nitrogen gas filter – if required	RMSN-2
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Big Universal Trap, 1/8" fittings, Hydrogen – if required	RMSHY-2
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Gas Clean Carrier Gas Kit for 7680 for Nitrogen or Helium; Bracket, Mount, and Filter – if required	CP17988
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Gas Clean Filter kit GC/MS 1/8" in (complete replacement kit) – if required	CP17974
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Gas Clean GS/MS Filter – if required	CP17973
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Chemical Ionization Gas Purifier (CI systems) – if required	5190-9071
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Foreline Pump Oil, Inland 45	6040-0834

MS Maintenance Supplies for 5973/5975/5977

Supplies			Description	Part number
Yes/No	Interim/Major/As needed			
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Diffusion pump fluid (Diffusion Pump Models)	6040-0809 Qty 2
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	IDP-3 Tip Seal Replacement Kit (IDP-3 Dry Pump Models)	G7077-67018
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	DS42 Oil Mist Eliminator 3/4" & 3/8"	SR03706556
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Exhaust oil mist trap (thread) Edwards/Hellifer	G1099-60039

MS Maintenance Supplies for 7000/7010

Supplies			Description	Part number
Yes/No	Interim/Major/As needed			
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Nitrogen gas filter	RMSN-2
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Oil Mist Filter RV5	GE600-30043



Agilent GC/MS Preventive Maintenance Checklist

MS Maintenance Supplies for 7200/7250

Supplies			Description	Part number
Yes/No	Interim/Major/As needed			
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Nitrogen gas filter	RMSN-2
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	RIS Probe Maintenance Kit (7200 Series only)	G7005-60170
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	DS502 Oil Mist Eliminator	SR03706800
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	IDP-15 Tip Seal Replacement Kit (IDP-15 Dry Pump Models)	X3815-67000
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Filter element for SH-110/SH-112/IDP-15 exhaust silencer	REPLSILFILTER1
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	DS 3/8 MAG. PLUG AND GASKET	SR03701824

MS Maintenance Supplies for JetClean

Supplies			Description	Part number
Yes/No	Interim/Major/As needed			
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Big Universal Trap, 1/8" fittings, Hydrogen – if required	RMSHY-2



Agilent GC/MS Preventive Maintenance Checklist

Parts -- Needs be purchased if found defective or worn out

Common MSD Maintenance Supplies 5973/5975/5977/7000/7010/7200/7250

Common Recommended Consumables Parts				
Yes/No	Interim/Major/As needed	Description	Part number	Qty 2
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	El High Temperature Filaments	G7005-60061	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	HES El Filaments	G7002-60001	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1E El Filaments	G3350-60021	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	CI High Temperature Filament -- all MSDs	G7005-60072	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	PTBA GCMS Tuning Standard calibrant	05971-60571	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	PFDT0 calibrant, 1 ml	8500-8510	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	PFET, IRM calibrant for GC QTOF 0.5 ml	5190-0531	

MS Maintenance Supplies for 5973/5975/5977

Supplies				
Yes/No	Interim/Major/As needed	Description	Part number	Qty 2
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	CI Interface tip seal (tip and spring combo)	G1999-60412	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	CI Interface tip seal (tip only)	G3870-20542	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	CI Interface tip seal spring (spring only)	G1999-20023	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Repeller insulator	G1099-20133	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Lens insulator/holder (HES)	G7002-20074	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Ring heater/sensor assembly (HES)	G7002-60043	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Ceramic insulator for Extractor (HES)	G7002-20064	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Transfer-Line Tip Cap, Threaded	G3870-20547	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Transfer-Line Tip Base, Threaded	G3870-20548	

MS Maintenance Supplies for 7000/7010

Supplies				
Yes/No	Interim/Major/As needed	Description	Part number	Qty 2
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	CI Interface tip seal - 7000	G1999-60412	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	CI Interface tip seal - 7010	G7002-60412	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	CI Interface tip seal (tip only)	G3870-20542	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	CI Interface tip seal spring (spring only)	G1999-20023	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Repeller insulator - 7000	G1099-20133	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Lens insulator/holder (HES)	G7002-20074	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Ring heater/sensor assembly (HES)	G7002-60043	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Ceramic insulator for Extractor (HES)	G7002-20064	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Transfer-Line Tip Cap, Threaded	G3870-20547	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Transfer-Line Tip Base, Threaded	G3870-20548	



Agilent GC/MS Preventive Maintenance Checklist

MS Maintenance Supplies for 7200

Supplies				
Yes/No	Interim/Major/As needed	Description	Part number	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Extractor Lens Insulator	G7005-20133	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Ion Focus Insulator	G7005-20442	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Ring Heater/Sensor Assembly	G7005-60110	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	RIS Xfer Tip	G7005-20542	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	RIS Xfer Tip Spring	G7005-20024	

MS Maintenance Supplies for 7250

Supplies				
Yes/No	Interim/Major/As needed	Description	Part number	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Lens insulator/holder (HES)	G7002-20074	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Ring heater/sensor assembly (HES)	G7002-60043	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Ceramic insulator for Extractor (HES)	G7002-20064	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Transfer-Line Tip Cap, Threaded	G3870-20547	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Transfer-Line Tip Base, Threaded	G3870-20548	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	El Extractor Transfer Tip	G3870-20542	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	CI Tip Compression Spring	G1999-20023	

MS Maintenance Supplies for Intuvo 9000 MS Systems

Systems				
Yes/No	Interim/Major/As needed	Description	Part number	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Swaged MS Tail - Packaged	G4590-60009	
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Swaged MS Tail (HES) - Packaged	G4590-60109	



Agilent GC/MS Preventive Maintenance Checklist

Preventive Maintenance Checklist:

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.

GC/MS

Yes/No	Interim/Major	Description
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Record instrument model no. G7077B
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Record instrument serial no. US1746M008
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Record Rough Vacuum.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Record Manifold Vacuum.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Type of Column installed. DB 5 MS

System Checks

Yes/No	Interim/Major	Description
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Check manually that you have calibration peaks.
<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 the calibrant levels – PTBFA, PFDTD (if appl), IRM (if appl). Refill if necessary.
<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"/>

Wet Mechanical vacuum pumps

Yes/No	Interim/Major	Description
<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"/>	Drain and replace mechanical pump oil.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Replace Oil Mist Filter if applicable.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Discuss with customer the need for more frequent oil changes if the oil is dirty.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Demonstrate ballast, if requested.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Anti-suckback test.

Dry Mechanical vacuum pumps - Diaphragm

Yes/No	Interim/Major	Description
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Check for evidence of poor vacuum - Turbo Power Demand, poor manifold vacuum, etc.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	If vacuum is poor, then replace the diaphragm pump.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Anti-suckback test.



Agilent GC/MS Preventive Maintenance Checklist

Yes/No	Interim/Major	Dry Mechanical vacuum pumps - Screw
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Description
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Replace the tip seal on the IDP pump.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Check for evidence of poor vacuum - Turbo Power Demand, poor manifold vacuum.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Replace the Exhaust Filter if required.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Discuss with customer the need for more frequent changes if needed.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Inform customer that pump gas ballast should be installed all the time.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Anti-suckback test.

Cleaning System and Filters

Yes/No	Interim/Major	Description
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Fans
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Remove dust from fans and vent covers.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Fans are functional. area is cleared around fans.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Source Cleaning
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Open analyzer and remove the source.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Disassemble, Clean, Re-assemble source.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Re-install source and close analyzer.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Filters
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Replace RSMH-2 Helium gas filter - if applicable.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Replace RSMH-2 Nitrogen gas filter - if applicable.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Replace RSMH-2 Hydrogen gas filter - if applicable.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	CP17988 – Gas Clean Carrier Gas Kit for 7890 for Nitrogen or Helium; Bracket, Mount, and Filter - if applicable.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	CP17974 – Gas Clean Filter Kit GC/MS 1/6 in. Mount and Filter - if applicable
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	CP17973 – Gas Clean Filter; Replacement Filter - if applicable.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	5190-9071 – Methane Gas Filter - if applicable.

System post-check

Yes/No	Interim/Major	Description
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Pump system back down. Wait until system stability has been achieved.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Verify system vacuum reading(s) via the gauge controller
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Leak Check
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Verify system in manual tune
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Compare against previous tune file report(s)
<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 checked="" type="checkbox"/>	Check manually that you have calibration peaks.
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	EI Autotune Performed
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Rough Vacuum
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Vacuum Manifold
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	High Vacuum 0.5 uTor

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.



Agilent GC/MS Preventive Maintenance Checklist

Service Review

- | | |
|-------------------------------------|--|
| <input checked="" type="checkbox"/> | Attach available reports/printouts of all tests to this documentation. |
| <input checked="" type="checkbox"/> | Record the PM Service activity in the customer's instrument records/logbook. |
| <input checked="" type="checkbox"/> | Update/reset instrument maintenance counters as appropriate. |
| <input checked="" type="checkbox"/> | Affix the PM sticker to the system or instrument logbook based on the customer's request. |
| <input checked="" type="checkbox"/> | Complete the Service Review Comments section below if there are additional comments. |
| <input checked="" type="checkbox"/> | Review the service and any test results with the customer. |
| <input type="checkbox"/> | 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. |

Agilent Test Results Table:

[illegible]

Agilent Parts List Table:

- ☐
- Section NOT Applicable

[illegible]

Agilent GC/MS Preventive Maintenance Checklist

Important Customer Web Links

How to get information on your product:

Literature Library

Need to know more?

Need technical support?

Need supplies?

www.agilent.com/chem/library

www.agilent.com/chem/education

www.agilent.com/chem/techsupp

www.agilent.com/chem/supplies

Service Engineer Comments (optional)

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

Service Completion

Service request number

6004665472

Date service completed

13 June 2021

Aqilent signature

P. Eschscholzi

Customer signature

Number of pages

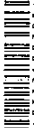
10

Mettler-Toledo (Thailand) Ltd.
846/4 - 846/5 Lualaba Rd., Bangna Tai Sub-District
Bangna District, Bangkok 10260
+662 723 0382
MT-TH.ServiceSupport@mt.com



Accuracy Calibration Certificate

Customer

Company: SGS (THAILAND) CO., LTD.
Address: 1/209, 1/211 Moo 1, Ban Chang
City: Ban Chang
Zip / Postal: 21130
State / Province: Rayong
Contact: Haisat Unjire
Order Number: 

Weighing Device

Manufacturer: Mettler Toledo
Model: XS205DU
Serial No.: B036065860
Building: LABORATORY
Floor: 1
Room: Balance Lab
Instrument Type: Weighing Instrument
Asset Number: SAT
Terminal Model: B036065860
Terminal Serial No.: N/A
Terminal Asset No.: N/A

Range	Max Capacity	Readability (d)
1	81 g	0.0001 g
2	220 g	0.001 g

Procedure

Calibration Guideline: EURAMET Cp-18 v. 4.0 (11/2015)
CPW002/20
METTLER TOLEDO Work Instruction:
This calibration certificate contains measurements for As Found calibration. No As Left calibration was performed because the device was not modified after As Found calibration. Therefore, results for As Left correspond to As Found.
The sensitivity span of the weighing instrument was adjusted before calibration with a built-in weight.
In accordance with EURAMET Cp-18 (11/2015), the test loads were selected to reflect the specific use of the weighing device or to accommodate specific calibration conditions.

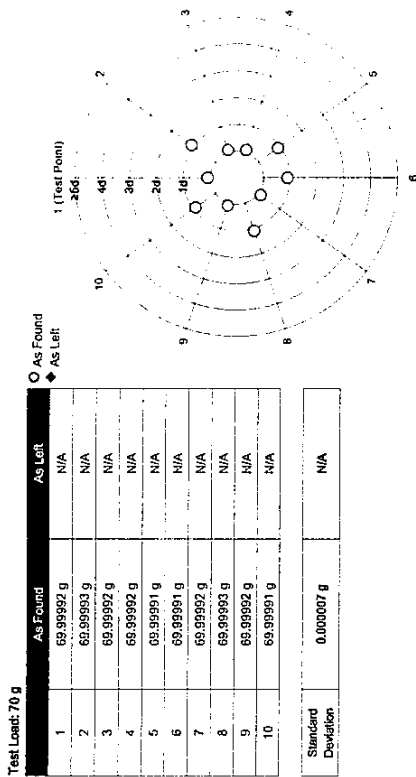
As Found	Temperature		Humidity	
	Start: 23.4 °C	End: 23.5 °C	Start: 74.0 %	End: 72.6 %

As Found Calibration Date: 18-Mar-2022
As Left Calibration Date: N/A
Issue Date: 19-Mar-2022

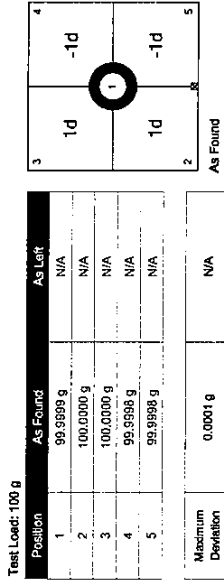
Approved Signatory

Measurement Results

Repeatability



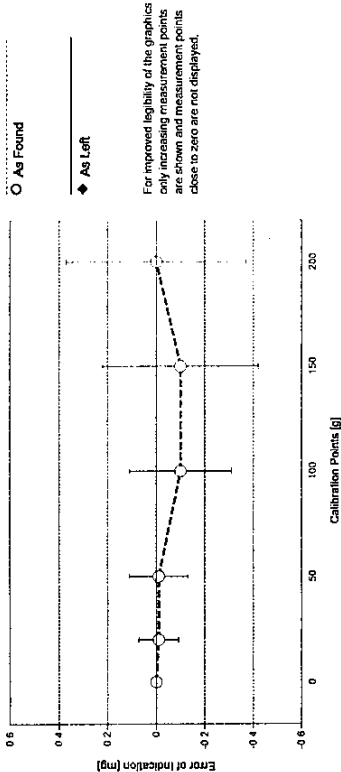
Eccentricity



Error of Indication

As Found	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.00000 g	0.00000 g	0.00000 g	0.018 mg	2
2	0.01000 g	0.00999 g	-0.00001 g	0.018 mg	2
3	0.10000 g	0.10000 g	0.00000 g	0.022 mg	2
4	1.00000 g	1.00000 g	0.00000 g	0.032 mg	2
5	5.00000 g	5.00000 g	0.00000 g	0.048 mg	2
6	9.99999 g	9.99999 g	0.00000 g	0.061 mg	2
7	19.99995 g	19.99994 g	-0.00001 g	0.082 mg	2
8	49.99997 g	49.99997 g	-0.00001 g	0.12 mg	2
9	100.00000 g	99.99999 g	-0.00001 g	0.21 mg	2
10	150.00000 g	149.99999 g	-0.00001 g	0.32 mg	2
11	199.99995 g	199.99998 g	0.00003 g	0.37 mg	2

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



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

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

Test Equipment

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

Weight Set 1: OIML E2			
Weight Set No.:	WS34	Date of Issue:	05-Jul-2021
Certificate Number:	174045	Calibration Due Date:	01-Jan-2023
Weight Set 2: OIML E2			
Weight Set No.:	WS71	Date of Issue:	21-Oct-2021
Certificate Number:	C142784703	Calibration Due Date:	27-Mar-2023
Hypnometer			
Equipment No.:	IN285	Date of Issue:	11-May-2021
Certificate Number:	21H1104	Calibration Due Date:	06-May-2022

Remarks

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

End of Accredited Section

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

Measurement Uncertainty of the Weighing Instrument in Use

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

Temperature coefficient for the evaluation of the measurement uncertainty in use: 1.5 · 10⁻⁶ / K
Temperature range on site for the evaluation of the measurement uncertainty in use: 5 K

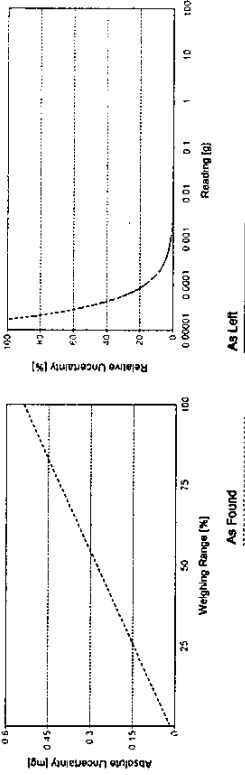
Linearization of Uncertainty Equation

Range		As Found		As Left	
d	Max				
1	0.00001 g	81 g	$U_1 = 0.017 \text{ mg} + 0.00645 \text{ mg/g} \cdot R$	N/A	N/A
2	0.0001 g	220 g	$U_2 = 0.05 \text{ mg} + 0.00639 \text{ mg/g} \cdot R$	N/A	N/A

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

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

Net Indication		As Found		As Left	
0.00220 g		0.017 mg	0.77%	N/A	N/A
0.02200 g		0.017 mg	0.078%	N/A	N/A
0.22000 g		0.018 mg	0.0084%	N/A	N/A
2.20000 g		0.031 mg	0.0014%	N/A	N/A
220.0000 g		1.5 mg	0.00067%	N/A	N/A



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

GWP®
Certificate



As Found ✓ As Left ✓

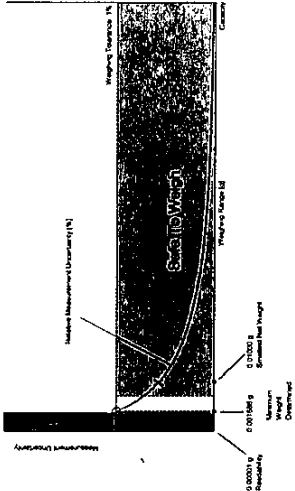
The weighing device meets the given process requirements.

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

Process Requirements

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

Safe Weighing Range



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

Minimum Weight

As Found Minimum Weight Table

Range 1

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.016975 g	0.034172 g	0.051595 g	0.087139 g	0.180288 g
0.2%	0.008460 g	0.016975 g	0.025545 g	0.043655 g	0.087139 g
0.5%	0.003377 g	0.006754 g	0.010159 g	0.016975 g	0.034172 g
1%	0.001688 g	0.003377 g	0.005069 g	0.008460 g	0.016975 g
2%	0.000844 g	0.001688 g	0.002532 g	0.004223 g	0.008460 g
5%	0.000337 g	0.000675 g	0.001012 g	0.001688 g	0.003377 g

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

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

As Left Minimum Weight Table

Range 1

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.016975 g	0.034172 g	0.051595 g	0.087139 g	0.180288 g
0.2%	0.008460 g	0.016975 g	0.025545 g	0.042855 g	0.087139 g
0.5%	0.003377 g	0.006754 g	0.010159 g	0.016975 g	0.034172 g
1%	0.001688 g	0.003377 g	0.005069 g	0.008460 g	0.016975 g
2%	0.000844 g	0.001688 g	0.002532 g	0.004223 g	0.008460 g
5%	0.000337 g	0.000675 g	0.001012 g	0.001688 g	0.003377 g

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

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

At these net minimum weight values, the measurement uncertainty of the weighing device is equal to or less than t_{91} (no safety factor), 1/2, 1/3, 1/5, or 1/10 of the required tolerance. The values are calculated with $k = 2$ and based on the linear formula of the measurement uncertainty of the weighing device in use.

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

Notes on minimum weight values in above table:

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

Measurement Results

Results Summary

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

✓ = Passed

✗ = Failed

Δ = Safety Factor not met

Repeatability

Test Load: 70 g

Tolerance		Control Limit		As Found		As Left	
				Std. Deviation	Result	Std. Deviation	Result
0.1%	0.00005 g	0.00005 g	0.00005 g	0.000007 g	✓	0.000007 g	✓
0.2%	0.00010 g	0.00010 g	0.00010 g	0.000007 g	✓	0.000007 g	✓
0.5%	0.00025 g	0.00025 g	0.00025 g	0.000007 g	✓	0.000007 g	✓
1%	0.00050 g	0.00050 g	0.00050 g	0.000007 g	✓	0.000007 g	✓
2%	0.00100 g	0.00100 g	0.00100 g	0.000007 g	✓	0.000007 g	✓
5%	0.00250 g	0.00250 g	0.00250 g	0.000007 g	✓	0.000007 g	✓

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

Eccentricity

Test Load: 100 g

Tolerance		Control Limit		As Found		As Left	
				Deviation	Result	Deviation	Result
0.1%	0.0050 g	0.0050 g	0.0050 g	0.00001 g	✓	0.00001 g	✓
0.2%	0.0100 g	0.0100 g	0.0100 g	0.00001 g	✓	0.00001 g	✓
0.5%	0.0250 g	0.0250 g	0.0250 g	0.00001 g	✓	0.00001 g	✓
1%	0.0500 g	0.0500 g	0.0500 g	0.00001 g	✓	0.00001 g	✓
2%	0.1000 g	0.1000 g	0.1000 g	0.00001 g	✓	0.00001 g	✓
5%	0.2500 g	0.2500 g	0.2500 g	0.00001 g	✓	0.00001 g	✓

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

METTLER TOLEDO Service

As Found

Reference Value	Error	Control limits for various weighing tolerances				
		0.1%	0.2%	0.5%	1%	5%
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A
19.99995 g	-0.00001 g	0.01000 g	0.02000 g	0.05000 g	0.10000 g	0.50000 g
49.99998 g	-0.00001 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	1.25000 g
100.00000 g	-0.0001 g	0.05000 g	0.1000 g	0.2500 g	0.5000 g	2.5000 g
150.00000 g	-0.0001 g	0.07500 g	0.1500 g	0.3750 g	0.7500 g	3.7500 g
199.99998 g	0.00000 g	0.10000 g	0.2000 g	0.5000 g	1.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓

As Left

Reference Value	Error	Control limits for various weighing tolerances				
		0.1%	0.2%	0.5%	1%	5%
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A
19.99995 g	-0.00001 g	0.01000 g	0.02000 g	0.05000 g	0.10000 g	0.50000 g
49.99998 g	-0.0001 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	1.25000 g
100.00000 g	-0.0001 g	0.05000 g	0.1000 g	0.2500 g	0.5000 g	2.5000 g
150.00000 g	-0.0001 g	0.07500 g	0.1500 g	0.3750 g	0.7500 g	3.7500 g
199.99998 g	0.00000 g	0.10000 g	0.2000 g	0.5000 g	1.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓

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

Service Date: 2022-03-18
Document Number: TH2076-029-031822-LABBalanceHR
SGS (THAILAND) CO.,LTD.
1/209,1/211 Moo 1, Ban Chang, Ban Chang, Rayong 21130
Haiaat Lijao

METTLER TOLEDO

Balance Health Report

Device Details	
Manufacturer:	Mettler Toledo
Model:	XK205DU
Serial number:	B03065880
Firmware:	1.05.0
Weight set for routine testing:	Yes /
History	
Device History	Service History
Instrument in use:	Yes
Instrument age:	> 10 years
Spare parts available:	Yes
Regulations:	ISO
Process tolerance in %:	1%
Smallest sample net weight:	0.01000g
Routine testing performed:	Yes
Check List	
Environmental Conditions	General & Functional Checks
Room temperature fluctuation	✓
Exposure to direct sun	✓
Vibrations	✓
Draft	✓
Dirt or dust	✓
Static	✓
Mechanical Component Checks	
Draft shield	✓
Weighting pan position	✓
Housing	✓
Other - objections noted as additional remarks	Other - objections noted as additional remarks
Recommendations	
Instrument calibration	Uninstall instrument
Identify safe weighing range	Replace instrument
GWP verification / risk assessment	Replace / add parts (see additional remarks)
Preventive maintenance	Onsite repair
Perform routine testing with test weights	Repair repair
User training	Use of accessories (see additional remarks)
Contact:	Name: Hahani Lijao Position: Chemist Phone: 0022699909 Email: emd@sgs.thailandsgs.com
Additional Remarks & Recommendations	
Engineer Details	
Date:	18-Mar-2022
Name:	Sirasi Kossichanontkul
Signature:	

This is not a certificate.

It should not be used to interpret final results for the testing of these devices.

Legend: ✓ Good/Pass ✗ Needs Attention ✗ Buff/Off Not Applicable

SINGLE-POINT CALIBRATION REPORT



Customer : SGS
 Application : AQMS AND CEMS
 Location (s) : Environmental Solution Integrator Co., Ltd.
 Calibration Date : 8/05/2021
 Calibration Time : 11:00
 Calibrated by : Environmental Solution Integrator Co., Ltd.

Manufacturer	Environmental S.A.
Analyzer Model	: HCS1M
Serial Number	: 859
Note	: GAS METHANE CONC 699.1 PPM

Gas Measurement : CH4 HCNM THC Measuring Range : 0-1000 PPM Cylinder ID Number : ccd47839 Certification Date : Apr 16 2014 Expiry Date : Apr 16 2022 K : 1.609 K : 1.143 CH4 Reading : before calibration CH4 : 2.83 : after calibration : 1.96	
---	--

Zero Calibration

After Calibration		
Zero Adjustment	Reading	Result
0	0	PASS
Note		

Before Calibration		
Zero Adjustment	Reading	Result
0	0	PASS
Note		

Span Calibration

After Calibration		
K	Delta	Reading
1.143	1.2	10
Note		
Expect 10.0 PPM		

Before Calibration		
K	Delta	Reading
1.609	0.0%	14
Note		
Fail		

Remark :

Report Check Sheet



Job Number : 8592021
 Working Date : Environmental Solution Integrator Co., Ltd.
 Calibrated by : Environmental Solution Integrator Co., Ltd.



Manufacturer :

Customer : SGS
 Application : AQMS AND CEMS
 Location (s) : Environmental Solution Integrator Co., Ltd.

Equipment : HCS1M
 Serial Number : 859

Mux Signals	Status	Reading	Result
GND	(0-5V-10V) mv	1	Passed
Int.Temp.	(150-550) mv	359	Passed
Hz Press.	(400-750) mv	582	Passed
Air Press.	(1100-1500) mv	1283	Passed
Sample Pn	(200-400) mv	300	Passed
Air Flow	(3000-4000) mv	3520	Passed
Sample Pk	(2000-3000) mv	3317	Passed
Signal	(0-9999) mv	1694	Passed
Auto-Zero	(500-1500) mv	1050	Passed
Flame	(off or on) mv	9998	Passed
2V Ref	(1600-2200) mv	1986	Passed
Sample Te	(750-950) mv	804	Passed
FID Temp.	(800-980) mv	934	Passed
HCNM Ten	(950-1050) mv	998	Passed
ZERO Ten	(1095-1195) mv	971	Passed
BaroEX		0	Passed

FID	Status	Reading	Result
Sample T ^o	54	54	Passed
FID T ^o	150	150	Passed
NMHC T ^o	209	209	Passed
ZERO T ^o	169	169	Passed
CH4 REF	300.8	300.8	Passed
THC REF	304.8	304.8	Passed
CH4	1.9	1.9	Passed
THC	2.2	2.2	Passed
NMHC	0.2	0.2	Passed
Sample low	81	81	Passed
Air	365	365	Passed
H2 P	582	582	Passed
Air P	1294	1294	Passed
Sample P.	301	301	Passed
Signal	2125	2125	Passed
Auto-Zero	1050.0	1050.0	Passed

Offset / Conversion		
Gas	Offset	Conversion
THC	0	1.96
CH4	0	1
HCNM	0	0.720

Remark :

Environmental Solution Integrator Co., Ltd.
 1212 M. 119 Phrasimphong Road, Klong Sae Suburban, Bangkok 10110
 Phone: 02-262-2421 Fax: 02-262-2421 E-mail: esi@esimthailand.com

Environmental Solution Integrator Co., Ltd.
 1212 M. 119 Phrasimphong Road, Klong Sae Suburban, Bangkok 10110
 Phone: 02-262-2421 Fax: 02-262-2421 E-mail: esi@esimthailand.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Airgas, Inc.
600 Union Landing Road
Cranston, NJ 08077
(856) 828-7878 Fax: (856) 828-6576
www.airgas.com

Part Number: E02N199E15AC03C
Cylinder Number: CC447838
Laboratory: ASG - Riverton - NJ
PGVP Number: 552014
Customer PO Number: 6091153
Reference Number: 82-124428012-1
Cylinder Volume: 144.4 CF
Cylinder Pressure: 2015 PSIG
Valve Outlet: 350
Certification Date: Apr 16, 2014
Expiration Date: Apr 16, 2022

Certification performed in accordance with EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012) document EPA 600/R-12/031, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume 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
METHANE	700.0 PPM	699.1 PPM	G1	+/- 1.0% NIST Traceable
NITROGEN	Balance			04/16/2014
CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Uncertainty
NTRM	11001217	CC344304	985.2 PPM METHANE/AIR	+/- 0.6%
ANALYTICAL EQUIPMENT				
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration	Expiration Date	
Nicolet 6700 AHR0801933 CH4	FTIR	Apr 16, 2014	May 23, 2017	

Triad Data Available Upon Request

Notes: Certified by an ISO17025

Accredited Laboratory

Approved for Release



CALIBRATION CERTIFICATE

Date of Issue: Jun 28, 2021
Site Calibration: Jun 28, 2021
Gert No.: 212392
Order No.: 21060292

Customer: SGS (Thailand) Limited.
1209, 1/211 Moo 1, T. Ban Chang, A. Ban Chang Rayong 21130 Thailand.

Place of Calibration: Sample Area

Description: Indicator
Model: I250DS
Serial No.: I250402-0810-0319
ID.No.: I2010004
Date of Receipt: Jun 24, 2021
Date of Calibration: Jun 24, 2021

Environment: Temperature (Min) 22.4 °C (Max) 23.2 °C
Relative Humidity (Min) 65.5 %RH (Max) 77.4 %RH

Calibration Method

WI-17: The reference thermometer was placed into the chamber and measurement was performed based on AS-2853.
The temperature scale in use at this laboratory is the International Temperature Scale of 1890.

Standard

1) Data Acquisition with Sensor Model 34972A S/N. MY49025696, Certificate No. CR20-0994, Calibrated by Quality Reborn Co., Ltd., ONAC Calibration No. 0292.

This certificate is traceable to SI unit.

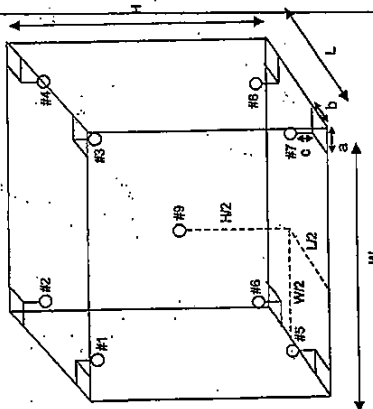


CALIBRATION CERTIFICATE

Date of Issue Jun 28, 2021
 Site Calibration

Cert No. 21/2392
 Order No. 21060292

Results (without adjustment)



Position of reference thermometers were placed

Note.

- 1). Dimension (W x L x H) is 50 x 50 x 105 cm
- 2). Stability - greatest one half of difference between max peak and min peak of each reference probe measured temperature obtained during the calibration interval.
- 3). Uniformity - the maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady state conditions. The reference sensor should preferably be located at the geometric center of the chamber.

CALIBRATION CERTIFICATE

Date of Issue Jun 28, 2021
 Site Calibration

Cert No. 21/2392
 Order No. 21060292

Results (without adjustment)

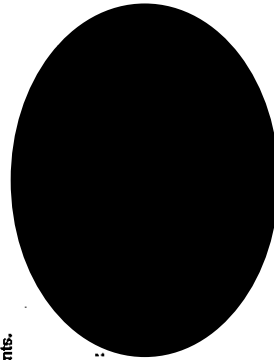
UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)	Stability (°C)	Uniformity (°C)	Uncertainty (°C)
20.0	20.0	Position 1	20.337	0.424	±0.64
		Position 2	20.050		
		Position 3	20.156		
		Position 4	19.953		
		Position 5	20.037		
		Position 6	20.104		
		Position 7	19.997		
		Position 8	20.021		
		Position 9	20.018		

The stability and uniformity was taken into account in the measurement uncertainty stated.

The above results are valid exclusively for calibration samples as mentioned in the report.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with ONAC requirements.

APPROVED SIGNATORY :





Thermology Co., Ltd.

96/177-96/178 Moo 6, T. La-harn, A. Bangbouthong, Nonthaburi 11110
Tel: 0 2191 6479 Fax: 0 2191 6480 website: www.thermology.co.th



ISO 9001:2015
CERTIFICATION

CALIBRATION CERTIFICATE

Date of Issue Jun 28, 2021
Site Calibration
Cert No. 21/2393
Order No. 21060292

Customer SGS (Thailand) Limited.
1/209, 1/211 Moo 1, T. Ban Chang, A. Ban Chang Rayong 21130 Thailand.

Place of Calibration Hot Lab

Description Oven
Model UFE400
Serial No. G410.0833
ID.No. O2010002

Date of Receipt Jun 24, 2021
Date of Calibration Jun 24, 2021

Environment
Temperature (Min) 19.8 °C (Max) 23.4 °C
Relative Humidity (Min) 55.8 %RH (Max) 83.9 %RH

Calibration Method

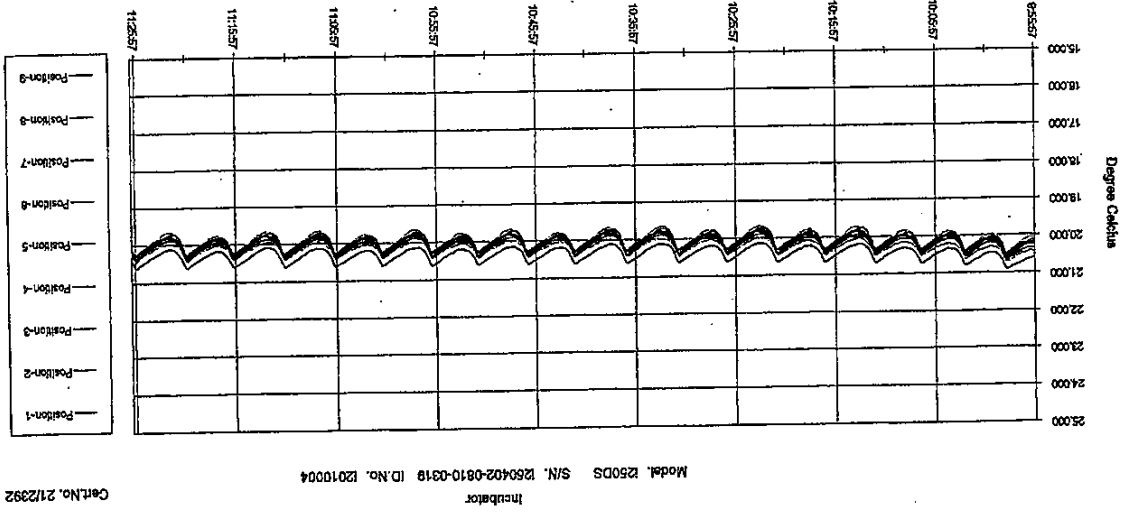
WI-17: The reference thermometer was placed into the chamber and measurement was performed based on AS-2853.
The temperature scale in use at this laboratory is the International Temperature Scale of 1990.

Standard

1) Data Acquisition with Sensor Model 34972A S/N. MY49007789, Certificate No. Q120-2119, Calibrated by Quality Reborn Co., Ltd., ONAC Calibration No. 0292.
This certificate is traceable to SI unit.

Page 1 of 5

This certificate is issued in accordance with the conditions of Thermology Laboratory. The traceability of the unit of measurement realized at corresponding national standard laboratory. This certificate may not be valid without the prior written approval of laboratory.





Thermology Co., Ltd.
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CALIBRATION CERTIFICATE

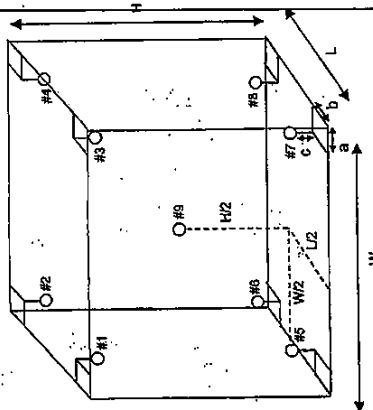
Date of Issue Jun 28, 2021

Site Calibration

Cert No. 21/2393

Order No. 21060292

Results (without adjustment)



Position of reference thermometers were placed

Note.

- 1). Dimension (W x L x H) is 40 x 33 x 40 cm
- 2). Stability - greatest one half of difference between max peak and min peak of each reference probe measured temperature obtained during the calibration interval.
- 3). Uniformity - the maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady state conditions. The reference sensor should preferably be located at the geometric center of the chamber.

CALIBRATION CERTIFICATE

Date of Issue Jun 28, 2021

Site Calibration

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Results (without adjustment)

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)	Stability (°C)	Uniformity (°C)	Uncertainty (°C)
85.0	85.0	Position 1	0.051	-0.628	0.33
		Position 2			
		Position 3			
		Position 4			
		Position 5			
		Position 6			
		Position 7			
		Position 8			
		Position 9			

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)	Stability (°C)	Uniformity (°C)	Uncertainty (°C)
104.0	104.0	Position 1	0.098	0.830	0.46
		Position 2			
		Position 3			
		Position 4			
		Position 5			
		Position 6			
		Position 7			
		Position 8			
		Position 9			



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Results (without adjustment)

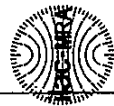
UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)	Stability ±(°C)	Uniformity (°C)	Uncertainty ±(°C)
150.0	150.0	Position 1 150.908	0.093	1.195	0.50
		Position 2 150.480			
		Position 3 150.146			
		Position 4 150.483			
		Position 5 149.689			
		Position 6 149.484			
		Position 7 148.775			
		Position 8 150.171			
		Position 9 149.763			

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)	Stability ±(°C)	Uniformity (°C)	Uncertainty ±(°C)
180.0	180.0	Position 1 181.408	0.113	1.382	0.53
		Position 2 180.973			
		Position 3 180.494			
		Position 4 180.879			
		Position 5 179.979			
		Position 6 179.794			
		Position 7 178.906			
		Position 8 180.581			
		Position 9 180.088			



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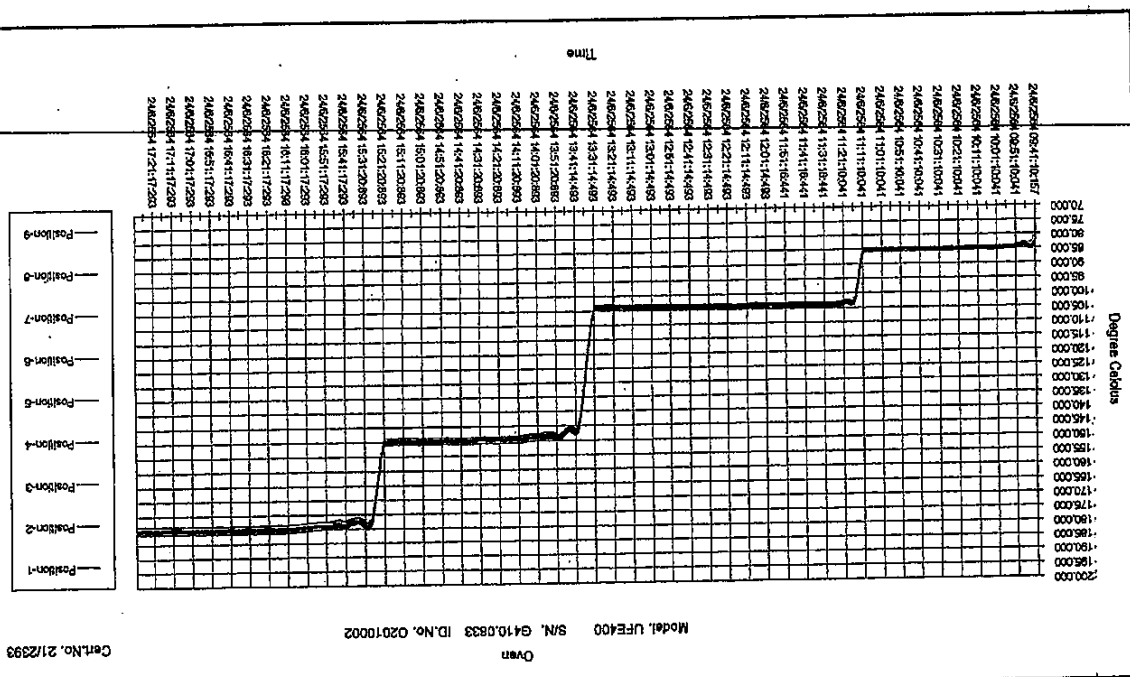
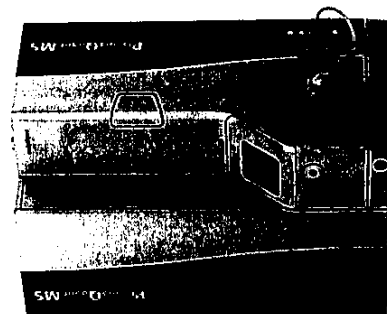
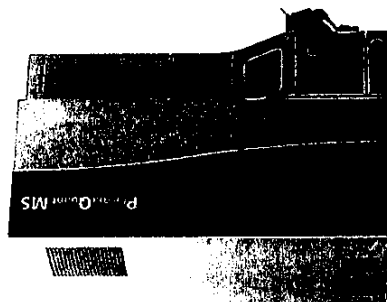
Cert No. 21/2393
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The stability and uniformity was taken into account in the measurement uncertainty stated.
The above results are valid exclusively for calibration samples as mentioned in the report.
The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with ONAC requirements.

APPROVED SIGNATORY

Maintenance Protocol

PlasmaQuant® MS (Elite) ICP-MS



Analytikjena AG
Königsplatz 1
0755 Jena Germany
Phone: +49 3641 77 70
Fax: +49 3641 77 9779
info@analytikjena.com
www.analytikjena.com

Version 01.18
15.01

Maintenance Protocol

1 Customer and service data

Customer data	
Company	SAS
Department	LAB
Name	
Address (Street, Number, ZIP code, City)	RaVong
Telephone	
E-Mail	
Customer no.	
Order no.	
Device data	
Device Type	PQMS Elite s/n 10-5000-030-26-AR109
Serial number	
Data of the authorized person for the Maintenance	
Name, Company	Sondai Nondak, Analytik Jena East
Date of the Maintenance	23 June 2021
Maintenance with following Operational Qualification OQ (requires a separate OQ protocol)	
yes	no
<input type="checkbox"/>	<input checked="" type="checkbox"/>

Maintenance Protocol

2 Maintenance Checklist

Tick each checkbox as the steps are completed.

Parts required

<input checked="" type="checkbox"/>	10-5000-220-20	Kit preventative maintenance CP-MS
<input checked="" type="checkbox"/>	13-410-540	Cooling Water Additives
Choose one of the following oil types as it is important for rotary pump type:		
<input type="checkbox"/>	418-88089-0	Vacuum Pump Oil (Esther Oil LVO 200)
<input checked="" type="checkbox"/>	418-10-406-251	Vacuum Pump Oil (PFPE Oil LVO 420)

Not used

Initial performance tests

<input checked="" type="checkbox"/>	Print out Details, Plasma Align (Time Scan mode), Res & Trim, Mass Call, Detector Setup, Mass Scan (after new scan with tuning solution), Vacuum (Gate Valve opened and closed), (CRC, Ion Optics and Stepper pages from the instrument setup
<input checked="" type="checkbox"/>	Verify performance (sensitivity/oxides/double charges) of system before starting maintenance

Vacuum system

<input checked="" type="checkbox"/>	Drain and replace oil in rotary pump.
<input checked="" type="checkbox"/>	Clean exterior of pump.
<input checked="" type="checkbox"/>	Test vacuum interlock by attempting to start vacuum with Turbo pump #1 dismounted. Verify that appropriate error message is displayed.

inspected

Mass spectrometer system

<input checked="" type="checkbox"/>	Check/adjust gate valve.
<input checked="" type="checkbox"/>	Clean sampler/skimmer cones/replace O-rings.
<input checked="" type="checkbox"/>	Check quadrupole resolution and check Quad Controller resonance.
	Resonance peak voltage is 2.75 ✓
<input checked="" type="checkbox"/>	Clean entrance lens and entrance plate
	Detector voltage is: 3750 V ✓

Maintenance Protocol

Sample introduction system

<input checked="" type="checkbox"/>	Inspect torch.
<input checked="" type="checkbox"/>	Inspect/replace torch gas tubing.
<input checked="" type="checkbox"/>	Inspect/clean/adjust RF coil.
<input checked="" type="checkbox"/>	Inspect igniter/replace igniter cable.
<input checked="" type="checkbox"/>	Clean sampler/skimmer cones/replace O-rings.
<input checked="" type="checkbox"/>	Clean extraction lenses #1 and #2.
<input checked="" type="checkbox"/>	Remove nebulizer from spray chamber. Turn on the peristaltic pump (15 rpm) and nebulizer gas flow (1.0 L/min) and aspirate de-ionized water. Check that the aerosol produced by the nebulizer is normal and uniform.
<input checked="" type="checkbox"/>	Check spray chamber and replace all O-rings and water tubing.
<input checked="" type="checkbox"/>	Inspect sample introduction system electrical connections.

Water cooling system

<input checked="" type="checkbox"/>	Drain water reservoir.
<input checked="" type="checkbox"/>	Clean air intake filters & heat exchange fins as needed.
<input checked="" type="checkbox"/>	Inspect all water hoses for cracks/leaks.
<input checked="" type="checkbox"/>	Disassemble inline water filter & clean cartridge.
<input checked="" type="checkbox"/>	Fill water reservoir with additives and check the water conductivity according to instruction.
<input checked="" type="checkbox"/>	Inspect mains cable and plug.
<input checked="" type="checkbox"/>	Turn on and re-check water level.
<input checked="" type="checkbox"/>	Check pressure (440±40 kPa) and temperature set point (20 °C); adjust if necessary.
<input checked="" type="checkbox"/>	Verify operation of the water solenoid.

Basic instrument

<input checked="" type="checkbox"/>	Inspect condition of argon supply hose.
<input checked="" type="checkbox"/>	Inspect mains power cable and plug.
<input checked="" type="checkbox"/>	Check operation of exhaust system and inspect airflow sensor; if necessary clean according to instruction.
<input checked="" type="checkbox"/>	Inspect USB and serial cables/connections.
<input checked="" type="checkbox"/>	Clean all external covers and fans.
<input checked="" type="checkbox"/>	Check argon inlet pressure if it is at recommended pressure of 700 kPa (100 psi) (allowed range is 600 to 830 kPa, 90 to 120 psi) Actual setting is 400 kPa/psi.
<input checked="" type="checkbox"/>	Check IQR for leakage and back/dage according to service info. Check gas pressures: He - 150 kPa (22 psi), H ₂ - 100 kPa (16 psi)

Maintenance Protocol

Interlock Tests

<input checked="" type="checkbox"/>	Turn off argon supply and ignite plasma. Verify if low argon error message is displayed.
<input checked="" type="checkbox"/>	Ignite plasma and press emergency stop button. Verify that plasma goes out and appropriate error message is displayed.
<input checked="" type="checkbox"/>	Ignite plasma and unlatch plasma compartment/main RF door. Verify that plasma goes out and appropriate error message is displayed.
<input checked="" type="checkbox"/>	Ignite plasma and turn off argon supply. Check if plasma is turned off and appropriate low argon flow message is displayed.
<input checked="" type="checkbox"/>	Turn off water cooler and light plasma. Verify if appropriate error message is displayed.

Accessories

<input checked="" type="checkbox"/>	Verify initialization and operation of auto sampler. Check belts and wheels etc.
<input checked="" type="checkbox"/>	Check all other accessories.

Performance tests

<input checked="" type="checkbox"/>	Update entries in Details page of Instrument Setup window as required.
<input checked="" type="checkbox"/>	Print out every section of the Instrument Setup (service model) and put it into the logbook.
<input checked="" type="checkbox"/>	Tune up instrument and run performance test. Perform any corrective action necessary if results do not meet specifications. Add performance test results to logbook.

Instrument condition

<input checked="" type="checkbox"/>	Assess and comment on condition of ICP-MS system
<input checked="" type="checkbox"/>	Discuss condition, preventative maintenance results and instrument performance with the customer.
<input checked="" type="checkbox"/>	Sign and date this checklist after obtaining customer's signature.

Instrument and environmental conditions

<input checked="" type="checkbox"/>	Good	<input type="checkbox"/>	Fair	<input type="checkbox"/>	Poor
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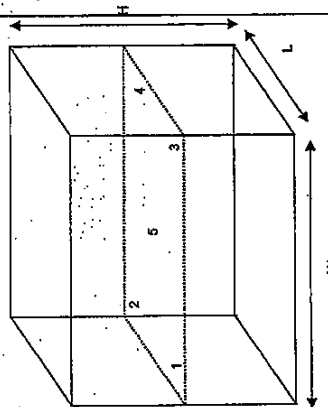


CALIBRATION CERTIFICATE

Date of Issue Jun 28, 2021
Site Calibration

Cert No. 21/2395
Order No. 21060292

Results (without adjustment)



Position of reference thermometers were placed

Note:

- 1). Dimension (W x L x H) is 35 x 29 x 16 cm
- 2). Stability - greatest one half of difference between max peak and min peak of each reference probe measured temperature obtained during the calibration interval.
- 3). Uniformity - the maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at as close an observation time as possible to determine the temperature pattern or homogeneity within the chamber under steady state conditions. The reference sensor should preferably be located at the geometric center of the chamber.

APPROVED SIGNATORY



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Results (without adjustment)

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)	Stability ±(°C)	Uniformity (°C)	Uncertainty ±(°C)
60.0	60.0	Position 1 59.975	0.051	0.127	0.15
		Position 2 60.013			
		Position 3 60.029			
		Position 4 60.088			
		Position 5 60.047			
UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)	Stability ±(°C)	Uniformity (°C)	Uncertainty ±(°C)
[[[100.8	Position 1 100.752	0.212	0.473	0.32
		Position 2 100.665			
		Position 3 100.780			
		Position 4 100.620			
		Position 5 100.565			

The stability and uniformity was taken into account in the measurement uncertainty stated.
The above results are valid exclusively for calibration samples as mentioned in the report.
The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with ONAC requirements.

