

ภาคผนวก ง

สำเนาใบรับรองการสอบเทียบเครื่องมือ

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บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

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

รายชื่ออุปกรณ์ / เครื่องมือ : NO<sub>x</sub> Analyzer

รุ่นของอุปกรณ์ / เครื่องมือ : T200

วันที่ : 29 มิถุนายน 2566

บริษัทผู้ผลิต : Teledyne API

หมายเลขอุปกรณ์ / เครื่องมือ : 2975

TEST VALUES			
API MODEL T200		BEFORE	AFTER
1	RANGE	50 - 20,000 PPB	500.0
2	STABILITY	≤ 1 PPB	0.2
3	SAMPLE FLOW	500 ± 10% cc/min	488
4	OZONE FLOW	80 ± 10% cc/min	78
5	PMT	mV	457.0
6	NORM PMT	mV	510.9
7	A ZERO	-20 To 150 MV	270.7
8	HPVS	400 - 900 V	795
9	RX CELL TEMP	50 ± 1 °C	50.0
10	BOX TEMP	AMBIENT ± 5 °C	34.7
11	PMT TEMP	7 ± 2 °C	7.5
12	MOLY TEMP	315 ± 5 °C	313.9
13	RX CELL PRESSURE	<10 in - Hg-A	9.6
14	SAMPLE PRESSURE	25 - 35 in - Hg-A	28.3
15	NOX SLOPE	1.0 ± 0.3	1.519
16	NOX OFFSET	-50 To 150	260.5
17	NO SLOPE	1.0 ± 0.3	1.320
18	NO OFFSET	-50 To 150	257.0
19	NO SAMPLE READING	PPB	156.0
20	NO2 SAMPLE READING	PPB	47.1
21	NOX SAMPLE READING	PPB	202.4
22	OPTIC TEST	2000 ± 1000 mV	1880.8
23	ELECTRICAL TEST	2000 ± 1000 mV	2096.0
24	VOLTAGE TEST	+5 V +12 V +15 V -15 V	5.28 / 12.21 / 15.73 / -15.17
25	ZERO GAS NO/NO <sub>x</sub>	0.00/0.00 PPB	134.2 / 153.1
26	SPAN GAS NO/NO <sub>x</sub>	400.00/400.00 PPB	652.5 / 739.8

หมายเหตุ

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

- ตรวจเช็คพบว่า A ZERO WARNING เนื่องจากหลอด PMTเสื่อมสภาพ ทำการเปลี่ยน หลอด CD PMT 1 หลอด

VERIFIED

BY

ลงนามเจ้าหน้าที่ (Signature)

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ : คุณพรชัย ผาดีวนาวิรักษ์ โทรศัพท์ : 0-2515-8987

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

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd

EQUIPMENT NAME : NO<sub>x</sub> Analyzer

MANUFACTURER : Teledyne - API

MODEL : T200

SERIAL NO : 2975

STANDARD GAS CONCENTRATION (PPM) : 53.40

CYLINDER NO : CC745169

CYLINDER PRESSURE (psig) : 1400

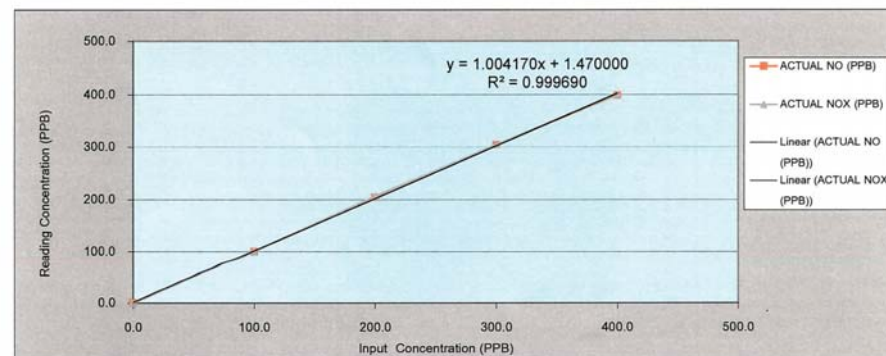
CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10, 2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS						
	IDEAL (PPB)	ACTUAL NO (PPB)	ERROR NO (PPB)	% ERROR NO	ACTUAL NO <sub>x</sub> (PPB)	ERROR NO <sub>x</sub> (PPB)	% ERROR NO <sub>x</sub>
ZERO	0.0	0.1	0.1	-	0.1	0.1	-
1	100.0	100.5	0.5	0.5	100.5	0.5	0.5
2	200.0	204.2	4.2	2.1	206.2	6.2	3.1
3	300.0	304.1	4.1	1.4	304.6	4.6	1.5
4	400.0	399.1	-0.86	-0.1	400.1	0.1	0.0
AVERAGE (%)				1.0	1.3		



CALIBRATED BY :

DATE : 29 มิถุนายน 2566

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิคเพิ่มเติม :

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

Customer service report

บริษัท เอส จี เอส (ประเทศไทย) จำกัด

Manufacturer	Equipment	Model
Teledyne API	NOx Analyzer	T200
S/N	Quotation	
2975	Q-B2-2023-125-SV	

● Checking Date ●

29/6/2023

● Problem

- ตรวจเช็คพบว่าเครื่องมีอาการ A ZERO WARNING เนื่องจากหลอด CD PMT เสื่อมสภาพ



B2



contact us



● Correlation working / Remark

1. ทำการเปลี่ยน หลอด CD PMT
2. ทำการเปลี่ยนวัสดุสิ้นเปลือง Sintered Filter , O-ring , Spring
3. จากการทดสอบการทำงานของเครื่อง \*เครื่องสามารถทำงานปกติ

● Repair parts ●

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

ASSY, PMT, LOW DARK CURR/HI GAIN, NOx Ultra / PN:022890000 จำนวน 1 ชิ้น

Technician / Engineer

**CERTIFICATE OF ANALYSIS**

**Grade of Product: EPA Protocol**

Part Number:	E04NI99E15A0622	Reference Number:	160-402045691-1
Cylinder Number:	CC745169	Cylinder Volume:	144.4 CF
Laboratory:	124 - Plumsteadville - PA	Cylinder Pressure:	2015 PSIG
PGVP Number:	A12021	Valve Outlet:	660
Gas Code:	CO,NO,NOX,SO2,BALN	Certification Date:	Mar 10, 2021

Expiration Date: Mar 10, 2029

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

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

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

CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Expiration Date
NTRM	07060227	EB0079116	100.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%
PRM	12386	D685025	9.91 PPM AIR/NITROGEN DIOXIDE	2.0%
GMIS	124206889	CC323707	4.028 PPM NITROGEN DIOXIDE/NITROGEN	2.1%
NTRM	16010203	KAL003087	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/-0.8%
NTRM	08012341	KAL004716	4857 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%

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

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1KD579	NDIR	Feb 26, 2021
Nicolet ISSO FTIR AUP2010245 NO	FTIR	Feb 11, 2021
Nicolet ISSO FTIR AUP2010245 NO2	FTIR	Feb 22, 2021
Nicolet ISSO FTIR AUP2010245 SO2	FTIR	Feb 18, 2021

Triad Data Available Upon Request

NOTES:

Gross Weight: 28.1 Kg

Net Weight: 4.6 Kg





บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

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

วันที่ : 24 กุมภาพันธ์ 2566

รายชื่ออุปกรณ์ / เครื่องมือ : CO Analyzer

บริษัทผู้ผลิต : Teledyne API

รุ่นของอุปกรณ์ / เครื่องมือ : T300

หมายเลขอุปกรณ์ / เครื่องมือ : 5881

TEST VALUES			
API MODEL T300		BEFORE	AFTER
1	RANGE 1 - 1000 PPM	50.0	50.0
2	STABILITY $\leq 1$ PPM	0.01	0.01
3	CO MEASURE 2500 - 4800 mV	3909.3	4017.3
4	CO REFERENCE 2000 - 4800 mV	3376.8	3472.5
5	MR RATIO 1.1 - 1.3	1.161	1.2
6	PRESEEUURE 25 - 35 in - Hg-A	28.8	29.0
7	SAMPLE FLOW 800 $\pm$ 10% cc/min	848	828
8	SAMPLE TEMP 48 $\pm$ 4 °C	48.4	46.7
9	BENCH TEMP 48 $\pm$ 2 °C	48.0	48.0
10	WHEEL TEMP 68 $\pm$ 2 °C	68.0	67.9
11	BOX TEMP AMBIENT $\pm$ 5 °C	33.4	38.3
12	PHT DRIVE 250 - 4750 mV	2541.7	2360.6
13	CO SLOPE 1.0 $\pm$ 0.3	1.056	1.020
14	CO OFFSET 0.0 $\pm$ 0.3	-0.049	-0.049
15	CO READING (AMBIENT) PPM	0.283	0.021
16	ELECTRICAL TEST 40 $\pm$ 2 PPM	40.0	40.3
17	VOLTAGE TEST +5 V +12 V +15 V -15 V	5.18 /12.16 /16.29 /-15.20	5.18 /12.16 /16.29 /-15.20
18	ZERO GAS 0.00 PPM	0.103	0.034
19	SPAN GAS 40.0 PPM	42.590	40.143

หมายเหตุ

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

VERIFIED

B

ลงนามเจ้าหน้าที่ (Signature)

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ : คุณพรชัย นาคิวนารักษ์

โทรศัพท์ : 0-2515-8987

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

MULTI POINT CALIBRATION REPORT

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

EQUIPMENT NAME : CO Analyzer

MANUFACTURER : Teledyne - API

MODEL : T300

SERIAL NO : 5881

STANDARD GAS CONCENTRATION (PPM) :

4512

CYLINDER NO : CC745169

CYLINDER PRESSURE (psig) :

1550

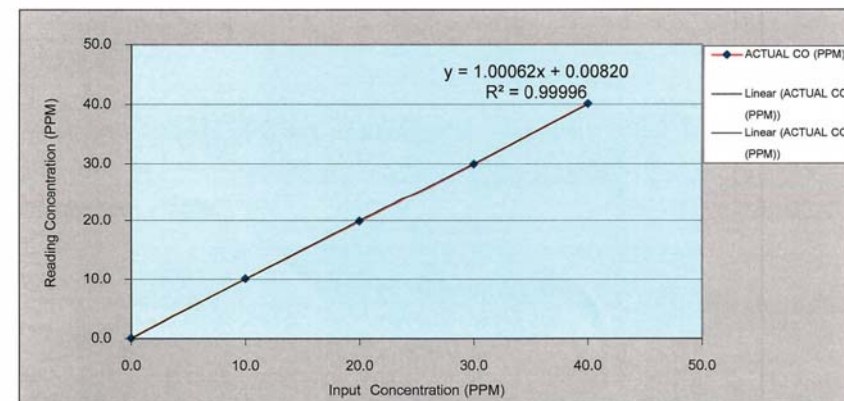
CERTIFIED DATE : Mar 10 ,2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10 ,2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	IDEAL (PPM)	ACTUAL CO (PPM)	ERROR CO (PPM)	% ERROR CO
ZERO	0.00	0.034	0.034	0.00
1	10.00	10.077	0.077	0.770
2	20.00	19.928	-0.072	-0.360
3	30.00	29.921	-0.079	-0.263
4	40.00	40.143	0.143	0.358
AVERAGE (%)				0.505



CALIBRATED BY :

DATE : 24 /02 /2566

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม :

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



## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA Protocol

Part Number: E04NI99E15A0622 Reference Number: 160-402045691-1  
Cylinder Number: CC745169 Cylinder Volume: 144.4 CF  
Laboratory: 124 - Plumsteadville - PA Cylinder Pressure: 2015 PSIG  
PGVP Number: A12021 Valve Outlet: 660  
Gas Code: CO,NO,NOX,SO2,BALN Certification Date: Mar 10, 2021

Expiration Date: Mar 10, 2029

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.  
Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

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

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	07060227	EB0079116	100.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Jul 23, 2023
PRM	12386	D685025	9.91 PPM AIR/NITROGEN DIOXIDE	2.0%	Feb 20, 2020
GMIS	124208889	CC323707	4.028 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Aug 15, 2021
NTRM	16010203	KAL003087	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Dec 23, 2021
NTRM	08012341	KAL004716	4857 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 07, 2024

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

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1KD579	NDIR	Feb 26, 2021
Nicolet IS50 FTIR AUP2010245 NO	FTIR	Feb 11, 2021
Nicolet IS50 FTIR AUP2010245 NO2	FTIR	Feb 22, 2021
Nicolet IS50 FTIR AUP2010245 SO2	FTIR	Feb 18, 2021

Triad Data Available Upon Request

#### NOTES:

Gross Weight: 28.1 Kg  
Net Weight: 4.6 Kg



Approved for Release

Page 1 of 160-402045691-1

### รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

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

รายชื่ออุปกรณ์ / เครื่องมือ : CO Analyzer

รุ่นของอุปกรณ์ / เครื่องมือ : T300

วันที่ : 7 กุมภาพันธ์ 2565

บริษัทผู้ผลิต : Teledyne API

หมายเลขอุปกรณ์ / เครื่องมือ : 5881

TEST VALUES			
	API MODEL T300	BEFORE	AFTER
1	RANGE	1 - 1000 PPM	50
2	STABILITY	≤ 1 PPM	0.15
3	CO MEASURE	2500 - 4800 mV	4489.4
4	CO REFERENCE	2000 - 4800 mV	3873.5
5	PRESEURE	25 - 35 in - Hg-A	29.0
6	SAMPLE FLOW	800 ± 10% cc/min	837
7	SAMPLE TEMP	48 ± 4 °C	46.5
8	BENCH TEMP	48 ± 2 °C	48
9	WHEEL TEMP	68 ± 2 °C	67.9
10	BOX TEMP	AMBIENT ± 5 °C	38.8
11	SLOPE	1.0 ± 0.3	1.065
12	OFFSET	0.0 ± 0.3	-0.045
13	CO READING (AMBIENT)	PPM	1.339
14	VOLTAGE TEST	+5 V +12 V +15 V -15 V	-
15	ZERO GAS	0.00 PPM	0.750
16	SPAN GAS	40.0 PPM	41.574

หมายเหตุ

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ลงนามเจ้าหน้าที่ (Signature)

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ : คุณพรชัย ผาดีวนารักษ์ โทรศัพท์: 0-2515-8987

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



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

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

วันที่ : 9 กุมภาพันธ์ 2566

รายชื่ออุปกรณ์ / เครื่องมือ : SO<sub>2</sub> Analyzer

บริษัทผู้ผลิต : Teledyne API

รุ่นของอุปกรณ์ / เครื่องมือ : T100

หมายเลขอุปกรณ์ / เครื่องมือ : 1771

TEST VALUES			
API MODEL T100		BEFORE	AFTER
1	RANGE	50 - 20,000 PPB	500
2	STABILITY	≤ 1 PPB	0.0
3	PRESSURE	25 - 35 in - Hg-A	29.2
4	SAMPLE FLOW	650 ± 10% cc/min	445
5	PMT	mV	70.2
6	NORM PMT	mV	63.2
7	UV LAMP	1000 - 4800 mV	3982.1
8	LAMP RATIO	30 To 120 %	92.7
9	STRAY LIGHT	≤ 100 PPB	73.1
10	DARK PMT	-50 ± 200 % mV	47.5
11	DARK LAMP	-50 ± 200 % mV	4.6
12	SO <sub>2</sub> SLOPE	1.0 ± 0.3	1.345
13	SO <sub>2</sub> OFFSET	< 250 mV	138.7
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	SO <sub>2</sub> SAMPLE READING	PPB	0.1
19	OPTIC TEST	2000 ± 1000 mV	1123.8
20	ELECTRICAL TEST	2000 ± 1000 mV	1095.1
21	VOLTAGE TEST	+5 V +12 V +15 V -15 V	4.8 / 12.2 / 16.2 / -16.2
22	ZERO GAS	0.00 PPB	-55.8
23	SPAN GAS	400.00 PPB	1024.3

หมายเหตุ

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



ลงนามเจ้าหน้าที่ (Signature)

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

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

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd

EQUIPMENT NAME : SO<sub>2</sub> ANALYZER

MANUFACTURER : Teledyne - API

MODEL : T100

SERIAL NO : 1771

STANDARD GAS CONCENTRATION : 53.79 PPM

CYLINDER NO : CC745169

CYLINDER PRESSURE (psig) : 1550

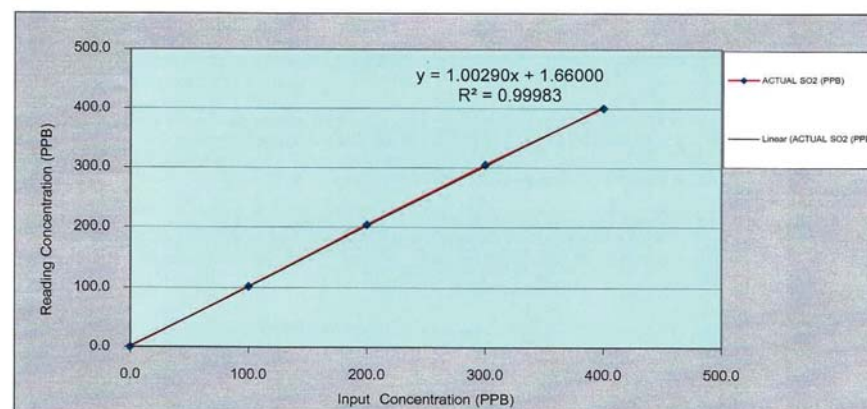
CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10, 2029

CALIBRATION RESULTS

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



CALIBRATED BY :

DATE : 9 กุมภาพันธ์ 2566

ต้องการข้อมูลเพิ่มเติมทางเทคนิคเพิ่มเติม :

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



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

### รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

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

วันที่ : 7 มีนาคม 2566

รายชื่ออุปกรณ์ / เครื่องมือ : NO<sub>x</sub> Analyzer

บริษัทผู้ผลิต : Teledyne API

รุ่นของอุปกรณ์ / เครื่องมือ : T200

หมายเลขอุปกรณ์ / เครื่องมือ : 2199

TEST VALUES			
API MODEL T200		BEFORE	AFTER
1	RANGE	50 - 20,000 PPB	500
2	STABILITY	≤ 1 PPB	0.1
3	SAMPLE FLOW	500 ± 10% cc/min	487
4	OZONE FLOW	80 ± 10% cc/min	77
5	PMT	mV	854.7
6	NORM PMT	mV	906.8
7	A ZERO	-20 To 150 MV	378.7
8	HPVS	400 - 900 V	782
9	RX CELL TEMP	50 ± 1 °C	50.0
10	BOX TEMP	AMBIENT ± 5 °C	35.7
11	PMT TEMP	7 ± 2 °C	6.1
12	MOLY TEMP	315 ± 5 °C	317.0
13	RX CELL PRESSURE	<10 in - Hg-A	10.2
14	SAMPLE PRESSURE	25 - 35 in - Hg-A	28.7
15	NOX SLOPE	1.0 ± 0.3	1.529
16	NOX OFFSET	-50 To 150	172.3
17	NO SLOPE	1.0 ± 0.3	1.423
18	NO OFFSET	-50 To 150	162.0
19	NO SAMPLE READING	PPB	-608.1
20	NO2 SAMPLE READING	PPB	-227.2
21	NOX SAMPLE READING	PPB	-835.1
22	OPTIC TEST	2000 ± 1000 mV	2724.4
23	ELECTRICAL TEST	2000 ± 1000 mV	2563.0
24	VOLTAGE TEST	+5 V +12 V +15 V -15 V	5.23 / 12.24 / 15.72 / -15.07
25	ZERO GAS NO/NO <sub>x</sub>	0.00/0.00 PPB	-888.47 / -1223.9
26	SPAN GAS NO/NO <sub>x</sub>	400.00/400.00 PPB	-0.3 / -0.8

#### หมายเหตุ

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



ลงนามเจ้าหน้าที่ (Signature)

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

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

#### MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd

EQUIPMENT NAME : NO<sub>x</sub> Analyzer

MANUFACTURER : Teledyne - API

MODEL : T200

SERIAL NO : 2199

STANDARD GAS CONCENTRATION (PPM) : 53.40

CYLINDER NO : CC745169

CYLINDER PRESSURE (psig) : 1550

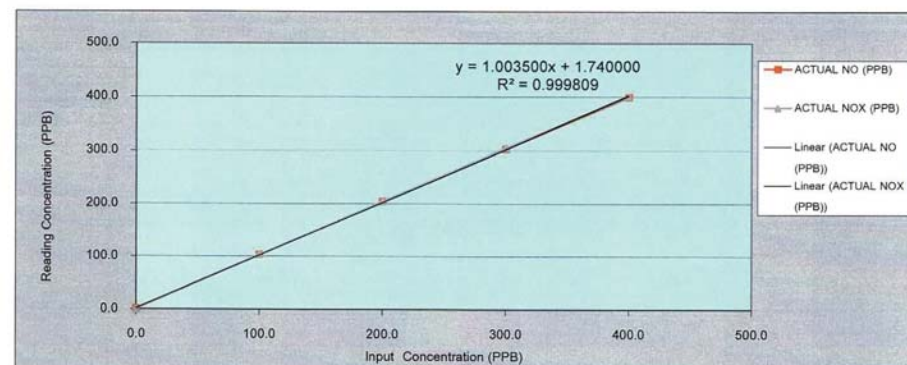
CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10, 2029

#### CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS						
	IDEAL (PPB)	ACTUAL NO (PPB)	ERROR NO (PPB)	% ERROR NO	ACTUAL NO <sub>x</sub> (PPB)	ERROR NO <sub>x</sub> (PPB)	% ERROR NO <sub>x</sub>
ZERO	0.0	0.0	0.0	-	0.0	0.0	-
1	100.0	102.4	2.4	2.4	102.5	2.5	2.5
2	200.0	204.0	4.0	2.0	204.1	4.1	2.1
3	300.0	303.2	3.2	1.1	305.2	5.2	1.7
4	400.0	398.9	-1.1	-0.1	400.4	0.4	0.1
AVERAGE (%)				1.4			1.6



CALIBRATED BY :

DATE : 7 มีนาคม 2566

ต้องการข้อมูลเพิ่มเติมทางเทคนิคเพิ่มเติม

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





บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

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

วันที่ : 29 สิงหาคม 2565

รายชื่ออุปกรณ์ / เครื่องมือ : CO Analyzer

บริษัทผู้ผลิต : Teledyne API

รุ่นของอุปกรณ์ / เครื่องมือ : T300

หมายเลขอุปกรณ์ / เครื่องมือ : 2550

TEST VALUES				
API MODEL T300		BEFORE	AFTER	
1	RANGE	1 - 1000 PPM	50.0	50.0
2	STABILITY	≤ 1 PPM	0.01	0.01
3	CO MEASURE	2500 - 4800 mV	3064.5	3567.0
4	CO REFERENCE	2000 - 4800 mV	2564.2	2987.2
5	PRESEEURE	25 - 35 in - Hg-A	29.4	29.7
6	SAMPLE FLOW	800 ± 10% cc/min	805.7	804.2
7	SAMPLE TEMP	48 ± 4 °C	44.4	44.4
8	BENCH TEMP	48 ± 2 °C	48.0	48.0
9	WHEEL TEMP	68 ± 2 °C	68.0	68.0
10	BOX TEMP	AMBIENT ± 5 °C	32.1	33.4
11	SLOPE	1.0 ± 0.3	0.921	0.925
12	OFFSET	0.0 ± 0.3	-0.006	-0.007
13	CO READING (AMBIENT)	PPM	0.65	0.33
14	ELECTRICAL TEST	40 ± 2 PPM	-	-
15	VOLTAGE TEST	+5 V +12 V +15 V -15 V	5.21 / 12.22 / 16.56 / -15.19	5.21 / 12.22 / 16.56 / -15.19
16	ZERO GAS	0.00 PPM	0.32	0.01
17	SPAN GAS	40.0 PPM	39.72	40.02

หมายเหตุ

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

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บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด



ลงนามเจ้าหน้าที่ (Signature)

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

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

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd

EQUIPMENT NAME : CO Analyzer

MANUFACTURER : Teledyne - API

MODEL : T300

SERIAL NO : 2550

STANDARD GAS CONCENTRATION (PPM) : 4512

CYLINDER NO : CC745169

CYLINDER PRESSURE (psig) : 1750

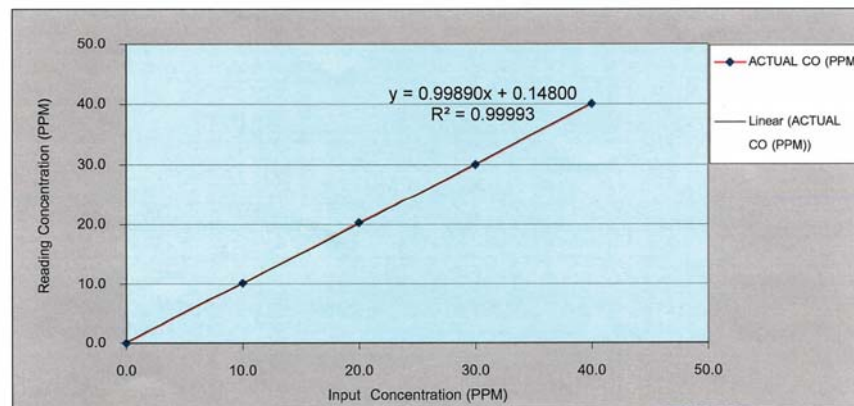
CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10, 2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	IDEAL (PPM)	ACTUAL CO (PPM)	ERROR CO (PPM)	% ERROR CO
ZERO	0.00	0.01	0.01	-
1	10.00	10.21	0.21	2.10
2	20.00	20.31	0.31	1.55
3	30.00	30.08	0.08	0.27
4	40.00	40.02	0.02	0.05
AVERAGE (%)				0.99



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

CALIBRATED BY :

DATE : 29 สิงหาคม 2565

ต้องการข้อมูลเพิ่มเติมทางเทคนิคเพิ่มเติม :

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



## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA Protocol

Part Number: E04NI99E15A0622  
Cylinder Number: CC745169  
Laboratory: 124 - Plumsteadville - PA  
PGVP Number: A12021  
Gas Code: CO,NO,NOX,SO<sub>2</sub>,BALN

Reference Number: 160-402045691-1  
Cylinder Volume: 144.4 CF  
Cylinder Pressure: 2015 PSIG  
Valve Outlet: 660  
Certification Date: Mar 10, 2021

Expiration Date: Mar 10, 2029

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.  
Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

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

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	07060227	E80079116	100.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Jul 23, 2023
PRM	12386	D685025	9.91 PPM AIR/NITROGEN DIOXIDE	2.0%	Feb 20, 2020
GMIS	124206889	CC323707	4.028 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Aug 15, 2021
NTRM	16010203	KAL003087	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/-0.8%	Dec 23, 2021
NTRM	08012341	KAL004716	4857 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 07, 2024

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

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1KD579	NDIR	Feb 26, 2021
Nicolet IS50 FTIR AUP2010245 NO	FTIR	Feb 11, 2021
Nicolet IS50 FTIR AUP2010245 NO2	FTIR	Feb 22, 2021
Nicolet IS50 FTIR AUP2010245 SO2	FTIR	Feb 18, 2021

Triad Data Available Upon Request

#### NOTES:

Gross Weight: 28.1 Kg  
Net Weight: 4.6 Kg



Approved for Release

Page 1 of 160-402045691-1

#### รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

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

รายชื่ออุปกรณ์ / เครื่องมือ : SO<sub>2</sub> Analyzer

รุ่นของอุปกรณ์ / เครื่องมือ : T100

วันที่ : 3 พฤษภาคม 2566

บริษัทผู้ผลิต : Teledyne API

หมายเลขอุปกรณ์ / เครื่องมือ : 1385

TEST VALUES			
API MODEL T100		BEFORE	AFTER
1	RANGE	50 - 20,000 PPB	500.0
2	SO <sub>2</sub> STABILITY	≤ 1 PPB	0.3
3	PRESSURE	25 - 35 in - Hg-A	27.4
4	SAMPLE FLOW	700 ± 10% cc/min	663
5	PMT	mV	89.1
6	NORM PMT	mV	90.1
7	UV LAMP	1000 - 4800 mV	3779.6
8	LAMP RATIO	30 To 120 %	101.4
9	STRAY LIGHT	≤ 100 PPB	24.7
10	DARK PMT	-50 ± 200 % mV	18.6
11	DARK LAMP	-50 ± 200 % mV	-3.9
12	SO <sub>2</sub> SLOPE	1.0 ± 0.3	1.632
13	SO <sub>2</sub> OFFSET	< 250 mV	30.3
14	HVPS	400 - 900 V	606
15	RX CELL TEMP	50 ± 1 °C	50.0
16	BOX TEMP	AMBIENT ± 5 °C	34.8
17	PMT TEMP	7 ± 2 °C	8.7
18	SO <sub>2</sub> SAMPLE READING	PPB	61.5
19	OPTIC TEST	2000 ± 1000 mV	1259.1
20	ELECTRICAL TEST	2000 ± 1000 mV	1438.1
21	VOLTAGE TEST	+5 V +12 V +15 V -15 V	5.23/ 12.15/15.28 /-15.20
22	ZERO GAS	0.00 PPB	24.1
23	SPAN GAS	400.00 PPB	314.7

#### หมายเหตุ

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

VERIFIED

BY

ลงนามเจ้าหน้าที่ (Signature)

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ : คุณพรชัย ผาติวนาภิรักษ์ โทรศัพท์ : 0-2515-8987

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

## MULTI POINT CALIBRATION REPORT

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

EQUIPMENT NAME : SO<sub>2</sub> Analyzer

MANUFACTURER : Teledyne - API

MODEL : T100

SERIAL NUMBER : 1385

STANDARD GAS CONCENTRATION (PPM) : 53.79

CYLINDER NO : CC745169

CYLINDER PRESSURE (PSIG) : 1450

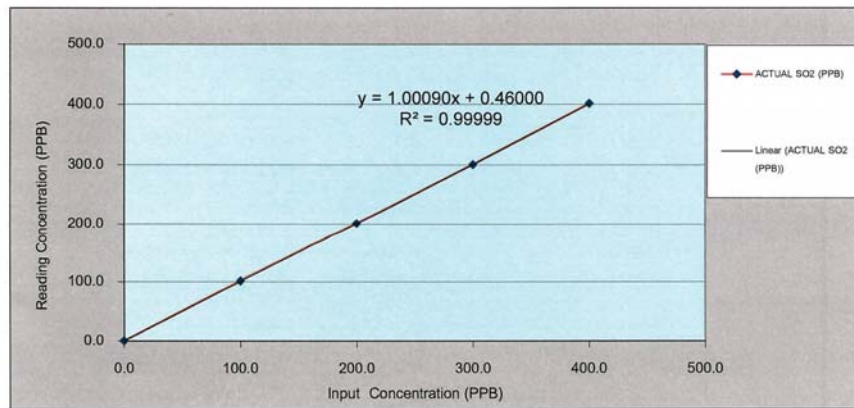
CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10, 2029

## CALIBRATION RESULTS

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



CALIBRATED BY :

DATE : 03 /05 /2566

ต้องการข้อมูลทางด้านเทคนิคเพิ่มเติม : คุณพรชัย ผาติวนารักษ์ โทรศัพท์ : 02-515-8987

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

**Airgas**  
 an Air Liquide company

 Airgas Specialty Gases  
 Airgas USA, LLC  
 6141 Easton Road  
 Bldg 2  
 Plumsteadville, PA 18949  
 Airgas.com

## CERTIFICATE OF ANALYSIS

## Grade of Product: EPA Protocol

Part Number: E04NI99E15A0622

Cylinder Number: CC745169

Laboratory: 124 - Plumsteadville - PA

PGVP Number: A12021

Gas Code: CO,NO,NOX,SO<sub>2</sub>,BALN

Reference Number: 160-402045691-1

Cylinder Volume: 144.4 CF

Cylinder Pressure: 2015 PSIG

Valve Outlet: 660

Certification Date: Mar 10, 2021

Expiration Date: Mar 10, 2029

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

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

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

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	07060227	E80079116	100.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Jul 23, 2023
PRM	12386	D685025	9.91 PPM AIR/NITROGEN DIOXIDE	2.0%	Feb 20, 2020
GMIS	124206889	CC323707	4.028 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Aug 15, 2021
NTRM	16010203	KAL003087	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/-0.8%	Dec 23, 2021
NTRM	08012341	KAL004716	4857 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 07, 2024

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

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1KD579	NDIR	Feb 26, 2021
Nicolet IS50 FTIR AUP2010245 NO	FTIR	Feb 11, 2021
Nicolet IS50 FTIR AUP2010245 NO2	FTIR	Feb 22, 2021
Nicolet IS50 FTIR AUP2010245 SO2	FTIR	Feb 18, 2021

Triad Data Available Upon Request

## NOTES:

Gross Weight: 28.1 Kg

Net Weight: 4.6 Kg



Approved for Release

Page 1 of 160-402045691-1





บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

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

รายชื่ออุปกรณ์ / เครื่องมือ : NO<sub>x</sub> Analyzer

รุ่นของอุปกรณ์ / เครื่องมือ : T200

วันที่ : 27 กุมภาพันธ์ 2566

บริษัทผู้ผลิต : Teledyne API

หมายเลขอุปกรณ์ / เครื่องมือ : 7534

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

หมายเหตุ

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

VERIFIED

BY

ลงนามเจ้าหน้าที่ (Signature)

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

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

AAQ1 22005

MULTI POINT CALIBRATION REPORT

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

EQUIPMENT NAME : NO<sub>x</sub> Analyzer

MANUFACTURER : Teledyne - API

MODEL : T200

SERIAL NO : 7534

STANDARD GAS CONCENTRATION (PPM) : 53.4

CYLINDER NO : CC745169

CYLINDER PRESSURE (psig) : 1550

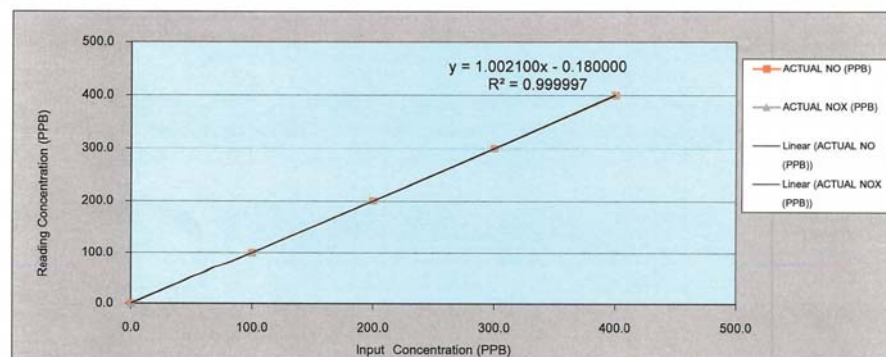
CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10, 2029

CALIBRATION RESULTS

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



CALIBRATED BY :

DATE : 27 /02 /2566

ต้องการข้อมูลเพิ่มเติมทางเทคนิคเพิ่มเติม

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

## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA Protocol

Part Number: E04NI99E15A0622 Reference Number: 160-402045691-1  
Cylinder Number: CC745169 Cylinder Volume: 144.4 CF  
Laboratory: 124 - Plumsteadville - PA Cylinder Pressure: 2015 PSIG  
PGVP Number: A12021 Valve Outlet: 660  
Gas Code: CO,NO,NOX,SO2,BALN Certification Date: Mar 10, 2021  
Expiration Date: Mar 10, 2029

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.  
Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

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

CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Expiration Date
NTRM	07060227	EB0079116	100.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0% Jul 23, 2023
PRM	12386	D685025	9.91 PPM AIR/NITROGEN DIOXIDE	2.0% Feb 20, 2020
GMIS	124208889	CC323707	4.028 PPM NITROGEN DIOXIDE/NITROGEN	2.1% Aug 15, 2021
NTRM	16010203	KAL003087	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/-0.8% Dec 23, 2021
NTRM	08012341	KAL004716	4857 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6% Jun 07, 2024

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

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1KD579	NDIR	Feb 26, 2021
Nicolet IS50 FTIR AUP2010245 NO	FTIR	Feb 11, 2021
Nicolet IS50 FTIR AUP2010245 NO2	FTIR	Feb 22, 2021
Nicolet IS50 FTIR AUP2010245 SO2	FTIR	Feb 18, 2021

Triad Data Available Upon Request

#### NOTES:

Gross Weight: 28.1 Kg  
Net Weight: 4.6 Kg



Approved for Release

Page 1 of 160-402045691-1

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

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

รายชื่ออุปกรณ์ / เครื่องมือ : NO<sub>x</sub> Analyzer

รุ่นของอุปกรณ์ / เครื่องมือ : T200

วันที่ : 7 กุมภาพันธ์ 2565

บริษัทผู้ผลิต : Teledyne API

หมายเลขอุปกรณ์ / เครื่องมือ : 7534

TEST VALUES			
API MODEL T200		BEFORE	AFTER
1	RANGE	50 - 20,000 PPB	500
2	STABILITY	≤ 1 PPB	0.15
3	SAMPLE FLOW	500 ± 10% cc/min	485
4	OZONE FLOW	80 ± 10% cc/min	86
5	PMT	mV	10.1
6	NORM PMT	mV	23.5
7	A ZERO	-20 To 150 MV	19.1
8	HPVS	400 - 900 V	650
9	RX CELL TEMP	50 ± 1 °C	50.0
10	BOX TEMP	AMBIENT ± 5 °C	32.7
11	PMT TEMP	7 ± 2 °C	7.0
12	MOLY TEMP	315 ± 5 °C	315.6
13	RX CELL PRESSURE	<10 in - Hg-A	4.6
14	SAMPLE PRESSURE	25 - 35 in - Hg-A	28.6
15	NOX SLOPE	1.0 ± 0.3	0.992
16	NOX OFFSET	-50 To 150	-7.5
17	NO SLOPE	1.0 ± 0.3	0.983
18	NO OFFSET	-50 To 150	-8.1
19	NO SAMPLE READING	PPB	0.2
20	NO2 SAMPLE READING	PPB	15.2
21	NOX SAMPLE READING	PPB	15.4
22	OPTIC TEST	2000 ± 1000 mV	2304.7
23	ELECTRICAL TEST	2000 ± 1000 mV	2115.1
24	VOLTAGE TEST	+5 V +12 V +15 V -15 V	-
25	ZERO GAS NO/NOx	0.00/0.00 PPB	1.0 / 1.3
26	SPAN GAS NO/NOx	400.00/400.00 PPB	518 / 523.4

หมายเหตุ

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บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

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

รายชื่ออุปกรณ์ / เครื่องมือ : CO Analyzer

รุ่นของอุปกรณ์ / เครื่องมือ : T300

วันที่ : 25 สิงหาคม 2565

บริษัทผู้ผลิต : Teledyne API

หมายเลขอุปกรณ์ / เครื่องมือ : 1885

TEST VALUES			
API MODEL T300		BEFORE	AFTER
1	RANGE	1 - 1000 PPM	50.0
2	STABILITY	≤ 1 PPM	0.009
3	CO MEASURE	2500 - 4800 mV	3164.7
4	CO REFERENCE	2000 - 4800 mV	2584.4
5	MR RATION	1.1 ± 1.3	1.235
6	PRESEURE	25 - 35 in - Hg-A	28.9
7	SAMPLE FLOW	800 ± 10% cc/min	818
8	SAMPLE TEMP	48 ± 4 °C	45.2
9	BENCH TEMP	48 ± 2 °C	48.0
10	WHEEL TEMP	68 ± 2 °C	68.0
11	BOX TEMP	AMBIENT ± 5 °C	32.3
12	PHT DRIVE	250 - 4750 mV	3818.7
13	SLOPE	1.0 ± 0.3	0.873
14	OFFSET	0.0 ± 0.3	0.025
15	CO READING (AMBIENT)	PPM	0.126
16	ELECTRICAL TEST	40 ± 2 PPM	40.463
17	VOLTAGE TEST	+5 V +12 V +15 V -15 V	5.21 / 12.38 / 15.38 / -15.38
18	ZERO GAS	0.00 PPM	-0.011
19	SPAN GAS	40.0 PPM	40.098

หมายเหตุ

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

**KINETICS**  
บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

ลงนามเจ้าหน้าที่ (Signature)

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

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

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd

EQUIPMENT NAME : CO Analyzer

MANUFACTURER : Teledyne - API

MODEL : T300

SERIAL NO : 1885

STANDARD GAS CONCENTRATION (PPM) : 4512

CYLINDER NO : CC745169

CYLINDER PRESSURE (psig) : 1750

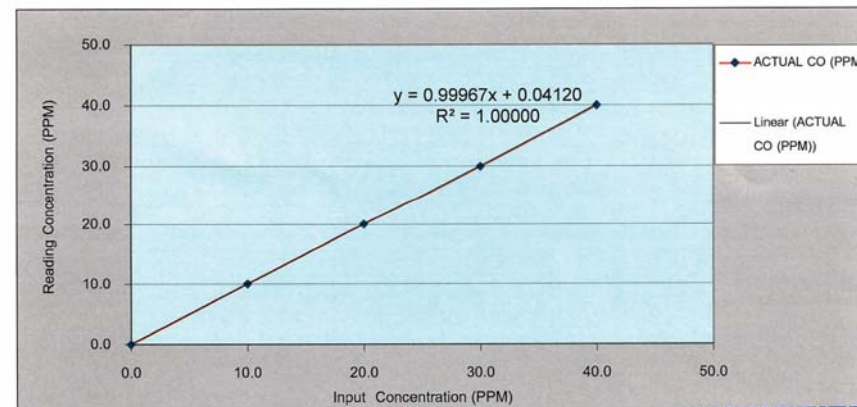
CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10, 2029

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	IDEAL (PPM)	ACTUAL CO (PPM)	ERROR CO (PPM)	% ERROR CO
ZERO	0.00	0.000	0.00	-
1	10.00	10.077	0.08	0.77
2	20.00	20.061	0.06	0.31
3	30.00	30.026	0.03	0.09
4	40.00	40.009	0.01	0.02
AVERAGE (%)				0.29



**KINETICS**  
บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

CALIBRATED BY

DATE : 25 สิงหาคม 2565

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิคเพิ่มเติม :

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

## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA Protocol

Part Number: E04NI99E15A0622  
Cylinder Number: CC745169  
Laboratory: 124 - Plumsteadville - PA  
PGVP Number: A12021  
Gas Code: CO,NO,NOX,SO<sub>2</sub>,BALN

Reference Number: 160-402045691-1  
Cylinder Volume: 144.4 CF  
Cylinder Pressure: 2015 PSIG  
Valve Outlet: 660  
Certification Date: Mar 10, 2021

Expiration Date: Mar 10, 2029

Certification performed in accordance with EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012) document EPA 800/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.  
Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

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

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	07060227	E80079116	100.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Jul 23, 2023
PRM	12386	D685025	9.91 PPM AIR/NITROGEN DIOXIDE	2.0%	Feb 20, 2020
GMIS	124206889	CC323707	4.028 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Aug 15, 2021
NTRM	16010203	KAL003087	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/-0.8%	Dec 23, 2021
NTRM	08012341	KAL004716	4857 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 07, 2024

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

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1KD579	NDIR	Feb 26, 2021
Nicolet IS50 FTIR AUP2010245 NO	FTIR	Feb 11, 2021
Nicolet IS50 FTIR AUP2010245 NO2	FTIR	Feb 22, 2021
Nicolet IS50 FTIR AUP2010245 SO2	FTIR	Feb 18, 2021

Triad Data Available Upon Request

#### NOTES:

Gross Weight: 28.1 Kg  
Net Weight: 4.6 Kg



Approved for Release

Page 1 of 160-402045691-1

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

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

รายชื่ออุปกรณ์ / เครื่องมือ : SO<sub>2</sub> Analyzer

รุ่นของอุปกรณ์ / เครื่องมือ : T100

วันที่ : 7 ธันวาคม 2565

บริษัทผู้ผลิต : Teledyne API

หมายเลขอุปกรณ์ / เครื่องมือ : 2512

TEST VALUES			
API MODEL T100		BEFORE	AFTER
1	RANGE	50 - 20,000 PPB	500
2	STABILITY	≤ 1 PPB	0.13
3	PRESSURE	25 - 35 in - Hg-A	28.2
4	SAMPLE FLOW	650 ± 10% cc/min	655.1
5	PMT	mV	85.5
6	NORM PMT	mV	51.7
7	UV LAMP	1000 - 4800 mV	3295.2
8	LAMP RATIO	30 To 120 %	93.0
9	STRAY LIGHT	≤ 100 PPB	14.6
10	DARK PMT	-50 ± 200 % mV	35.1
11	DARK LAMP	-50 ± 200 % mV	2.2
12	SO2 SLOPE	1.0 ± 0.3	1.649
13	SO2 OFFSET	< 250 mV	17.8
14	HVPS	400 - 900 V	577
15	RX CELL TEMP	50 ± 1 °C	50.0
16	BOX TEMP	AMBIENT ± 5 °C	29.9
17	PMT TEMP	7 ± 2 °C	8.4
18	SO2 SAMPLE READING	PPB	29.2
19	VOLTAGE TEST	+5 V +12 V +15 V -15 V	5.17 / 12.18 / 16.01 / -15.33
20	ZERO GAS	0.00 PPB	27.9
21	SPAN GAS	400.00 PPB	297.8

หมายเหตุ

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ลงนามเจ้าหน้าที่ (Signature)

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

## MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd

EQUIPMENT NAME : SO<sub>2</sub> Analyzer

MANUFACTURER : Teledyne - API

MODEL : T100

SERIAL NO : 2512

STANDARD GAS CONCENTRATION (PPM) : 53.79

CYLINDER NO : CC745169

CYLINDER PRESSURE (psig) : 1650

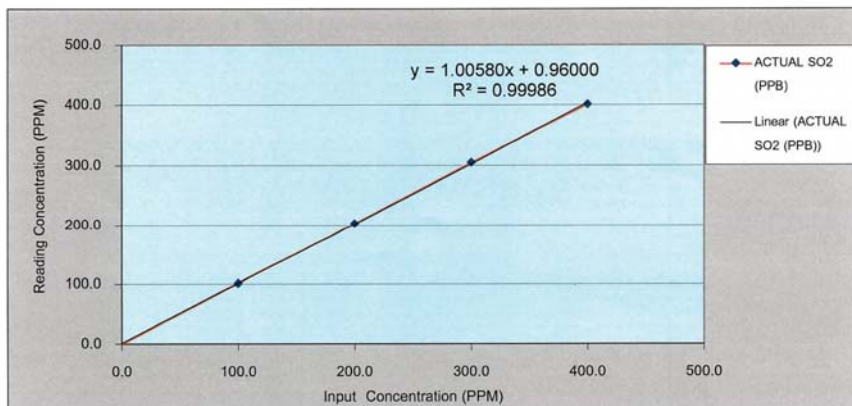
CERTIFIED DATE : Mar 10, 2021

CERTIFIED BY : AIRGAS SPECIALTY GASES

EXPIRED DATE : Mar 10, 2029

## CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	IDEAL (PPB)	ACTUAL SO <sub>2</sub> (PPB)	ERROR SO <sub>2</sub> (PPB)	% ERROR SO <sub>2</sub>
ZERO	0.0	-0.1	0.1	-
1	100.0	101.3	1.3	1.3
2	200.0	203.4	3.4	1.7
3	300.0	305.1	5.1	1.7
4	400.0	400.9	0.9	0.2
AVERAGE (%)				1.2



CALIBRATED BY :

DATE : 7 ธันวาคม 2565

ต้องการข้อมูลเพิ่มเติม

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



Airgas Specialty Gases  
Airgas USA, LLC  
6141 Easton Road  
Bldg 2  
Plumsteadville, PA 18949  
Airgas.com

## CERTIFICATE OF ANALYSIS

## Grade of Product: EPA Protocol

Part Number: E04NI99E15A0622

Cylinder Number: CC745169

Laboratory: 124 - Plumsteadville - PA

PGVP Number: A12021

Gas Code: CO, NO, NOX, SO<sub>2</sub>, BALN

Reference Number: 160-402045691-1

Cylinder Volume: 144.4 CF

Cylinder Pressure: 2015 PSIG

Valve Outlet: 660

Certification Date: Mar 10, 2021

Expiration Date: Mar 10, 2029

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

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

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

CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Uncertainty
NTRM	07060227	EB0079116	100.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%
PRM	12386	D685025	9.91 PPM AIR/NITROGEN DIOXIDE	2.0%
GMIS	124206889	CC323707	4.028 PPM NITROGEN DIOXIDE/NITROGEN	2.1%
NTRM	16010203	KAL003087	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%
NTRM	08012341	KAL004716	4857 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%

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

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1KD579	NDIR	Feb 26, 2021
Nicolet IS50 FTIR AUP2010245 NO	FTIR	Feb 11, 2021
Nicolet IS50 FTIR AUP2010245 NO <sub>2</sub>	FTIR	Feb 22, 2021
Nicolet IS50 FTIR AUP2010245 SO <sub>2</sub>	FTIR	Feb 18, 2021

Triad Data Available Upon Request

## NOTES:

Gross Weight: 28.1 Kg

Net Weight: 4.6 Kg



Approved for Release

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## SINGLE-POINT CALIBRATION REPORT



## Report Check Sheet

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

Calibration Date : 24/05/2022  
Calibration Time : 13.30  
Calibrated by : Environmental Solution Integrator Co., Ltd.

Gas Measurement	: CH4,HCNM,THC
Measuring Range	: 0-1000 PPM
Cylinder ID Number	: ND43933
Certification Date	: Jul 16,2021
Expiry Date	: Jul 16,2029
K	: before calibration CH4 : 1.414
	: after calibration CH4 : 1.515
	: before calibration N3H8 : 1.000
	: after calibration N3H8 : 1.000
CH4 Reading	: before calibration : 1.40
	: after calibration : 3.20
N3H8 Reading	: before calibration : 1.14
	: after calibration : 1.32

Manufacturer	
Analyzer Model	: HC51M
Serial Number	: 886
Note	: METHANE CONC 211.4 PPM : PROPANE CONC 217.1 PPM

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

Job Number : ST65ES001  
Working Date : 24/05/2022  
Calibrated by : Environmental Solution Integrator Co., Ltd.

Equipment : HC51M  
Serial Number : 886

Manufacturer :

FID		
Status	Reading	Result
Sample T°	54	Passed
FID T°	152	Passed
NMHC T°	213	Passed
ZERO T°	398	Passed
CH4 REF	290.8	Passed
THC REF	290.8	Passed
CH4	3.4	Passed
THC	3.7	Passed
NMHC	0.4	Passed
Sample flow	75	Passed
Air	373	Passed
H2 P	612	Passed
Air P	1321	Passed
Sample P.	311	Passed
Signal	55	Passed
Auto-Zero	55.0	Passed

Mux Signals		
Status	Reading	Result
GND ((-)-(+10)) mv	0	Passed
Int.Temp. (150-550) mv	331	Passed
H2 Press. (450-750) mv	621	Passed
Air Press. (1100-1500) mv	1321	Passed
Sample Press. (200-400) mv	311	Passed
Air Flow (3000-4600) mv	3706	Passed
Sample Flow (2500-3900) mv	3227	Passed
Signal (0-9999) mv	55	Passed
Auto-Zero (500-1500) mv	555	Passed
Flame (off or on) mv	9998	Passed
2V Ref (1800-2200) mv	1992	Passed
Sample Temp. (750-950) mv	807	Passed
FID Temp. (880-980) mv	938	Passed
HCNM Temp (950-1050) mv	1005	Passed
ZERO Temp (1095-1195) mv	1158	Passed
Baro/Ext.	0	Passed

### Zero Calibration

Gas	Before Calibration		
	Zero Adjustment	Reading	Result
CH4	0	0	PASS
C3H8	0	0	PASS

After Calibration		
Zero Adjustment	Reading	Result
0	0	PASS
0	0	PASS

### Span Calibration

Gas	Before Calibration			
	K	Delta	Reading	Result
CH4	1.1414	0.0%	203	PASS
C3H8	1	0.0%	651.2	PASS

After Calibration			
K	Delta	Reading	Result
1.515	-25%	211.4	PASS
1	0%	651.2	PASS
Expect : METHANE 211.4 PPM			
: PROPANE 651.3 PPM			

Offset / Conversion			
Gas	Offset	Convers	Result
THC	0	1.96	Passed
CH4	0	1	Passed
HCNM	0	0.720	Passed

Remark :

Remark :

Performed by

Approved by

Service Engineer

Service Manager

Performed by

Approved by

Service Engineer

Service Manager

Environmental Solution Integrator Co.,Ltd.

82/42 Moo.19 Phutthamonthon Sai2 Road, Sala Thammasop, Thawi Watthana, Bangkok 10170

Phone: 0-2408-2042 = Fax: 0-2408-2043 = www.esithailand.com

Environmental Solution Integrator Co.,Ltd.

82/42 Moo.19 Phutthamonthon Sai2 Road, Sala Thammasop, Thawi Watthana, Bangkok 10170

Phone: 0-2408-2042 • Fax: 0-2408-2043 • www.esithailand.com



# CERTIFICATE OF ANALYSIS

## Grade of Product: EPA PROTOCOL STANDARD

Customer: BANGKOK INDUSTRIAL  
GAS CO LTD  
Part Number: E04NI99E80ACP0C  
Cylinder Number: LL164665  
Laboratory: 124 - Plumsteadville - PA  
PGVP Number: A12022  
Gas Code: CO,NO,NOX,SO2,BALN

Reference Number: 160-402557716-1  
Cylinder Volume: 83.0 CF  
Cylinder Pressure: 2215 PSIG  
Valve Outlet: 660  
Certification Date: Oct 21, 2022

Expiration Date: Oct 21, 2025

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted. The results relate only to the items tested. The report shall not be reproduced except in full without approval of the laboratory. Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	45.00 PPM	45.01 PPM	G1	+/- 1.3% NIST Traceable	10/13/2022, 10/21/2022
NITRIC OXIDE	45.00 PPM	45.01 PPM	G1	+/- 1.2% NIST Traceable	10/13/2022, 10/21/2022
SULFUR DIOXIDE	45.00 PPM	45.11 PPM	G1	+/- 0.9% NIST Traceable	10/13/2022, 10/21/2022
CARBON MONOXIDE	4500 PPM	4511 PPM	G1	+/- 0.8% NIST Traceable	10/14/2022
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	210607-21	CC708065	48.41 PPM NITRIC OXIDE/NITROGEN	+/- 1.2%	Sep 21, 2025
PRM	12395	D887660	9.91 PPM NITROGEN DIOXIDE/AIR	+/- 2.0%	Feb 22, 2022
GMIS	124206889110	CC322674	4.474 PPM NITROGEN DIOXIDE/AIR	+/- 2.0%	Feb 25, 2025
NTRM	160102-32	KAL004062	97.69 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Nov 01, 2027
NTRM	08012355	KAL004734	4857 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 07, 2024

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

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1KD579	NDIR	Sep 22, 2022
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Oct 20, 2022
Nicolet iS50 FTIR AUP2010245 NO2	FTIR	Oct 06, 2022
Nicolet iS50 FTIR AUP2010245 SO2	FTIR	Sep 29, 2022

Triad Data Available Upon Request

NOTES: PO# 5222004798  
Gross Weight: 17.2 Kg  
Net Weight: 2.7 Kg  
Cylinder: 80A



Approved for Release

Page 1 of 1

# Certificate of Calibration

Calibration Certification Information				
Cal. Date:	November 28, 2022	Rootmeter S/N:	438320	Ta: 294 °K
Operator:	Jim Tisch			Pa: 748.8 mm Hg
Calibration Model #:	TE-5025A	Calibrator S/N:	1290	

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3960	3.2	2.00
2	3	4	1	0.9800	6.4	4.00
3	5	6	1	0.8770	8.0	5.00
4	7	8	1	0.8370	8.8	5.50
5	9	10	1	0.6930	12.8	8.00

Data Tabulation					
Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H \left( \frac{Ta}{Pa} \right)}$ (y-axis)
0.9944	0.7123	1.4133	0.9957	0.7133	0.8862
0.9901	1.0103	1.9987	0.9915	1.0117	1.2532
0.9880	1.1266	2.2346	0.9893	1.1281	1.4011
0.9869	1.1791	2.3436	0.9882	1.1807	1.4695
0.9816	1.4164	2.8265	0.9829	1.4183	1.7723
QSTD	m=	2.00726	QA	m=	1.25691
	b=	-0.02247		b=	-0.01409
	r=	0.99994		r=	0.99994

Calculations	
Vstd= ΔVol((Pa-ΔP)/Pstd)(Tstd/Ta)	Va= ΔVol((Pa-ΔP)/Pa)
Qstd= Vstd/ΔTime	Qa= Va/ΔTime
For subsequent flow rate calculations:	
Qstd= 1/m $\left( \sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)} \right) - b$	Qa= 1/m $\left( \sqrt{\Delta H \left( \frac{Ta}{Pa} \right)} \right) - b$

Standard Conditions	
Tstd:	298.15 °K
Pstd:	760 mm Hg
Key	
ΔH:	calibrator manometer reading (in H2O)
ΔP:	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 the Atmosphere, 9.2.17, page 30

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

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

### Certificate of Calibration

#### Customer

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

Certificate No : 23-SLM-041  
Request No : Req-2023-0295

#### Unit Under Calibration Details

Measurement item : Sound Level Meter  
Manufacturer : Cirrus  
Model : CR-161B  
Serial Number : G078054  
ID : ENSL 16122  
Resolution : 0.1 dB  
Microphone Class : 1  
Microphone Model : MK224  
Microphone S/N : 206565A  
Preamplifier Model : KM-170  
Preamplifier S/N : 0824  
Instrument Status : Used

#### Calibration Environment and Details

Temperature : 23 °C ± 2 °C  
Humidity : 50 %RH ± 20 %RH  
Barometric Pressure : 1013 hPa ± 10 hPa  
Received Date : 2 February 2023  
Calibrated Date : 9 February 2023  
Calibration Procedure : In-house method CP-SLM-01 based on IEC 61672-3 : 2013 Electroacoustics - Sound level meters - Part 3: Periodic tests  
Location of Calibration : Lab Acoustic

#### Reference Standard

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

#### Note

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

Calibrated By :

Calibration Officer

Approved By :

Calibration Engineer Supervisor

Issue Date : 9 February 2023



Certificate No : 23-SLM-041  
Request No : Req-2023-0295

#### 1. Indication at the calibration check frequency

UUC Setting	Nominal Level (dB)	Before Adjust		Adjust		UNCERTAINTY ( ± dB)	Acceptance Limit ( ± dB)
		UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)		
1000 Hz 94.00 dB	93.81	93.7	-0.11	93.8	-0.01	0.20	0.3

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

#### 2. Self-generated noise, Microphone installed

UUC Setting	Measured (dB)	UNCERTAINTY ( ± dB)
FAST / 20-140		
UUC Weighting	(dB)	( ± dB)
A	19.7	0.10

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

UUC Setting	Measured (dB)	UNCERTAINTY ( ± dB)
FAST / 20-140		
UUC Weighting	(dB)	( ± dB)
A	-	0.10
C	18.2	0.10
Z	31.1	0.10

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY ( ± dB)	Acceptance Limit ( ± dB)
	A	C	Z		
FAST / 20-140	(dB)	(dB)	(dB)	( ± dB)	( ± dB)
STD Setting	(dB)	(dB)	(dB)	( ± dB)	( ± dB)
125 Hz	0.5	0.3	0.2	0.50	1.0
1000 Hz	0.0	0.0	0.0	0.60	0.7
4000 Hz	-0.8	-0.7	-0.3	0.60	1.0
8000 Hz	0.2	0.5	0.9	0.70	+1.5 -2.5



Certificate No : 23-SLM-041  
 Request No : Req-2023-0295

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

UUC Setting	Deviation from various Frequency			UNCERTAINTY	Acceptance
FAST / 20-140	Weighting Response curve				
STD Setting	A (dB)	C (dB)	Z (dB)	( ± dB)	Limit ( ± dB)
63 Hz	0.2	0.0	0.0	0.2	1.0
125 Hz	0.2	0.0	0.0		1.0
250 Hz	0.2	0.0	0.0		1.0
500 Hz	0.1	0.0	0.0		1.0
1000 Hz	0.0	0.0	0.0		0.7
2000 Hz	-0.2	0.0	0.0		1.0
4000 Hz	-0.4	-0.2	0.0		1.0
8000 Hz	-0.5	-0.4	-0.1		+1.5, -2.5
16000 Hz	0.1	0.2	-0.3		+2.5, -16.0

#### 6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY ( ± dB)	Acceptance Limit ( ± dB)
FAST / 20-140	REF	UUC	ERR		
UUC Weighting	(dB)	(dB)	(dB)	0.2	0.2
A	114.00	114.0	0.0		
C	114.00	114.0	0.0		
Z	114.00	114.0	0.0		

UUC Setting	STD	Measured		UNCERTAINTY ( ± dB)	Acceptance Limit ( ± dB)
20-140 / A	REF	UUC	ERR		
UUC Time Response	(dB)	(dB)	(dB)	0.2	0.1
Fast	114.00	114.0	0.0		
Slow	114.00	114.0	0.0		
Leq	114.00	114.0	0.0		

Certificate No : 23-SLM-041  
 Request No : Req-2023-0295

#### 7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY ( ± dB)	Acceptance Limit ( ± dB)
FAST / A / 20-140	UUC		
STD Setting	(dB)	0.1	0.1
Initial	114.0		
Final	114.0		
Deviated	0.0		

#### 8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY ( ± dB)	Acceptance Limit ( ± dB)
FAST / A / 20-140	REF	UUC	ERR		
STD dB	(dB)	(dB)	(dB)	0.3	0.8
139.00	139	139.0	0.0		
134.00	134	134.0	0.0		
129.00	129	129.0	0.0		
124.00	124	124.0	0.0		
119.00	119	119.0	0.0		
114.00	114	114.0	0.0		
109.00	109	109.0	0.0		
104.00	104	104.0	0.0		
99.00	99	99.0	0.0		
94.00	94	94.0	0.0		
89.00	89	89.0	0.0		
84.00	84	84.0	0.0		
79.00	79	79.0	0.0		
74.00	74	74.0	0.0		
69.00	69	69.0	0.0		
64.00	64	64.0	0.0		
59.00	59	59.0	0.0		
54.00	54	54.0	0.0		
49.00	49	49.0	0.0		
44.00	44	44.0	0.0		
39.00	39	39.0	0.0		
34.00	34	34.0	0.0		
29.00	29	29.1	0.1		
24.00	24	23.9	-0.1		

Certificate No : 23-SLM-041  
 Request No : Req-2023-0295

#### 9. Level linearity including the level range control

3) Level intensity including the level range center.					
UUC Setting	STD	Measured		UNCERTAINTY ( ± dB)	Acceptance
FAST / A	REF	UUC	ERR		Limit
UUC Range	(dB)	(dB)	(dB)		( ± dB)
20-140	25.3	25.4	0.1	0.3	0.8
	114	114.0	0.0		0.8

#### 10. Tone burst response

UUC Setting		STD	Anticipated	Measured		UNCERTAINTY	Acceptance
A / 20-140		Toneburst	Ref	UUC	ERR		Limit
UUC Time Response			(ms)	(dB)	(dB)	(dB)	( ± dB)
Fast	200	136.0	136.0	0.0	0.3	0.5	
	2	119.0	118.9	-0.1		+1.0, -1.5	
	0.25	110.0	109.9	-0.1		+1.0, -3.0	
Slow	200	129.6	129.6	0.0		0.5	
	2	110.0	110.0	0.0		+1.0, -3.0	
SEL	200	130.0	130.0	0.0		0.5	
	2	110.0	110.0	0.0		+1.0, -1.5	
	0.25	101.0	101.0	0.0		+1.0, -3.0	

#### 11. Peak C Sound level

UUC Setting		Anticipated	Measured		UNCERTAINTY	Acceptance
FAST / C / 20-140			UUC	ERR		
STD Setting		REF	(dB)	(dB)	( ± dB)	Limit ( ± dB)
Complete cycle		135.4	135.6	+0.20	0.2	2.0
Positive half cycle		134.4	134.2	-0.20		1.0
Negative half cycle		134.4	134.2	-0.20		1.0

Certificate No : 23-SLM-041  
 Request No : Req-2023-0295

#### 12. Overload indication

12. Overload indication			
UUC Setting	Measured	UNCERTAINTY ( ± dB)	Acceptance Limit ( ± dB)
FAST / A / 20-140	UUC		
STD Setting	(dB)		
Positive one-half cycle	143.7		
Negative one-half cycle	143.6		
Deviated	0.1	0.2	1.5

#### 13. High Level Stability

120° High Level Stability		Measured	UNCERTAINTY ( ± dB)	Acceptance
UUC Setting	FAST / A / 20-140			Limit
STD Setting		(dB)		( ± dB)
Initial		139.0		
Final		139.0		
Deviated		0.0	0.1	0.1

End of Certificate



ENSL 16126

INNOVATIVE INSTRUMENT CALIBRATION LAB  
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE  
7/139 MOO 13, SOI SUTINAKORN 11 TAMBON BANG KAE0,  
AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10540 THAILAND  
TEL: (66)0-2116-5860-1 FAX: (66)0-2116-7140



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## Certificate of Calibration

### Customer

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

Certificate No : 23-SLM-089  
Request No : Req-2023-0583

### Unit Under Calibration Details

Measurement item : Sound Level Meter  
Manufacturer : Cirrus  
Model : CR-171B  
Serial Number : G078137  
ID : ENSL 16126  
Resolution : 0.1 dB  
Microphone Class : 1  
Microphone Model : MK224  
Microphone S/N : 211825D  
Preamplifier Model : MK-170  
Preamplifier S/N : 0799  
Instrument Status : Used

### Calibration Environment and Details

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

### Reference Standard

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

### Note

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

Calibrated By :

Calibration Officer

Approved By :

Calibration Engineer Supervisor

Issue Date : 13 March 2023

VERIFIED

BY

DATE

13/03/2023

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

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

INNOVATIVE INSTRUMENT CALIBRATION LAB  
INNOVATIVE INSTRUMENT CO., LTD. HEAD OFFICE  
7/139 MOO 13, SOI SUTINAKORN 11 TAMBON BANG KAE0,  
AMPHOE BANG PHLI SAMUT PRAKAN PROVINCE 10540 THAILAND  
TEL: (66)0-2116-5860-1 FAX: (66)0-2116-7140



Page : 2/6.

Certificate No : 23-SLM-089

Request No : Req-2023-0583

### 1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust		Adjust		UNCERTAINTY	Acceptance
FAST / A / 20-140	Level	UUC	ERR	UUC	ERR	( ± dB)	Limit ( ± dB)
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)		
1000 Hz 94.00 dB	94.03	93.7	-0.33	93.8	-0.23	0.20	0.3

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

### 2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 20-140	(dB)	( ± dB)
UUC Weighting		
A	17.2	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 20-140	(dB)	( ± dB)
UUC Weighting		
A	-	0.10
C	16.8	0.10
Z	29.4	0.10

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

UUC Setting	Deviation from various Frequency Weighting Response curve			UNCERTAINTY	Acceptance
FAST / 20-140	A	C	Z	( ± dB)	Limit ( ± dB)
STD Setting	(dB)	(dB)	(dB)		
125 Hz	0.3	0.1	0.0	0.50	1.0
1000 Hz	0.0	0.0	0.0	0.60	0.7
4000 Hz	-0.1	0.1	0.3	0.60	1.0
8000 Hz	0.3	0.4	0.7	0.70	+1.5 -2.5

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

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

Certificate No : 23-SLM-089  
 Request No : Req-2023-0583

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

UUC Setting	Deviation from various Frequency			UNCERTAINTY	Acceptance Limit
FAST / 20-140	Weighting Response curve				
STD Setting	A (dB)	C (dB)	Z (dB)	( ± dB)	( ± dB)
63 Hz	0.3	0.0	0.0	0.2	1.0
125 Hz	0.2	0.0	0.0		1.0
250 Hz	0.1	0.0	0.0		1.0
500 Hz	0.1	0.0	0.0		1.0
1000 Hz	0.0	0.0	0.0		0.7
2000 Hz	-0.2	0.0	0.0		1.0
4000 Hz	-0.4	-0.2	0.0		1.0
8000 Hz	-0.4	-0.3	-0.2		+1.5, -2.5
16000 Hz	0.2	0.3	-0.2		+2.5, -16.0

#### 6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY ( ± dB)	Acceptance Limit ( ± dB)
FAST / 20-140	REF	UUC	ERR		
UUC Weighting	(dB)	(dB)	(dB)	0.2	0.2
A	114.00	114.0	0.0		
C	114.00	114.0	0.0		
Z	114.00	114.0	0.0		

UUC Setting	STD	Measured		UNCERTAINTY ( ± dB)	Acceptance Limit ( ± dB)
20-140 / A	REF	UUC	ERR		
UUC Time Response	(dB)	(dB)	(dB)	0.2	0.1
Fast	114.00	114.0	0.0		
Slow	114.00	114.0	0.0		
Leq	114.00	114.0	0.0		

Certificate No : 23-SLM-089  
 Request No : Req-2023-0583

#### 7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY ( ± dB)	Acceptance Limit ( ± dB)
FAST / A / 20-140	UUC		
STD Setting	(dB)		
Initial	114.0		
Final	114.0		
Deviated	0.0	0.1	0.1

#### 8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY ( ± dB)	Acceptance Limit ( ± dB)
FAST / A / 20-140	REF	UUC	ERR		
STD dB	(dB)	(dB)	(dB)	0.3	0.8
139.00	139	139.0	0.0		
134.00	134	134.0	0.0		
129.00	129	129.0	0.0		
124.00	124	124.0	0.0		
119.00	119	119.0	0.0		
114.00	114	114.0	0.0		
109.00	109	109.0	0.0		
104.00	104	104.0	0.0		
99.00	99	99.0	0.0		
94.00	94	94.0	0.0		
89.00	89	89.0	0.0		
84.00	84	84.0	0.0		
79.00	79	79.0	0.0		
74.00	74	74.0	0.0		
69.00	69	69.0	0.0		
64.00	64	64.0	0.0		
59.00	59	59.0	0.0		
54.00	54	54.0	0.0		
49.00	49	49.0	0.0		
44.00	44	44.0	0.0		
39.00	39	39.1	0.1		
34.00	34	34.1	0.1		
29.00	29	29.1	0.1		
24.00	24	24.2	0.2		

UUC Setting	STD	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)		
		UUC	ERR				
FAST / A	REF						
UUC Range	(dB)	(dB)	(dB)				
20-140	29.2	29.5	0.3	0.3	0.8		
	114	114.0	0.0		0.8		

UUC Setting		STD	Anticipated	Measured		UNCERTAINTY	Acceptance
A / 20-140		Toneburst	Ref	UUC	ERR		Limit
UUC Time Response		(ms)	(dB)	(dB)	(dB)	( $\pm$ dB)	( $\pm$ dB)
Fast		200	136.0	136.0	0.0	0.3	0.5
		2	119.0	118.9	-0.1		+1.0, -1.5
		0.25	110.0	109.9	-0.1		+1.0, -3.0
Slow		200	129.6	129.5	-0.1		0.5
		2	110.0	109.9	-0.1		+1.0, -3.0
SEL		200	130.0	130.0	0.0		0.5
		2	110.0	109.9	-0.1		+1.0, -1.5
		0.25	101.0	100.9	-0.1		+1.0, -3.0

UUC Setting	Anticipated	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance
	REF	UUC	ERR		Limit
	(dB)	(dB)	(dB)		( $\pm$ dB)
FAST / C / 20-140				0.2	2.0
STD Setting					1.0
Complete cycle	135.4	135.2	-0.20		1.0
Positive half cycle	134.4	134.2	-0.20		
Negative half cycle	134.4	134.2	-0.20		

UUC Setting	Measured	UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
FAST / A / 20-140	UUC		
STD Setting	(dB)		
Positive one-half cycle	141.3		
Negative one-half cycle	141.4		
Deviated	-0.1	0.2	1.5

UUC Setting	Measured	UNCERTAINTY ( $\pm$ dB)	Acceptance Limit
FAST / A / 20-140	UUC		( $\pm$ dB)
STD Setting	(dB)		( $\pm$ dB)
Initial	139.0		
Final	139.0		
Deviated	0.0	0.1	0.1

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



### Certificate of Calibration

#### Customer

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

Certificate No : 23-SLM-088  
Request No : Req-2023-0582

#### Unit Under Calibration Details

Measurement item : Sound Level Meter  
Manufacturer : Cirrus  
Model : CR171B  
Serial Number : G078138  
ID : ENSL 16127  
Resolution : 0.1 dB  
Microphone Class : I  
Microphone Model : MK224  
Microphone S/N : 202157A  
Preamplifier Model : MK170  
Preamplifier S/N : 0805  
Instrument Status : Used

#### Calibration Environment and Details

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

#### Reference Standard

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

#### Note

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

Calibrated By :

Calibration Officer

Approved By :

Calibration Engineer Supervisor

Issue Date : 13 March 2023



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

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

Certificate No : 23-SLM-088  
Request No : Req-2023-0582

#### 1. Indication at the calibration check frequency

UUC Setting	Nominal	Before Adjust	Adjust	UNCERTAINTY	Acceptance
FAST / A / 20-140	Level	UUC	ERR	UUC	ERR
Calibrator Setting	(dB)	(dB)	(dB)	(dB)	(dB)
1000 Hz 94.00 dB	94.03	93.8	-0.23	93.8	-0.23
				0.20	0.3

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

#### 2. Self-generated noise, Microphone installed

UUC Setting	Measured	UNCERTAINTY
FAST / 20-140	(dB)	(± dB)
UUC Weighting		
A	18.1	0.10

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

UUC Setting	Measured	UNCERTAINTY
FAST / 20-140	(dB)	(± dB)
UUC Weighting		
A	-	0.10
C	19.4	0.10
Z	30.9	0.10

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

UUC Setting	Deviation from various Frequency	UNCERTAINTY	Acceptance
FAST / 20-140	Weighting Response curve	(± dB)	Limit
STD Setting	A C Z	(dB)	(± dB)
125 Hz	0.4 0.5 0.6	0.50	1.0
1000 Hz	0.0 0.0 0.0	0.60	0.7
4000 Hz	-0.6 -0.5 -0.4	0.60	1.0
8000 Hz	-1.7 -1.6 -1.7	0.70	+1.5 -2.5

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

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

Certificate No : 23-SLM-088  
 Request No : Req-2023-0582

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

UUC Setting	Deviation from various Frequency			UNCERTAINTY	Acceptance
FAST / 20-140	Weighting Response curve				
STD Setting	A (dB)	C (dB)	Z (dB)	( ± dB)	Limit ( ± dB)
63 Hz	0.2	0.1	0.0	0.2	1.0
125 Hz	0.2	0.0	0.0		1.0
250 Hz	0.1	0.0	0.0		1.0
500 Hz	0.1	0.0	0.0		1.0
1000 Hz	0.0	0.0	0.0		0.7
2000 Hz	-0.2	0.0	0.0		1.0
4000 Hz	-0.3	-0.2	0.0		1.0
8000 Hz	-0.4	-0.3	-0.1		+1.5, -2.5
16000 Hz	0.2	0.2	-0.2		+2.5, -16.0

6. Frequency and time weightings at 1kHz

UUC Setting	STD	Measured		UNCERTAINTY ( ± dB)	Acceptance Limit ( ± dB)
FAST / 20-140	REF	UUC	ERR		
UUC Weighting	(dB)	(dB)	(dB)	0.2	0.2 0.2 0.2
A	114.00	114.0	0.0		
C	114.00	114.0	0.0		
Z	114.00	114.0	0.0		

UUC Setting	STD	Measured		UNCERTAINTY ( ± dB)	Acceptance Limit ( ± dB)
20-140 / A	REF	UUC	ERR		
UUC Time Response	(dB)	(dB)	(dB)	0.2	0.1 0.1 0.1
Fast	114.00	114.0	0.0		
Slow	114.00	114.0	0.0		
Leq	114.00	114.0	0.0		

Certificate No : 23-SLM-088  
 Request No : Req-2023-0582

7. Long Term Stability

UUC Setting	Measured	UNCERTAINTY ( ± dB)	Acceptance Limit ( ± dB)
FAST / A / 20-140	UUC		
STD Setting	(dB)	0.1	0.1
Initial	114.0		
Final	114.0		
Deviated	0.0		

8. Level linearity on the reference level range

UUC Setting	Anticipated	Deviation		UNCERTAINTY ( ± dB)	Acceptance Limit ( ± dB)
FAST / A / 20-140	REF	UUC	ERR		
STD dB	(dB)	(dB)	(dB)	0.3	0.8 0.8
139.00	139	139.0	0.0		
134.00	134	134.0	0.0		
129.00	129	129.0	0.0		
124.00	124	124.0	0.0		
119.00	119	119.0	0.0		
114.00	114	114.0	0.0		
109.00	109	109.0	0.0		
104.00	104	104.0	0.0		
99.00	99	99.0	0.0		
94.00	94	94.0	0.0		
89.00	89	89.0	0.0		
84.00	84	84.0	0.0		
79.00	79	79.0	0.0		
74.00	74	74.0	0.0		
69.00	69	69.0	0.0		
64.00	64	64.0	0.0		
59.00	59	59.0	0.0		
54.00	54	54.1	0.1		
49.00	49	49.1	0.1		
44.00	44	44.1	0.1		
39.00	39	39.1	0.1		
34.00	34	34.1	0.1		
29.00	29	29.2	0.2		
24.00	24	24.2	0.2		

Certificate No : 23-SLM-088  
 Request No : Req-2023-0582

9. Level linearity including the level range control

UUC Setting	STD	Measured		UNCERTAINTY	Acceptance
FAST / A	REF	UUC	ERR	( ± dB)	Limit
UUC Range	(dB)	(dB)	(dB)		( ± dB)
20-140	24.9	25.3	0.4	0.3	0.8
	114	114.0	0.0		0.8

10. Tone burst response

UUC Setting	STD	Anticipated	Measured		UNCERTAINTY	Acceptance
A / 20-140	Toneburst	Ref	UUC	ERR	( ± dB)	Limit
UUC Time Response	(ms)	(dB)	(dB)	(dB)		( ± dB)
Fast	200	136.0	136.0	0.0	0.3	0.5
	2	119.0	118.9	-0.1		+1.0, -1.5
	0.25	110.0	109.9	-0.1		+1.0, -3.0
Slow	200	129.6	129.6	0.0		0.5
	2	110.0	110.0	0.0		+1.0, -3.0
SEL	200	130.0	130.0	0.0		0.5
	2	110.0	110.0	0.0		+1.0, -1.5
	0.25	101.0	100.9	-0.1		+1.0, -3.0

11. Peak C Sound level

UUC Setting	Anticipated	Measured		UNCERTAINTY	Acceptance
FAST / C / 20-140	REF	UUC	ERR	( ± dB)	Limit
STD Setting	(dB)	(dB)	(dB)		( ± dB)
Complete cycle	135.4	135.5	+0.10	0.2	2.0
Positive half cycle	134.4	134.3	-0.10		1.0
Negative half cycle	134.4	134.3	-0.10		1.0

Certificate No : 23-SLM-088  
 Request No : Req-2023-0582

12. Overload indication

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 20-140	UUC	( ± dB)	Limit
STD Setting	(dB)		( ± dB)
Positive one-half cycle	141.1		
Negative one-half cycle	140.9		
Deviated	0.2	0.2	1.5

13. High Level Stability

UUC Setting	Measured	UNCERTAINTY	Acceptance
FAST / A / 20-140	UUC	( ± dB)	Limit
STD Setting	(dB)		( ± dB)
Initial	139.0		
Final	139.0		
Deviated	0.0	0.1	0.1

End of Certificate





### Certificate of Calibration

#### Customer

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

Certificate No : 23-ACT-102  
Request No : Req-2023-1374

#### Unit Under Calibration Details

Measurement item : Acoustic Calibrator Class : 1  
Manufacturer : Cirrus Range : 94 dB / 1000 Hz  
Model : CR:515 Instrument Status : Used  
Serial Number : 88336  
ID : ENSL 19173

#### Calibration Environment and Details

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



Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEI	31 May 2024
THD Multimeter	2015	1047765	NIMT	31 January 2024

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

#### Note

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

Calibrated By :   
Service Calibration Engineer

Approved By :   
Calibration Engineer Supervisor  
Issue Date : 23 June 2023



Certificate No : 23-ACT-102

Request No : Req-2023-1374

#### Sound pressure level

Calibration Results : Without Adjustment

Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)		Uncertainty ( ± dB)	Acceptance limit Class 1 ( ± dB)
	Measured	Error	Measured	Error		
94 dB / 1000 Hz	94.10	0.10	-	-	0.13	0.25

#### Frequency of Sound pressure level

Calibration Range (Hz)	Without Adjustment		Adjustment		Uncertainty ( ± %)	Acceptance limit Class 1 ( ± %)
	Measured (Hz)	Error (%)	Measured (Hz)	Error (%)		
94 dB / 1000 Hz	1000.00	0.00	-	-	0.01	0.70

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

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



**Metrology and Calibration Department**  
**Electrical Maintenance Division**  
**Electricity Generating Authority of Thailand**

81 Moo 11 Bangkrual - Sainoi Rd., Sainoi, Nonthaburi 11150 Tel. (662) 436-8789 Ext. 6155

ENSL16118



## Certificate of Calibration

Issued by : Vibration Laboratory

Certificate No. : 23V029

Reference No. : CBLUE01V007

Received Date : 17 March 2023

Calibrated Date : 29 March 2023

Page 1 of 5

Client : SGS (Thailand) Limited

Address : 100 Nanglinchee Road, Chongnonsi, Yannawa Bangkok 10120

Equipment : VIBRATION METER

Manufacture /Brand : INSTANTEL

Model : Micromate

Serial No./ ID No. : UM7003 / ENSL 16118



Authorised Signatory  
Issue Date 3 / Apr. / 2023

This certificate is issued in accordance with the conditions of accreditation granted by The National Accreditation Council of Thailand which has assessed the measurement capability of the laboratory and its traceability to recognised national standards and to the units of measurement realised at the corresponding national standards laboratory. This certificate may not be reproduced other than in full, except with the prior written approval of the head of Calibration services and environmental analysis department. This reported measurement result relates only the measurand and applies only at the time of measurement.

FM-02/QP-MCC-09 Rev.4  
e-mail : MCC@egat.co.th



**Metrology and Calibration Department**  
**Electrical Maintenance Division**  
**Electricity Generating Authority of Thailand**

Continued of Calibration Report

Certificate Number. 23V029

Page 2 of 5

### Standard Used

The table below is described the calibrator through the International System of Unit.

Description	Manufacture/Model	Serial No.	Traceable No.	Due Date
Conditioning Amplifier Type 2626	Brue! & Kjaer	1242376	AV-0003-23	23 January 2025
Accelerometer Type 8305	Brue! & Kjaer	2378223	AV-0012-22	11 July 2024
Digital Multimeter /8846A	FLUKE	4330020	22E507	26 September 2023

### Ambient Environment :

The Calibration was performed in an environment of  $(23 \pm 2) ^\circ\text{C}$  and  $(50 \pm 10) \%$  relative humidity.

### Measurement Method :

The unit under calibration was calibrated by comparison with standard accelerometer. The calibration method is based on WI-MCC-E-301 by comparison with reference accelerometer standard .

### Measurement Results

The measurement results, labeled in the following pages give the calibration results and associated with measurement uncertainties.

### Measurement Uncertainty

The Measurement Uncertainty are labeled on the following pages Completed the expanded uncertainty, that was calculated in accordance with the method in M3003, using coverage factor  $k = 2$  . The value of the measured lies within the assigned ranges of values of confidence level of approximately 95%.

### Traceability :

The measurement is traceable to the International System of Unit through

- The National Institute of Metrology (Thailand)
- Metrology and Calibration Department



Metrology and Calibration Department  
Electrical Maintenance Division  
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 23V029

Page 3 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
<b>Vertical</b>			
Frequency (Hz)	mm/s <sub>p</sub>	mm/s <sub>p</sub>	± mm/s <sub>p</sub>
*20	10.00	10.37	0.15
*30	10.00	10.24	0.15
40	10.00	10.22	0.15
80	10.00	10.12	0.15

\* Calibration maked "Not TISI Accredited" in this Certificate have been included for completeness.

**Tranducer** Part : ENSL 16118

**Condition** : Installation by vertical direction



Metrology and Calibration Department  
Electrical Maintenance Division  
Electricity Generating Authority of Thailand

Continued of Calibration Report

Certificate Number. 23V029

Page 4 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
<b>Transverse</b>			
Frequency (Hz)	mm/s <sub>p</sub>	mm/s <sub>p</sub>	± mm/s <sub>p</sub>
*20	10.00	10.23	0.15
*30	10.00	10.11	0.15
40	10.00	10.09	0.15
80	10.00	10.01	0.15

\* Calibration maked "Not TISI Accredited" in this Certificate have been included for completeness.

**Tranducer** Part : ENSL 16118

**Condition** : Installation by Transverse direction





**Metrology and Calibration Department**  
**Electrical Maintenance Division**  
**Electricity Generating Authority of Thailand**

Continued of Calibration Report

Certificate Number. 23V029

Page 5 of 5

DESCRIPTION	INSTRUMENT VALUE		UNCERTAINTY
	STANDARD SETTING	UUC READING	
<b>Longitude</b>			
Frequency (Hz)	mm/s <sub>p</sub>	mm/s <sub>p</sub>	± mm/s <sub>p</sub>
*20	10.00	10.21	0.15
*30	10.00	10.08	0.15
40	10.00	10.03	0.15
80	10.00	9.93	0.14

\* Calibration made "Not TISI Accredited" in this Certificate have been included for completeness.

**Transducer** Part : ENSL 16118

**Condition** : Installation by Longitude direction

**\*\* End Certificate of Calibration \*\***



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert.No.: 22CH1216/1  
Page.: 1 of 3

## Certificate of Calibration

This Certificate was issued to replace to the Certificate No.22CH1216

**Equipment :** pH Meter

**Manufacturer :** Mettler Toledo

**Model :** Seven Easy S20

**Serial No. :** 1231235141

**ID No. :** P2010024

**Condition As-Received:** Used Item

**Received Date :** 07 September 2022

**Calibration Date :** 08 September 2022 (CP-CH5)  
**28 September 2022 (CP-CH8)**

**Reference :** 2209-0286WSC-1

**Submitted by :** SGS (Thailand) Limited  
1/209, 1/211 Moo 1, T.Ban Chang,  
A.Ban Chang, Rayong 21130

**Ambient Temperature :** (25 ± 2.5) °C

**Relative Humidity :** (50 ± 15) %

**Calibration Procedure :** In - house method :  
- CP-CH5 by direct measurement with standard  
voltage calibrator and direct measurement with  
certified reference material (CRM)  
- CP-CH8 by comparison with standard thermometer

**Calibrated by :** Warakorn Lerngagtrakul (CP-CH5)  
**Walalak Sirithean (CP-CH8)**

**Approved by :**

Approved Signatory

( / ) Malee Butkruea  
( ) Saithip Meangmai  
( ) Warakorn Lerngagtrakul

**Issue Date :** 29 September 2022

The Uncertainties are for a confidence probability of approximately 95%

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

A 0045691



Cert.No.: 22CH1216/1  
Page.: 2 of 3

### Condition of this calibration result

1. Reference Standard Instrument :-

Instrument	Serial No.	ID No.	Cert. No.	Due Date
1) Document Process Calibrator	54030049	130RC116	22E2769	24 Aug 2023
2) Ref. Standard Thermometer	4982054	110RC044	2111201	26 Oct 2022

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

- Traceable to National Institute of Metrology (Thailand), NIMT

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

Buffer Solution	Manufacturer	Lot No.	Exp. date
pH 1.681	CPA chem	754027	28 June 2023
pH 4.008	CPA chem	823320	20 June 2024
pH 6.985	CPA chem	794122	14 Feb 2023
pH 10.008	CPA chem	823323	20 June 2023

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

### Calibration Results

**Function :** mV Measurement

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

Unit Under Calibration	Nominal Value	Standard Voltage Input	Actual Reading		Uncertainty of Measurement ( ±mV )	Coverage factor k
			mV	pH		
pH Meter S/N.: 1231235141	1.680	314.73	314.9	1.680	0.058	2.00
	4.000	177.48	177.6	4.000	0.058	2.00
	7.000	0.00	0.2	7.000	0.058	2.00
	10.000	-177.48	-177.2	10.000	0.058	2.00

Malee

a 1128803



Cert.No.: 22CH1216/1

Page.: 3 of 3

#### Calibration Results

Function : pH Measurement

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

Unit Under Calibration	Standard pH Buffer Solution	Actual pH Reading	Actual mV Reading ( mV )	Uncertainty of pH measurement ( $\pm$ )	Coverage factor $k$
pH Electrode S/N.: 8446396	1.681	1.699	307.7	0.0047	2.00
	4.008	4.011	172.1	0.0051	2.05
	6.985	6.985	-2.5	0.0084	2.00
	10.008	10.010	-177.0	0.0066	2.00

Function : Temperature Measurement

( \* ) Without adjustment

This equipment was connected with Temperature Probe;

- Model : InLabExpert Pro

- Serial No. : 8446396

Dimension of probe;

- Length : 120 mm.

- Diameter : 12 mm.

- Immersion Depth : 110 mm.

Calibration Point ( °C )	Standard Temperature ( °C )	UUC* Reading ( °C )	Error ( °C )	Uncertainty of measurement ( $\pm$ °C )	Coverage factor $k$
25.0	25.001	25.0	-0.001	0.13	2.00

Remark : - UUC\* = Unit Under Calibration

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

-o0o-

Malu.





## CALIBRATION CERTIFICATE

Date of Issue Jun 29, 2022 Cert No. 22/2280  
Site Calibration Order No. 22060270

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 21, 2022

Date of Calibration Jun 21, 2022

### Environment

Temperature	(Min)	23.3	°C	(Max)	28.7	°C
Relative Humidity	(Min)	42.5	%RH	(Max)	69.7	%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. MY59003190, Certificate No. QR22-1088, Calibrated by Quality Reborn Co., Ltd., ONAC Calibration No. 0292.

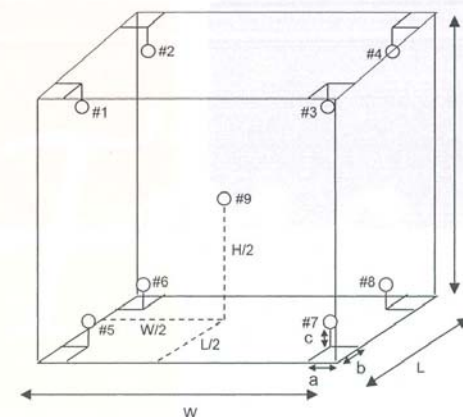
This certificate is traceable to SI unit.



## CALIBRATION CERTIFICATE

Date of Issue Jun 29, 2022 Cert No. 22/2280  
Site Calibration Order No. 22060270

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 29, 2022

Cert No. 22/2280

Site Calibration

Order No. 22060270

Results (without adjustment)

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)		Stability $\pm$ (°C)	Uniformity (°C)	Uncertainty $\pm$ (°C)
85.0	85.0	Position 1	85.635	0.075	1.415	0.45
		Position 2	85.580			
		Position 3	84.985			
		Position 4	85.222			
		Position 5	85.231			
		Position 6	85.297			
		Position 7	83.795			
		Position 8	84.736			
		Position 9	85.137			

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)		Stability $\pm$ (°C)	Uniformity (°C)	Uncertainty $\pm$ (°C)
104.0	104.0	Position 1	104.701	0.094	1.692	0.57
		Position 2	104.648			
		Position 3	103.856			
		Position 4	104.127			
		Position 5	104.250			
		Position 6	104.371			
		Position 7	102.575			
		Position 8	103.731			
		Position 9	104.137			



## CALIBRATION CERTIFICATE

Date of Issue Jun 29, 2022

Cert No. 22/2280

Site Calibration

Order No. 22060270

Results (without adjustment)

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)		Stability $\pm$ (°C)	Uniformity (°C)	Uncertainty $\pm$ (°C)
150.0	150.0	Position 1	151.078	0.160	2.300	0.70
		Position 2	151.176			
		Position 3	149.441			
		Position 4	150.079			
		Position 5	150.558			
		Position 6	150.878			
		Position 7	148.111			
		Position 8	150.052			
		Position 9	150.278			

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)		Stability $\pm$ (°C)	Uniformity (°C)	Uncertainty $\pm$ (°C)
180.0	180.0	Position 1	181.137	0.207	2.541	0.76
		Position 2	181.344			
		Position 3	179.363			
		Position 4	179.921			
		Position 5	180.564			
		Position 6	181.059			
		Position 7	177.811			
		Position 8	180.259			
		Position 9	180.175			



# Thermology Co., Ltd.

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



## CALIBRATION CERTIFICATE

Date of Issue Jun 29, 2022

Cert No. 22/2280

Site Calibration

Order No. 22060270

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

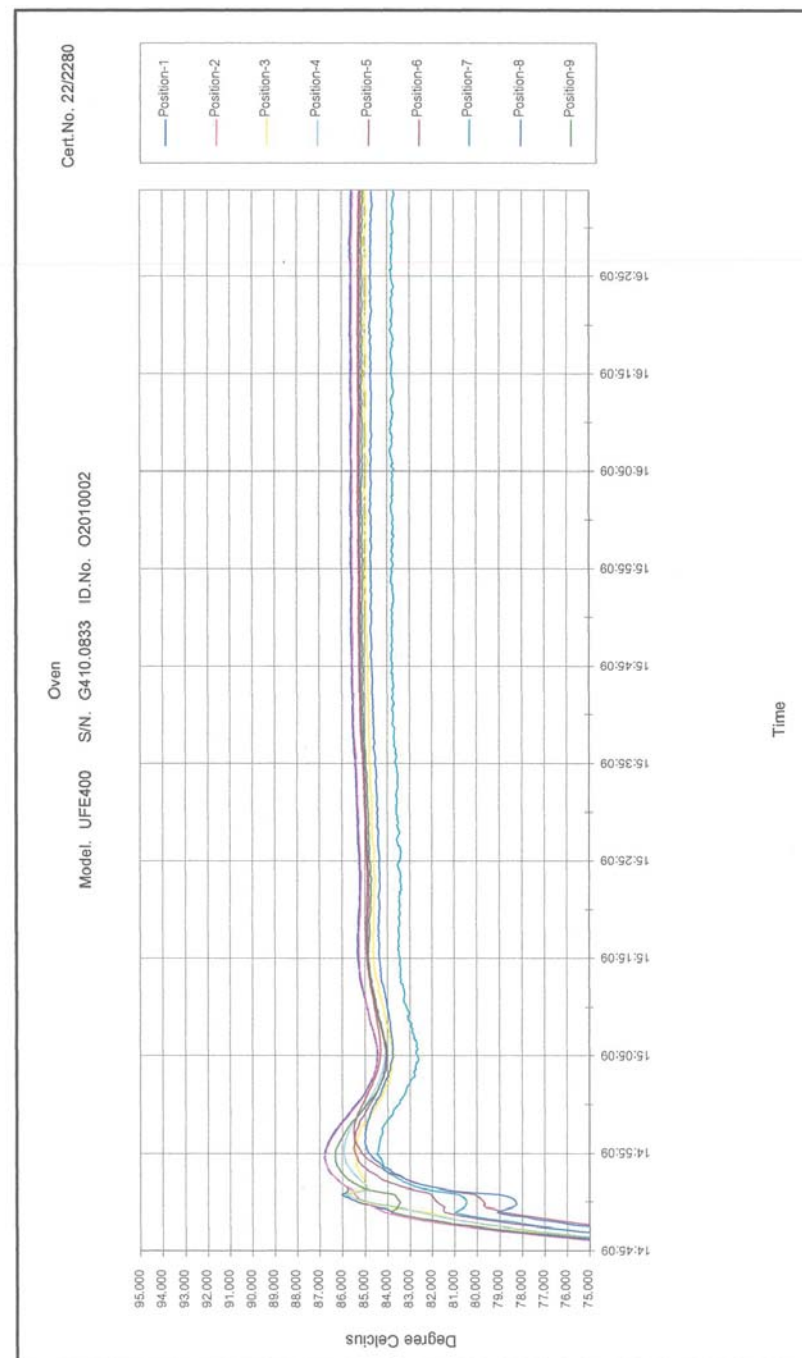
The above results are valid exclusively for calibration samples as mentioned in the report.

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



Page 5 of 5



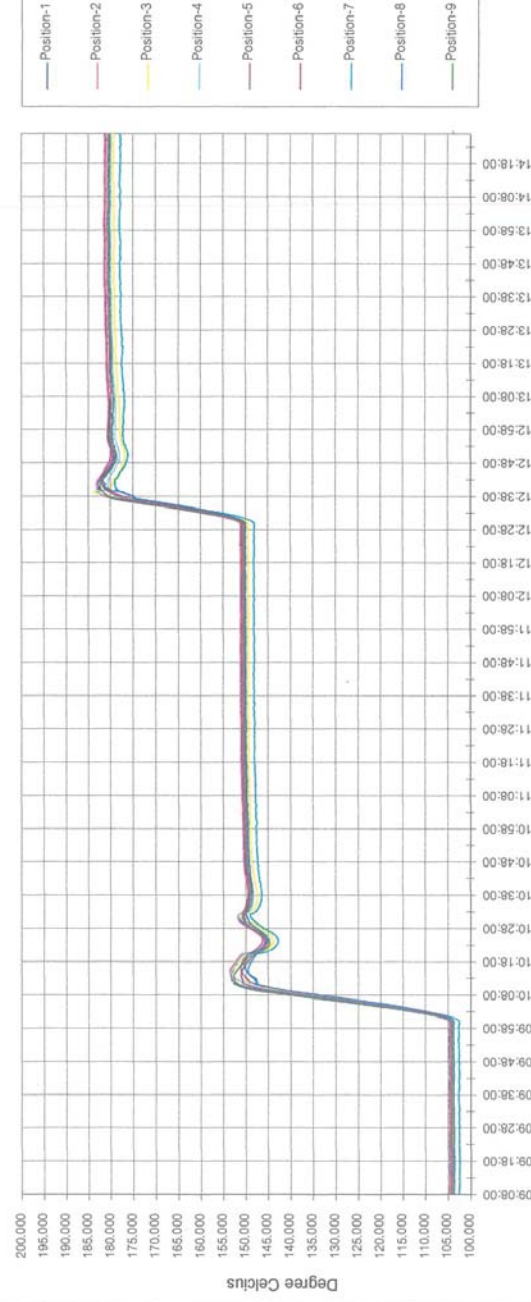
Handwritten signature



Oven

Cert No. 22/2280

Model: UFE400 S/N: G410.0833 ID No. O2010002



Sh d.



**Certificate of Calibration**  
**Aquion : Anion (ID#1054)**

This certificate is to verify that instrument below are calibrated  
by Archemica International Co.,Ltd.

Aquion S/N : 220380025

AS-DV S/N : 2203880170

for  
**SGS (THAILAND) Limited**



Operator Signature :



Date : Nov 22, 2022

Applications Chemist

## **IQ Report**

### **Software and Hardware**



AquionRFIC

## Installation Qualification Report

Qualification #: 456112

Prepared:23-May-2022

For: SGS (THAILAND) LIMITED (Rayong Branch)

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## DOCUMENT GENERATION

Generation	This document was automatically generated based on the system configuration being qualified.		
Application Version	RPG Reports v2.054		
Document Generated	23-May-2022		
Service Representative Name			

## INSTALLATION QUALIFICATION

### Introduction

Documented evidence must be provided to demonstrate the integrity of data collected and validate the results obtained on laboratory instrumentation.

Many laboratories achieve this by formal quality systems, which are generally implemented in accordance with one or more of the following recognized quality standards and other quality guidelines:

- Good Laboratory Practice (GLP)
- Current Good Manufacturing Practice (cGMP)
- International Organization for Standardization (ISO) guidelines
- United States Pharmacopeia (USP)

These standards are written in broad terms, to make them as widely applicable as possible. All stipulate general requirements specifying instruments must be fit for purpose, properly maintained, and calibrated to national or international standards. The procedure used for the Thermo Fisher Scientific qualification methodology is adapted to these standards.

This qualification is intended to be performed only by trained and certified individuals. This report was created for a Thermo Scientific system using the RPG Reports software.

### Reference Documents

- Site Preparation Document(s)
- Individual Component Manuals
- Factory Installation Procedures

## Installation Qualification Scope

A hardware installation qualification is documented verification that a system is installed according to written and pre-approved specifications.

Qualification testing is recommended:

- At initial installation or upon relocation of the instrument
- When a new module is added to an existing instrument
- After a firmware update
- After replacing a non-consumable hardware component that has a serial number

This IQ report documents the following:

- **Service Representative Information**
- **Customer Information**
- **Qualification Details**  
Record the qualification number, date, type, system type and qualification control software.
- **Component Information**  
Detailed configuration information for each system component have been recorded.
- **Computer Information**  
Detailed operating system and computer hardware information for the instrument computer have been recorded.
- **Installed Software**  
Detailed information for installed instrument software has been captured.
- **Unpacking and Setup**  
Verifies that the instrumentation, software, manuals, supplies and any other accessories arrived undamaged as specified in the sales order.  
  
Verifies instrumentation is assembled and installed and any initial diagnostics tests have been performed. Any abnormal event(s) observed during assembly and installation have been documented.
- **Utility, Facility, Environmental**  
Verifies that the installation site satisfactorily meets manufacturer-specified environmental requirements.

## System Information

System Name	Asset Number/Tag
AquionRFIC	ID:1054

## Service Representative Information

Name	Prasert Mammard
Title	Applications Chemist
Company	Archemica International Co.,Ltd.

## Customer Information

Company Name	SGS (THAILAND) LIMITED (Rayong Branch)
Contact Name	K.Saijai Ruangsawat
Title	Supervisor
Street Address	1/209,1/211 Moo1,Tambon Ban Chang
Dept/Building/Floor/Room	Environmental Laboratory Building
City	Amphoe Ban Chang
State/Province	Rayong
Country	Thailand
Zip/Postal Code	21130
Phone	038-685260-4

#### IC Information

IC Model	Aquion
IC Serial Number	220380025
IC Firmware	3.1.0
Include Manual Flow Rate Tests?	Yes
Column Heater/Oven	Heated
Eluent Generator	Eluent Generator (EG)
Instrument Loop Volume	25 µL
Powered On Successfully	Yes
Successfully Configured in System	Yes

#### Primary Detector Information

Detector Model	Conductivity (CD)
Serial Number	220260110
Connection Type (USB, RS-232, TCP/IP)	-
Connection Address (if applicable)	-

#### Autosampler Information

Autosampler Model	AS-DV
Serial Number	2203880170
Firmware Version	1.6.0
Syringe Size	N/A
Vial Size	5.0 mL
Connection Type (USB, RS-232, TCP/IP)	USB
Connection Address (if applicable)	USB-2203880170

#### Computer Information

Computer Name	DESKTOP-U6OSBC5
Manufacturer	HP
Model	HP Z2 Tower G5 Workstation
Serial Number	4CE138CZ8M
Asset Number	N/A
Available Disk Space	953 GB
CPU Speed	2.9 GHz
RAM	16 GB
BIOS Version	S50 Ver. 01.02.02
Network Adapter 1	Linksys WUSB600N Wireless-N USB Network Adapter with Dual-Band ver. 2
Network Adapter 1 IP Address	192.168.70.95
Network Adapter 2	N/A
Network Adapter 2 IP Address	N/A
Network Adapter 3	N/A
Network Adapter 3 IP Address	N/A

#### Installed Software

Windows Version	Microsoft Windows 10 Pro
-----------------	--------------------------

Installed Software	Version
Chromeleon	7.3.1.6535
N/A	
N/A	
N/A	
N/A	
N/A	
N/A	
N/A	
N/A	
N/A	



#### Unpacking and Setup

Did the Computer arrive undamaged?	Yes
Did the IC arrive undamaged?	Yes
Did the Peripherals arrive undamaged?	Yes
Were the Accessories and the Manuals included?	Yes
Was the Instrument Install completed?	Yes
Was the Computer Install completed?	Yes
Was the Software Install completed?	Yes
Was the System Cabling completed?	Yes
Is a Contact Closure present?	Yes

#### Utility, Facility, Environmental

Is the Ambient Temperature acceptable?	Yes
Is the Ambient Humidity acceptable?	Yes
Is the Power acceptable?	Yes
Is the Space Clearance and Firm Surface acceptable?	Yes

#### IQ COMMENTS

##### Comments

N/A

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## IQ REVIEW AND COMPLETION

### Service Representative

By signing, the Service Representative affirms that this Installation Qualification Report has been reviewed and its contents are accurate.

### Customer

By signing, the Customer acknowledges their acceptance of this Installation Qualification Report.

Once completed, the documentation is the property of the customer.



<b>Field Service Representative Signature:</b>	<b>Customer Signature:</b>
<i>[Signature]</i>	
Date: <i>24 May 2022</i>	Date:



## CALIBRATION CERTIFICATE

Date of Issue Jul 08, 2022 Cert No. 22/2426  
Site Calibration Order No. 22070313

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

Place of Calibration Sample Area

Description BOD Incubator

Model ICP450

Serial No. F721.0023

ID.No. I2022007

Date of Receipt Jul 07, 2022

Date of Calibration Jul 07, 2022

### Environment

Temperature	(Min)	25.3	°C	(Max)	25.9	°C
Relative Humidity	(Min)	43.3	%RH	(Max)	58.7	%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 Logger with Sensor Model RTDTempX12 S/N. R63632, Certificate No. QR22-0121, Calibrated by Quality Reborn Co., Ltd., ONAC Calibration No. 0292.

This certificate is traceable to SI unit.

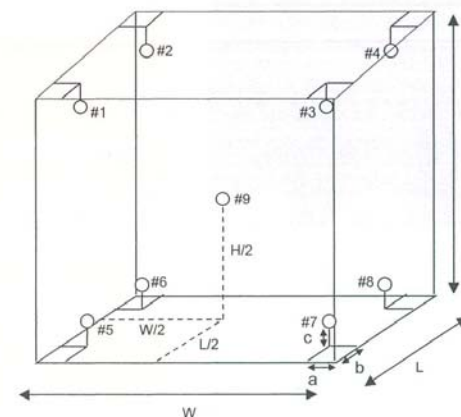
*D.M.*



## CALIBRATION CERTIFICATE

Date of Issue Jul 08, 2022 Cert No. 22/2426  
Site Calibration Order No. 22070313

Results (without adjustment)



Position of reference thermometers were placed

### Note.

- 1). Dimension (W x L x H) is 104 x 60 x 72 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.

*D.M.*





## CALIBRATION CERTIFICATE

Date of Issue Jul 08, 2022

Cert No. 22/2426

Site Calibration

Order No. 22070313

Results (without adjustment)

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)		Stability $\pm(^{\circ}\text{C})$	Uniformity (°C)	Uncertainty $\pm(^{\circ}\text{C})$
20.0	20.0	Position 1	20.029	0.315	0.351	0.48
		Position 2	20.057			
		Position 3	20.185			
		Position 4	20.161			
		Position 5	20.026			
		Position 6	20.051			
		Position 7	19.880			
		Position 8	19.978			
		Position 9	20.066			

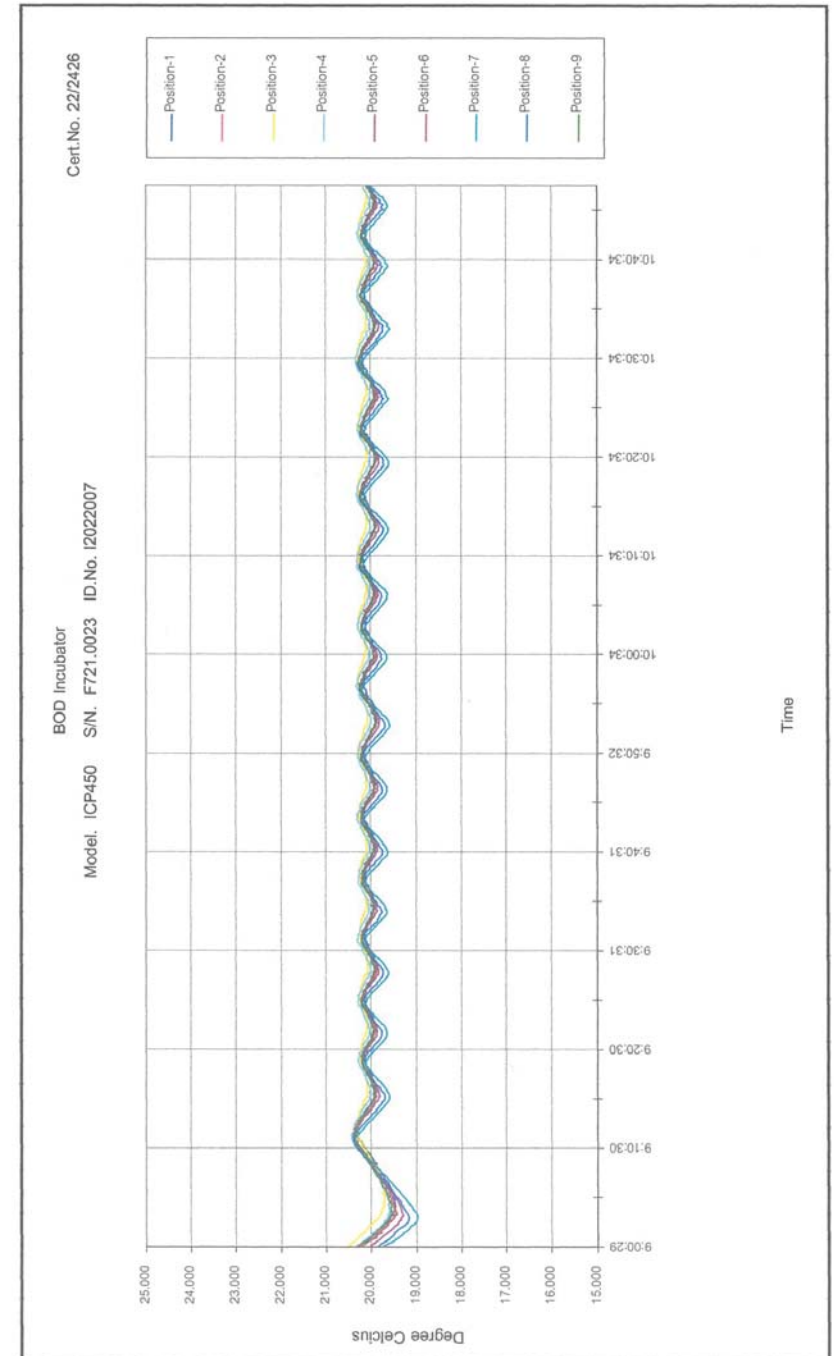
The stability and uniformity was taken into account in the measurement uncertainty stated.

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 :

(MR. DAMRONG MULSING)





THAI HEART CALIBRATION CO., LTD.

112/1 Moo 5, Phraek Sa, Muang, Samut Prakan 10280  
Tel. 0-2394-2162, 0-2757-8435; 0-2757-8496 Fax.: 0-2757-8507



ENWA19105

## CERTIFICATE OF CALIBRATION

Certificate No.: C0-0408006/22 Page 1 of total 2 pages

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

Equipment pH Meter  
Manufacturer HANNA Model HI98195  
Serial No. 04160034101 ID No. ENWA19105  
Description Range : 0 - 14 pH, Resolution : 0.01 pH

Environmental Conditions Ambient Temperature:  $(20 \pm 2) ^\circ\text{C}$   
Relative Humidity:  $(50 \pm 10) \%$   
Atmospheric Pressure: -

Calibration Location Jayhawks Laboratory (CL&GL)

Received Date 4 August 2022

Calibration Date 5 August 2022

Date of Issue 8 August 2022

Checked by [Signature]

Act as Technical Manager

Approved by [Signature]

Representative of Managing Director

( ) ( Krisyosl K. ) ( ) ( Sakda Y. )  
( ) ( Patiphan K. ) ( ) ( Onnappa P. )  
( ) ( Pongsak H. ) ( ) ( Nitiphong K. )  
( ) ( Kanung C. ) ( ) ( Nonthachai K. )  
( ) ( Pramong P. ) ( ) ( Noppol P. )

VERIFIED

BY [Signature]

DATE Aug 15, 2022

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FE-169

REV.02 02/24/21



THAI HEART CALIBRATION CO., LTD.

112/1 Moo 5, Phraek Sa, Muang, Samut Prakan 10280  
Tel. 0-2394-2162, 0-2757-8435; 0-2757-8496 Fax.: 0-2757-8507



Certificate No.: C0-0408006/22

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	Jan. 22, 2023	NIMT
	7.01	020221	Jan. 18, 2023	
	10.00	091020	Dec. 24, 2022	

Type	Model	Serial No.	Certificate No.	Due Date	Traceability
Digital Thermometer with Sensor	1523 / 5622	1709138 / 4605984-005	10-1006004/22	Jun. 9, 2023	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.: K3409432)

pH Standard Solution ( pH )	Measured Value		Uncertainty ( $\pm$ pH )
	( pH )	( mV )	
4.01	4.00	167.3	0.013
7.01	7.01	-9.2	0.013
10.00	10.01	-181.7	0.013

Note : Adjust Curve to Buffer Solution pH (4,7,10)

Temperature stability of micro bath :  $25 \pm 0.2 ^\circ\text{C}$

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 approximately 95%.

- End of Certificate -

Calibrated by [Signature]

FE-169

REV.02 02/24/21





THAI HEART CALIBRATION CO., LTD.

112/1 Moo 5, Phraek Sa, Muang, Samut Prakan 10280  
Tel. 0-2394-2162, 0-2757-8435; 0-2757-8496 Fax.: 0-2757-8507



ENWA 19105

## CERTIFICATE OF CALIBRATION

Certificate No.: T0-0408014/22 Page 1 of total 2 pages

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

Equipment Digital Thermometer with Probe  
Manufacturer HANNA Model HI98195  
Serial No. 04160034101 ID No. ENWA19105  
Description Temperature range : 20 °C to 50 °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 4 August 2022

Calibration Date 4 August 2022

Date of Issue 8 August 2022

Checked by [Signature]  
Act as Technical Manager

Approved by [Signature]  
Representative of Managing Director

( ) ( Krisyosl K. ) ( ) ( Sakda Y. )  
( ) ( Patiphan K. ) ( ) ( Onnapa P. )  
(✓) ( Pongsak H. ) ( ) ( Nitiphong K. )  
( ) ( Kanung C. ) ( ) ( Nonthachai K. )  
( ) ( Pramong P. ) ( ) ( Noppol P. )

VERIFIED

BY

DATE Aug 15, 2022

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FE-169

REV.02.02/24/21



THAI HEART CALIBRATION CO., LTD.

112/1 Moo 5, Phraek Sa, Muang, Samut Prakan 10280  
Tel. 0-2394-2162, 0-2757-8435; 0-2757-8496 Fax.: 0-2757-8507



Certificate No.: T0-0408014/22

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	I0-1011001/21	Nov. 10, 2022	THC
Platinum Resistance Thermometer	5626	4854	C0A30047	Oct. 22, 2023	FLUKE
Liquid Bath	XORTS-40A	XO111019	I0-0306002/21	Jun. 3, 2023	THC

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

- FLUKE, Fluke Corporation, U.S.A.
- THC, Thai Heart Calibration Co., Ltd.

Measurement Results: ( X ) Without Adjustment

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

Immersion Depth (mm.)	Standard Reading (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
75	20.001	20.02	-0.019	0.015
75	30.001	30.02	-0.019	0.015
75	50.001	50.03	-0.029	0.015

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%.

- End of Certificate -

Calibrated by [Signature]

REV.02.02/24/21

FE-169





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250  
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 22LM108  
Page.: 1 of 2

## Certificate of Calibration

**Equipment :** DO Meter with Sensor  
**Manufacturer :** YSI  
**Model :** 5000  
**Serial No. :** 17E101765  
**ID No. :** D2017006  
**Submitted by :** SGS (Thailand) Limited  
1/209, 1/211 Moo 1 T. Ban Chang,  
A. Ban Chang,  
Rayong 21130  
**Location :** TPA Onsite Calibration Laboratory  
**Received Order :** 26 July 2022  
**Calibrated Date :** 4 August 2022  
**Ambient Temperature :** ( 26 ± 10 ) °C  
**Relative Humidity :** ( 50 ± 30 ) %  
**AC Line Voltage :** ( 220 ± 22 ) V

**Calibrated by :**

**Approved by :**

Approved Signatory

( ) Pornthippa Tameyakul  
(✓) Malee Butkruea  
( ) Suwit Imjai

**Issue Date :** 9 August 2022

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

A 0043379



**Equipment :** DO Meter with Sensor  
**Condition As-Received :** Used Item  
**Reference :** 2207-0794WSC-4  
**Procedure Used :-**

**Cert. No.:** 22LM108  
**Page.:** 2 of 2

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer ( IPRT ) into Temperature Bath.

The temperature scale used was based on ITS-90.

### Condition of this result of calibration

1. Reference standard instrument:-

Instrument	Model	Serial No.	Cert. No.	Due Date
1) Digital Thermometer	1502A	A52847	2111144	20 Oct 2022

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

3. This certification is traceable to the International System of Unit.

**Result of Calibration :-** ( \* ) Without Adjustment

**Function :** Temperature measurement.

This instrument was connected with temperature sensor, S/N.: 17B100103

Calibration Point ( °C )	Immersion Depth ( mm )	Standard Temperature ( °C )	UUC* Reading ( °C )	Error ( °C )	Uncertainty ( ± °C )	Coverage Factor k
20.00	60	20.002	19.97	-0.032	0.15	2.00

UUC\* : Unit Under Calibration

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

-o0o-

Malee

a 1119662

## Verification COD Reactor

Equipment Name	Dri-Block Heater-Digital	Temperature Ver	150±2 °C
Serial No.	000827-A	Model	DB 200/3
Reference Standard	Thermocouple Type K	Certificate No.	21/4272
Calibration Date	10/03/2023	Next Cal. Date	10/03/2024

### Left

Hole 1				Hole 2				Hole 3			
NO.	Result			NO.	Result			NO.	Result		
	temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.
1	151.1	-0.36	150.7	1	150.6	-0.36	150.2	1	151.4	-0.36	151.0
2	150.8	-0.36	150.4	2	151.7	-0.36	151.3	2	151.3	-0.36	150.9
3	151.2	-0.36	150.8	3	151.1	-0.36	150.7	3	151.7	-0.36	151.3
Mean			150.67	Mean			150.77	Mean			151.11
SD			0.208	SD			0.551	SD			0.208
%RSD			0.138	%RSD			0.365	%RSD			0.138

Hole 4				Hole 5				Hole 6			
NO.	Result			NO.	Result			NO.	Result		
	temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.
1	151.7	-0.36	151.3	1	150.5	-0.36	150.1	1	151.5	-0.36	151.1
2	151.6	-0.36	151.2	2	151.3	-0.36	150.9	2	151.4	-0.36	151.0
3	151.5	-0.36	151.1	3	150.6	-0.36	150.2	3	150.5	-0.36	150.1
Mean			151.24	Mean			150.44	Mean			150.77
SD			0.100	SD			0.436	SD			0.551
%RSD			0.066	%RSD			0.290	%RSD			0.365

Hole 7				Hole 8				Hole 9			
NO.	Result			NO.	Result			NO.	Result		
	temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.
1	151.3	-0.36	150.9	1	151.7	-0.36	151.3	1	150.5	-0.36	150.1
2	151.0	-0.36	150.6	2	150.5	-0.36	150.1	2	151.2	-0.36	150.8
3	151.3	-0.36	150.9	3	151.4	-0.36	151.0	3	150.8	-0.36	150.4
Mean			150.84	Mean			150.84	Mean			150.47
SD			0.173	SD			0.624	SD			0.351
%RSD			0.115	%RSD			0.414	%RSD			0.233

Hole 10				Hole 11				Hole 12			
NO.	Result			NO.	Result			NO.	Result		
	temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.
1	151.6	-0.36	151.2	1	151.5	-0.36	151.1	1	150.7	-0.36	150.3
2	151.6	-0.36	151.2	2	151.2	-0.36	150.8	2	151.6	-0.36	151.2
3	150.8	-0.36	150.4	3	151.5	-0.36	151.1	3	151.2	-0.36	150.8
Mean			150.97	Mean			151.04	Mean			150.81
SD			0.462	SD			0.173	SD			0.451
%RSD			0.306	%RSD			0.115	%RSD			0.299

Verified By

Approved By

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## Verification COD Reactor

Equipment Name	Dri-Block Heater Digital	Temperature Ver	150±2 °C
Serial No.	000827-A	Model	DB 200/3
Reference Standard	Thermocouple Type K	Certificate No.	21/4272
Calibration Date	10/03/2023	Next Cal. Date	10/03/2024

### Middle

Hole 1				Hole 2				Hole 3			
NO.	Result			NO.	Result			NO.	Result		
	temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.
1	151.2	-0.36	150.8	1	150.7	-0.36	150.3	1	151.1	-0.36	150.7
2	151.5	-0.36	151.1	2	151.7	-0.36	151.3	2	151.6	-0.36	151.2
3	151.6	-0.36	151.2	3	150.8	-0.36	150.4	3	150.9	-0.36	150.5
Mean			151.07	Mean			150.71	Mean			150.84
SD			0.208	SD			0.551	SD			0.361
%RSD			0.138	%RSD			0.365	%RSD			0.239

Hole 4				Hole 5				Hole 6			
NO.	Result			NO.	Result			NO.	Result		
	temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.
1	151.5	-0.36	151.1	1	151.6	-0.36	151.2	1	150.5	-0.36	150.1
2	150.7	-0.36	150.3	2	151.2	-0.36	150.8	2	150.6	-0.36	150.2
3	151.6	-0.36	151.2	3	151.2	-0.36	150.8	3	151.2	-0.36	150.8
Mean			150.91	Mean			150.97	Mean			150.41
SD			0.493	SD			0.231	SD			0.379
%RSD			0.327	%RSD			0.153	%RSD			0.252

Hole 7				Hole 8				Hole 9			
NO.	Result			NO.	Result			NO.	Result		
	temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.
1	151.5	-0.36	151.1	1	151.5	-0.36	151.1	1	151.2	-0.36	150.8
2	150.5	-0.36	150.1	2	151.7	-0.36	151.3	2	150.9	-0.36	150.5
3	150.8	-0.36	150.4	3	151.1	-0.36	150.7	3	151.4	-0.36	151.0
Mean			150.57	Mean			151.07	Mean			150.81
SD			0.513	SD			0.306	SD			0.252
%RSD			0.341	%RSD			0.202	%RSD			0.167

Hole 10				Hole 11				Hole 12			
NO.	Result			NO.	Result			NO.	Result		
	temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.
1	151	-0.36	150.6	1	151.5	-0.36	151.1	1	151.2	-0.36	150.8
2	150.6	-0.36	150.2	2	150.6	-0.36	150.2	2	150.5	-0.36	150.1
3	151.5	-0.36	151.1	3	151.0	-0.36	150.6	3	151.1	-0.36	150.7
Mean			150.67	Mean			150.67	Mean			150.57
SD			0.451	SD			0.451	SD			0.379
%RSD			0.299	%RSD			0.299	%RSD			0.251

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## Verification COD Reactor

Equipment Name	Dri-Block Heater Digital	Temperature Ver	150±2 °C
Serial No.	000827/A	Model	DB 200/3
Reference Standard	Thermocouple Type K	Certificate No.	21/4272
Calibration Date	10/03/2023	Next Cal. Date	10/03/2024

Right

Hole 1				Hole 2				Hole 3			
NO.	Result			NO.	Result			NO.	Result		
	temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.
1	149.9	-0.36	149.5	1	150.3	-0.36	149.9	1	151.0	-0.36	150.6
2	151.1	-0.36	150.7	2	151.0	-0.36	150.6	2	151.0	-0.36	150.6
3	150.9	-0.36	150.5	3	149.9	-0.36	149.5	3	150.4	-0.36	150.0
	Mean		150.27		Mean		150.04		Mean		150.44
	SD		0.643		SD		0.557		SD		0.346
	%RSD		0.428		%RSD		0.371		%RSD		0.230

Hole 4				Hole 5				Hole 6			
NO.	Result			NO.	Result			NO.	Result		
	temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.
1	150.8	-0.36	150.4	1	150.0	-0.36	149.6	1	150.5	-0.36	150.1
2	151.0	-0.36	150.6	2	150.0	-0.36	149.6	2	150.8	-0.36	150.4
3	150.9	-0.36	150.5	3	150.7	-0.36	150.3	3	149.8	-0.36	149.4
	Mean		150.54		Mean		149.87		Mean		150.01
	SD		0.100		SD		0.404		SD		0.513
	%RSD		0.066		%RSD		0.270		%RSD		0.342

Hole 7				Hole 8				Hole 9			
NO.	Result			NO.	Result			NO.	Result		
	temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.
1	150.8	-0.36	150.4	1	151.1	-0.36	150.7	1	150.2	-0.36	149.8
2	150.9	-0.36	150.5	2	150.7	-0.36	150.3	2	150.2	-0.36	149.8
3	151.0	-0.36	150.6	3	151.1	-0.36	150.7	3	149.9	-0.36	149.5
	Mean		150.54		Mean		150.61		Mean		149.74
	SD		0.100		SD		0.231		SD		0.173
	%RSD		0.066		%RSD		0.153		%RSD		0.116

Hole 10				Hole 11				Hole 12			
NO.	Result			NO.	Result			NO.	Result		
	temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.		temp. °C	Corr.	temp+Corr.
1	150.6	-0.36	150.2	1	150.5	-0.36	150.1	1	150.9	-0.36	150.5
2	150.5	-0.36	150.1	2	150.9	-0.36	150.5	2	150.0	-0.36	149.6
3	149.9	-0.36	149.5	3	151.1	-0.36	150.7	3	150.5	-0.36	150.1
	Mean		149.97		Mean		150.47		Mean		150.11
	SD		0.379		SD		0.306		SD		0.451
	%RSD		0.252		%RSD		0.203		%RSD		0.300

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## สรุปผลการ Verify

ปรับอุณหภูมิ 154.0 °C แต่ค่าควบคุมยังมีอุณหภูมิ 150 ± 2 °C ทุกครั้ง


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## Certificate of Calibration

Date of Issue : 29 August 2022  
Certificate No. : 221658/ME  
Customer Company : SGS (Thailand) Limited  
1/209, 1/211 Moo 1, T.Ban Chang, A.Ban Chang,  
Rayong 21130  
Instrument Manufacturer : Metrohm  
Instrument Type : Piston burettes of volumetric apparatus for automatic titrator  
Model : 20 ml for Exchange Units  
Instrument Serial Number : 257435  
Calibration Place : Calibration Lab, Metrohm Siam Ltd.  
979/111-115 S.M.Tower 33 Floor, Phahonyothin Road,  
Phyathai, Phyathai, Bangkok 10400  
Environment Status : Temperature :  $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$   
Humidity :  $60\% \pm 10\%$   
Barometric Pressure :  $995\text{ mBar} \pm 10\text{ mBar}$   
Date of Receipt : 23 August 2022  
Date of Calibration : 25 August 2022  
Job Number : CAL220518/ME  
Condition of Calibration Item : Used Item  
Result of Calibration : ☒ Without Adjustment ☐ Adjustment  
Calibrated By : Mr. Teerayut Cheepdamrong  
Approved By :   
Authorized Signatory

☐ Mr. Kowit Photang  
☒ Mr. Patipon Musigapala  
☐ Mr. Teerayut Cheepdamrong

The uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full except with the prior written approval of the issuing Laboratory Metrohm Siam Ltd.

## Calibration Report

Certificate No: 221658/ME

### 1. Reference Standards

Item	Description/Model	Serial No.	Manufacturing	Certificate No.	Due Date
1	Electronic Balance MSE1203S-100-DU	32506673	Sartorius	C01222343	18 Jan 2023
2	Digital Thermometer with Sensor CKT 100	378192	Anton Paar	21T1866	29 Aug 2022
3	Humidity/Baro/Temp. Data Recorder	BO12860	Lutron	AD2205-176-003	24 May 2023
4	Humidity/Baro/Temp. Data Recorder	BO12860	Lutron	AD2205-176-002	19 May 2023
5	Titration 904	1904001052924	Metrohm	212447/ME	23 Dec 2022

2. The measurement standards are traceable to International system of units (SI) by mean of an unbroken chain of calibration via accredited calibration laboratory, National or International metrology institute.

3. 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%.

4. The results of test were found accurate as shown on date and place of test only.

### 5. Procedure Used :

In-house method WI-03 base on ISO-8655:2002 (E)

## Calibration Report

Certificate No: 221658/ME

### 1. Piston burettes of volumetric apparatus for automatic titrator 20 ml

Nominal Volume ( ml )	Mean Volume ( ml )	Systematic Error ( $\mu$ l )	Random Error ( $\mu$ l )	Uncertainty ( $\pm$ $\mu$ l )
2.0	2.0009	0.94	0.47	4.0
10.0	10.0010	0.99	0.85	4.1
20.0	19.9994	-0.61	0.32	4.6

Reference Temperature : 20 °C

### 2. Permitted limits according to ISO 8655-3:2002 (E)

Table 1 - Maximum permissible errors for motor-driven piston burettes

Cylinder Volume	Maximum Systematic Error	Maximum Random Error
20 ml	$\pm 40 \mu$ l	$\pm 14 \mu$ l


**End of data**

Mettler-Toledo (Thailand) Ltd.  
846/4 - 846/5 Lasalle 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 Contact: Hatairat Linjee  
Zip / Postal: 21130  
State / Province: Rayong  
Order Number: 

## Weighing Device

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

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

## Procedure



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

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

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

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

	Temperature		Humidity	
As Found	Start: 20.1 °C	End: 19.9 °C	Start: 71.6 %	End: 60.2 %

As Found Calibration Date: 14-Mar-2023 Calibrator:   
As Left Calibration Date: N/A  
Issue Date: 15-Mar-2023  
Approved Signatory:   
Technical Manager / Head of Calibration Center

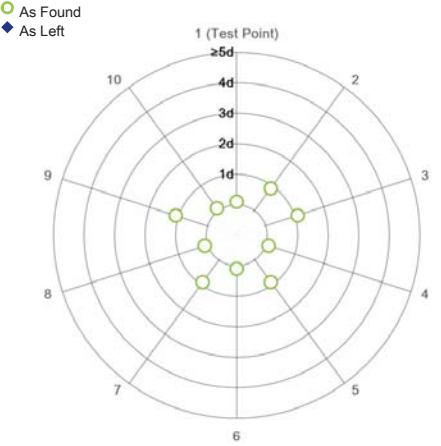
# Measurement Results

## Repeatability

Test Load: 70 g

	As Found	As Left
1	70.00005 g	N/A
2	70.00004 g	N/A
3	70.00006 g	N/A
4	70.00005 g	N/A
5	70.00004 g	N/A
6	70.00005 g	N/A
7	70.00004 g	N/A
8	70.00005 g	N/A
9	70.00006 g	N/A
10	70.00005 g	N/A

Standard Deviation	0.000007 g	N/A
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The "d" in the graph represents the readability of the range/interval in which the test was performed.

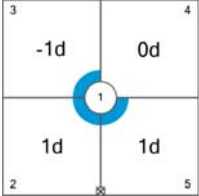
The results of this graph are based upon the absolute values of the differences from the mean value.

## Eccentricity

Test Load: 100 g

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

Maximum Deviation	0.0001 g	N/A
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As Found

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

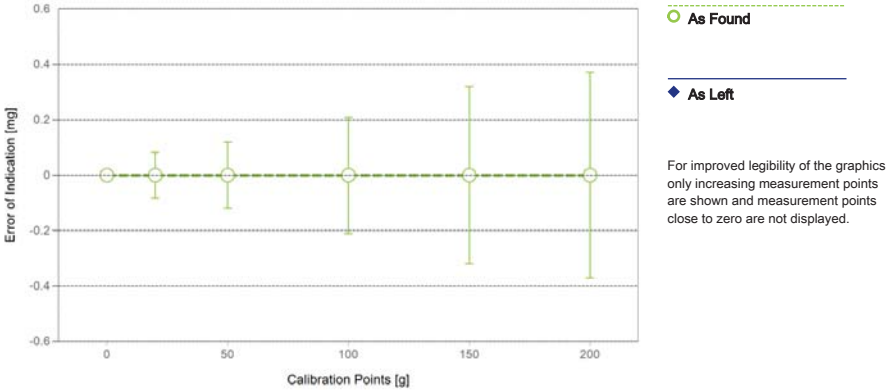


Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.00000 g	0.00000 g	0.00000 g	0.016 mg	2
2	0.01000 g	0.01000 g	0.00000 g	0.018 mg	2
3	0.10000 g	0.10000 g	0.00000 g	0.022 mg	2
4	0.99999 g	0.99998 g	-0.00001 g	0.032 mg	2
5	4.99998 g	4.99997 g	-0.00001 g	0.048 mg	2
6	9.99999 g	10.00000 g	0.00001 g	0.061 mg	2
7	20.00000 g	20.00000 g	0.00000 g	0.082 mg	2
8 <sup>1</sup>	50.00005 g	50.00005 g	0.00000 g	0.12 mg	2
9	100.0001 g	100.0001 g	0.0000 g	0.21 mg	2
10	150.0001 g	150.0001 g	0.0000 g	0.32 mg	2
11	200.0001 g	200.0001 g	0.0000 g	0.37 mg	2

<sup>1</sup>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  $k$  – 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.:	WS28	Date of Issue:	01-Apr-2022
Certificate Number:	178498	Calibration Due Date:	17-Sep-2023

Thermo Hygrometer

Equipment No.:	IN51	Date of Issue:	17-Feb-2023
Certificate Number:	SG-H-00144/66	Calibration Due Date:	15-Feb-2024

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<sup>-6</sup> / K

Temperature range on site for the evaluation of the measurement uncertainty in use: 5 K

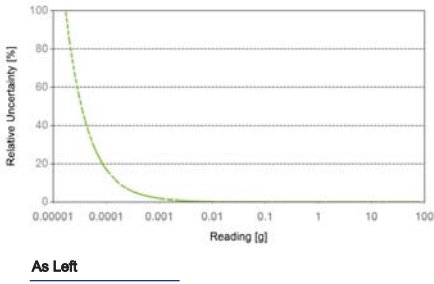
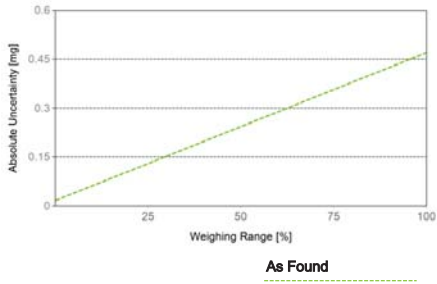
Linearization of Uncertainty Equation

	Range		As Found	As Left
	d	Max		
1	0.00001 g	81 g	U <sub>1</sub> = 0.017 mg + 0.00560 mg/g · R	N/A
2	0.0001 g	220 g	U <sub>2</sub> = 0.06 mg + 0.00554 mg/g · R	N/A

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

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

Net Indication	As Found		As Left	
0.00220 g	0.017 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	0.0083%	N/A	N/A
2.20000 g	0.029 mg	0.0013%	N/A	N/A
220.0000 g	1.3 mg	0.00058%	N/A	N/A



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

GWP®  
Certificate



As Found



As Left



The weighing device meets the given process requirements.

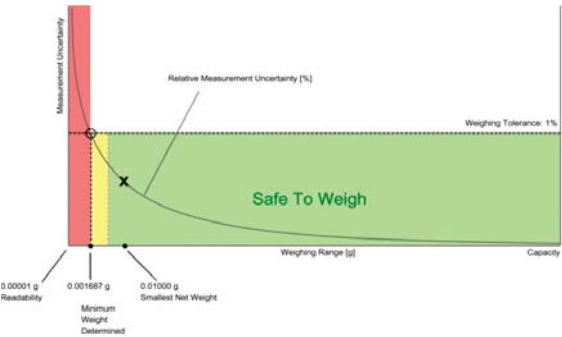
The weighing device meets the given process requirements.

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

Process Requirements

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

Safe Weighing Range



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


# Minimum Weight

## As Found Minimum Weight Table

Range 1

Minimum weights for different weighing tolerances and safety factors					
Tolerance	Safety Factor				
	1	2	3	5	10
0.1%	0.016961 g	0.034113 g	0.051461 g	0.086758 g	0.178664 g
0.2%	0.008456 g	0.016961 g	0.025513 g	0.042763 g	0.086758 g
0.5%	0.003377 g	0.006761 g	0.010153 g	0.016961 g	0.034113 g
1%	0.001687 g	0.003377 g	0.005068 g	0.008456 g	0.016961 g
2%	0.000844 g	0.001687 g	0.002532 g	0.004222 g	0.008456 g
5%	0.000337 g	0.000675 g	0.001012 g	0.001687 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%	0.016961 g	0.034113 g	0.051461 g	0.086758 g	0.178664 g
0.2%	0.008456 g	0.016961 g	0.025513 g	0.042763 g	0.086758 g
0.5%	0.003377 g	0.006761 g	0.010153 g	0.016961 g	0.034113 g
1%	0.001687 g	0.003377 g	0.005068 g	0.008456 g	0.016961 g
2%	0.000844 g	0.001687 g	0.002532 g	0.004222 g	0.008456 g
5%	0.000337 g	0.000675 g	0.001012 g	0.001687 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 1/1 (no safety factor), 1/2, 1/3, 1/5, or 1/10 of the required tolerance. The values are calculated with k = 2 and based on the linear formula of the measurement uncertainty of the weighing device in use.

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

### Notes on minimum weight values in above table:

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

# Measurement Results

## Results Summary

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

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

## Repeatability

Test Load: 70 g

Tolerance	Control Limit	As Found		As Left	
		Std. Deviation	Result	Std. Deviation	Result
0.1%	0.000005 g	0.000007 g	✗	0.000007 g	✗
0.2%	0.000010 g		✓		⚠
0.5%	0.000025 g		✓		✓
1%	0.000050 g		✓		✓
2%	0.000100 g		✓		✓
5%	0.000250 g		✓		✓

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

## Eccentricity

Test Load: 100 g

Tolerance	Control Limit	As Found		As Left	
		Deviation	Result	Deviation	Result
0.1%	0.0500 g	0.0001 g	✓	0.0001 g	✓
0.2%	0.1000 g		✓		✓
0.5%	0.2500 g		✓		✓
1%	0.5000 g		✓		✓
2%	1.0000 g		✓		✓
5%	2.5000 g		✓		✓

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



Error of Indication

As Found

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A	N/A
20.00000 g	0.00000 g	0.01000 g	0.02000 g	0.05000 g	0.10000 g	0.20000 g	0.50000 g
50.00005 g	0.00000 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g
100.0001 g	0.0000 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
150.0001 g	0.0000 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
200.0001 g	0.0000 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓	✓

As Left

		Control limits for various weighing tolerances					
Reference Value	Error	0.1%	0.2%	0.5%	1%	2%	5%
0.00000 g	0.00000 g	N/A	N/A	N/A	N/A	N/A	N/A
20.00000 g	0.00000 g	0.01000 g	0.02000 g	0.05000 g	0.10000 g	0.20000 g	0.50000 g
50.00005 g	0.00000 g	0.02500 g	0.05000 g	0.12500 g	0.25000 g	0.50000 g	1.25000 g
100.0001 g	0.0000 g	0.0500 g	0.1000 g	0.2500 g	0.5000 g	1.0000 g	2.5000 g
150.0001 g	0.0000 g	0.0750 g	0.1500 g	0.3750 g	0.7500 g	1.5000 g	3.7500 g
200.0001 g	0.0000 g	0.1000 g	0.2000 g	0.5000 g	1.0000 g	2.0000 g	5.0000 g
Result		✓	✓	✓	✓	✓	✓

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