

ภาคผนวก ค  
สำเนาใบรับรองการสอบเทียบเครื่องมือ

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## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA Protocol

Part Number: E04N092E80A0041  
Cylinder Number: LL193448  
Reference Number: 160-401658125-1  
Laboratory: 124 - Plumsteadville - PA  
Cylinder Volume: 83.4 CF  
PGVP Number: A12019  
Cylinder Pressure: 2215 PSIG  
Gas Code: CO,NO,NOX,SO2,BALN  
Valve Outlet: 660  
Certification Date: Dec 12, 2019  
Expiration Date: Dec 12, 2022

Certification performed in accordance with EPA Traceability Protocol for Analytical and Calibration Standards (May 2012)\* document EPA 8200-B-12-001, using the assay procedures listed. Analytical measurements do not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration material. All concentrations are in g/g.

Do not use this cylinder below 100 psig, 10.0 g/g impurities.

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
NOX	45.00 PPM	44.38 PPM	G1	+/- 0.9% MST Traceable
NITRIC OXIDE	45.00 PPM	44.38 PPM	G1	+/- 0.9% MST Traceable
SULFUR DIOXIDE	45.00 PPM	45.38 PPM	G1	+/- 1.0% MST Traceable
CARBON MONOXIDE	4500 PPM	4541 PPM	G1	+/- 0.6% MST Traceable
NITROGEN	Balance			
CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Uncertainty
NITRM	16060636	CC442637	50.42 PPM NITRIC OXIDE/NITROGEN	+/- 0.9%
NITRM	16060636	CC442637	50.40 PPM NITROGEN	+/- 0.9%
NITRM	G4175911	KAL003197	49.87 PPM SULFUR DIOXIDE/NITROGEN	+/- 1.0%
NITRM	10015004	KAL003099	49.87 PPM SULFUR DIOXIDE/NITROGEN	+/- 1.0%
NITRM	08012218	KAL004620	4567 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%
ANALYTICAL EQUIPMENT				
Instrument/Make/Model	Analytical Principle			
MRCS FTR - CO2 - 009026781	FTIR			
MRCS FTR - NO - 00926781	FTIR			
MRCS FTR - NOx - 00926781	FTIR			
MRCS FTR - SO2 - 00926781	FTIR			

Triad Data Available Upon Request

NOTES: Gross Weight: 17.8 Kg, Net Weight: 2.4 Kg, PO# 5219005460.



Approved for Release

Page 1 of 16-401658125-1

ทางส่วนจำกัด บลู คอนซัลแตนท์ Blue Consultant Limited Partnership

32751 ถนนประชาอุทิศ แขวงทุ่งครุ เขตทุ่งครุ กรุงเทพฯ 10140

โทรศัพท์ 0-2873-6045 โทรสาร 0-2873-6046

ขอปฏิบัติการวิเคราะห์เพื่อประเมินโดยมาตรฐานวันที่ 14 สิงหาคม 2563

#### CALIBRATION REPORT

Equipment : CO Analyzer

Serial No. : 1069, 131, 3445

Brand/Model : API300, Teedyne-APIV300

Date of Calibration : March 30, 2021

Reference Standard

Cylinder No. : EB0128767

Certification Date: October 28, 2019

Expiry Date: October 29, 2027

Component: SO2: 55.62 ppm, NO: 67.21 ppm, CO : 4.551 ppm

#### Calibration Check ( Before adjust )

Serial No.	Zero		Span	
	Reading Value (ppm)	Expected Value (ppm)	Reading Value (ppm)	Drift (ppm)
1069	0.2	0	39.7	-0.3
131	-0.1	0	41.1	1.1
3445	0.3	0	40.7	0.7

#### Calibration Check ( After adjust )

Serial No.	Zero		Span	
	Reading Value (ppm)	Expected Value (ppm)	Reading Value (ppm)	Drift (ppm)
1069	0	0	40	0
131	0	0	40	0
3445	0	0	40	0

ขอรับรองปฏิบัติการวิเคราะห์เพื่อประเมินโดยมาตรฐานวันที่ 14 สิงหาคม 2563  
Blue Consultant Limited Partnership

(นางสาวนิศากร อนันต์สุวรรณชัย)  
ผู้จัดการเพื่อปฏิบัติการ

ห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์ Blue Consultant Limited Partnership

32/751 ถนนประชาอุทิศ แขวงทุ่งครุ เขตทุ่งครุ กรุงเทพฯ 10140

โทร 0-2873-6045-6 โทรสาร 0-2873-6046

ห้องปฏิบัติการวิเคราะห์ไอสารในอนุภาคผงวันที่ 14 สิงหาคม 2563

CALIBRATION REPORT

Equipment : NOx Analyzer  
Serial No. : 3205, 4088, 17C-66152-359

Brand/Model: Teledyne-API/T200, Thermo/17C  
Date of Calibrate : March 30, 2021

Reference Standard  
Certification Date: October 28, 2019  
Component: SO2: 55.62 ppm, NO: 57.21 ppm, CO: 4.551 ppm

Cylinder No.: EB0128767

Expiry Date: October 28, 2027

Calibration Check ( Before adjust )					
Serial No.	Zero			Span	
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)
3205	3.8/1.1/4.7	0/0/0	3.6/1.1/4.7	NO/NO2/NOx	NO/NO2/NOx
4088	4.0/2.2/6.2	0/0/0	4.0/2.2/6.2	368.1/3.6/401.7	400/0/400
17C-66152-359	3.4/1.4/4.9	0/0/0	3.4/1.4/4.9	400.3/4.1/404.4	400/0/400
				401.0/3.8/404.8	400/0/400
					1.0/3.8/4.8
Calibration Check ( After adjust )					
Serial No.	Zero			Span	
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)
3205	0/0/0	NO/NO2/NOx	0/0/0	NO/NO2/NOx	NO/NO2/NOx
4088	0/0/0	NO/NO2/NOx	0/0/0	400/0/400	400/0/400
17C-66152-359	0/0/0	NO/NO2/NOx	0/0/0	400/0/400	400/0/400

นางสาววิภาดา อนันต์สุวรรณ (นางสาววิภาดา อนันต์สุวรรณ)

ผู้จัดทำใบปฏิบัติการ

ห้างหุ้นส่วนจำกัด บลู คอนซัลแตนท์ Blue Consultant Limited Partnership

32/751 ถนนประชาอุทิศ แขวงทุ่งครุ เขตทุ่งครุ กรุงเทพฯ 10140

โทร 0-2873-6045-6 โทรสาร 0-2873-6046

ห้องปฏิบัติการวิเคราะห์ไอสารในอนุภาคผงวันที่ 14 สิงหาคม 2563

CALIBRATION REPORT

Equipment : SO<sub>2</sub> Analyzer  
Serial No. : 2707

Brand/Model: Teledyne-API/T100  
Date of Calibrate : March 30, 2021

Reference Standard  
Certification Date: October 28, 2019  
Component: SO2: 55.62 ppm, NO: 57.21 ppm, CO: 4.551 ppm

Cylinder No.: EB0128767

Expiry Date: October 28, 2027

Calibration Check ( Before adjust )					
Serial No.	Zero			Span	
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)
2707	-0.1	0	-0.1	400.8	400
Calibration Check ( After adjust )					
Serial No.	Zero			Span	
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)
2707	0	0	0	400	400

นางสาววิภาดา อนันต์สุวรรณ (นางสาววิภาดา อนันต์สุวรรณ)

ผู้จัดทำใบปฏิบัติการ





บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

รายงานผลการสอบและปรับเทียบเครื่องวัดความดันแก๊ส

ลูกค้า : บริษัท SGS (Thailand) Co., Ltd

รหัส : 24 ปี 000 2503

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

ปัจจัยการปรับ / เครื่องมือ : T100

วันที่ : 24 ปี 000 2503

บริษัทผู้ผลิต : Tiedyne API

มาตรฐานการปรับ / เครื่องมือ : 1300

RANGE		SPAN	
A	RANGE	50 - 20,000 PPM	500
B	H <sub>2</sub> S STABILITY	± 1 PPM	0.20
C	PRESSURE	25.35 in. Hg A	28.20
D	SAMPLE FLOW	650 ± 10% c/min	650
E	PMT	mV	66.40
F	NORM PMT	mV	105.20
G	UV LAMP	1000 - 4800 mV	3781.60
H	LAMP RATIO	30 To 120 %	57.60
I	STRAY LIGHT	± 100 PPM	51.40
J	DARK PMT	-50 ± 200 % mV	74.20
K	DARK LAMP	-50 ± 200 % mV	1.40
L	H <sub>2</sub> S SLOPE	1.0 ± 0.3	3.327
M	H <sub>2</sub> S OFFSET	< 250 mV	30.90
N	PMPS	400 - 900 V	520
O	POX CELL TEMP	50 ± 1 °C	50.0
P	BOX TEMP	AMBIENT ± 5 °C	33.80
Q	PMT TEMP	7 ± 2 °C	6.60
R	SO <sub>2</sub> SAMPLE READING	PPM	122.60
S	OPTIC TEST	2000 ± 1000 mV	1253.60
T	ELECTRICAL TEST	2000 ± 1000 mV	104.70
U	VOLTAGE TEST	45 V +12 V +15 V -15 V	5.70 12.11 16.45 -15.32
V	ZERO GAS	0.00 PPM	26.30
W	SPAN GAS	40100 PPM	248.10

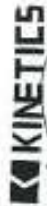
หมายเหตุ

Sample Flow Warning เมื่อจาก Pump ไม่ถูก ไม่สามารถทำการ Cal ZeroSpan ได้ถ้าใช้ Pump สมมติว่า Cal ZeroSpan

- สลัก O-ring 3 ชิ้น

- Sealed Pipe 1 ชิ้น

- Spring 1 ชิ้น



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

ลายเซ็นเจ้าหน้าที่ (Signature)

ผลการตรวจสอบเป็นไปตามข้อกำหนดคุณภาพผลิตภัณฑ์ : คุณภาพสินค้า : คุณภาพ : 0.2515-8987

เลขที่ 388 ถนนวิภาวดีรังสิต แขวงจันทน์นอก เขตจตุจักร กรุงเทพฯ 10000 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 : Tiedyne - API

MODEL : T100

SERIAL NO : 1390

STANDARD GAS CONCENTRATION (PPM) : 45.00

CYLINDER PRESSURE (psi) : 2015

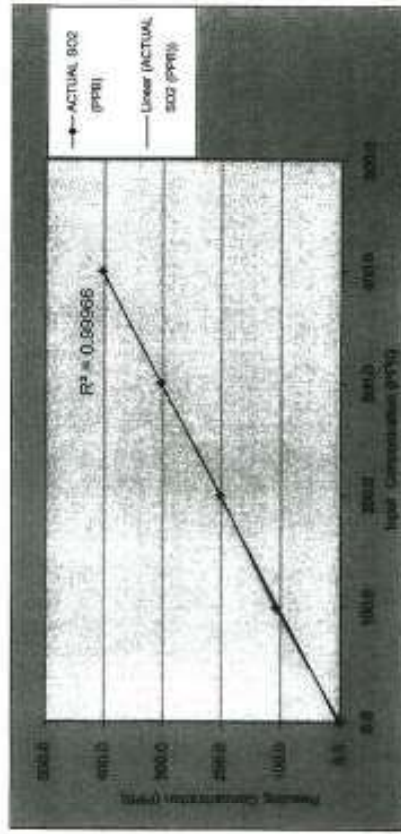
CERTIFIED DATE : Mar 29, 2017

EXPIRED DATE : Mar 29, 2020

### CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	IDEAL (PPM)	ACTUAL (PPM)	CHANGE (PPM)	% ERROR SO <sub>2</sub>
20060	0.00	0.30	0.00	-
1	100.00	100.20	0.20	0.20
2	200.00	202.50	2.50	1.25
3	300.00	303.70	3.70	1.23
4	400.00	402.50	2.50	0.63
Average (ppm) (%)				3.43

Weighted Average = ผลรวมของ (ข้อมูลแต่ละตัว x น้ำหนักของข้อมูล)  
หารรวมของค่าตัวน้ำหนัก



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

CALIBRATED BY : คุณพรชัย มาลีมาลี

ผลการตรวจสอบเป็นไปตามข้อกำหนดคุณภาพผลิตภัณฑ์ : คุณภาพสินค้า : คุณภาพ : 0.2515-8987

เลขที่ 388 ถนนวิภาวดีรังสิต แขวงจันทน์นอก เขตจตุจักร กรุงเทพฯ 10000 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : info@kinetics.co.th



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

ขอสงวนสิทธิ์ในเอกสารฉบับนี้เพื่อใช้ในการตรวจสอบคุณภาพ

ลูกค้า / หมายเลข : 808 (Thailand) Co., Ltd

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

ใบตรวจอุปกรณ์ / เครื่องมือ : 1100

วันที่ : 3 เมษายน 2563

เจ้าหน้าที่ : Teledyne API

หมายเลขอุปกรณ์ / เครื่องมือ : 2512

API SPECIFICATION		REQUIREMENT	TEST RESULT
A	RANGE	50 - 20,000 PPM	500
B	H <sub>2</sub> S STABILITY	≤ 1 PPM	0.16
C	PRESSURE	25 - 35 in. Hg-A	30.10
D	SAMPLE FLOW	850 ± 10% cc/min	714.1
E	PMT	nV	140.20
F	NORM PMT	nV	20.40
G	UV LAMP	1000 - 4800 nV	3050.10
H	LAMP RATIO	30 To 120 %	106.80
I	STRAY LIGHT	≤ 100 PPM	19.50
J	DARK PMT	450 ± 200 nV	102.00
K	DARK LAMP	50 ± 200 nV	2.20
L	H <sub>2</sub> S SLOPE	1.0 ± 0.3	1.111
M	H <sub>2</sub> S OFFSET	≤ 150 nV	35.00
N	H <sub>2</sub> S	400 - 900 V	511
O	OX CELL TEMP	50 ± 1 °C	50.0
P	BOX TEMP	AMBIENT ± 5 °C	29.50
Q	PMT TEMP	T ± 2 °C	-
R	SO <sub>2</sub> SAMPLE REMOVAL	PPM	5.20
S	OPTIC TEST	2000 ± 1000 nV	-
T	ELECTRICAL TEST	2000 ± 1000 nV	-
U	VOLTAGE TEST	+5V +12V +15V -15V	5.21, 12.16, 15.06, -15.24
V	ZERO GAS	0.00 PPM	-1.00
W	SPRINK GAS	400.00 PPM	393.40
X	REMARK		400.20

หมายเหตุ

- ใช้ Spring 2 ชิ้น

- ใช้ Spring Stained Fiber 1 ชิ้น

- ใช้ Spring 1 ชิ้น



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

ลงนามเจ้าหน้าที่ (Signature)

การตรวจสอบคุณภาพสินค้าตามข้อกำหนด : คุณภาพ : คุณภาพ : วันที่ : 02-15-6087

เลขที่ 388 ถนนพหลโยธิน แขวงจันทบุรี กรุงเทพมหานคร 10500 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) : 45.00

CYLINDER NO : CC495062

CERTIFIED DATE : Mar 29, 2017

EXPIRED DATE : Mar 29, 2020

CYLINDER PRESSURE (psi) : 2015

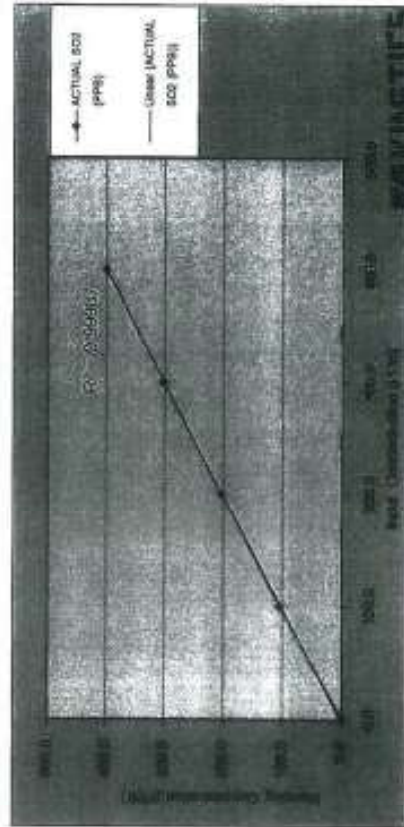
CERTIFIED BY : AIRGAS SPECIALTY GASES

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	PPM (REF)	ACTUAL (PPM)	Offset (PPM)	% Error (PPM)
ZERO	0.00	0.10	0.00	-
1	100.00	104.20	4.20	4.20
2	200.00	202.80	2.80	1.40
3	300.00	301.20	1.20	0.40
4	400.00	399.70	-0.30	-0.08
AVERAGE (%)				1.66

Weighted Average = ผลรวมของ (ข้อมูลแต่ละตัว x น้ำหนักของข้อมูล)

หารด้วยผลรวมน้ำหนัก



CALIBRATED BY : คุณหญิง ภาณุมาศ

การตรวจสอบคุณภาพสินค้าตามข้อกำหนด : คุณภาพ : คุณภาพ : วันที่ : 02-15-6087

เลขที่ 388 ถนนพหลโยธิน แขวงจันทบุรี กรุงเทพมหานคร 10500 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : info@kinetics.co.th



RECALIBRATION  
DUE DATE:  
January 27, 2022

Calibration Certification Information			
Cal. Date:	January 27, 2021	Room/Room S/N:	436320
Operator:	Jim Tisch	Test:	794
Calibration Model #:	TE-5028A	Calibrator S/N:	1547
		Pat:	754.38
		mm Hg	

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.2520	4.4	1.50
2	3	4	1	0.9740	7.2	3.50
3	5	6	1	0.8920	8.6	3.00
4	7	8	1	0.8230	10.1	3.50
5	9	10	1	0.6240	17.3	6.00

Data Tabulation			
Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)
1.0002	0.7989	1.2385	0.9942
0.9905	1.0021	1.5860	0.9905
0.9946	1.1151	1.7373	0.9686
0.9926	1.2091	1.8765	0.9866
0.9830	1.5764	2.4570	0.9771
QA	1.57954	2.4570	0.9771
QA	1.57954	2.4570	0.9771
QA	1.57954	2.4570	0.9771
QA	1.57954	2.4570	0.9771
QA	1.57954	2.4570	0.9771

Calculations			
Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)
1.0002	0.7989	1.2385	0.9942
0.9905	1.0021	1.5860	0.9905
0.9946	1.1151	1.7373	0.9686
0.9926	1.2091	1.8765	0.9866
0.9830	1.5764	2.4570	0.9771
QA	1.57954	2.4570	0.9771
QA	1.57954	2.4570	0.9771
QA	1.57954	2.4570	0.9771
QA	1.57954	2.4570	0.9771
QA	1.57954	2.4570	0.9771

Standard Conditions	
Temp:	298.15 °K
Press:	760 mm Hg
Key	
ΔH: calibrator manometer reading (in H2O)	
ΔP: notimeter 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 Clowes, OH 45002  
WWW.TISCH-ENV.COM  
TOLL FREE: 1-877-263-7610  
FAX: (513) 467-9009  
DATE 26/02/2021

VERIFIED

ENAB 17108

THAI METEOROLOGICAL DEPARTMENT  
4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2804, 0-2399-0469  
Calibration Certificate



Issued by : Calibration & Test Section : Meteorological Instruments Bureau  
Date of Issue : 17 January, 2021  
Certification No. : 02621  
Page : 1 of 6

Object : Precision Weather Station  
Manufacturer : Davis Instruments  
Type : Verlage Pro2  
Model No. : 6152C  
Mfg Code : Display AZ170619023  
Transmitter : AZ170619023  
Customer : SGS (Thailand) Limited  
100 Nanglinchee Road, Chongnonsi, Yamaa, Bangkok 10120.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1017.6 hPa

NATIONAL STANDARD WIND TUNNEL  
: Thermal Anemometer 642 SN 91563  
: Wind Anemometer Board  
: HOOK GAGE NO 1425

N.I.S.T. Test Reference Number 731241460

Model DA-650-3TV (sensor TR-90AH)  
Serial Number 1107330129 (sensor 120626566)  
JAPAN QUALITY ASSURANCE ORGANIZATION

: Theodor Friedrich : Dry No. 838094 Wet No. 838994  
: Thermochiesler No. 918908

: Digital Barometer Vaisala : FTB220 NO. 1107330129



STANDARD BAROMETER

Calibrated by :  
Mr. Weibang Subwas  
Mechanical Engineer



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 03621

17 January, 2021

Page : 2 of 6

Standard Effluent Anemometer m/sec	HOOK GAUGE NO. 1425			TESTED ANEMOMETER	
	Pressure Inches	Vacuum Inches	Pressure hPa	Velocity m/sec	Correction m/sec
1.00	-	-	-	0.9	0.10
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.5	0.50
7.00	-	-	-	6.7	0.30
9.02	-	-	-	8.5	0.52
11.03	-	-	-	10.3	0.71
13.01	-	-	-	12.1	0.91
15.03	-	-	-	14.3	0.71
17.02	-	-	-	16.1	0.92
20.02	-	-	-	19.3	0.72

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

Calibrated by :

Mr. Wacharapol Subwat  
Mechanical Engineer



Average

Calibrated by :

Mr. Wacharapol Subwat  
Mechanical Engineer



Certification No. 021621

Page : 3 of 6

17 January, 2021

Standard Barometer Pressure	Tested Barometer Pressure	Correction
761.57	762.6	-1.23
761.39	762.6	-1.21
761.25	762.5	-1.25
760.54	761.8	-1.16
760.46	761.5	-1.04
758.48	759.7	-1.22
758.32	758.5	-1.18
758.21	758.4	-1.19
758.21	760.3	-1.09
758.33	760.4	-1.07
759.40	760.5	-1.10
759.68	760.7	-1.02
759.55	762.6	-1.05
759.36	760.4	-1.04
759.07	760.1	-1.03
758.94	760.0	-1.06
758.60	759.9	-1.21
757.87	758.0	-1.13
756.91	756.1	-1.19
756.31	757.4	-1.09

### The Result of Calibration

17 January, 2021

Certification No. 026/23  
 Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.6	45.7	-0.1
30.2	30.2	0.0
15.4	15.4	0.0

Calibrated by : 

Mr. Watchapol Subwat  
 Mechanical Engineer



### The Result of Calibration

17 January, 2021

Certification No. 026/23  
 Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading % R.H.	Correction % R.H.
40.6	43	-2.40
62.2	66	-3.80
93.4	80	-4.00

Calibrated by : 

Mr. Watchapol Subwat  
 Mechanical Engineer





Date of Issue 17 January, 2021



Certification No. 026/21

Page : 6 of 6

## ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ชีตส์ Davis Instruments แบบ TIPPING  
BUCKET Product No. 6152 C Mfg No. AZ170619023 ทำการสอบเทียบกับแก้ว  
ฝนแบบแก้ววง GAUGE DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA  
LONDON No 71082 และสามารถนำไปใช้ได้ นับจากตั้งตามรายละเอียดของ  
เครื่องมือ ( 0.01 in/TIP)



## THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2894, 0-2389-0469



## Calibration Certificate

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 11 June, 2020 Certification No. 369/20

Page : 1 of 6

Object : Precision Weather Station

Manufacturer : Davis Instruments

Type : Vantage Pro 2 Model No. : 6152C

Mfg Code : Display AM140310043 Transmitter AM140310043

Customer : SGS (Thailand) Limited  
100 NangInchae Road, Chongnonsa,  
Yamawa, Bangkok 10120

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1006.3 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563  
HOOK GAGE NO 1425 : Wind Anemometer Board

N.I.S.T. Test Reference Number 731241480



Model DA-550-3TV (Sensor TR-30A-4)

Serial Number 110730329 (Sensor 127029506)

JAPAN QUALITY ASSURANCE ORGANIZATION

STANDARD THERMOMETER : Theodor Friedrich : Dry No. 8390194 Wet No. 8390194

: Thermoschneider No.9188 : 1000.1000

STANDARD BAROMETER : Digital Barometer Vaisala Type PTU270014

Calibrated by :

Mr. Wacharapol Subvira

Mechanical Engineer





# THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 0-2396-0156, 0-2399-9469

## The Result of Calibration



# THAI METEOROLOGICAL DEPARTMENT

4353 Sukhumvit, Bangna, Bangkok 10260 Tel. 081-454-2884, 0-2399-9469

## The Result of Calibration

Certification No. 269/20

11 June, 2020

Page : 2 of 6

Standard Ultrasonic Anemometer m/sec	HOOK GAUGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches	Vacuum inches	Pressure kPa	Velocity m/sec	Corrective m/sec
1.00	-	-	-	0.9	0.10
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.5	0.50
7.00	-	-	-	6.7	0.30
9.02	-	-	-	8.5	0.52
11.01	-	-	-	10.8	0.21
13.01	-	-	-	12.4	0.61
15.01	-	-	-	14.8	0.21
17.02	-	-	-	16.4	0.62
20.02	-	-	-	19.3	0.72

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



Calibrated by :

Mr. Wachampol Subwat

Mechanical Engineer

Certification No. 269/20

Page : 3 of 6

11 June, 2020

Standard Barometer Pressure	Tested Barometer Pressure	Corrective
756.16	756.7	0.06
756.32	756.9	-0.58
756.36	756.6	-0.44
756.46	757.0	0.54
756.68	757.2	-0.62
756.77	757.3	-0.53
756.89	757.5	-0.61
756.87	757.0	-0.53
756.19	756.8	-0.61
756.05	756.0	-0.55
755.91	756.8	-0.59
755.45	756.1	-0.65
755.30	756.9	0.60
755.20	756.8	-0.60
755.04	755.6	-0.56
754.86	755.2	-0.54
754.28	754.9	-0.62
755.84	756.4	-0.56
755.93	756.0	-0.57
756.23	756.8	-0.57

Average

Calibrated by :

Mr. Wachampol Subwat

Mechanical Engineer





THAI METEOROLOGICAL DEPARTMENT

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



THAI METEOROLOGICAL DEPARTMENT

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

## The Result of Calibration

11 June, 2020  
Certification No. 269/20  
Page : 4 of 6

Standard Temp °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.1	45.2	-0.1
30.6	30.6	0.0
15.4	15.4	0.0

Calibrated by :



Mr. Wanchampol Suhrwat  
Mechanical Engineer



## The Result of Calibration

11 June, 2020  
Certification No. 269/20  
Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading % R.H.	Correction % R.H.
80.14	83	-2.86
60.34	63	-2.66
40.58	42	-1.32

Calibrated by :



Mr. Wanchampol Suhrwat  
Mechanical Engineer







Date of Issue: 11 June 2020

Certification No. 269/20

Page : 6 of 6

## ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ชีลล์ Davis Instruments แบบ TIPPING BUCKET Product No. 6152 C Mfg. Code. AM140310043 ที่การสอบเทียบกับแก้วฝนแบบแก้ว GAUGE DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA LONDON No 71082 และสามารถนำไปใช้ได้ นำมาคำนวณความละเอียดของ เครื่องวัด ( 0.01 mm / TIP )



## THAI METEOROLOGICAL DEPARTMENT

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

## Calibration Certificate



Issued by : Calibration & Test Section Meteorological Instruments Bureau

Date of Issue : 12 May, 2020

Certification No. 233/20

Page : 1 of 6

Object : Precise Weather Station

Manufacturer : Davis Instruments

Type : Vantage Pro 2 Model No. 6152C

Mfg Code : Display AK130026036 Transmitter A111101P020

Customer : SCS (Thailand) Limited  
100 Nanglinchae Road, Chongnonsi,  
Yamawa, Bangkok 10120.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1010.8 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 842 5M 91563  
- Hook Gage No 1426 : Wind Anemometer Board

N.I.S.T. Test Reference Number 731241460

Thermal Anemometer

Model DA-650-3TV (Sensor TR-90A-1)

Serial Number 110730029 (Sensor 120629588)

JAPAN QUALITY ASSURANCE ORGANIZATION

STANDARD THERMOMETER

Thermoschneider No. 9188 : Testa. 1050 1050

STANDARD BAROMETER

Digital Barometer Vaisala Type PT3220

Calibrated by :

Mr. Wachampol Subwat

Mechanical Engineer

Mr. Pichat Pichasit





THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

THAI METEOROLOGICAL DEPARTMENT

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



The Result of Calibration

Certification No. 233-20

12 May, 2020

Page : 2 of 6

Standard Ultrasonic Anemometer anemometer	HOOK GAGE NO. 1425		TESTED ANEMOMETER	
	Pressure inches	Vacuum inches	Velocity m/sec	Correction mm/sec
1.00	-	-	0.9	0.10
3.00	-	-	2.7	0.32
5.00	-	-	4.5	0.50
7.00	-	-	6.7	0.30
9.00	-	-	8.5	0.52
11.00	-	-	10.3	0.71
13.00	-	-	12.5	0.54
15.00	-	-	14.3	0.71
17.00	-	-	16.1	0.92
20.00	-	-	19.2	0.82

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



Calibrated by

Mt. Wachampol Sobrat  
Mechanical Engineer

Certification No. 233-20

Page : 3 of 6

12 May, 2020

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	Correction
753.64	752.9	0.74
752.88	752.1	0.79
752.77	752.0	0.77
752.82	752.1	0.82
753.17	752.4	0.77
753.56	752.8	0.76
753.89	753.1	0.79
754.16	753.4	0.76
754.04	753.3	0.74
754.38	753.6	0.79
754.65	753.8	0.85
755.55	754.7	0.85
755.84	755.0	0.94
756.28	755.4	0.88
756.35	755.5	0.87
756.04	754.1	0.84
756.04	754.2	0.84
756.48	754.6	0.86
756.68	754.8	0.89
756.87	755.0	0.87
Average		

Calibrated by

Mt. Wachampol Sobrat  
Mechanical Engineer





## The Result of Calibration

Certification No. 233/20

Page : 4 of 6

12 May, 2020

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.3	-45.6	-0.3
30.4	-30.7	-0.3
15.2	-15.4	-0.2

Calibrated by :

Mr. Wacharapol Sathwat  
Mechanical Engineer



## The Result of Calibration

Certification No. 233/20

Page : 5 of 6

12 May, 2020

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading % R.H.	Correction % R.H.
85.42	81	-0.58
60.26	61	-0.72
40.51	41	-0.89

Calibrated by :

Mr. Wacharapol Sathwat  
Mechanical Engineer







Date of Issue 12 May 2020

Certification No. 233/20

Page : 6 of 6

### ใบรับมอบ

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดหนา ยี่ห้อ Davis Instruments แบบ TIPPING  
BUCKET Product No. 6352 CUK Mfg. Code. A111101P020 ที่กรมชั่งตวงวัด  
แก่หน่วยงานที่วัด 74 GAUGE DIAMETER 8.0 INCHES, NEGRETTE & ZAMBRA  
LONDON No 71.082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามระบบหน่วย  
เครื่องมือ ( 0.2 mm/ TIP )



MIRACLE INTERNATIONAL TECHNOLOGY CO., LTD.

214 Bangwaek Rd., Bangwaek, Bangkok 10170  
Tel. (0-2665-4647-8 Fax: 0-2665-4649) <http://www.mil.in.th>



## CALIBRATION CERTIFICATE

Certificate No. : AD2101-166-0802

Date Issued : 25-Jan-21

Customer : SAC-S (Thailand) Limited  
100 Nanglinchee Road, Chongnonsi, Yanmawa, Bangkok 10120

Equipment : DryCal  
Manufacturer : Bins  
Model : Defender S30-11  
Serial No. : 128738  
ID No./Tag No. : UNAH060  
Date Received : 19-Jan-21  
Date Calibrated : 23-Jan-21  
Calibrated by : Mr. Sonjiet Onbua

Calibration Method or Calibration Procedure Used

In-house method : CP-34 by comparison against mass flow calibrator

This certificate is traceable to national standards, which realize the units of measurement according to the International System of Units (SI).

### Result of Calibration

The reported uncertainty of measurement was based on standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level confidence approximately 95 percent.

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

Approved by :

( Mr. Tassana Sukkum )  
Technical Manager

VERIFIED

DATE 29/01/2021



Page 1 of 3

Certificate No.: AD2101-166-0002

Environment : Ambient temperature : ( 23 ± 2 ) °C  
 Relative humidity : ( 50 ± 15 ) % RH  
 Capacity Range : 30 l/min  
 Calibration Media : Air  
 Type : Volumetric Flowmeter

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

Temperature ( °C )	Pressure ( kPa )	UUC Reading ( l/min )	STD Reading ( l/min )	Error ( l/min )	Uncertainty ( ± l/min )
24.56	100.90	0.50313	0.4976	0.00553	0.016
24.58	100.92	1.0106	1.0135	0.0061	0.025
24.60	100.95	5.0398	5.075	-0.0353	0.14
24.61	101.10	10.012	10.031	-0.019	0.28
24.65	101.75	20.039	19.912	0.127	0.34
24.65	102.42	30.029	29.81	0.219	1.7

Error = Unit Under Calibration - Standard



FLOWRATE ( l/min )

Error ( l/min ) --- Upper Limit ( l/min ) --- Lower Limit ( l/min )

Page 2 of 3

Certificate No.: AD2101-166-0002

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

$$Q_{actual} = Q_{ref} \times \frac{P_{ref}}{P_{act}} \times \frac{T_{act}}{T_{ref}}$$

- Q : Flow rate
- P : Absolute pressure
- T : Absolute temperature
- Subscript "Meas" : Measurement condition
- Subscript "Ref" : Reference condition

Traceability of Certificate :

The International System of Units (SI) through

MIT Calibration Certificate No. 1,1910-516 for Mass Flow Calibrator (2000 SCCM) Serial No. 96997001 W, Due 10-Sep-21

MIT Calibration Certificate No. 1,1910-517 for Mass Flow Calibrator (20 SCCM) Serial No. 96997001 W, Due 11-Sep-21

MIT Calibration Certificate No. AD2011-038-0001 for Mass Flow Calibrator (100 LPM) Serial No. 001219580, Due 07-Nov-22

End of Certificate

Page 3 of 3

MTC No. FFL. RP. 38/0963

Nominal Output of Unit Under Test = 94 dB re 20  $\mu$ Pa at 1000 Hz

Acoustic Output in dB re 20  $\mu$ Pa. Corrected to Reference Conditions: 101.325 kPa, 23.0  $^{\circ}$ C and 50 %RH

### 1. Sound Pressure Level

### Ambient Temperature

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SN 12097

sound pressure level generated by sound

an insert voltage technique.

### at Electrical and Electronic Standards

through

and the uncertainty limits caused refer to the

measured values only.

Date of Receipt: 14 Sep. 2020

Date of Calibration : 16 Sep. 2020

VERIFIED

DATE 02/10/2020

142

The results relate only to the 10 ms tested or collected.

Head Office

Head Office  
15, Market Street, London E.C. 4

1001-5796

Overweight and obese

Tel. (661) 0 25

Firm: 16010 25

**Example 1** (continued)

**Abstract**





Certificate No.: CO-1408003/20

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	180619	Dec. 24, 2020	NIMT
	7.00	020719	Dec. 28, 2020	
	10.02	190619	Nov. 21, 2020	

Type	Model	Serial No.	Certificate No.	Due Date	Traceability
Digital Thermometer with Sensor	TH-03C	375021353	10-1202003/20	Feb. 11, 2021	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.: N85144)

pH Standard Solution	(pH)	Measured Value		Uncertainty (± pH)
		(pH)	(mV)	
4.01	4.02	167.7	0.013	0.013
7.01	7.00	-5.8	0.013	0.013
10.03	10.04	-174.0	0.013	0.013

Note 1: Adjust Curve to Buffer Solution pH (4, 7, 10)

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 -

**CERTIFICATE OF CALIBRATION**

Certificate No.: CO-1408003/20

Page 1 of total 2 pages

**Customer**  
SGS (THAILAND) LIMITED  
100 Nanglinchee Road, Chongmonsee,  
Yamawa, Bangkok 10120 Thailand

**Equipment**  
pH Meter  
**Manufacturer**  
HANNA  
**Serial No.**  
04160034101  
**Model**  
H098195  
**ID No.**  
ENWA19105  
**Description**  
Range : 0 - 14 pH, Resolution : 0.01 pH

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

**Calibration Location**  
Chemical Laboratory  
**Received Date**  
14 August 2020  
**Calibration Date**  
14 August 2020

**Date of Issue**  
17 August 2020

**Checked by**  **Approved by** 

Act as Technical Manager

Representative of Managing Director

- ( ) (Krisol K.)
- ( ) (Pattiphan K.)
- ( ) (Pongsak H.)
- ( ) (Karnung C.)
- ( ) (Pranong P.)
- ( ) (Sakda Y.)
- ( ) (Onasapa P.)
- ( ) (Nitiphong K.)
- ( ) (Nonthachai K.)
- ( ) (Noppol P.)

(Dr. Ekachai Puriwitwong)



## CERTIFICATE OF CALIBRATION

Certificate No.: T0-140801720 Page 1 of total 2 pages

## Customer

SGS (THAILAND) LIMITED  
100 Nanglinlee Road, Chongnotsee,  
Yonawa, Bangkok 10120 Thailand

## Equipment

Digital Thermometer with Probe

## Manufacturer

HANNA HI98195

## Serial No.

04160034101 ID No. ENWA19105

## Description

Temperature range : 20 °C to 40 °C, Resolution of UUC : 0.01 °C

## Environmental Conditions

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

## Calibration Location

Temperature &amp; Humidity Laboratory

## Received Date

14 August 2020

## Calibration Date

18 August 2020

## Date of Issue

20 August 2020

## Checked by

Approved by

Act as Technical Manager

Representative of Managing Director

( ) (Krisyol K.) ( ) (Sakda Y.)  
( ) (Patiphan K.) ( ) (Omaga P.)  
( ) (Pongsak H.) ( ) (Nitiphong K.)  
( ) (Kanung C.) ( ) (Nombachai K.)  
( ) (Pransong P.) ( ) (Noppol P.)

( Dr. Ekachai Puntiswong )



Certificate No.: T0-140801720

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	19E4568	Nov. 28, 2020	TPA
Semi-Standard Platinum Resistance Thermometer	5628	2166	TT-0063-17	Dec. 19, 2020	NIMT
Liquid Bath	XORTS-40A	XOI11019	10-0506003/19	Jun. 7, 2021	THC

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

- TPA, Technology Promotion Association (Thailand-Japan).
- NIMT, National Institute of Metrology (Thailand).
- 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	20.000	20.00	0.000	0.0070
75	30.000	30.00	0.000	0.0070
75	40.001	39.99	0.011	0.0070

UUC : Unit Under Calibration

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

- End of Certificate -



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
334/1 PATTANAKARN ROAD SOI 18, SUKHUMVIT, BANGKOK 10110

Tel: 0-2717-3001-7 FAX: 0-2719-9484



Cert.No.: 20CHO426  
Page: 1 of 3

## Certificate of Calibration

Equipment : Spectrophotometer  
Manufacturer : Perkin Elmer  
Model : Lambda 25  
Serial No. : 501S14022112  
ID No. : S2014004  
Condition As-Received:  
Received Date : 30 June 2020  
Calibration Date : 30 June 2020  
Reference : 2006-10760C-1  
Submitted by : SGS (Thailand) Limited-Laboratory (Rayong)  
1209,1211 Moo.1 Ban Chang,  
Ban Chang, Rayong 21130

Calibration Place : Spectrophotometry Lab  
( 23.5 - 22.6 ) °C (On-Site)  
( 39.6 - 36.1 ) % (On-Site)  
In - house method : CP-004  
based on direct measurement by  
using wavelength standard filter and  
absorbance standard filter

Calibrated by : Sathip Meangmai

Approved by :   
Ponthipha Tameyokul  
Malee Bulkruea  
Sathip Meangmai

Issue Date : 8 August 2020

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services & Equipment Calibration and Testing Services.



Cert. No. : 20CHO426  
Page : 2 of 3

### Condition of calibration result

#### 1. Reference Standard Material :

Material	Serial No.	Certificate No.	Due date
1. Absorbance Standard set	32013	84010	11 May 2022
2. Absorbance Standard set	32014	84011	11 May 2022
3. Absorbance Standard set	30132	79279	23 Sep 2021
4. Wavelength Standard set	14536	74104	10 Jan 2021
5. Wavelength Standard set	14537	74105	10 Jan 2021
6. Stray Light Standard set	14004	74102	10 Jan 2021

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

3. This certificate is traceable to the International System of Unit maintained at :

- National Physical Laboratory (NPL), The United Kingdom of Great Britain and Northern Ireland  
- National Institute of Standards and Technology (NIST), The United States of America

4. Spectral Bandwidth : 1 nm

Scan Speed : 60 nm/min

Calibration Results : without adjustment

Wavelength Accuracy

Certified Values of Reference Material ( nm )	Reading ( nm )	Uncertainty of Measurement ( ± nm )	Coverage Factor k
241.70	241.62	0.12	2.00
416.53	416.42	0.13	2.00
459.99	459.84	0.12	2.00
585.19	585.22	0.12	2.00
879.41	878.94	0.12	2.00

000000

A 0017721

1013007





Calibration Certificate ID  
TH4004-03A-031021-ACC-JH

Mettler-Toledo (Thailand) Ltd.  
240/4 - 8485 Lantana Rd., Bangna Tal Sub-District  
Bangna District, Bangkok 10260  
+66 2723 0382  
MT-TN-ServiceSupport@mt.com

## Accuracy Calibration Certificate

### Customer

Company: SGS (THAILAND) CO., LTD.  
Address: 1009, U211 Moo 1  
City: San Chang, Ban Chang  
Zip / Postal: 21130  
State / Province: Rayong  
Order Number: 

### Weighing Device

Manufacturer: Mettler Toledo  
Model: X2505DU  
Serial No.: B03616880  
Building: LABORATORY  
Room: 1  
Balanced Lab  
Instrument Type: Asset Number:  
Terminal Model: SAT  
Terminal Serial No.: B03616888  
Terminal Asset No.: N/A  
Weighing Instrument: N/A

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

### Procedure

Calibration Subline: EURAMET 97-18 v. 4.0 (11/2015)  
Mettler Toledo Work Instruction: CPM000203

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 of the weighing instrument was adjusted before calibration with a built-in weight.

Temperature		Humidity	
As Found	Start: 16.8 °C End: 16.8 °C Start: 43.6 % End: 48.0 %	As Found	Start: 43.6 % End: 48.0 %

As Found Calibration Date: 18-Mar-2021  
As Left Calibration Date: N/A  
Issue Date: 19-Mar-2021

Approved Signature:

  
Signature: [Redacted]  
Name: [Redacted]  
Position: [Redacted]

Software Version: 1.26.17  
Model Number: 3.0.4  
Print Date: 1/2021

Cert. No.: 20CH0426

Page: 3 of 3

### Calibration Results : without adjustment Photometric Accuracy

Wavelength (nm)	Certified Values of Reference Material (Abs)	Reading (Abs)	Uncertainty of Measurement (sAbs)	Coverage Factor k
235.0	Zero 0.4861 Zero 0.7429	0.0000 0.4952 0.0000 0.7402	0.0046 0.0046 0.0050 0.0050	2.00 2.00 2.00 2.00
485.0	Zero 0.5189 0.9496 1.8796	0.0000 0.5178 0.9493 1.8784	0.0028 0.0028 0.0028 0.0080	2.00 2.00 2.00 2.00
635.0	Zero 0.5617 1.0955 1.9290	0.0000 0.5619 1.0973 1.9287	0.0028 0.0028 0.0028 0.0080	2.00 2.00 2.00 2.00

### Stray Light

* Straylight at Wavelength 260.53 nm	Reading at 260.53 nm
Abs	2.0435
%T	0.95

### Remark

- Each individual filter is measured against the empty filter holder (blank) used to zero the spectrophotometer
- The Potassium Dichromate filled cells are measured against a Perchloric acid Blank.
- Cut-off wavelength of stray light reference material (Potassium Iodide) = 260.53 nm
- Result = Pass, if Absorbance > 2.00 Abs and Transmittance < 1.0 %T at wavelength 260.53 nm
- \*: Not NIS-ONSC Accredited

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 %.

-000-

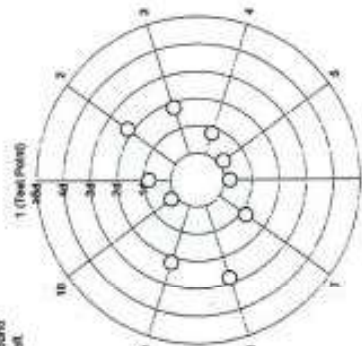
## Measurement Results

### Repeatability

Test Load: 10 g

Position	As Found	As Left
1	99.91659 g	N/A
2	99.91666 g	N/A
3	99.91660 g	N/A
4	99.91669 g	N/A
5	99.91668 g	N/A
6	99.91668 g	N/A
7	99.91667 g	N/A
8	99.91669 g	N/A
9	99.91668 g	N/A
10	99.91668 g	N/A

Standard Deviation	0.000176 g	N/A
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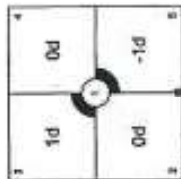
The "1" in the graph represents the repeatability of the measurement in which the test was performed.  
The results of this graph are based upon the absolute values of the difference from the mean value.

### Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	99.91659 g	N/A
2	99.91669 g	N/A
3	100.00000 g	N/A
4	99.99999 g	N/A
5	99.99998 g	N/A

Maximum Deviation	0.0001 g	N/A
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The "1d" in the graph represents the repeatability of the measurement in which the test was performed.

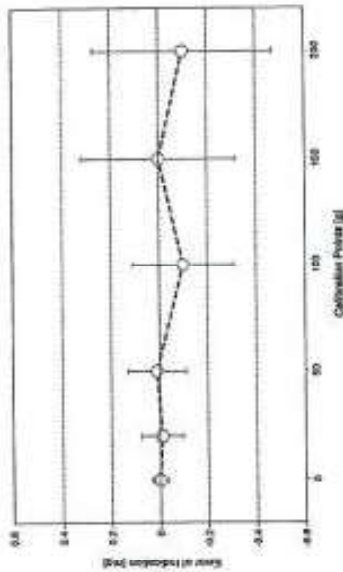
## Error of Indication

### As Found

Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1 0.00000 g	0.00000 g	0.00000 g	0.003 mg	2
2 0.01000 g	0.01001 g	0.00001 g	0.004 mg	2
3 0.10000 g	0.10000 g	0.00000 g	0.008 mg	2
4 1.00000 g	0.99999 g	-0.00001 g	0.043 mg	2
5 4.99999 g	4.99997 g	-0.00002 g	0.055 mg	2
6 10.00000 g	9.99999 g	-0.00001 g	0.087 mg	2
7 19.99999 g	19.99998 g	-0.00001 g	0.087 mg	2
8 49.99999 g	49.99998 g	-0.00001 g	0.12 mg	2
9 99.99999 g	99.99998 g	-0.00001 g	0.21 mg	2
10 149.99999 g	149.99998 g	-0.00001 g	0.32 mg	2
11 200.00000 g	199.99999 g	-0.00001 g	0.37 mg	2

As Found

As Left



For improved legibility of the graph, only increasing measurement points are shown and measurement points close to zero are not displayed.

The uncertainty stated in the expanded uncertainty of calibration obtained by multiplying the standard combined uncertainty by the coverage factor k - which can be larger than 2 according to EURAMET cp-14. The value of the measurement 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	W532	Date of Issue:	14-Sep-2020
Weight Set No.:	154665	Calibration Due Date:	14-Sep-2022
Certificate Number:			
Thermo Hyprometer			
Equipment No.:	8174	Date of Issue:	24-Jun-2020
Certificate Number:	2011531	Calibration Due Date:	24-Jun-2021

Remarks

Equipment condition: Good  
Next calibration according to customer's procedure

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 calculation of the uncertainty under consideration of the errors of indication. The value  $R$  represents the net load indication in the level of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use:  $1,3 \cdot 10^{-7} / K$

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

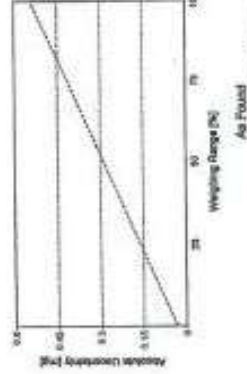
Uncertainty of Uncertainty Equation

Range	Max	As Found	As Left
1 0,00001 g	81 g	$U_1 = 0,033 \text{ mg} + 0,00038 \text{ mg/g} \cdot R$	N/A
2 0,0001 g	220 g	$U_2 = 0,07 \text{ mg} + 0,00038 \text{ mg/g} \cdot R$	N/A

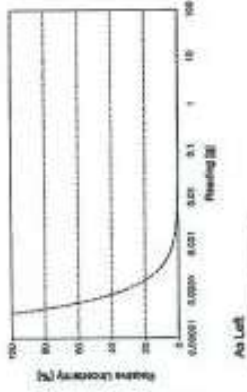
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

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

Net Indication	As Found	As Left
0,00220 g	0,033 mg	1,5%
0,02009 g	0,033 mg	0,15%
0,20003 g	0,034 mg	0,016%
2,00009 g	0,047 mg	0,0021%
220,0000 g	1,0 mg	0,00007%
		N/A



The weighing range shown in the absolute uncertainty graph refers to the full interrange of the device.







# GWP® Certificate

As Found ☒ As Left ☒

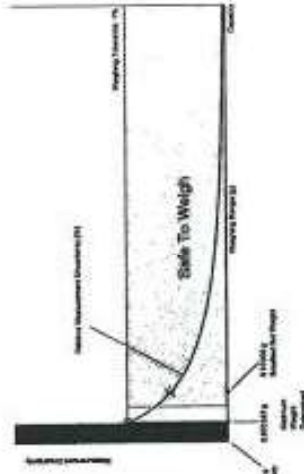
The weighing device meets the given process requirements.

Tested Performance: ☒ As Found ☐ As Left ☒ No adjustment required mode. 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 merely a visual representation. The graph reflects the left testing, unless only the Found test is performed.

## Minimum Weight As Found Minimum Weight Table

Range 1

Minimum weights for different weighing tolerances and safety factors					
Tolerance	1	2	3	5	10
0.1%	0.003011 g	0.001649 g	0.102123 g	0.172411 g	0.360360 g
0.1%	0.016753 g	0.003011 g	0.000776 g	0.044631 g	0.172411 g
0.1%	0.009586 g	0.013394 g	0.003116 g	0.033011 g	0.007649 g
1%	0.003342 g	0.000589 g	0.010030 g	0.016753 g	0.033611 g
2%	0.001671 g	0.003342 g	0.009516 g	0.003342 g	0.00753 g
5%	0.000589 g	0.001336 g	0.003005 g	0.003342 g	0.000686 g

The minimum weight table applies to the full 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	1	2	3	5	10
0.1%	0.003011 g	0.001649 g	0.102123 g	0.172411 g	0.360360 g
0.1%	0.016753 g	0.003011 g	0.000776 g	0.044631 g	0.172411 g
0.1%	0.009586 g	0.013394 g	0.003116 g	0.033011 g	0.007649 g
1%	0.003342 g	0.000589 g	0.010030 g	0.016753 g	0.033611 g
2%	0.001671 g	0.003342 g	0.009516 g	0.003342 g	0.00753 g
5%	0.000589 g	0.001336 g	0.003005 g	0.003342 g	0.000686 g

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

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

At the minimum weight values, the measurement uncertainty of the weighing device is equal to or less than 1% (no safety factor), 1%, 1%, 1%, or 1% 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 last occurred. For the past, it is necessary to know that the tolerance was met, but not the safety factor. The safety factor is a proactive measure to apply for future measurements.

Notes on minimum weight values in above table:

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



## Measurement Results

### Results Summary

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

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

### Repeatability

Test Load: 79 g

Control Limit		As Found		As Left	
Test Load	Control Limit	Result	Std. Deviation	Result	Std. Deviation
0.1%	0.000015 g	✗		✗	
0.2%	0.000010 g	✗		✗	
0.5%	0.000025 g	✓		✓	
1%	0.000050 g	✓	0.000016 g	✓	0.000016 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

Control Limit		As Found		As Left	
Test Load	Control Limit	Result	Deviation	Result	Deviation
0.1%	0.000015 g	✓		✓	
0.2%	0.000010 g	✓		✓	
0.5%	0.000025 g	✓		✓	
1%	0.000050 g	✓	0.00001 g	✓	0.00001 g
2%	0.000100 g	✓		✓	
5%	0.000250 g	✓		✓	

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

### Error of Indication

As Found

Reference Value		0.1%		0.2%		0.5%		1%		2%		5%	
Reference Value	Error	As Found	As Left	As Found	As Left	As Found	As Left	As Found	As Left	As Found	As Left	As Found	As Left
0.000015 g	0.000015 g	0.000015 g	0.000015 g	0.000015 g	0.000015 g	0.000015 g	0.000015 g	0.000015 g	0.000015 g	0.000015 g	0.000015 g	0.000015 g	0.000015 g
0.000025 g	0.000025 g	0.000025 g	0.000025 g	0.000025 g	0.000025 g	0.000025 g	0.000025 g	0.000025 g	0.000025 g	0.000025 g	0.000025 g	0.000025 g	0.000025 g
0.000050 g	0.000050 g	0.000050 g	0.000050 g	0.000050 g	0.000050 g	0.000050 g	0.000050 g	0.000050 g	0.000050 g	0.000050 g	0.000050 g	0.000050 g	0.000050 g
0.000100 g	0.000100 g	0.000100 g	0.000100 g	0.000100 g	0.000100 g	0.000100 g	0.000100 g	0.000100 g	0.000100 g	0.000100 g	0.000100 g	0.000100 g	0.000100 g
0.000250 g	0.000250 g	0.000250 g	0.000250 g	0.000250 g	0.000250 g	0.000250 g	0.000250 g	0.000250 g	0.000250 g	0.000250 g	0.000250 g	0.000250 g	0.000250 g

As Left

Reference Value		0.1%		0.2%		0.5%		1%		2%		5%	
Reference Value	Error	As Found	As Left	As Found	As Left	As Found	As Left	As Found	As Left	As Found	As Left	As Found	As Left
0.000015 g	0.000015 g	0.000015 g	0.000015 g	0.000015 g	0.000015 g	0.000015 g	0.000015 g	0.000015 g	0.000015 g	0.000015 g	0.000015 g	0.000015 g	0.000015 g
0.000025 g	0.000025 g	0.000025 g	0.000025 g	0.000025 g	0.000025 g	0.000025 g	0.000025 g	0.000025 g	0.000025 g	0.000025 g	0.000025 g	0.000025 g	0.000025 g
0.000050 g	0.000050 g	0.000050 g	0.000050 g	0.000050 g	0.000050 g	0.000050 g	0.000050 g	0.000050 g	0.000050 g	0.000050 g	0.000050 g	0.000050 g	0.000050 g
0.000100 g	0.000100 g	0.000100 g	0.000100 g	0.000100 g	0.000100 g	0.000100 g	0.000100 g	0.000100 g	0.000100 g	0.000100 g	0.000100 g	0.000100 g	0.000100 g
0.000250 g	0.000250 g	0.000250 g	0.000250 g	0.000250 g	0.000250 g	0.000250 g	0.000250 g	0.000250 g	0.000250 g	0.000250 g	0.000250 g	0.000250 g	0.000250 g

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 above the zero point cannot be assessed.



**Thermology Co., Ltd.**

96/177-96/178 Moo 6, T. La-harn, A. Bangbunthong, Nonthaburi 11110  
Tel: 0 2191 6479 Fax: 0 2191 6480 website: [www.thermology.co.th](http://www.thermology.co.th)



# CALIBRATION CERTIFICATE

Date of Issue	Jun 08, 2020	Cert No.	2011903
Site Calibration		Order No.	20050287

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

Place of Calibration	Sample Area
Description	Incubator
Model	i25UOS
Serial No.	i250402-0810-0319
ID No.	I2010004
Date of Receipt	Jun 05, 2020
Date of Calibration	Jun 05, 2020
Environment	
Temperature	(Min) 22.9 °C (Max) 24.3 °C
Relative Humidity	(Min) 66.5 %RH (Max) 77.0 %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. MV49007769, Certificate No. QR19-1952, Calibrated by Quality Reform Co. Ltd. OIMAC Calibration No. 02502

This certificate is traceable to SI unit

Page 1 of 3

2023

This certificate is issued in accordance with the conditions of Thermology Laboratory. The traceability to recognised national standard and the unit of measurement realised at corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of laboratory.

**METTLER TOLEDO**

Service Date: 2021-03-16  
Document Number: TH4904-150-231021-LA85056549R  
995 (THAILAND) CO., LTD.  
10029, 10111 Map 1, Ban Chang, Ban Chang, Rayong 21150  
Thailand  
Thailand Head Office

## Balance Health Report

Device Details		Service History	
Manufacturer:	Mettler Toledo	Accessory 1:	
Model:	OS205N1	Accessory 2:	
Serial number:	6036695200	Weight set for routine testing:	No
Partners:	1.6		

Device usage		Service history	
Installed by user:	Yes	Last preventive maintenance:	< 1 year
Installation date:	> 10 years	Last instrument calibration:	< 1 year
Is any parts available?	No	Last minimum weight demonstrated:	Never
Regulation:	ISO	Routine testing performed:	Don't know
Precise tolerance in %:	1%		
Sensitization test weight:	5.01000 g		

Instrument Capabilities		General & Functional Checks	
From technical literature	<input checked="" type="checkbox"/>	Loading	<input checked="" type="checkbox"/>
Exposure to direct sun	<input checked="" type="checkbox"/>	Overstrain	<input checked="" type="checkbox"/>
Vibration	<input checked="" type="checkbox"/>	Compliance - missing parts see additional remarks	<input checked="" type="checkbox"/>
Cable	<input checked="" type="checkbox"/>	Sensors calibrated for operating environment	<input checked="" type="checkbox"/>
DRI or dual	<input checked="" type="checkbox"/>	Other - additions noted as additional remarks	-
Static	<input checked="" type="checkbox"/>	Unloaded Compliance Checks	<input checked="" type="checkbox"/>

Mechanical Component Checks		Recommendations	
Load mass	<input checked="" type="checkbox"/>	Power supply	<input checked="" type="checkbox"/>
Weighing rate position	<input checked="" type="checkbox"/>	Bleed down time	<input checked="" type="checkbox"/>
Hoveling	<input checked="" type="checkbox"/>	Inherent weight error	<input checked="" type="checkbox"/>
Other - additions noted as additional remarks	-	Oscillator	<input checked="" type="checkbox"/>
		Other - additions noted as additional remarks	-

Instrument Calibration		General Remarks & Recommendations	
Identify safe weighing range		Unusual instruments	
Gross verification / risk assessment	Yes	Supplier information	
Prescriptive requirements		Replace load pans (see additional remarks)	
Perform routine testing with test weights		Online repair	
User training		Direct repair	
Contact Name:	Khan Hakeem Iqbal	Name of accessories (see additional remarks)	
Position:	Production	Use of accessories (see additional remarks)	
Checklist	Completed	Phone:	0025525800
		Email:	mohd.a.yg.m@neclogica.com

Approval Remarks & Signatures	
Date:	18 Mar 2021
Name:	Signature

Article has not been certified

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

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A. Moulds Attribution

**METTLER TOLEDO Service**

Printed by **Wiley** on **12/04/2016** Version **4.73.72** Pages **17** of **17**

## CALIBRATION CERTIFICATE

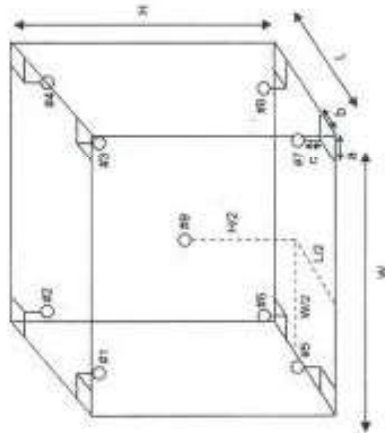
Date of Issue  
 Site Calibration

Jun 08, 2020

Cert No.  
 Order No.

201903  
 20050287

Results (without adjustment)



Position of reference thermometers were placed

Note

- 1) Dimension (W x L x H) is 50 x 50 x 105 cm
- 2) Stability - greatest one half of difference between max peak and min peak of each reference probe measured temperature obtained during the calibration interval
- 3) Uniformity - the maximum difference of measured temperatures at any sensors and the measured temperature at the reference location which are observed at the same time or at its 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  
 Site Calibration

Jun 08, 2020

Cert No.  
 Order No.

201903  
 20050287

Results (without adjustment)

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)	Stability ±(°C)	Uniformity (°C)	Uncertainty ±(°C)
20.0	19.9	Position 1 20.412	0.316	0.537	0.59
		Position 2 20.287			
		Position 3 20.309			
		Position 4 20.199			
		Position 5 20.102			
		Position 6 20.141			
		Position 7 20.019			
		Position 8 20.055			
		Position 9 20.004			

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)





96/177-96/178 Moo 6, T. La-burn, A. Bangbunthong, Nonthaburi 11110  
Tel: 0 2191 6479 Fax: 0 2191 6480 website: [www.thermology.co.th](http://www.thermology.co.th)



Date of Issue	Jun 08, 2020	Cert No.	201906
Site Calibration		Order No.	20050287

Customer	SGS (THAILAND) Limited 11209 1/211 Moo 1, T.Ban Chang, A.Ban Chan, Rayong 21130 Thailand.
----------	--

Place of Calibration	Hot Lab
1	1
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75	75
76	76
77	77
78	78
79	79
80	80
81	81
82	82
83	83
84	84
85	85
86	86
87	87
88	88
89	89
90	90
91	91
92	92
93	93
94	94
95	95
96	96
97	97
98	98
99	99
100	100

Description	Water Bath
Model	WNE29
Serial No.	1611 0546
D.No.	W2012002

Date of Receipt	Jun 04, 2020
Date of Calibration	Jun 04, 2020

Environment	Temperature	Relative Humidity	Line Voltage
	(Min)	(Max)	(Max)
	19.9 °C	23.4 °C	
	(Min)	(Max)	(Max)
	54.8 %RH	77.4 %RH	
	(Min)	(Max)	(Max)
	225.1 Vac	230.1 Vac	

### Calibration Method

W-18: The reference thermometers were placed into the bath and the measurement was based on ASTM E715-80. The temperature scale in use at this laboratory is the International Temperature Scale of 1990.

## Standard

†) Data Acquisition with Sensor Model 34972A S/N: MY49007789, Certificate No. QR19-1993, Calibrated by Quality Reform Co. Ltd., ONAC Calibration No. 0292

This certificate is traceable to SI unit.

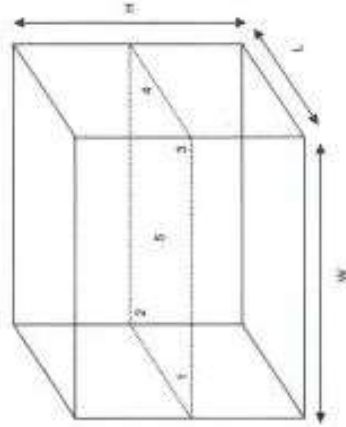
This certificate is issued in accordance with the conditions of Thermoflex Laboratory. The traceability to recognized national standard and the method of measurement realized at corresponding national standard laboratory. This certificate may not be reproduced other than in full except with the prior written approval of laboratory.

## CALIBRATION CERTIFICATE

Date of Issue Jun 08, 2020  
 Site Calibration

Cert No. 2019006  
 Order No. 20050287

Results (without adjustment)



Position of reference thermometers were placed

### Note:

- 1) Dimension (W x L x H) is 59 x 35 x 14 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 08, 2020  
 Site Calibration  
 Results (without adjustment)

Cert No. 2019006  
 Order No. 20050287

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)	Stability $\pm$ (°C)	Uniformity (°C)	Uncertainty $\pm$ (°C)
60.0	60.0	Position 1 59.906 Position 2 60.005 Position 3 59.966 Position 4 60.054 Position 5 60.020	0.041	0.132	0.16

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)	Stability $\pm$ (°C)	Uniformity (°C)	Uncertainty $\pm$ (°C)
111	101.0	Position 1 110.220 Position 2 110.419 Position 3 110.253 Position 4 110.333 Position 5 110.408	0.156	0.413	0.35

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)



**Thermology Co., Ltd.**

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



ISO 9001:2015  
ISO 17025:2017  
CALIBRATION

## CALIBRATION CERTIFICATE

Date of Issue Jun 08, 2020 Cert No. 201904  
Site Calibration Order No. 20060287

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. Q2010002  
Date of Receipt Jun 04, 2020  
Date of Calibration Jun 04, 2020  
Environment

Temperature	(Min)	19.9 °C	(Max)	23.4 °C
Relative Humidity	(Min)	54.8 %RH	(Max)	77.4 %RH

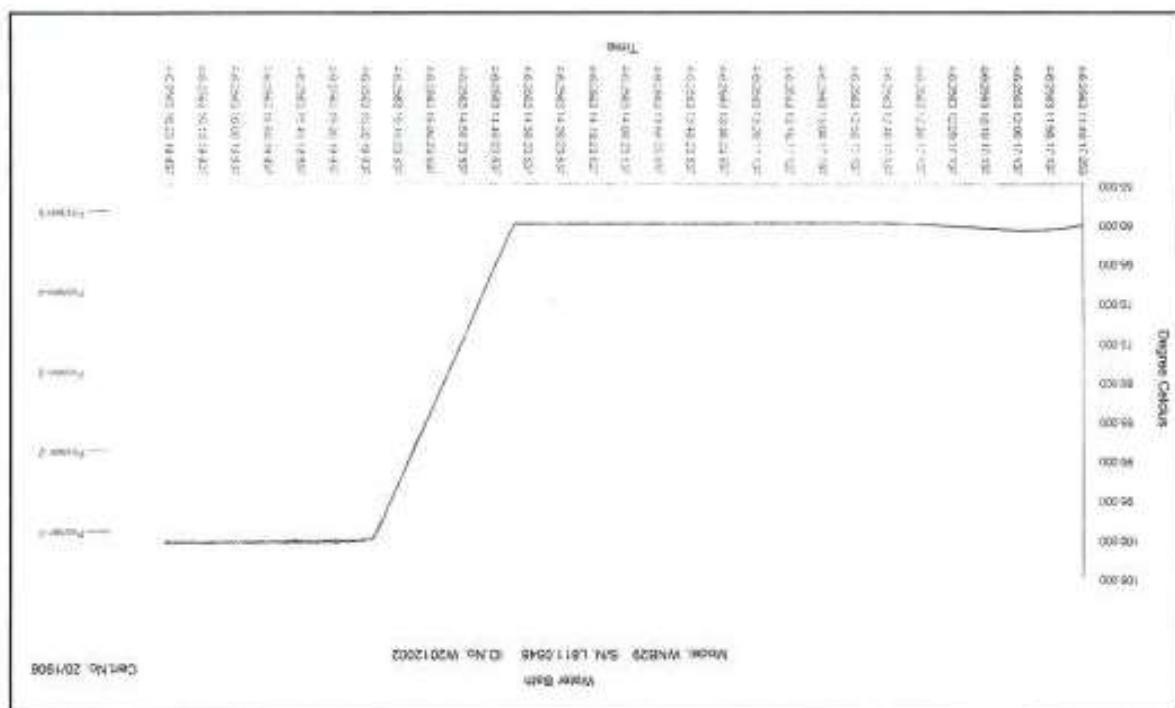
### Calibration Method

W1.17: 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 34872A S/N MY56002130, Certificate No. 0520-0585, Calibrated by  
Quality Reborn Co., Ltd., OJQC Calibration No. 0292

This certificate is traceable to SI unit





# CALIBRATION CERTIFICATE

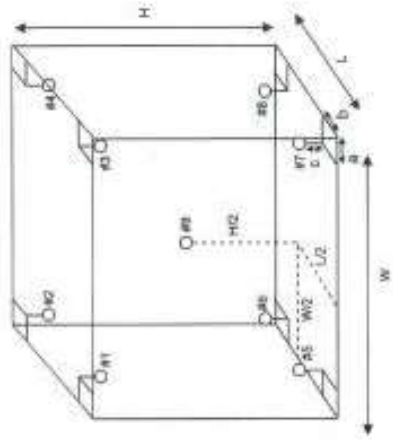
Date of Issue  
 Site Calibration

Jun 08, 2020

Cert No.  
 Order No.

20/1504  
 20050287

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  
 Site Calibration

Jun 08, 2020

Cert No.  
 Order No.

20/1504  
 20050287

Results (without adjustment)

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)	Stability ±1°C)	Uniformity (°C)	Uncertainty ±1°C)
85.0	85.0	Position 1 85.494	0.039	0.478	0.31
		Position 2 85.429			
		Position 3 85.533			
		Position 4 85.305			
		Position 5 85.039			
		Position 6 85.098			
		Position 7 84.696			
		Position 8 85.447			
		Position 9 85.052			

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)	Stability ±1°C)	Uniformity (°C)	Uncertainty ±1°C)
104.0	104.0	Position 1 104.402	0.075	0.575	0.43
		Position 2 104.365			
		Position 3 104.178			
		Position 4 104.170			
		Position 5 103.854			
		Position 6 103.940			
		Position 7 103.408			
		Position 8 104.384			
		Position 9 103.898			



**Thermology Co., Ltd.**

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NSC-TS1-TS1-2025  
CALIBRATION 1109

## CALIBRATION CERTIFICATE

Date of Issue : Jun 08, 2020  
Site Calibration

Cert No. : 20/1904  
Order No. : 20050287

Results (without adjustment)

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)	Stability (°C)	Uniformity (°C)	Uncertainty (°C)
150.0	150.0	Position 1 150.949	0.134	0.895	0.48
		Position 2 150.829			
		Position 3 150.611			
		Position 4 150.495			
		Position 5 150.030			
		Position 6 150.179			
		Position 7 149.350			
		Position 8 150.000			
		Position 9 150.140			

UUC Setting (°C)	UUC Reading (°C)	Reference Thermometer (°C)	Stability (°C)	Uniformity (°C)	Uncertainty (°C)
180.0	180.0	Position 1 181.390	0.086	1.117	0.49
		Position 2 181.174			
		Position 3 180.027			
		Position 4 180.766			
		Position 5 180.193			
		Position 6 180.377			
		Position 7 179.445			
		Position 8 181.212			
		Position 9 180.353			



**Thermology Co., Ltd.**

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NSC-TS1-TS1-2025  
CALIBRATION 0199

## CALIBRATION CERTIFICATE

Date of Issue : Jun 08, 2020  
Site Calibration

Cert No. : 20/1904  
Order No. : 20050287

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)

