

ภาคผนวก ง

สำเนาใบรับรองการสอบเทียบเครื่องมือ



Airgas Specialty Gases
Airgas USA, LLC
6141 Easton Road
Bldg 1
Plumsteadville, PA 18949
Airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number:	E04N198E80A0041	Reference Number:	160-401658125-1
Cylinder Number:	LI193431	Cylinder Volume:	83.4 CF
Laboratory:	124 - Plumsteadville - PA	Cylinder Pressure:	2215 PSIG
PGVP Number:	A12019	Valve Outlet:	660
Gas Code:	CO,NO,NOX,S02,BALN	Certification Date:	Dec 12, 2019
		Expiration Date:	Dec 12, 2022

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 molar/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	45.00 PPM	44.57 PPM	GI	+/- 0.9% NIST Traceable	12/04/2019, 12/12/2019	
NITRIC OXIDE	45.00 PPM	44.57 PPM	GI	+/- 0.9% NIST Traceable	12/04/2019, 12/12/2019	
SULFUR DIOXIDE	45.00 PPM	45.33 PPM	GI	+/- 1.0% NIST Traceable	12/04/2019, 12/12/2019	
CARBON MONOXIDE	4500 PPM	4539 PPM	GI	+/- 0.6% NIST Traceable	12/04/2019	
NITROGEN	Balance					
CALIBRATION STANDARDS						
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date	
NTRM	16060636	CC442637	50.42 PPM NITRIC OXIDE/NITROGEN	+/- 0.8%	Jun 27, 2020	
NTRM	16060636	CC442637	50.49 PPM NOX/NITROGEN	+/- 0.8%	Jun 27, 2020	
NTRM	04170911	KAL003197	49.87 PPM SULFUR DIOXIDE/NITROGEN	+/- 1.0%	Jun 20, 2022	
NTRM	10010904	KAL000399	49.87 PPM SULFUR DIOXIDE/NITROGEN	+/- 1.0%	Jun 20, 2022	
NTRM	09012318	KAL004620	48.57 PPM CARBON MONOXIDE/NITROGEN	+/- 0.6%	Jun 07, 2024	
ANALYTICAL EQUIPMENT						
Instrument/Make/Model	Analytical Principle			Last Multipoint Calibration		
MKS FTIR - CO2 - 000928781	FTIR			Nov 08, 2019		
MKS FTIR - NO - 000928781	FTIR			Dec 12, 2019		
MKS FTIR - NOx - 000928781	FTIR			Dec 12, 2019		
MKS FTIR - SO2 - 000928781	FTIR			Nov 27, 2019		

Triad Data Available Upon Request

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



Page 1 of 160-401658125-1

<p>RECALIBRATION</p> <p>DUE DATE:</p> <p>January 24, 2023</p>

250 JUN 3

Certificate of Calibration

Calibration Certification Information	
Cal. Date: January 24, 2022	Rootsmeeter S/N: 438320
Operator: Jim Tisch	Ta: 294 °K
Calibration Model #: TE-5028A	Pa: 741.17 mm Hg
	Calibrator S/N: 1547

Run	Vol. Init (m3)	Vol. Final (m3)	Δ Vol. (m3)	Δ Time (min)	Δ P (mm Hg)	Δ H (in H ₂ O)
1	1	2	1	1.2590	4.3	1.50
2	3	4	1	0.9730	7.2	2.50
3	5	6	1	0.8860	8.6	3.00
4	7	8	1	0.8180	10.1	3.50
5	9	10	1	0.6210	17.2	6.00

Data Tabulation					
Vatid (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left(\frac{P_a}{P_{std}} \times \frac{t_{std}}{t_a} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H \left(\frac{T_a}{P_a} \right)}$ (y-axis)
0.9828	0.7806	1.2177	0.9942	0.7897	0.7714
0.9789	1.0061	1.5720	0.9903	1.0178	0.9958
0.9770	1.1027	1.7221	0.9884	1.1156	1.0909
0.9750	1.1920	1.8600	0.9864	1.2058	1.1783
0.9656	1.5548	2.4354	0.9768	1.5729	1.5427
QSTD	m=	1.57206	QA	m=	0.98440
	b=	-0.01065		b=	-0.00675
	r=	0.99999		r=	0.99999

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

Standard Conditions	
Tstd:	298.15 °K
Pstd:	760 mm Hg
Key	
ΔH: calorimeter manometer reading (in H ₂ O)	
ΔP: rootsmeter manometer reading (mm Hg)	
T _a : actual absolute temperature (°K)	
P _a : 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.

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

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

รายงานผลการซ่อมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd
วันที่ : 25 กรกฎาคม 2565
รายชื่ออุปกรณ์ / เครื่องมือ : NO_x Analyzer
บริษัทผู้ผลิต : Teledyne API
รุ่นของอุปกรณ์ / เครื่องมือ : T200

TEST VALUES		BEFORE		AFTER	
API MODEL T200					
1	RANGE	50 - 20,000 PPB	500	500	
2	STABILITY	≤ 1 PPB	0.4	0.2	
3	SAMPLE FLOW	500 ± 10% cc/min	471	501	
4	OZONE FLOW	80 ± 10% cc/min	79	80	
5	PMT	mV	779.2	191.4	
6	NORM PMT	mV	659.8	65.5	
7	A ZERO	-20 To 150 mV	277.1	119.5	
8	HPVS	400 - 900 V	681	743	
9	RX CELL TEMP	50 ± 1 °C	50.0	50.0	
10	BOX TEMP	AMBIENT ± 5 °C	30.6	30.1	
11	PMT TEMP	7 ± 2 °C	7.2	7.0	
12	MOLY TEMP	315 ± 5 °C	316.1	317.2	
13	RX CELL PRESSURE	< 10 in-Hg-A	6.9	6.2	
14	SAMPLE PRESSURE	25 - 35 in-Hg-A	27.8	29.7	
15	NOX SLOPE	1.0 ± 0.3	1.272	1.006	
16	NOX OFFSET	-50 To 150	196.7	-3.6	
17	NO SLOPE	1.0 ± 0.3	1.179	0.974	
18	NO OFFSET	-50 To 150	160.9	-3.3	
19	NO SAMPLE READING	PPB	303.1	150	
20	NO2 SAMPLE READING	PPB	24.6	23.6	
21	NOX SAMPLE READING	PPB	327.1	38.9	
22	OPTIC TEST	2000 ± 1000 mV	2492.1	1643.5	
23	ELECTRICAL TEST	2000 ± 1000 mV	4900.8	1749.8	
24	VOLTAGE TEST	+5V +12V +15V -15V	5.22 / 12.54 / 15.75 / -15.22	5.22 / 12.54 / 15.75 / -15.22	
25	ZERO GAS NO/NOx	0.000/0.00 PPB	188.5 / 185.0	0.1 / 0.1	
26	SPAN GAS NO/NOx	400.00/400.00 PPB	788.3 / 842.1	399.2 / 401.8	

หมายเหตุ

- Sample Pressure ค่าไม่เต็ม / เปลี่ยนเรียบร้อยแล้ว
- Auto Zero Warning จึงทำให้ PMT และ NORM PMT มีค่าสูง / เปลี่ยนเรียบร้อยแล้ว
- ทำการเปลี่ยน Pressure Sensor 1 ชิ้น

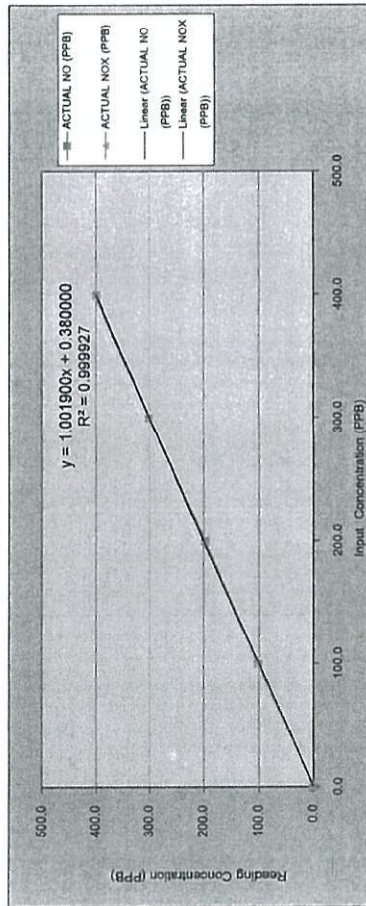
ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ : คุณพรชัย มาสิตนวกะห์ โทรศัพท์ : 0-2515-8987
เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทระเกษม เขตจตุจักร กรุงเทพฯ 10900 โทรศัพท์ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : info@kinetics.co.th

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd
EQUIPMENT NAME : NO_x Analyzer
MANUFACTURER : Teledyne - API
MODEL : T200
SERIAL NO : 1652
STANDARD GAS CONCENTRATION (PPM) : 53.40
CYLINDER NO : CT45166
CERTIFIED DATE : Mar 10, 2021
CYLINDER PRESSURE (psig) : 1800
EXPIRED DATE : Mar 10, 2029
CERTIFIED BY : AIRGAS SPECIALTY GASES

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS				
	IDEAL (PPB)	ACTUAL NO (PPB)	% ERROR NO (PPB)	ACTUAL NO _x (PPB)	% ERROR NO _x
ZERO	0.0	0.1	0.1	0.1	0.1
1	100.0	100.7	0.7	102.3	2.3
2	200.0	197.0	-3	196.8	-1.2
3	300.0	300.7	0.7	300.8	0.8
4	400.0	399.2	-0.8	401.8	1.8
AVERAGE (%)					0.6



KINETICS
บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

CALIBRATED BY : XXXXXXXXXX DATE : 25 กรกฎาคม 2565

ต้องการข้อมูลเพิ่มเติมทางด้านเทคนิค กรุณาติดต่อ : คุณพรชัย มาสิตนวกะห์ 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

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04N199E15A0822
Cylinder Number: C745169
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12021
Gas Code: CO, NO, NOX, SO2, BALN
Reference Number: 160-402045691-1
Cylinder Volume: 144.4 CF
Cylinder Pressure: 2015 PSIG
Valve Outlet: 660
Certification Date: Mar 10, 2021
Expiration Date: Mar 10, 2029

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

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

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
NOX	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable
NITRIC OXIDE	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable
SULFUR DIOXIDE	53.00 PPM	53.79 PPM	G1	+/- 0.9% NIST Traceable
CARBON MONOXIDE	4500 PPM	4512 PPM	G1	+/- 0.6% NIST Traceable
NITROGEN	Balance			
Assay Dates				
				03/03/2021, 03/10/2021
				03/03/2021, 03/10/2021
				03/03/2021, 03/10/2021
				03/04/2021
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 AR/NITROGEN DIOXIDE	2.0%
GMIS	124206889	CC323707	4.028 PPM NITROGEN DIOXIDE/NITROGEN	2.1%
NTRM	16010203	KAL003097	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 GMS used in the assay and not part of the analysis.				
ANALYTICAL EQUIPMENT				
Instrument/Make/Model			Last Multipoint Calibration	
SIEMENS ULTRAMAT 5 N1K0579			NDIR	Feb 20, 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

Notes:

Gross Weight: 28.1 Kg
Net Weight: 4.6 Kg



388 Ratchadapisek Rd. 32
Chadrasakem, Chatuchak
Bangkok 10900 | Thailand
+66 (0) 2-515-8999
Env_Service@kinetics.co.th

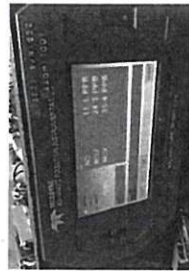
Environmental Science Business Unit

Service Report

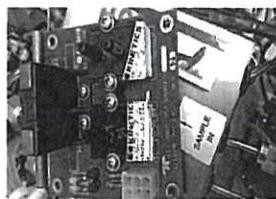
Physical Checking

ตรวจสอบเบื้องต้นพบว่า

- ฝาปิดแน่น
- Sample Pressure ค่าไม่สูง
- Auto Zero Warning ใช้งาน PMT และ NORM PMT ได้ถูกต้อง



รูป หน้าจอแสดงค่า



รูป Pressure Sensor

Correction Working

- ทำการทดสอบเปลี่ยน Pressure Sensor 1 ชิ้น
- จากการทดสอบการเปลี่ยนและไหลแล้วลงใช้งานเครื่อง *เครื่องสามารถทำงานปกติ

*รายการเปลี่ยน

Recommendation

ต้องทำการเปลี่ยนและไหลตามรายการที่ 1 เช้าให้เครื่องใช้งานได้ปกติ



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

KINETICS CORPORATION LTD.

รายงานผลการรวมและปรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd
วันที่ : 25 สิงหาคม 2565
รายชื่ออุปกรณ์ / เครื่องมือ : CO Analyzer
วันที่ผลิต : Teledyne API
รุ่นของอุปกรณ์ / เครื่องมือ : T300
หมายเลขอุปกรณ์ / เครื่องมือ : 1885

TEST VALUES		
API MODEL T300		
	BEFORE	AFTER
1 RANGE	1 - 1000 PPM	50.0
2 STABILITY	≤ 1 PPM	0.006
3 CO MEASURE	2500 - 4800 mV	3164.7
4 CO REFERENCE	2000 - 4800 mV	2926.6
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	828
8 SAMPLE TEMP	48 ± 4 °C	45.0
9 BENCH TEMP	48 ± 2 °C	48.0
10 WHEEL TEMP	68 ± 2 °C	69.0
11 BOX TEMP	AMBIENT ± 5 °C	31.9
12 PHT DRIVE	250 - 4750 mV	3616.8
13 SLOPE	1.0 ± 0.3	0.873
14 OFFSET	0.0 ± 0.3	0.024
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 / -15.32
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



บริษัท ไคเนติกส์ คอร์ปอเรชั่น จำกัด

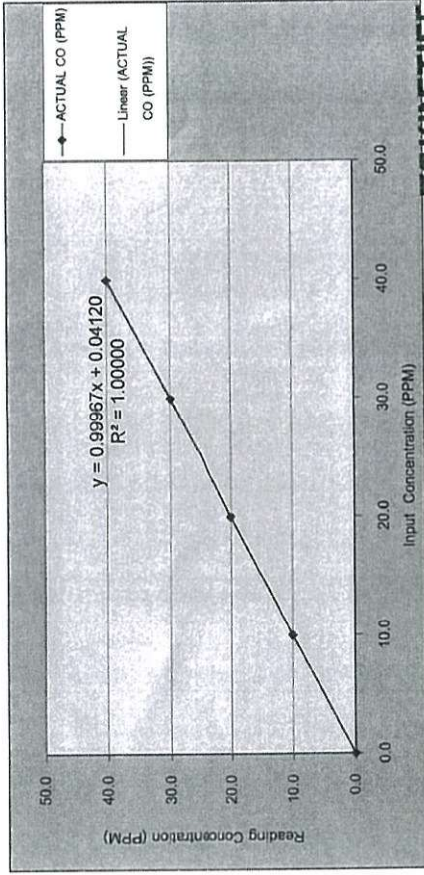
ต้องการข้อมูลเพิ่มเติมทางด้านการติดตั้ง อุปกรณ์ติดต่อ : คุณพรชัย นาคิวนรักษ์ โทรที่ : 0-2515-8987
เลขที่ 388 ถนนรัชดาภิเษก แขวงจันทรมณฑล เขตจตุจักร กรุงเทพฯ 10900 โทรที่ : 0-2515-8999 โทรสาร : 0-2515-8988 E-Mail : info@kinetics.co.th

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd	
EQUIPMENT NAME : CO Analyzer	
MANUFACTURER : Teledyne - API	SERIAL NO : 1885
MODEL : T300	
CYLINDER NO : CC745169	
STANDARD GAS CONCENTRATION (PPM) : 4512	
CERTIFIED DATE : Mar 10, 2021	
CYLINDER PRESSURE (psig) : 1750	
EXPIRED DATE : Mar 10, 2029	
CERTIFIED BY : AIRGAS SPECIALTY GASES	

CALIBRATION RESULTS

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



DATE : 25 สิงหาคม 2565

ต้องการข้อมูลเพิ่มเติมทางด้านการติดตั้ง : คุณพรชัย นาคิวนรักษ์ โทรที่ : 02-515-8987

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

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04N99E15A0522
Cylinder Number: CC745169
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12021
Gas Code: CO, NO, NOX, SO₂, BALN
Reference Number: 160-402045591-1
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 Testability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2013)*, following EPA 600R-12931, 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
NOX	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable
NITRIC OXIDE	53.00 PPM	53.40 PPM	G1	+/- 1.1% NIST Traceable
SULFUR DIOXIDE	53.00 PPM	53.79 PPM	G1	+/- 0.9% NIST Traceable
CARBON MONOXIDE	4500 PPM	4512 PPM	G1	+/- 0.6% NIST Traceable
NITROGEN	Balance			
CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Uncertainty
NTRM	07060227	EB0079116	100.3 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%
PRM	12386	D985025	9.91 PPM AIR/NITROGEN DIOXIDE	2.0%
GMS	124206899	CC323707	4.028 PPM NITROGEN DIOXIDE/NITROGEN	2.1%
NTRM	16010203	KAL003067	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 GMS 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



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

CALIBRATION CERTIFICATE

Certificate No. : AD2201-176-0001
Date Issued : 31-Jan-22

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

Equipment : DryCal
Manufacturer : MESA LABS
Model : DEFENDER 530-L
Serial No. : 137758
ID No./Tag No. : ENWP 15147
Date Received : 20-Jan-22
Date Calibrated : 22-Jan-22

Calibrated by :
Calibration Method or Calibration Procedure Used :
In-house method : CP-34 by comparison against mass flow calibrator.

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

Result of Calibration

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

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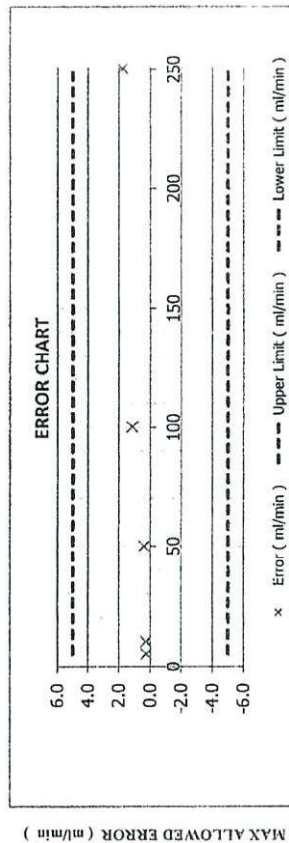
Approved by :

Certificate No. : AD2201-176-0001

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

Unit Under Calibration Reference Condition :					At atmospheric pressure and room temperature condition		
Temperature (° C)	Pressure (kPa)	UUC Reading (ml/min)	STD Reading (ml/min)	Error (ml/min)	Uncertainty (± ml/min)		
22.64	100.73	5.0566	4.791	0.2656	0.18		
22.73	100.77	10.040	9.761	0.279	0.18		
22.87	100.87	50.048	49.65	0.398	1.7		
22.81	100.93	100.17	99.02	1.15	1.6		
22.56	100.82	250.25	248.5	1.75	7.6		

Error = Unit Under Calibration - Standard



Page 2 of 3

Certificate No. : AD2201-176-0001

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

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

; Q = Flow rate
; P = Absolute pressure
; T = Absolute temperature
; Subscript "Meas" = Measurement condition
; Subscript "Ref" = Reference condition

Condition As-Received : Used Item

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

Traceability of Certificate :

The International System of Units (SI) through

NIMT Calibration Certificate No. MW-0003-20 for Mass Flow Calibrator (20 SCCM) Serial No. G500971G20, Due 22-Jan-22

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

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

End of Certificate

Page 3 of 3

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 : 2 September, 2022

Certification No. 317/22

Page : 1 of 6

Object : Precision Weather Station

Manufacturer : Davis Instruments

Type : Vantage Pro 2 Model No. : 6152C

Mfg Code : Display BD190415075 Transmitter BD190415075

Customer : SGS (Thailand) Limited.

100 Nanglinchee Road, Chongnonsi,
Yannawa, Bangkok 10120.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1008.2 hPa

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

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

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

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

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

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

: Thermoschneider No.9188 : testo 615, S/N 161829057

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB220 S/N V1220015



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 317/22

2 September, 2022

Page : 2 of 6

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425		TESTED ANEMOMETER	
	Pressure inches H ₂ O	Vacuum inches H ₂ O	Velocity m/sec	Correction m/sec
1.00	-	-	0.9	0.10
3.02	-	-	3.1	-0.08
5.00	-	-	4.9	0.10
7.00	-	-	7.2	-0.20
9.02	-	-	8.5	0.52
11.01	-	-	10.7	0.31
13.01	-	-	12.5	0.51
15.01	-	-	15.2	-0.19
17.02	-	-	17.0	0.02
20.02	-	-	19.3	0.72

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





THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 317/22

2 September, 2022

Page : 3 of 6

Standard Barometer Pressure	Tested Barometer Pressure	Correction
757.25	758.3	-1.05
757.37	758.4	-1.03
757.43	758.5	-1.07
757.26	758.3	-1.04
757.20	758.1	-0.90
756.96	757.8	-0.84
756.83	757.6	-0.77
756.71	757.5	-0.79
756.13	756.8	-0.67
755.96	756.7	-0.74
755.52	756.3	-0.78
755.29	756.2	-0.91
756.68	757.7	-1.02
756.86	757.9	-1.04
756.93	758.0	-1.07
757.04	758.1	-1.06
756.74	757.6	-0.86
755.81	756.7	-0.89
755.64	756.6	-0.96
755.48	756.4	-0.92



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 317/22

2 September, 2022

Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.5	45.5	0.0
30.5	30.6	-0.1
15.2	15.3	-0.1

THAI METEOROLOGICAL DEPARTMENT

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



The Result of Calibration

2 September, 2022

Certification No. 317/22

Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading % R.H.	Correction % R.H.
85.6	85	0.60
60.4	60	0.40
42.3	43	-0.70



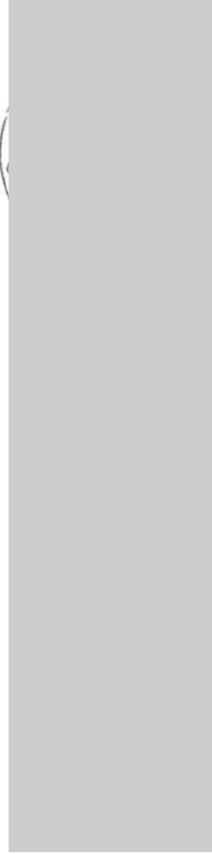
Date of Issue 2 September, 2022

Certification No. 317/22

Page : 6 of 6

ใบรับรอง

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



รายงานผลการสอบเทียบและรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ

ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd
วันที่ : 7 มีนาคม 2565
รายชื่ออุปกรณ์ / เครื่องมือ : NO_x Analyzer
รุ่นของอุปกรณ์ / เครื่องมือ : T200

TEST VALUES		BEFORE		AFTER	
API MODEL T200		500	500	500	
1 RANGE	50 - 20,000 PPB				
2 STABILITY	≤ 1 PPB	0.2		0.1	
3 SAMPLE FLOW	500 ± 10% cc/min	487		502	
4 OZONE FLOW	80 ± 10% cc/min	77		80	
5 PMT	mV	854.7		52.1	
6 NORM PMT	mV	906.8		0.5	
7 A ZERO	-20 To 150 mV	378.7		48.3	
8 HPVS	400 - 900 V	762		668	
9 RX CELL TEMP	50 ± 1 °C	50.0		50.0	
10 BOX TEMP	AMBIENT ± 5 °C	35.7		30.6	
11 PMT TEMP	7 ± 2 °C	6.1		6.9	
12 MOLY TEMP	315 ± 5 °C	317.0		315.8	
13 RX CELL PRESSURE	<10 in - Hg-A	10.2		6.4	
14 SAMPLE PRESSURE	25 - 35 in - Hg-A	28.7		28.8	
15 NOX SLOPE	1.0 ± 0.3	1.955		1.011	
16 NOX OFFSET	-50 To 150	1792.3		2.0	
17 NO SLOPE	1.0 ± 0.3	1.545		0.993	
18 NO OFFSET	-50 To 150	1692.0		-4.2	
19 NO SAMPLE READING	PPB	-805.1		0.4	
20 NO2 SAMPLE READING	PPB	-227.2		9.5	
21 NOX SAMPLE READING	PPB	-835.1		9.9	
22 OPTIC TEST	2000 ± 1000 mV	2724.4		2095.3	
23 ELECTRICAL TEST	2000 ± 1000 mV	2563.0		1945.4	
24 VOLTAGE TEST	+5 V +12 V +15 V -15 V	5.23 / 12.24 / 15.72 / -15.07		5.23 / 12.24 / 15.72 / -15.07	
25 ZERO GAS NONOX	0.00/0.00 PPB	-888.47 / -1223.9		0.0 / 0.0	
26 SPAN GAS NONOX	400.00/400.00 PPB	-0.3 / -0.8		399.8 / 400.4	

หมายเหตุ

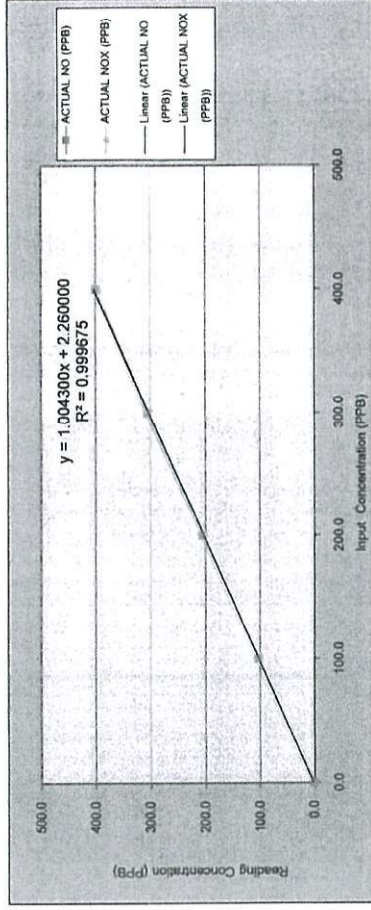
- ทำการเปลี่ยน Sintered Filter 1 ชิ้น, O-ring 2 ชิ้น, Spring 1 ชิ้น
- ทำการเปลี่ยนหลอด CD PMT 1 ชิ้น
- หน้าจอแสดงผลบนหน้าจอ Touch Screen ให้สามารถใช้งานได้
- ตรวจสอบค่า SAMPLE READING มีค่าติดลบ และ พบค่า NOX SLOPE, NO SLOPE, NOX OFFSET, NO OFFSET มีค่าสูง
- ไม่สามารถทำการ Calibrate ZERO / SPAN ได้ / แก้ไขเรียบร้อยแล้ว

MULTI POINT CALIBRATION REPORT

CUSTOMER NAME : SGS (Thailand) Co., Ltd
EQUIPMENT NAME : NO_x Analyzer
MANUFACTURER : Teledyne - API
MODEL : T200
SERIAL NO : 2199
STANDARD GAS CONCENTRATION (PPM) : 53.40
CYLINDER NO : CC745169
CERTIFIED DATE : Mar 10, 2021
CYLINDER PRESSURE (psig) : 2000
EXPIRED DATE : Mar 10, 2029
CERTIFIED BY : AIRGAS SPECIALTY GASES

CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS				
	IDEAL (PPB)	ACTUAL NO (PPB)	ERROR NO (PPB)	% ERROR NO	% ERROR NO ₂
ZERO	0.0	0.0	0.0	0.0	0.0
1	100.0	103.4	3.4	3.4	3.3
2	200.0	205.0	5.0	2.5	2.6
3	300.0	304.7	4.7	1.6	2.3
4	400.0	399.8	-0.2	-0.1	0.1
AVERAGE (%)					2.1







388 Ratchadapisek Rd. 32
Chadrasakem, Chatuchak
Bangkok 10900 | Thailand
+66 (0) 2-515-8999
Env_Service@kinetics.co.th

Customer Name : SGS (Thailand) Co., Ltd	
Contact : คุณณัฐวัฒน์ 02-678-1813	
Description	
Manufacturer : Teledyne API	Model : T200
Equipment : NOx Analyzer	Serial No : 2199
Working Date : 07/03/2022	Qualification : Q-45-2021-255-SV Rev.02

Environmental Science Business Unit

Service Report

Physical Checking	<p>ตรวจเช็คเบื้องต้นพบว่า</p> <ul style="list-style-type: none">- ไม่สามารถทำการ Calibrate ZERO / Span ได้  
Correction Working	<p>พบ หลอด CD PMT</p> <ul style="list-style-type: none">- ทำการเปลี่ยน หลอด CD PMT 1 ชิ้น- ทำการเปลี่ยน Sintered Filter 1 ชิ้น- ทำการเปลี่ยน O-ring 2 ชิ้น- ทำการเปลี่ยน Spring 1 ชิ้น
Recommendation	

Action By : Mr.Pornchai Date : 07/03/2022



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: E04N199E15A0822
Cylinder Number: CC745169
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12021
Gas Code: CO,NO,NOX,SO2,BALN
Reference Number: 160-402045691-1
Cylinder Volume: 144.4 CF
Cylinder Pressure: 2015 PSIG
Valve Outlet: 660
Certification Date: Mar 10, 2021
Expiration Date: Mar 10, 2029

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/031, using the assay procedure described therein. The methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. These are the maximum uncertainties for the assay and the 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
NOX	53.00 PPM	53.40 PPM	G1
NITRIC OXIDE	53.00 PPM	53.40 PPM	G1
SULFUR DIOXIDE	53.00 PPM	53.79 PPM	G1
CARBON MONOXIDE	4500 PPM	4512 PPM	G1
NITROGEN	Balance		
ANALYTICAL RESULTS			
Component	Requested Concentration	Actual Concentration	Protocol Method
NOX	53.00 PPM	53.40 PPM	G1
NITRIC OXIDE	53.00 PPM	53.40 PPM	G1
SULFUR DIOXIDE	53.00 PPM	53.79 PPM	G1
CARBON MONOXIDE	4500 PPM	4512 PPM	G1
NITROGEN	Balance		
CALIBRATION STANDARDS			
Type	Lot ID	Cylinder No	Concentration
NTRM	07060227	EB0079116	100.3 PPM NITRIC OXIDE/NITROGEN
PRM	12386	D885025	9.91 PPM NITROGEN DIOXIDE
GMIS	124206869	CC333707	4.028 PPM NITROGEN DIOXIDE/NITROGEN
NTRM	16010203	KAL003007	97.89 PPM SULFUR DIOXIDE/NITROGEN
NTRM	08012341	KAL004716	4857 PPM CARBON MONOXIDE/NITROGEN
The SRM, PRM or RGM noted above is only in reference to the GMS used in the assay and not part of the analysis.			
ANALYTICAL EQUIPMENT			
Instrument/Make/Model			Analytical Principle
SIEMENS ULTRAMAT 6 N1K0579			NDIR
Nicolet IS50 FTIR AUP2010245 NO			FTIR
Nicolet IS50 FTIR AUP2010245 NO2			FTIR
Nicolet IS50 FTIR AUP2010245 SO2			FTIR
Last Multipoint Calibration			
			Feb 26, 2021
			Feb 11, 2021
			Feb 22, 2021
			Feb 18, 2021

Triad Data Available Upon Request

NOTES:

Gross Weight: 28.1 Kg

Net Weight: 4.6 Kg



รายงานผลการสอบเทียบและรับเทียบอุปกรณ์ตรวจวัดคุณภาพอากาศ
ลูกค้า / หน่วยงาน : SGS (Thailand) Co., Ltd
วันที่ : 7 กุมภาพันธ์ 2565
รายชื่ออุปกรณ์ / เครื่องมือ : CO Analyzer
รุ่นของอุปกรณ์ / เครื่องมือ : T300

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	46.6
8	BENCH TEMP	48 ± 2 °C	48
9	WHEEL TEMP	68 ± 2 °C	69.3
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

THAI METEOROLOGICAL DEPARTMENT

Calibration Certificate

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



Issued by : Calibration & Test Section : Meteorological Instruments Bureau
Date of Issue : 20 January, 2022 Certification No. 018/22
Page : 1 of 6

Object : Precision Weather Station
Manufacturer : Davis Instruments
Type : Vantage Pro 2 Model No. : 6152C
Mfg Code : Display AZ170619031 Transmitter AM140127096

Customer : SGS (Thailand) Limited.
100 Nanglinchee Road, Chongnonsi,
Yannawa, Bangkok 10120.
Calibration Condition : Temperature 25.1 °C Barometric Pressure 1011.3 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563
: HOOK GAGE NO 1425 : Wind Anemometer Plotting Board
N.I.S.T. Test Reference Number 731/241460
: Ultrasonic Anemometer Model DA 650-3TV (sensor IR-95AH)
Serial Number 110/30029 (sensor 120629586)

STANDARD THERMOMETER : Theodor Friedrich : Dry No.839094 Wei No. 8390934

: Thermoschneider No.9188 : testo, testo 555 sensor No. 0349034

STANDARD BAROMETER : Digital Baropneier Vaisala Type PTB26 No. V12200157





THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 018/22

Page : 3 of 6

20 January, 2022

Standard Barometer Pressure	Tested Barometer Pressure	Correction
760.50	761.3	-0.80
760.13	761.0	-0.87
760.67	761.5	0.83
760.73	761.6	0.87
757.28	758.1	-0.82
757.34	758.2	0.86
757.52	758.4	0.88
757.79	758.7	0.91
758.10	759.0	-0.90
758.16	759.1	-0.94
758.66	759.5	0.84
759.47	759.3	0.83
758.56	759.4	-0.84
758.75	759.7	-0.95
758.98	759.9	-0.92
759.36	760.2	0.84
756.54	757.4	-0.86
756.66	757.5	-0.84
757.00	757.9	-0.90
757.15	758.0	0.85



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 018/22

Page : 2 of 6

20 January, 2022

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H2O	Vacuum inches H2O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	0.4	0.60
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.5	0.50
7.00	-	-	-	6.7	0.30
9.02	-	-	-	8.5	0.52
11.01	-	-	-	10.7	0.31
13.01	-	-	-	12.5	0.51
15.01	-	-	-	14.8	0.21
17.02	-	-	-	16.5	0.52
20.02	-	-	-	19.3	0.72

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





The Result of Calibration

Certification No. 018/22

Page : 4 of 6

20 January, 2022

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.2	45.2	0.0
30.4	30.4	0.0
15.1	15.2	-0.1

THAI METEOROLOGICAL DEPARTMENT



The Result of Calibration

Certification No. 018/22

Page : 5 of 6

20 January, 2022

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading % R.H.	Correction % R.H.
81.15	83	-1.85
60.23	64	-3.77
45.21	49	-3.79

THAI METEOROLOGICAL DEPARTMENT



Date of Issue 20 January, 2022

Certification No. 018/22

Page : 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis Instruments แบบ TIPPING BUCKET Product No. 6152 C Mfg No. AM140127096 ที่ทำการสอบเทียบกับแก้วฝนแบบแก้ว GAUGE DIAMETER 8.0 INCHES, NEGRETTE & ZAMBRA LONDON No 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (0.01 in/ 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 17 May, 2022

Certification No. 184/22

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 Nanglinchee Road, Chongnonsi,
Yannawa, Bangkok 10120.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1010.2 hPa

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

N.I.S.T. Test Reference Number 731/241460 : Standard Velocity at 20 - 30 m/sec
: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)

Serial Number 110730029 (sensor 120629586)
JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

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

: Thermoschneider No.9188 : testo, testo 645 Serial No. 078448061

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB220 No. 11220015





THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

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

THAI METEOROLOGICAL DEPARTMENT



The Result of Calibration

Certification No. 184/22

Page : 2 of 6

17 May, 2022

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H2O	Vacuum inches H2O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	0.9	0.10
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.9	0.10
7.00	-	-	-	6.3	0.70
9.02	-	-	-	8.5	0.52
11.01	-	-	-	10.3	0.71
13.01	-	-	-	13.0	0.01
15.01	-	-	-	14.3	0.71
17.02	-	-	-	17.0	0.02
20.02	-	-	-	19.3	0.72

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



Certification No. 184/22

Page : 3 of 6

17 May, 2022

Standard Barometer Pressure	Tested Barometer Pressure	Correction
756.11	756.9	-0.79
756.26	757.1	-0.84
756.92	756.7	-0.78
753.01	753.9	-0.89
752.57	753.5	-0.93
752.92	753.8	-0.88
753.26	754.1	-0.84
753.92	754.6	-0.88
754.33	755.2	-0.87
754.98	755.9	-0.92
755.51	756.4	-0.89
753.83	754.7	-0.87
754.25	755.2	-0.95
755.29	756.3	-1.01
755.27	757.3	-1.03
755.59	757.6	-1.01
756.87	757.9	-1.03
756.23	757.3	-1.07
756.63	756.6	-0.97
754.89	755.9	-1.01

Average

ค่าเฉลี่ย



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

17 May, 2022

Certification No. 184/22

Page : 4 of 6

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



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

17 May, 2022

Certification No. 184/22

Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading % R.H.	Correction % R.H.
82.40	80	2.40
61.62	62	-0.38
45.32	47	-1.68



Date of Issue 17 May, 2022

Certification No. 184/22

Page : 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis Instruments แบบ TIPPING BUCKET Product No. 6152 C Mfg No. AM140310043 ทำการสอบเทียบกับ แก้วฝนแบบแก้วดวง GAUGE DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA LONDON No 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของ เครื่องมือ (0.01 in./ 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 17 May, 2022 Certification No. 187/22

Page : 1 of 6

Object : Precision Weather Station

Manufacturer : Davis Instruments

Type : Vantage Pro 2 Model No. : 6152C

Mfg Code : Display AZ170619045 Transmitter AZ170619045

Customer : SGS (Thailand) Limited.

100 Nanglinchee Road, Chongnonsi,
Yannawa, Bangkok 10120.

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1006.5 hPa

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

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

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

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

Serial Number 110730029 (sensor 120629586)

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

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

: Thermoschneider No.9188 : Iesco Iesco 645 Serial No. 07846957

STANDARD BAROMETER : Digital Barometer Valsala Type PTB220 No. A1220015





THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 187/22

Page : 3 of 6

17 May, 2022

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
756.11	756.1	0.01
756.26	756.3	-0.04
755.92	756.1	-0.18
753.01	753.1	-0.09
752.57	752.7	-0.13
752.92	753.0	-0.08
753.26	753.4	-0.14
753.92	754.1	-0.18
754.33	754.4	-0.07
754.98	755.0	-0.02
755.51	755.6	-0.09
753.83	754.0	-0.17
754.25	754.4	-0.15
755.29	755.3	-0.01
756.27	756.4	-0.13
756.59	756.7	-0.11
756.87	757.0	-0.13
756.23	756.4	-0.17
755.63	755.7	-0.07
754.89	755.0	-0.11



THAI METEOROLOGICAL DEPARTMENT

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

The Result of Calibration

Certification No. 187/22

Page : 2 of 6

17 May, 2022

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

Wind Aloft Plotting Board.

US.DEPARTMENT OF COMMERCE WEATHER BUREAU

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





THAI METEOROLOGICAL DEPARTMENT

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

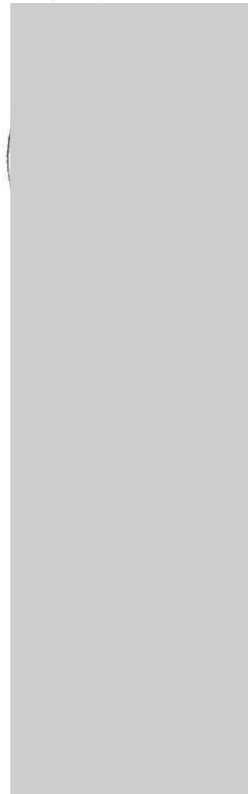
The Result of Calibration

17 May, 2022

Certification No. 187/22

Page : 4 of 6

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



THAI METEOROLOGICAL DEPARTMENT

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

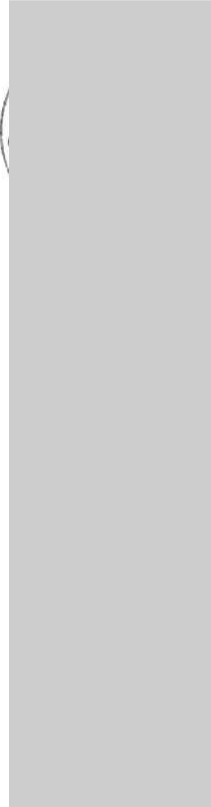
The Result of Calibration

17 May, 2022

Certification No. 187/22

Page : 5 of 6

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



THAI METEOROLOGICAL DEPARTMENT

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

Calibration Certificate



Certification No. 187/22

Date of Issue 17 May, 2022

Page : 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ซีห้อ Davis Instruments แบบ TIPPING BUCKET Product No. 6152 C Mfg. Code. AZI70619045 ที่การสอบเทียบกับแก้วฝนแบบแก้วทอง GAUGE DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA LONDON No 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (0.01 in/ TIP)



Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 15 June, 2022 Certification No. 220/22

Page : 1 of 6

Object : Precision Weather Station

Manufacturer : Davis Instruments

Type : Vantage Pro 2 Model No. : 6152C

Mfg Code : Display AZI70619022 Transmitter AZI70619028

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

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1009.6 hPa

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

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

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

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

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

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

: Thermoschneider No.9188 : testo 1es10 645 Serial No. 02849057



The Result of Calibration

Certification No. 220/22

Page : 3 of 6

15 June, 2022

Standard Barometer Pressure	Tested Barometer Pressure	Correction
754.87	756.4	-1.53
754.75	756.2	-1.45
754.27	755.8	-1.53
754.55	756.0	-1.45
754.74	756.2	-1.46
755.22	756.7	-1.48
755.49	756.9	-1.41
755.78	757.2	-1.42
755.99	757.3	-1.31
756.51	757.8	-1.29
756.05	757.4	-1.35
756.33	757.6	-1.27
756.47	757.9	-1.43
753.77	755.2	-1.43
754.03	755.5	-1.47
755.03	756.5	-1.47
755.25	756.8	-1.55
755.59	757.9	-1.31
755.74	757.1	-1.36
755.99	757.4	-1.41



The Result of Calibration

Certification No. 220/22

Page : 2 of 6

15 June, 2022

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

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





The Result of Calibration

Certification No. 220/22

Page : 4 of 6

15 June, 2022

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.5	45.4	0.1
30.2	30.2	0.0
15.4	15.4	0.0



The Result of Calibration

Certification No. 220/22

Page : 5 of 6

15 June, 2022

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading % R.H.	Correction % R.H.
83.02	82	1.02
62.18	63	-0.82
43.27	45	-1.73



Date of Issue 15 June, 2022

Certification No. 220/22

Page : 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis Instruments แบบ TIPPING
BUCKET Product No. 6152 C Mfg. Code. AZ170619028 ทำการสอบเทียบกับแก้ว
ฝนแบบแก้วดวง GAUGE DIAMETER 8.0 INCHES, NEGRETTE & ZAMBRA
LONDON No 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของ
เครื่องมือ (0.01 in/TIP)



THAI HEART CALIBRATION CO., LTD.
112/1 Moo 5, Phraek Sai, Muang, Samut Prakan 10280
Tel: 0-2394-2162, 0-2357-8435, 0-2757-8496 Fax: 0-2357-8807



GNWA 19105

CERTIFICATE OF CALIBRATION

Page 1 of total 2 pages

Certificate No.: C0-0408006/22

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

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

Model: HI98195

ID No.: ENWA19105

Environmental Conditions: Ambient Temperature: (20 ± 2) °C
Relative Humidity: (50 ± 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:

Approved by:

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

FE-169

REV.02 02/24/21

Certificate No.: CO-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 -

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
Serial No. 04160034101
Description Temperature range : 20°C to 50°C , Resolution of UUC : 0.01°C
Model HI98195
ID No. ENWA19105

Environmental Conditions
Ambient Temperature: $(23 \pm 3)^\circ\text{C}$
Relative Humidity: $(50 \pm 15) \%$
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] Approved by [Signature]

Re

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

Certificate No.: TO-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	10-1011001/21	Nov. 10, 2022	THC
Platinum Resistance Thermometer	5626	4854	C0A30047	Oct. 22, 2023	FLUKE
Liquid Bath	XORTS-40A	XO111019	10-0306002/21	Jun. 3, 2023	THC

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

- 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 -

Certificate of Calibration

Customer

Name : SGS (Thailand) Limited.
Address : 100 Nanglinetee Road, Chongnonsi, Yamaawa Bangkok 10120

Certificate No : 22-ACT-165

Request No : Req-2022-0421

Unit Under Calibration Details

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

Calibration Environment and Details

Temperature : (23 ±2 °C)
Humidity : (50 ± 20 %RH)
Barometric Pressure : (1013 ±10.0 hPa)
Received Date : 23 February 2022
Calibration Date : 7 March 2022

Location of Calibration : LAB 1 Acoustic

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

Reference Standard	Model	Serial Number	Traceable	Due Calibration
Sound Calibrator	SV 35A	58079	EEL	14 May 2022
THD Multimeter	2015	1047765	NIMT	2 February 2023

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

Note

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

Calibrated By :

Approved By :

Issue Date :



Certificate No : 22-ACT-165
 Request No : Req-2022-0421

Sound pressure level				
Calibration Range (dB)	Without Adjustment (dB)		Adjustment (dB)	
	Measured	Error	Measured	Error
94 dB / 1000 Hz	94.08	0.08	-	-
				0.11
				0.25

Frequency of Sound pressure level				
Calibration Range (Hz)	Without Adjustment		Adjustment	
	Measured (Hz)	Error (%)	Measured (Hz)	Error (%)
94 dB / 1000 Hz	1000.00	0.00	-	-
				0.10
				0.70

Total Harmonic Distortion plus Noise of Sound pressure level (THD+N %)				
Calibration Range (Hz)	Without Adjustment		Adjustment	
	Measured (%)	Error (%)	Measured (%)	Error (%)
94 dB / 1000 Hz	0.05	-	-	-
				0.40
				2.5

Note :

- Acceptance limit was IEC 60912:2017 Class 1
- The calibration results exclude the calibration pressure correction
- The calibration results exclude the microphone volume correction

End of Calibration