

## ภาคผนวกที่ 5-2

เอกสารผลการสอบเทียบเครื่องมือตรวจวัด  
สถานีรถไฟฟ้าช่องนนทรี (อาคารโดมอันทาวเวอร์)  
และสถานีรถไฟฟ้าศาลาแดง (สถานีอาคารหอแว่น)  
ครั้งที่ 3/2565  
วันที่ตรวจวัด วันที่ 20-25 มกราคม 2566



### TSP High Volume Sampler Calibration

Verification Report No.  
SO2200264-E001 -TSP 03

☐ PM ☒ Onsite  
Site: BTS ศาลาแดง  
UTM : 47P N 1518201 E 665635  
Sampler: ETSPW31  
Recorder: ECRANG15315234  
Date: 20 Jan 23  
Technical: [Redacted]  
Approval: [Redacted]

#### CONDITIONS

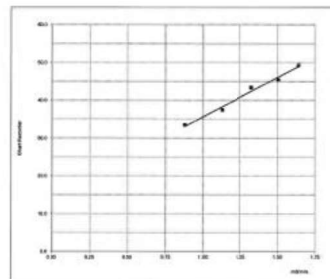
Barometric Press. (hPa): 1010.0 Corrected Pressure (mm Hg): 757.6  
Temperature (deg C): 32.0 Temperature (deg K): 305.0  
Average Press. (hPa): 1013.0 Corrected Avg. Press. (mm Hg): 759.8  
Average Temp. (deg C): 30.0 Average Temp. (deg K): 303.0

#### CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc Qstd Slope: 2.03736  
Model: TE-5025A Qstd Intercept: -0.03733  
Serial#: 759 Date Certified: 18 Jan 23

#### CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	11.28	1.845	52.0	51.32	Slope = 23.2330 Intercept = 12.7814 Corr. coeff. = 0.9989 # of Observations: 5 Range of Chart at 1.1 - 1.7 m3/min: 39 52
2	10.38	1.579	50.0	49.34	
3	7.33	1.330	44.0	43.42	
4	4.82	1.062	38.0	37.50	
5	3.15	0.878	34.0	33.55	



Calibrated by: [Redacted]

20 January 2023

Approved by: [Redacted]

20 January 2023

www.evtesting.com

Tested by: [Redacted]

Environmental responsibility with accuracy measurement



### TSP High Volume Sampler Calibration

Verification Report No.  
SO2200264-E001 -TSP 04

☐ PM ☒ Onsite  
Site: BTS ศาลาแดง  
UTM : 47P N 1517741 E 665363  
Sampler: ETSPW30  
Recorder: ECRANG15315232  
Date: 20 Jan 23  
Technical: [Redacted]  
Approval: [Redacted]

#### CONDITIONS

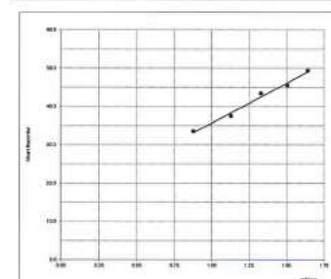
Barometric Press. (hPa): 1010.0 Corrected Pressure (mm Hg): 757.6  
Temperature (deg C): 32.0 Temperature (deg K): 305.0  
Average Press. (hPa): 1013.0 Corrected Avg. Press. (mm Hg): 759.8  
Average Temp. (deg C): 30.0 Average Temp. (deg K): 303.0

#### CALIBRATION ORIFICE

Brand: Tisch Environmental, Inc Qstd Slope: 2.03736  
Model: TE-5025A Qstd Intercept: -0.03733  
Serial#: 759 Date Certified: 18 Jan 24

#### CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	11.04	1.628	52.0	51.32	Slope = 22.1060 Intercept = 14.6702 Corr. coeff. = 0.9911 # of Observations: 5 Range of Chart at 1.1 - 1.7 m3/min: 40 52
2	10.22	1.567	50.0	49.34	
3	7.34	1.331	44.0	43.42	
4	4.85	1.065	38.0	37.50	
5	3.26	0.893	36.0	35.53	



Calibrated by: [Redacted]

20 January 2023

Approved by: [Redacted]

20 January 2023

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Tested by: [Redacted]

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**PM10 High Volume Sampler Calibration**

Verification Report No. SO2200264-E001 -PM 03

☐ PM ☒ Onsite  
Site: BTS ศาลาแดง  
UTM : 47P N 1518201 E 665835  
Sampler: EPM29  
Recorder: ECRAN00004599  
Date: 20 Jan 23  
Technical: [Redacted]  
Approval: [Redacted]

**CONDITIONS**

Barometric Press. (hPa): 1010.0 Corrected Pressure (mm Hg): 757.6  
Temperature (deg C): 32.0 Temperature (deg K): 305.0  
Average Press. (hPa): 1013.0 Corrected Avg. Press. (mm Hg): 759.8  
Average Temp. (deg C): 30.0 Average Temp. (deg K): 303.0

**CALIBRATION OFFICE**

Brand: Tisch Environmental, Inc Qstd Slope: 1.27576  
Model: TE-5025A Qstd Intercept: -0.02337  
Serial#: 759 Date Certified: 18 Jan 23

**CALIBRATIONS**

Plate or Test #	H2O (l)	Qs (m3/min)	I (char)	IC (corrected)
1	10.00	1.591	52.0	32.99
2	8.11	1.435	48.0	29.19
3	6.21	1.258	42.0	26.65
4	4.23	1.041	36.0	22.84
5	3.43	0.939	34.0	21.57

**LINEAR REGRESSION**

Slope = 17.2256  
Intercept = 5.0685  
Corr. coeff = 0.9956  
SFR = 1.141  
SSP = 38.96  
# of Observations: 5  
Range of Chart at SFR ±10%: 37 / 41

Calibrated by: [Redacted]  
20 January 2023

Approved by: [Redacted]  
20 January 2023

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Environmental responsibility with accuracy measurements  
PM10 Cal. Rev 07 / 14 October 2019

**PM10 High Volume Sampler Calibration**

Verification Report No. SO2200264-E001 -PM 04

☐ PM ☒ Onsite  
Site: BTS ศาลาแดง  
UTM : 47P N 1517741 E 665353  
Sampler: EPM29  
Recorder: ECRAN00004599  
Date: 20 Jan 23  
Technical: [Redacted]  
Approval: [Redacted]

**CONDITIONS**

Barometric Press. (hPa): 1010.0 Corrected Pressure (mm Hg): 757.6  
Temperature (deg C): 32.0 Temperature (deg K): 305.0  
Average Press. (hPa): 1013.0 Corrected Avg. Press. (mm Hg): 759.8  
Average Temp. (deg C): 30.0 Average Temp. (deg K): 303.0

**CALIBRATION OFFICE**

Brand: Tisch Environmental, Inc Qstd Slope: 1.27576  
Model: TE-5025A Qstd Intercept: -0.02337  
Serial#: 759 Date Certified: 18 Jan 23

**CALIBRATIONS**

Plate or Test #	H2O (l)	Qs (m3/min)	I (char)	IC (corrected)
1	10.58	1.636	52.0	32.99
2	9.82	1.577	48.0	30.46
3	6.72	1.308	44.0	27.92
4	4.51	1.075	38.0	24.11
5	3.24	0.914	34.0	21.57

**LINEAR REGRESSION**

Slope = 14.6823  
Intercept = 8.2984  
Corr. coeff = 0.9904  
SFR = 1.141  
SSP = 39.48  
# of Observations: 5  
Range of Chart at SFR ±10%: 38 / 41

Calibrated by: [Redacted]  
20 January 2023

Approved by: [Redacted]  
20 January 2023

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PM10 Cal. Rev 07 / 14 October 2019



### Verification Test Report

Report No.:

SO2200264-E001 -SLM 01

☐ PM ☒ Onsite UTM : 47P N 1518190 E 665843

Calibrated Date: 20 January 2023

Site : BTS ศาลาแดง

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 44

Serial : 2198

Environment: Temperature 25 °C Humidity 72 %RH

Reference Standard: Acoustic Calibrator Class 1 Model 4230,Brue!&Kjaer

Serial No.1351075

Date of Calibration : 21 March 2022

#### Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
93.66	93.62	-0.04	93.66

Calibrated By: [Signature]

Date: 20 January 2023

Approve By: [Signature]

Date: 20 January 2023

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### Verification Test Report

Report No.:

SO2200264-E001 -SLM 02

☐ PM ☒ Onsite UTM : 47P N 1517741 E 665363

Calibrated Date: 20 January 2023

Site : BTS ปทุมธานี

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 44

Serial : 1974

Environment: Temperature 25 °C Humidity 72 %RH

Reference Standard: Acoustic Calibrator Class 1 Model 4230,Brue!&Kjaer

Serial No.1351075

Date of Calibration : 21 March 2022

#### Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
93.66	93.67	0.01	93.66

Calibrated By: [Signature]

Date: 20 January 2023

Approve By: [Signature]

Date: 20 January 2023

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**RECALIBRATION  
DUE DATE:  
January 18, 2024**

## Certificate of Calibration

Calibration Certification Information					
Cal. Date: January 18, 2023	Rootsmer S/N: 438320	Ta: 294	*K		
Operator: [REDACTED]		Pa: 750.1	mm Hg		
Calibration Model #: TE-5025A	Calibrator S/N: 0759				

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3960	3.2	2.00
2	3	4	1	0.9950	6.4	4.00
3	5	6	1	0.8850	8.0	5.00
4	7	8	1	0.8450	8.8	5.50
5	9	10	1	0.6990	12.8	8.00

Data Tabulation					
Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H \left( \frac{Ta}{Pa} \right)}$ (y-axis)
0.9961	0.7135	1.4145	0.9957	0.7133	0.8854
0.9918	0.9968	2.0004	0.9915	0.9964	1.2521
0.9897	1.1183	2.2365	0.9893	1.1179	1.3999
0.9886	1.1700	2.3456	0.9883	1.1695	1.4683
0.9833	1.4067	2.8289	0.9829	1.4062	1.7708

QSTD		QA	
m=	2.03736	m=	1.27576
b=	-0.03733	b=	-0.02337
r=	0.99997	r=	0.99997

Calculations	
Vstd=ΔVol((Pa-ΔP)/Pstd)(Tstd/Ta)	Va=ΔVol((Pa-ΔP)/Pa)
Qstd=Vstd/ΔTime	Qa=Va/ΔTime

For subsequent flow rate calculations:

$Qstd = 1/m \left( \sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)} - b \right)$	$Qa = 1/m \left( \sqrt{\Delta H \left( \frac{Ta}{Pa} \right)} - b \right)$
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Standard Conditions	
Tstd:	298.15 *K
Pstd:	760 mm Hg
Key	
ΔH:	calibrator manometer reading (in H2O)
ΔP:	rootsmer 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	

## Accuracy Calibration Certificate

**Customer**

Company: [REDACTED]  
 Address: [REDACTED]  
 City: Bang Khae  
 Zip / Postal: 10180  
 State / Province: Bangkok  
 Order Number: [REDACTED]

**Weighing Device**

Manufacturer:	Instrument Type:	Instrument Type:
Mettler Toledo	XS2050J	Weighing Instrument
Model:	XS2050J	Asset Number:
Serial No.:	B911383587	Terminal Model:
Building:	N/A	Terminal Serial No.:
Floor:	3	Terminal Asset No.:
Room:	B304	N/A

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

**Procedure**

Calibration Outline: EURAMET cp-18 v. 4.0 (11/2015)  
 METTLER TOLEDO Work Instruction: CPW002/20

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

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

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

As Found	Temperature		Humidity	
	Start: 22.2 *C	End: 22.6 *C	Start: 58.3 %	End: 59.7 %
As Found Calibration Date: 02-Mar-2022	Calibration:		[REDACTED]	
As Left Calibration Date: N/A				
Issue Date: 03-Mar-2022	Approved Signatory:		[REDACTED]	

Software Version: 1.20.0285  
 Report Version: 3.16.12  
 Form Number: F103C

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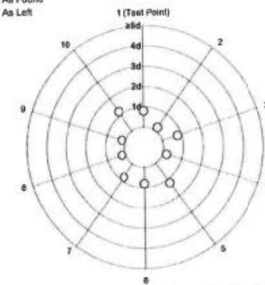
## Measurement Results

### Repeatability

Test Load: 70 g

	As Found	As Left
1	70.00001 g	N/A
2	70.00002 g	N/A
3	70.00001 g	N/A
4	70.00002 g	N/A
5	70.00003 g	N/A
6	70.00001 g	N/A
7	70.00001 g	N/A
8	70.00002 g	N/A
9	70.00002 g	N/A
10	70.00003 g	N/A
Standard Deviation	0.000008 g	N/A

○ As Found  
◆ As Left

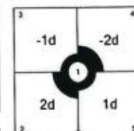


The "1" in the graph represents the repeatability of the range interval in which the test was performed.  
The results of this graph are based upon the absolute values of the differences from the mean value.

### Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	100.0000 g	N/A
2	100.0002 g	N/A
3	99.9999 g	N/A
4	99.9998 g	N/A
5	100.0001 g	N/A



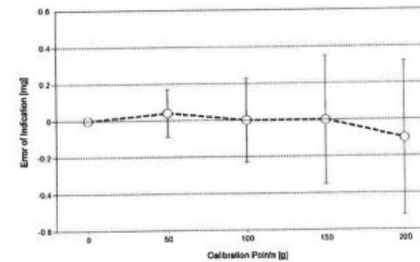
○ As Found

The "1" in the graph represents the repeatability of the range interval in which the test was performed.

## Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.00000 g	0.00000 g	0.00000 g	0.017 mg	2
2	0.10000 g	0.10000 g	0.00000 g	0.023 mg	2
3	0.50000 g	0.50001 g	0.00001 g	0.028 mg	2
4	0.99999 g	0.99999 g	0.00000 g	0.032 mg	2
5	1.99999 g	2.00000 g	0.00001 g	0.040 mg	2
6	5.00001 g	5.00001 g	0.00000 g	0.048 mg	2
7	10.00001 g	10.00002 g	0.00001 g	0.062 mg	2
8	49.99998 g	50.00002 g	0.00004 g	0.13 mg	2
9	100.0000 g	100.0000 g	0.0000 g	0.23 mg	2
10	150.0000 g	150.0000 g	0.0000 g	0.35 mg	2
11	199.9999 g	199.9998 g	-0.0001 g	0.42 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 is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor  $k=2$  which can be larger than 2 according to EURAMET cg-16. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

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

**Test Equipment**

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

**Weight Set 1: OIML E2**

Weight Set No.:	W522	Date of Issue:	06-Jan-2022
Certificate Number:	177036	Calibration Due Date:	03-Jul-2023

**Weight Set 2: OIML E2**

Weight Set No.:	W576	Date of Issue:	31-Jan-2022
Certificate Number:	C205470237	Calibration Due Date:	12-Jul-2023

**Thermo Hygrometer**

Equipment No.:	IN193	Date of Issue:	14-Jun-2021
Certificate Number:	21H1221	Calibration Due Date:	01-Jun-2022

**Remarks**

FACT adjustment functionality activated  
Equipment condition: Good  
Next calibration according to customer's procedure

End of Accredited Section

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

**Measurement Uncertainty of the Weighing Instrument in Use**

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

Temperature coefficient for the evaluation of the measurement uncertainty in use:  $1.5 \cdot 10^{-4} / K$

Temperature range on site for the evaluation of the measurement uncertainty in use:  $3 K$

**Linearization of Uncertainty Equation**

	Range		As Found	As Left
	Min	Max		
1	0.00001 g	81 g	$U_1 = 0.018 \text{ mg} + 0.00497 \text{ mg/g} \cdot R$	N/A
2	0.0001 g	220 g	$U_2 = 0.06 \text{ mg} + 0.00492 \text{ mg/g} \cdot R$	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 (Examples)**

Net Indication	As Found	As Left	As Found	As Left
0.00220 g	0.018 mg	0.82%	N/A	N/A
0.02200 g	0.018 mg	0.082%	N/A	N/A
0.22000 g	0.019 mg	0.0087%	N/A	N/A
2.20000 g	0.029 mg	0.0013%	N/A	N/A
220.0000 g	1.1 mg	0.00052%	N/A	N/A

Absolute Uncertainty [mg]

Weighing Range [g]

As Found

Relative Uncertainty [%]

Reading [g]

As Left

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

## Certificate of Calibration

Reference No. : 4182/2202-017

Customer : [REDACTED]

Equipment : Digital Thermo-Hygrometer

Manufacturer : Testo

Model : 608-H1

Serial No. : 83353607

ID No. : -

Received Date : 7 March 2022

Calibrated Date : 9 March 2022

Issued Date : 15 March 2022

Certificate No. : L2203-290

Page 1 of 2

Environment	Start Calibration	Stop Calibration
Ambient Temperature (°C)	24.7	25.5
Relative Humidity (% RH)	51	52

Calibrated by : [REDACTED]

**Calibration Method**

In-house method : by comparison with standard hygrometer for humidity measurement function and comparison with standard thermometer for temperature measurement function into humidity/temperature chamber

**Condition of this result of calibration**

- Reference standard instrument

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Hygrometer	HL-NT2-D	61468576	QR21-0851	13 May 22
2) Digital Thermometer With Probe	GT11	08000089	PSL-T 0072/65	14 November 2022
- This result of calibration was found accurate as shown on date and place of calibration only
- This certificate can be traceable to International System of Unit :
  - Through Thailand Institute of Scientific And Technological Research (TISTR)
  - Through Quality Reborn Co.,Ltd.

Approved by : [REDACTED]

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level of confidence level of approximately 95 %

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Certificate No. : L2203-290

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**Result of Calibration**

Function : Humidity Measurement Reference Temperature at 25 °C

STD Reading (% RH)	UUC Reading (% RH)	UUC Error (% RH)	Measurement Uncertainty (±% RH)
50.00	49.0	-1.00	2.3

Function : Temperature Measurement

STD Reading (°C)	UUC Reading (°C)	UUC Error (°C)	Measurement Uncertainty (±°C)
25.012	25.0	-0.012	0.36

Resolution : 0.1 (°C) , 0.1 % RH

STD= Standard

UUC= Unit Under Calibration

\*\* End of Calibration Report \*\*

## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA Protocol

Part Number: E04N199E15A00V3 Reference Number: 160-402021734-1  
Cylinder Number: EB0140762 Cylinder Volume: 144.4 Cubic Feet  
Laboratory: 124 - Plumsteadville - PA Cylinder Pressure: 2015 PSIG  
PGVP Number: A12021 Valve Outlet: 660  
Gas Code: CO,NO,NOX,SO2,BALN Certification Date: Feb 19, 2021

Expiration Date: Feb 19, 2024

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

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

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	45.00 PPM	44.68 PPM	G1	+/- 1.4% NIST Traceable	02/12/2021, 02/19/2021
NITRIC OXIDE	45.00 PPM	44.62 PPM	G1	+/- 1.4% NIST Traceable	02/12/2021, 02/19/2021
SULFUR DIOXIDE	45.00 PPM	45.34 PPM	G1	+/- 1.1% NIST Traceable	02/12/2021, 02/19/2021
CARBON MONOXIDE	4500 PPM	4500 PPM	G1	+/- 1.0% NIST Traceable	02/19/2021
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	200611-04	CC707968	49.82 PPM NITRIC OXIDE/NITROGEN	+/-1.0%	Feb 02, 2025
PRM	12386	D665025	9.91 PPM AIR/NITROGEN DIOXIDE	2.0%	Feb 20, 2020
GMS	124206889	CC323707	4.028 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Aug 15, 2021
NTRM	0141709	KAL003190	49.57 PPM SULFUR DIOXIDE/NITROGEN	+/-1.0%	Jun 20, 2022
NTRM	08012341	KAL004718	4857 PPM CARBON MONOXIDE/NITROGEN	+/-0.5%	Jun 07, 2024

The SRM, PRM or NRM 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	Jan 27, 2021
Nicolet iS90 FTIR AJP2010245 NO	FTIR	Feb 11, 2021
Nicolet iS90 FTIR AJP2010245 NO2	FTIR	Jan 21, 2021
Nicolet iS90 FTIR AJP2010245 SO2	FTIR	Jan 21, 2021

Triad Data Available Upon Request

#### NOTES:

Gross Weight: 28.4 Kg  
Net Weight: 4.5 Kg  
PO# 5221000405

## SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6601005

Calibrated Date: 5-Jan-23

☒ PM ☐ Onsite

### Instruments Information

Page:1/2

Analyzer Type: SO2 Analyzer Model: 100A	Manufacturer API S/N: ESOAI100EU0091
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### Calibration System

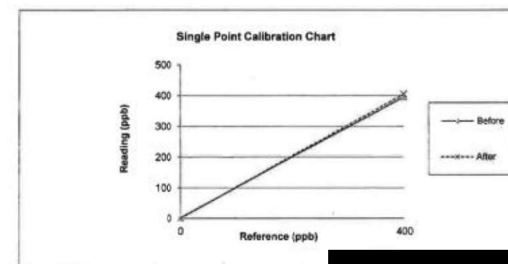
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792	NO Conc 44.68 PPM
ZERO AIR Generator ZAG7001 S/N: 644	SO2 Conc 45.34 PPM
	CO Conc 4500 PPM
	Expire Date: Feb 19, 2024 EB0140762

Environment: Temperature 25.6 °C

Humidity: 70 %RH

### Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	2.7	2.7	400.0	396.2	-0.5
After	0.0	0.8	0.8	400.0	405.0	0.6



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## SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6601005

Calibrated Date: 5-Jan-23

☒ PM ☐ Onsite

Page:2/2

Test Function Value	Nominal range	Unit	Before	After	Note
Date	5-Jan-23				
Time	13:45				
Range	50 - 20000	PPB	500.0	500.0	
Stability (Zero Gas)	< 0.2	PPB	0.2	0.1	
Sample Flow	850 (+/- 50)	cc/min	582.0	591.0	
PMT Detector	0 - 5000	mV	255.6	61.0	
Norm PMT Detector	0 - 5000	mV	59.7	65.2	
HVPS	400-900 constant	V	607.0	607.0	
DCPS	2500 (+/- 200)	mV	-	-	
RCELL TEMP	50 (+/- 1)	Degrees C	50.0	50.0	
BOX TEMP	20-40	Degrees C	34.0	34.1	
PMT TEMP	7 (+/-1)	Degrees C	8.0	8.0	
UV lamp	1000-4900	mV	1981.0	1981.0	
Lamp Ratio	30-120	%	82.6	82.6	
STR Light (Zero Gas)	<100	PPB	61.5	61.7	
Dark PMT	(-50) - (+200)	mV	3.6	3.6	
Dark lamp	(-50) - (+200)	mV	56.5	57.0	
SAMP PRES	20-30 constant	IN-Hg-A	29.3	29.3	
<b>Electric Test/Optic Test</b>					
PMT Volts	2000 (+/- 500)	mV	1682.0	2044.0	
SO2 Conc	1000 (+/- 250)	PPB	641.0	1022.0	
SO2 Slope	1 (+/- 0.3)	-	1.224	1.104	
SO2 Offset	< 250	mV	24.8	8.0	
Stability at Zero	< 0.2	PPB	0.2	0.2	
Stability at Span	< 2 ppb @ 400 ppb	PPB	0.2	0.2	
<b>Gas Test Response</b>					
Zero Gas (0.00 PPB)	0	ppb	2.7	0.8	
Span Gas (400 PPB)	400	ppb	396.2	405.0	± 5% of Range

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## SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6601001

Calibrated Date: 5-Jan-23

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Page:1/2

### Instruments Information

Analyzer Type: SO2 Analyzer Model: 100A	Manufacturer API S/N: ESOAI100E01002
--	---

### Calibration System

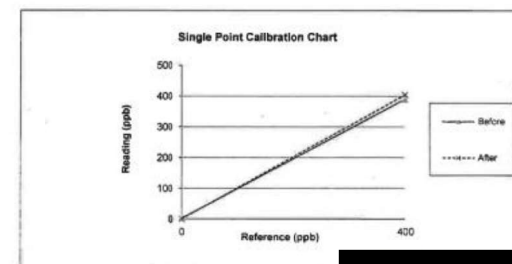
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792	NO Conc 44.68 PPM
ZERO AIR Generator ZAG7001 S/N: 644	SO2 Conc 45.34 PPM
	CO Conc 4500 PPM
	Expire Date: Feb 19, 2024 EB0140762

Environment: Temperature 25.7 °C

Humidity: 71 %RH

### Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	2.1	2.1	400.0	390.0	-1.3
After	0.0	0.8	0.8	400.0	404.0	0.5



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## SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6601001

Calibrated Date: 5-Jan-23

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Test Function Value	Nominal range	Unit	Before	After	Note
Date	5-Jan-23				
Time	13:45				
Range	50 - 20000	PPB	500.0	500.0	
Stability (Zero Gas)	< 0.2	PPB	0.2	0.1	
Sample Flow	150 (+/- 50)	cc/min	582.0	591.0	
PMT Detector	0 - 5000	mV	255.6	61.0	
Norm PMT Detector	0 - 5000	mV	59.7	65.2	
HVPS	400-900 constant	V	607.0	607.0	
DCPS	2500 (+/- 200)	mV	-	-	
RCCELL TEMP	50 (+/- 1)	Dewegoo C	50.0	50.0	
BOX TEMP	20-40	Dewegoo C	34.0	34.1	
PMT TEMP	7 (+/-1)	Dewegoo C	8.0	8.0	
UV lamp	1000-4900	mV	1961.0	1981.0	
Lamp Ratio	30-120	%	82.6	82.6	
STR. Light (Zero Gas)	<100	PPB	61.5	61.7	
Dark PMT	(-50) - (+200)	mV	3.8	3.8	
Dark lamp	(-50) - (+200)	mV	56.5	57.0	
SAMP PRES	20-30 constant	IN-Hg-A	29.3	29.3	
<b>Electric Test/Optic Test</b>					
PMT Volts	2000 (+/- 500)	mV	1582.0	2044.0	
SO2 Conc	1000 (+/- 250)	PPB	841.0	1022.0	
SO2 Slope	1 (+/- 0.3)	-	1.224	1.104	
SO2 Offset	< 250	mV	24.8	8.0	
Stability at Zero	< 0.2	PPB	0.2	0.2	
Stability at Span	< 2 ppb @ 400 ppb	PPB	0.2	0.2	
<b>Gas Test Responses</b>					
Zero Gas (0.00 PPB)	0	ppb	2.1	0.8	
Span Gas (400 PPB)	400	ppb	380.0	404.0	± 5% of Range

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## NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6601003

Calibrated Date: 5-Jan-23

Page: 1/1

☒ PM ☐ Onsite

### Instruments Information

Analyzer Type: NO/NO2/NOx Analyzer Model: T200	Manufacturer API S/N: ENCAIT20002458
---	---

### Calibration System

Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19, 2024 EB0140762

Environment: Temperature 25.8 °C

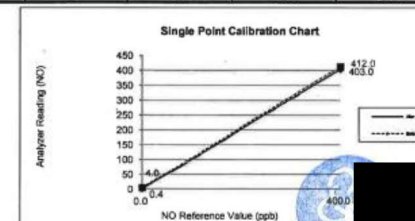
Humidity: 57 %RH

### Calibration Check ( Before adjust )

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	2.8	0.0	2.8	410.0	400.0	1.2
NO <sub>2</sub>	1.2	0.0	1.2	2.0	0.0	0.2
NOx	4.0	0.0	4.0	412.0	400.0	1.5

### Calibration Check ( After adjust )

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.7	0.0	0.7	401.6	400.0	0.2
NO <sub>2</sub>	-0.3	0.0	-0.3	1.4	0.0	0.2
NOx	0.4	0.0	0.4	403.0	400.0	0.4



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### NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6601003

Page: 1/1

Calibrated Date: 5-Jan-23

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Test Function Value	Nominal range	Unit	Before	After	Note
Date	5-Jan-23				
Time	10:15				
Range	0.00 - 500.00 PPM	PPM	500	500	
Stability (Zero Gas)	< 0.2	PPM	0.4	0.2	
Sample Flow	500 +/- 50	cc/min	482	486	
Ozone Flow	90-90	cc/min	80	80	
PMT Detector	0-5000	mV	33.2	25.1	
AZERO	-20-150	mV	23.4	23.0	
HVPS	400-900 constant	V	733	733	
DCPS	2500 +/- 200	mV	-	-	
RCCELL TEMP	50 +/- 1	Degrees C	48.9	50.0	
BOX TEMP	20-35	Degrees C	34.2	33.5	
PMT TEMP	7 +/- 1	Degrees C	7.0	7.0	
IZS TEMP	50 +/- 4	Degrees C	-	-	
MCCLY Temp	315 +/- 5	Degrees C	314.9	314.9	
RCCLY PRES	4-10 constant	IN-Hg-A	4.5	4.5	
SAMP PRES	20-30 constant	IN-Hg-A	29.5	23.0	
NO Slope	1 +/- 0.3		0.850	1.085	
Nux Slope	1 +/- 0.3		0.873	0.977	
NO Offset	-10 to + 150	mV	7.1	4.1	
NOx Offset	-10 to + 150	mV	-5.9	15.3	
Span and Cal Values					
Zero Value	NO	0	ppb	2.8	0.7
	NOx	0	ppb	4.0	0.4
Span Value	NO	400	ppb	410.0	401.8
	NOx	400	ppb	412.0	403.0

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### NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6601005

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Calibrated Date: 5-Jan-23

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#### Instruments Information

Analyzer Type: NO/NO2/NOx Analyzer Model: T200	Manufacturer API S/N: ENOAIT20000109
---	---

#### Calibration System

Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.88 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19, 2024 EB0140762

Environment: Temperature 25.7 °C

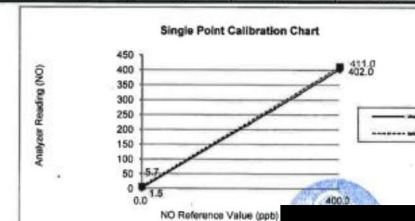
Humidity: 57 %RH

#### Calibration Check ( Before adjust )

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	4.2	0.0	4.2	408.0	400.0	1.0
NO <sub>2</sub>	1.5	0.0	1.5	3.0	0.0	0.4
NOx	5.7	0.0	5.7	411.0	400.0	1.4

#### Calibration Check ( After adjust )

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.9	0.0	0.9	400.0	400.0	0.0
NO <sub>2</sub>	0.6	0.0	0.6	2.0	0.0	0.2
NOx	1.5	0.0	1.5	402.0	400.0	0.2



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### NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6601005

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Calibrated Date: 5-Jan-23

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Test Function Value	Nominal range	Unit	Before	After	Note
Date	5-Jan-23				
Time	16:10				
Range	0.00 - 500.00 PPM	PPM	500	500	
Stability (Zero Gas)	< 0.2	PPM	0.5	0.2	
Sample Flow	500 +/- 50	cc/min	511	532	
Drawn Flow	80-90	cc/min	80	80	
PMT Detector	0-5000	mV	27.4	16.4	
AZERO	-20-150	mV	54.2	54.2	
HVPS	400-800 constant	V	819	819	
DCPS	2500 +/- 200	mV	-	-	
RCCELL TEMP	50 +/- 1	Dragee C	50	50	
BOX TEMP	20-35	Dragee C	33.7	32.9	
PMT TEMP	7 +/- 1	Dragee C	7.1	7.1	
IZS TEMP	50 +/- 4	Dragee C	-	-	
WOLY Temp	315 +/- 5	Dragee C	314.4	315.0	
RCCL PRES	4-10 constant	IN-Hg-A	10	10	
SAMP PRES	20-30 constant	IN-Hg-A	29.0	29.4	
NO Slope	1 +/- 0.3		0.620	0.601	
Nox Slope	1 +/- 0.3		0.648	0.613	
NO Offset	-10 to + 150	mV	10.2	15.3	
NOx Offset	-10 to + 150	mV	-2.0	-3.4	
<b>Span and Cal Values</b>					
Zero Value	NO	0	ppb	4.2	0.9
	NOx	0	ppb	5.7	1.5
Span Value	NO	400	ppb	408.0	400.0
	NOx	400	ppb	411.0	402.0

his report



### CO Analyzer Verification Test Report

Calibration Report No.: TD-C6601002

Calibrated Date: 5-Jan-23

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Page: 1/2

#### Instruments Information

Analyzer Type: CO Analyzer Model: T300	Manufacturer API S/N: ECOAIT30000099
---	---

#### Calibration System

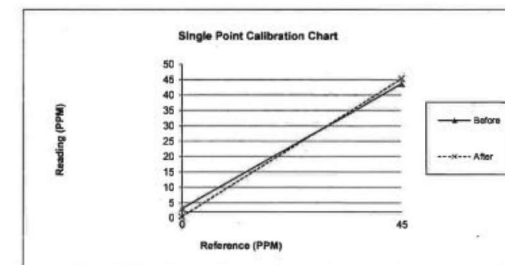
Calibrator Unit	Standard Gas
Dilutor Model ESA M3C101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.58 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19, 2024 EB0140762

Environment: Temperature 25.8 °C

Humidity 57 %RH

#### Calibration Report

Status	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	3.1	3.1	45.0	43.7	-1.5
After	0.0	0.5	0.5	45.0	45.3	0.3



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### CO Analyzer Verification Test Report

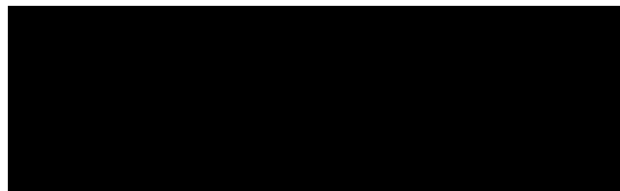
Calibration Report No.: TD-C6601002

Calibrated Date: 5-Jan-23

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Detail	Range	Unit	Before	After	Note
Date	5-Jan-23				
Time	14:57				
Range	0.1-1000 PPM	PPM	50	50	
Stability	(0.1-2PPB )	ppb	0.22	0	
CO Measure	2500 - 4800 MV.	mV	3793.2	3836.5	
CO Reference	2500 - 4800 MV.	mV	3143.6	3179.5	
MR Ratio	1.2 +/- 0.5		1.215	1.215	
Sample Pressure	26 - 30 in-Hg-A	In-Hg-A	28.6	28.6	
Sample Flow	720 - 880 cc/min	cc/min	859	859	
Sample Temp	44 - 52 deg.C	deg.C	47.8	46.7	
Bench Temp	47 - 49 deg.C	deg.C	48	48	
Wheel Temp	66 - 70 deg.C	deg.C	68	68	
Box Temp	27 - 50 deg.C	deg.C	32	34.9	
PHT drive	250 - 4750 mv.	mV	3015	3018.6	
Slope	0.800 - 1.200		0.867	0.875	
Offset	0.05 +/- 0.2		0.006	0.005	
<b>Gas Test Responses</b>					
Zero Gas	0	PPM	0.4	0.0	
Span Gas	45	PPM	45.6	45.0	± 5% of Range



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### CO Analyzer Verification Test Report

Calibration Report No.: TD-C6601003

Calibrated Date: 5-Jan-23

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Page: 1/2

#### Instruments Information

Analyzer Type: CO Analyzer Model: T300	Manufacturer API S/N: ECOAIT30000068
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#### Calibration System

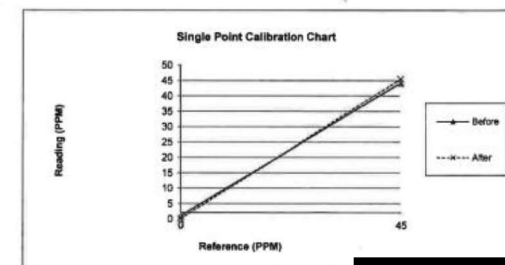
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19, 2024 EB0140762

Environment: Temperature 25.7 °C

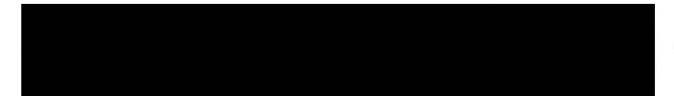
Humidity: 57 %RH

#### Calibration Report

Status	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	1.0	1.0	45.0	44.2	-0.9
After	0.0	0.1	0.1	45.0	45.4	0.4



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### CO Analyzer Verification Test Report

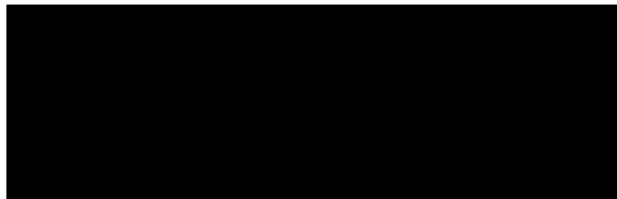
Calibration Report No.: TD-C6601003

Calibrated Date: 5-Jan-23

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Detail	Range	Unit	Before	After	Note
Date	8-Jun-22				
Time	10:51				
Range	0.1-1000 PPM	PPM	50	50	
Stability	(0.1-2PPM)	ppb	0.04	0.2	
CO Measure	2500 - 4800 MV.	mV	4465.6	4431.3	
CO Reference	2500 - 4800 MV.	mV	3768.5	3730.2	
MR Ratio	1.2 +/- 0.5		1.19	1.20	
Sample Pressure	26 - 30 in-Hg-A	in-Hg-A	28.7	28.6	
Sample Flow	720 - 880 cc/min	cc/min	904	898	
Sample Temp	44 - 52 deg.C	deg.C	48.5	43.3	
Bench Temp	47 - 49 deg.C	deg.C	48	48	
Wheel Temp	66 - 70 deg.C	deg.C	68	68	
Box Temp	27 - 50 deg.C	deg.C	33.3	34.8	
PHT drive	250 - 4750 mv.	mV	2912.3	2913.5	
Slope	0.800 - 1.200		1.197	1.138	
Offset	0.05 +/- 0.2		-0.015	-0.016	
<b>Gas Test Response</b>					
Zero Gas	0	PPM	0.4	0.0	
Span Gas	45	PPM	44.8	45.0	± 1% of Range



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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0383

MTC No. EEL. BP. 59/0365

### CALIBRATION CERTIFICATE

Submitted by

Address

Calibrated at

Instrument Calibrated :

Ambient Environment

Description : Acoustic Calibrator

Temperature : (23 ± 3) °C

Manufacturer : Bruel&Kjaer

Relative Humidity : (50 ± 15) %

Model : 4230

Ambient Pressure : (101.325 ± 1.500) kPa

Serial No. : 1351075

Standards used :

1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.
3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
4. Digital Multimeter Agilent 34401A S/N MY44005560.
5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.
6. Audio Analyzer Keithley 2015-P S/N 4106495.
7. Condenser Microphone Bruel&Kjaer 4180 S/N 2889871.

**Calibration Procedure:** CP-102-04 based on IEC 60942-2003; The sound pressure level generated by sound calibrator under test shall be measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).

The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

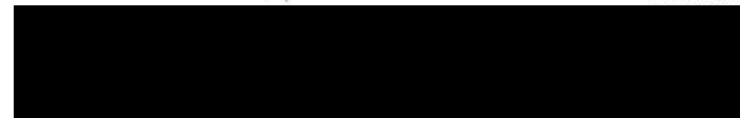
Date of Receipt : 10 Mar. 2022


Date of Calibration : 21 Mar. 2022

1 / 2

The results relate only to the items tested/calibrated or value assigned.  
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FM.BLMTC.002 Rev.4





THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

**Request No.** 21-65/0383 **MTC No.** EEL. BP. 59/0365

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level of confidence of approximately 95%.

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

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

**1. Sound Pressure Level**

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	93.66	-0.34	$\pm 0.10$	$\pm 0.40$ dB


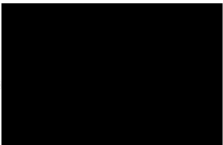
**2. Frequency**

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	997.8	-2.2	$\pm 1.5$	$\pm 1.0\%$

**3. Total Distortion**

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Bruel&Kjaer 4180	1.55	$\pm 0.50$	$\pm 3.0\%$

**Note :** 1. No adjustment.  
2. The calibrator pressure correction was not included.  
3. The microphone volume correction was not included.

**Calibrated by :**  **Approved by :** 

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

**Date of Calibration :** 21 Mar. 2022  
**Date of Issue :** 22 Mar. 2022

**Ref :** 2011265031501147002

**End of Certificate** 2 / 2

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**Issued by :** Calibration & Test Section : Meteorological Instruments Bureau

**Date of Issue :** 1 September, 2022 **Certification No.** 313/22

**Page :** 1 of 6


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**Object :** เครื่องมือตรวจวัดอุตุนิยมวิทยา

**Manufacturer :** NovaLynx

**Type :** Data Logger 110-WS-25DL-D

**Serial No. :** EWSNV110WS2509

**Customer :** 

**Calibration Condition :** Temperature 25.1 °C Barometric Pressure 1008.7 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-850-3TV (sensor TR-90AH-I)  
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.918892

**STANDARD BAROMETER :** Digital Barometer Vaisala : PTB220 No. 120015

### The Result of Calibration

Sensor model EWSNV110WS2509 Certification No. 313/22

1 September, 2022 Page : 2 of 6

Standard Ultrasonic Anemometer	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Velocity	Velocity	Correction
	Inches H2O	Inches H2O	in/sec	m/sec	m/sec
1.00	-	-	-	0.4	0.60
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.6	0.40
7.04	-	-	-	6.9	0.14
9.02	-	-	-	9.0	0.02
11.01	-	-	-	11.1	-0.09
13.01	-	-	-	13.1	-0.09
15.01	-	-	-	15.0	0.01
17.02	-	-	-	17.0	0.02
20.02	-	-	-	20.1	-0.08

Wind Aloft Plotting Board.	
U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	89
180	175
270	

### The Result of Calibration

Sensor model EWSNV110WS2509

Certification No. 313/22

1 September, 2022 Page : 3 of 6

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
1010.31	1009.62	0.69
1010.60	1009.93	0.67
1010.38	1009.86	0.52
1010.23	1009.60	0.63
1009.93	1009.33	0.60
1009.66	1009.07	0.59
1009.41	1008.80	0.61
1009.13	1008.53	0.60
1008.96	1008.27	0.69
1008.58	1008.00	0.58
1008.25	1007.74	0.51
1007.57	1007.20	0.37
1007.27	1006.94	0.33
1007.04	1006.67	0.37
1006.63	1006.40	0.23
1010.02	1009.47	0.55
1008.77	1008.24	0.53
1008.67	1008.17	0.50
1007.63	1007.20	0.43
1007.40	1006.94	0.46

Average

8.25

**The Result of Calibration**

Sensor model EWSNV110WS2509 Certification No. 313/22  
1 September, 2022 Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.5	45.5	0.0
30.5	30.5	0.0
15.2	15.4	-0.2

**The Result of Calibration**

Sensor model EWSNV110WS2509 Certification No. 313/22  
1 September, 2022 Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading % R.H.	Correction % R.H.
85.6	81.7	3.9
60.4	57.1	3.3
42.3	38.6	3.7

Date of Issue 1 September, 2022

Certification No. 313/22

Page : 6 of 6

### ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ที่ชื่อ Davis แบบ TIPPING BUCKET  
Model 7342.026 ID No.EWSNV110WS2509 ทำการสอบเทียบกับแก้วฝนแบบแก้ว  
ควง GAUGE DIAMETER 8.0 INCHES , NEGRETTI & ZAMBRA LONDON No  
71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของคู่มือ (User Manual) (IP)

วิศวกรชำนาญการ

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 1 September, 2022

Certification No. 312/22

Page : 1 of 6

Object : เครื่องมือตรวจวัดอุตุนิยมวิทยา

Manufacturer : NovaLynx

Type : Data Logger 110-WS-25DL-D

Serial No. : EWSNV110WS2510

Customer :

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1009.7 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 1206295686)

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.918800

STANDARD BAROMETER : Digital Barometer Vaisala : Model PTB220 No. 11120015



### The Result of Calibration

Sensor model EWSNV110WS2510 Certification No. 312/22

1 September, 2022

Page : 2 of 6

Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Velocity	Velocity	Correction
	inches H2O	inches H2O	ft/sec	m/sec	m/sec
1.00	-	-	-	0.4	0.60
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.6	0.40
7.04	-	-	-	7.1	-0.06
9.02	-	-	-	9.1	-0.08
11.01	-	-	-	10.7	0.31
13.01	-	-	-	12.8	0.21
15.01	-	-	-	14.8	0.21
17.02	-	-	-	17.1	-0.08
20.02	-	-	-	20.3	-0.28

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

Sensor model EWSNV110WS2510

Certification No. 312/22

1 September, 2022

Page : 3 of 6

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
1010.31	1009.82	0.49
1010.80	1010.36	0.24
1010.38	1010.09	0.29
1010.23	1009.82	0.41
1009.93	1009.56	0.37
1009.66	1009.29	0.37
1009.41	1009.03	0.38
1009.13	1008.76	0.37
1008.96	1008.76	0.20
1008.58	1008.49	0.09
1008.25	1008.23	0.02
1007.57	1007.43	0.14
1007.27	1007.16	0.11
1007.04	1006.90	0.14
1006.63	1006.63	0.00
1010.02	1009.82	0.20
1006.77	1006.49	0.28
1006.67	1006.23	0.44
1007.63	1007.70	-0.07
1007.40	1007.43	-0.03

Average



**The Result of Calibration**

Sensor model EWSNV110WS2510 Certification No. 312/22  
1 September, 2022 Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.5	45.7	-0.2
30.5	30.4	0.1
15.2	15.5	-0.3

**The Result of Calibration**

Sensor model EWSNV110WS2510 Certification No. 312/22  
1 September, 2022 Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading % R.H.	Correction % R.H.
85.6	82.1	3.5
60.4	56.7	3.7
42.3	38.7	3.6

Date of Issue 1 September, 2022

Certification No. 312/22

Page : 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝุ่น ชื่อ Davis แบบ TIPPING BUCKET  
Model 7342.026 ID No.EWSNV110WS2510 ทำการสอบเทียบกับแก้วฝนแบบแก้ว  
ควง GAUGE DIAMETER 8.0 INCHES , NEGRETTI & ZAMBRA-LONDON No  
71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของมือ (0.2 mm) (IP)

วิศวกรชำนาญการ

เอกสารผลการสอบเทียบเครื่องมือตรวจวัด  
สถานีรถไฟฟ้าชองนนทบุรี (อาคารโดมอันทาวเวอร์)  
สถานีรถไฟฟ้าศาลาแดง (สถานีอาคารหอแว่น)  
ครั้งที่ 4/2565  
วันที่ตรวจวัด วันที่ 21-26 เมษายน 2566

**evl**

**TSP High Volume Sampler Calibration**

Verification Report No. SO2300078-E001 -TSP 02

☐ PM ☒ Onsite  
Site: BTS สีลม  
UTM : 47P N 1517739 E 665366  
Sampler: ETSP#20  
Recorder: ECRANG15315224  
Date: 21 Apr 23  
Technical:   
Approval:

**CONDITIONS**

Barometric Press. (hPa): 951.0 Corrected Pressure (mm Hg): 713.3  
Temperature (deg C): 30.0 Temperature (deg K): 303.0  
Average Press. (hPa): 1013.0 Corrected Avg. Press. (mm Hg): 759.8  
Average Temp. (deg C): 30.0 Average Temp. (deg K): 303.0

**CALIBRATION CRIFICE**

Brand: Tisch Environmental, Inc Qstd Slope: 2.03736  
Model: TE-5025A Qstd Intercept: -0.03733  
Serial#: 759 Date Certified: 18 Jan 23

**CALIBRATIONS**

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)
1	11.63	1.627	58.0	55.72
2	10.22	1.526	54.0	51.88
3	7.34	1.296	46.0	44.20
4	4.85	1.057	38.0	36.51
5	2.98	0.832	34.0	32.67

LINEAR REGRESSION  
Slope = 29.6650  
Intercept = 6.5944  
Corr. coeff. = 0.9929  
# of Observations: 5  
Range of Chart at 1.1 - 1.7 m3/min 41 59

Calibrated by:   
21 April 2023  
Approved by:   
21 April 2023

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www.evltesting.com Environmental responsibility with accuracy measurement  
TS-0017-23 Rev.04/20/23

**evl**

**TSP High Volume Sampler Calibration**

Verification Report No. SO2300078-E001 -TSP 02

☐ PM ☒ Onsite  
Site: BTS สีลม  
UTM : 47P N 1517739 E 665366  
Sampler: ETSP#20  
Recorder: ECRANG15315224  
Date: 21 Apr 23  
Technical:   
Approval:

**CONDITIONS**

Barometric Press. (hPa): 951.0 Corrected Pressure (mm Hg): 713.3  
Temperature (deg C): 30.0 Temperature (deg K): 303.0  
Average Press. (hPa): 1013.0 Corrected Avg. Press. (mm Hg): 759.8  
Average Temp. (deg C): 30.0 Average Temp. (deg K): 303.0

**CALIBRATION CRIFICE**

Brand: Tisch Environmental, Inc Qstd Slope: 2.03736  
Model: TE-5025A Qstd Intercept: -0.03733  
Serial#: 759 Date Certified: 18 Jan 23

**CALIBRATIONS**

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)
1	11.63	1.627	58.0	55.72
2	10.22	1.526	54.0	51.88
3	7.34	1.296	46.0	44.20
4	4.85	1.057	38.0	36.51
5	2.98	0.832	34.0	32.67

LINEAR REGRESSION  
Slope = 29.6650  
Intercept = 6.5944  
Corr. coeff. = 0.9929  
# of Observations: 5  
Range of Chart at 1.1 - 1.7 m3/min 41 59

Calibrated by:   
21 April 2023  
Approved by:   
21 April 2023

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www.evltesting.com Environmental responsibility with accuracy measurement  
TS-0017-23 Rev.04/20/23

**PM10 High Volume Sampler Calibration**

Verification Report No. SO2300078-E001 -PM 01

L PM G Onsite  
Site: BTS ศาลาแดง  
UTM : 47P N 1518190 E 665853  
Sampler: EPM#38  
Recorder: ECRD501618124  
Date: 21 Apr 23  
Technical:   
Approval:   
Brand: Tisch Environmental, Inc  
Model: TE-5025A  
Serial#: 759  
Slope: 1.27576  
Intercept: -0.02337  
Date Certified: 18 Jan 23

**CONDITIONS**

Barometric Press. (hPa): 951.0  
Temperature (deg C): 30.0  
Average Press. (hPa): 1013.0  
Average Temp. (deg C): 30.0  
Corrected Pressure (mm Hg): 713.3  
Temperature (deg K): 303.0  
Corrected Avg Press. (mm Hg): 759.8  
Average Temp. (deg K): 303.0

**CALIBRATIONS**

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)
1	11.00	1.713	52.0	33.69
2	10.00	1.634	50.0	32.59
3	5.87	1.256	42.0	27.37
4	4.62	1.140	38.0	24.77
5	3.21	0.934	34.0	22.16

LINEAR REGRESSION  
Slope = 15.1372  
Intercept = 7.9440  
Corr. coeff = 0.9951  
SFR = 1.204  
SSP = 40.14  
# of Observations: 5  
Range of Chart at SFR ±10%: 38  
42

Calibrated by:   
21 April 2023  
Approved by:   
21 April 2023

[www.evtesting.com](http://www.evtesting.com)  
Environmental responsibility with accuracy measurement  
PE 0002-20 Rev 00 02/06/14

**PM10 High Volume Sampler Calibration**

Verification Report No. SO2300078-E001 -PM 02

L PM G Onsite  
Site: BTS ปิ่นเกล้า  
UTM : 47P N 1517739 E 665366  
Sampler: EPM#20  
Recorder: ECRD501618125  
Date: 21 Apr 23  
Technical:   
Approval:   
Brand: Tisch Environmental, Inc  
Model: TE-5025A  
Serial#: 759  
Slope: 1.27576  
Intercept: -0.02337  
Date Certified: 18 Jan 23

**CONDITIONS**

Barometric Press. (hPa): 945.7  
Temperature (deg C): 32.0  
Average Press. (hPa): 1013.0  
Average Temp. (deg C): 30.0  
Corrected Pressure (mm Hg): 709.3  
Temperature (deg K): 305.0  
Corrected Avg Press. (mm Hg): 759.8  
Average Temp. (deg K): 303.0

**CALIBRATIONS**

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)
1	10.00	1.644	50.0	32.79
2	8.11	1.482	46.0	30.16
3	6.21	1.299	42.0	27.54
4	4.23	1.075	34.0	22.29
5	3.43	0.970	32.0	20.98

LINEAR REGRESSION  
Slope = 18.0414  
Intercept = 3.4059  
Corr. coeff = 0.9959  
SFR = 1.218  
SSP = 38.72  
# of Observations: 5  
Range of Chart at SFR ±10%: 36  
41

Calibrated by:   
21 April 2023  
Approved by:   
21 April 2023

[www.evtesting.com](http://www.evtesting.com)  
Environmental responsibility with accuracy measurement  
PE 0002-20 Rev 00 02/06/14



### Verification Test Report

Report No.:

SO2300078-E001 -SLM 01

☐ PM ☒ Onsite UTM : 47P N 1518198 E 665853

Calibrated Date: 21 April 2023

Site : BTS ศาลาแดง

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 44

Serial : 2130

Environment: Temperature 25 °C Humidity 72 %RH

Reference Standard: Acoustic Calibrator Class 1 Model CB011,CESVA

Serial No.T252953

Date of Calibration : 02 December 2022

#### Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
93.92	93.57	-0.35	93.92

Calibrated By: [Signature]

Date: 21 April 2023

Approve By: [Signature]

Date: 21 April 2023

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### Verification Test Report

Report No.:

SO2300078-E001 -SLM 02

☒ PM ☐ Onsite UTM : 47P N 1517748 E 665368

Calibrated Date: 21 April 2023

Site : BTS ปrompt

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 44

Serial : 2128

Environment: Temperature 25 °C Humidity 72 %RH

Reference Standard: Acoustic Calibrator Class 1 Model CB011,CESVA

Serial No.T252953

Date of Calibration : 02 December 2022

#### Result of Test

Reference Standard (dB)	Instrument reading (dB)	Error (dB)	Adjust (dB)
93.92	93.70	-0.22	93.92

Calibrated By: [Signature]

Date: 21 April 2023

Approve By: [Signature]

Date: 21 April 2023

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**RECALIBRATION  
DUE DATE:  
January 18, 2024**

## Certificate of Calibration

Calibration Certification Information					
Cal. Date: January 18, 2023	Rootsmeter S/N: 438320	Ta: 294 °K			
Operator: [REDACTED]		Pa: 750.1 mm Hg			
Calibration Model #: TE-5025A	Calibrator S/N: 0759				

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.3960	3.2	2.00
2	3	4	1	0.9950	6.4	4.00
3	5	6	1	0.8850	8.0	5.00
4	7	8	1	0.8450	8.8	5.50
5	9	10	1	0.6990	12.8	8.00

Data Tabulation					
Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left( \frac{Pa}{Pstd} \right) \left( \frac{Tstd}{Ta} \right)}$ (y-axis)	Va	Qa (x-axis)	$\sqrt{\Delta H \left( \frac{Ta}{Pa} \right)}$ (y-axis)
0.9961	0.7135	1.4145	0.9957	0.7133	0.8854
0.9918	0.9968	2.0004	0.9915	0.9964	1.2521
0.9897	1.1183	2.2365	0.9893	1.1179	1.3999
0.9886	1.1700	2.3456	0.9883	1.1695	1.4683
0.9833	1.4067	2.8289	0.9829	1.4062	1.7708
<b>QSTD</b>		m= 2.03736	<b>QA</b>		m= 1.27576
		b= -0.03733			b= -0.02337
		r= 0.99997			r= 0.99997

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

Standard Conditions	
Tstd:	298.15 °K
Pstd:	760 mm Hg
Key	
ΔH:	calibrator manometer reading (in H2O)
ΔP:	rootsmeter manometer reading (mm Hg)
Ta:	actual absolute temperature (°K)
Pa:	actual barometric pressure (mm Hg)
b:	intercept
m:	slope

RECALIBRATION	
US EPA recommends annual recalibration per 1998 40 Code of Federal Regulations Part 50 to 51, Appendix B to Part 50, Reference Method for the Determination of Suspended Particulate Matter in the Atmosphere, 9.2.17, page 30	

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

## Certificate of Calibration

Certificate No. : 66-200066-1
Page : 1 of 2

Submitted by : [REDACTED]

Equipment : Electronic Balance

Manufacturer : Sartorius      Model : SECURA125-IS

Serial No. : 0034606552      ID No. : ELABBALANCEN05

Capacity : 120 g      Resolution : 0.0001 g

Environment : On site calibration was carried out at the B304 Balance Room, Envilab Co., Ltd.

Ambient Temperature : (21.7 to 22.0) °C

Relative Humidity : (47.0 to 47.1) %

Air Pressure : (1015.0 to 1016.0) mbar

Date of Received : 01 March 2023

Date of Calibration : 01 March 2023

Date of Issue : 04 March 2023

Calibrated by : [REDACTED]

Calibration Method : In-house method CAL-M2001 based on UKAS Publication ref: LAB 14 Edition 7 - November 2022

Reference Standard Instruments : This certification is traceable to the International System of Units

Standard Weights

ID No.	Cert. No.	Due Date	Traceability
E261-E2624	C02222345	10 Nov 2023	National Institute of Metrology (Thailand), (NIMT)

The Uncertainties are for a confidence probability of approximately 95%

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CAL-P00017-03

**Certificate of Calibration**

Certificate No. : 66-200066-1 Page : 2 of 2

Result of Calibration : Without Adjustment

UUC Condition As-Received : Good

Departure of indication from nominal value

Nominal Value (g)	Correction (g)	Uncertainty ± (g)
0.1	0.0000	0.000083
0.5	0.0000	0.000084
1	0.0000	0.000085
2	0.0000	0.000099
5	0.0000	0.000110
10	0.0000	0.000092
20	0.0000	0.000120
50	0.0000	0.00012
100	0.0000	0.00020
120	-0.0001	0.00018

This result of calibration was found accurate as shown on date and place of calibration only.

This reported uncertainty of measurement was based on a standard uncertainty multiplied by a coverage factor  $k = 2.00$ , providing a level of confidence of approximately 95%

Eccentric error

Load test	20 g
A	0.0001
B	0.0001
C	0.0000
D	0.0000
E	0.0000

g

Repeatability

Load test	100 g
Sidev.	0.00004 g

- o O o -

CAL-P0031-03

**Certificate of Calibration**

Certificate No. : 66-410024-1 Page : 1 of 2

Submitted by : [REDACTED]

Equipment : Digital Thermo-Hygrometer

Manufacturer : Jedto Model : HTC-1

Range Temperature : N/A °C Resolution : 0.1 °C

Range Humidity : N/A %R.H. Resolution : 1 %R.H.

Serial No. : PONPE5852094 ID No. : ELABTMHTC10003

Environment : Ambient Temperature : (23 ± 2) °C

Relative Humidity : (50 ± 15) %

Date of Received : 08 March 2023

Date of Calibration : 09 March 2023

Date of Issue : 09 March 2023

Calibrated by : [REDACTED]

Calibration Method : This instrument was calibrated by In-house method comparison technique CAL-M4013 by compared with standard probe sensor humidity/temperature into humidity/temperature chamber.

Reference Standard Instruments : This certification is traceable to the International System of Units

Digital Indicator with Standard Probe Temp&Hum

ID No.	Cert. No.	Due Date	Traceability
400034 & 400036	SG-H-00021/56	11 Jul 2023	Success Gateway Co., Ltd., Accredited by TISI Calibration No.0268

The Uncertainties are for a confidence probability of approximately 95%

This certificate may not be reproduced other than in full except with the prior written

CAL-P0031-03



## Certificate of Calibration

Certificate No. : 66-410024-1

Page : 2 of 2

UUC Condition As-Received : Good

Result of Calibration : Without Adjustment

Function : Temperature measurement

Reference Humidity @ 50 %R.H.

Standard Temperature (°C)	UUC Reading (°C)	Correction (°C)	Uncertainty (± °C)
25.01	25.0	0.0	0.46

Result of Calibration : Without Adjustment

Function : Humidity measurement

Reference Temperature @ 25 °C

Standard Humidity (%R.H.)	UUC Reading (%R.H.)	Correction (%R.H.)	Uncertainty (± %R.H.)
50.00	49	1	2.2

### Remark

UUC : Unit Under Calibration

This result of calibration was found accurate as shown on date and place of calibration only.

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

- o0o -

## CERTIFICATE OF ANALYSIS Grade of Product: EPA Protocol

Part Number: E04NI99E15A00V3 Reference Number: 160-402021734-1  
Cylinder Number: EB0140762 Cylinder Volume: 144.4 Cubic Feet  
Laboratory: 124 - Plumsteadville - PA Cylinder Pressure: 2015 PSIG  
PGVP Number: A12021 Valve Outlet: 560  
Gas Code: CO,NO,NOX,SO2,BALN Certification Date: Feb 19, 2021

Expiration Date: Feb 19, 2024

Certification performed in accordance with EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012) document EPA 600/R-12/031, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.  
Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	45.00 PPM	44.68 PPM	G1	+/- 1.4% NIST Traceable	02/12/2021, 02/19/2021
NITRIC OXIDE	45.00 PPM	44.62 PPM	G1	+/- 1.4% NIST Traceable	02/12/2021, 02/19/2021
SULFUR DIOXIDE	45.00 PPM	45.34 PPM	G1	+/- 1.1% NIST Traceable	02/12/2021, 02/19/2021
CARBON MONOXIDE	4500 PPM	4500 PPM	G1	+/- 1.0% NIST Traceable	02/15/2021
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	200611-04	CC707968	49.82 PPM NITRIC OXIDE/NITROGEN	+/-1.0%	Feb 02, 2025
PRM	12386	D685025	9.91 PPM AIR/NITROGEN DIOXIDE	2.0%	Feb 20, 2020
GMIS	124206889	CC323707	4.028 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Aug 15, 2021
NTRM	0141709	KAL003190	49.87 PPM SULFUR DIOXIDE/NITROGEN	+/-1.0%	Jun 20, 2022
NTRM	08012341	KAL004716	4867 PPM CARBON MONOXIDE/NITROGEN	+/-0.6%	Jun 07, 2024

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

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 N1KD579	NDIR	Jan 27, 2021
Nicolet iS50 FTIR AUP2010245 NO	FTIR	Feb 11, 2021
Nicolet iS50 FTIR AUP2010245 NO2	FTIR	Jan 21, 2021
Nicolet iS50 FTIR AUP2010245 SO2	FTIR	Jan 21, 2021

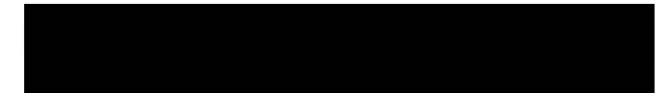
Triad Data Available Upon Request

### NOTES:

Gross Weight: 28.4 Kg

Net Weight: 4.5 Kg

PO# 5221000405



### SO2 Analyzer Verification Test Report

Calibration Report No.: ES-S6604003

Calibrated Date: 1-Apr-23

☒ PM ☐ Onsite

#### Instruments Information

Page: 1/2

Analyzer Type: SO2 Analyzer Model: AF22e	Manufacturer: Environnement SA, France S/N: NSOESAAF32E453
---	---

#### Calibration System

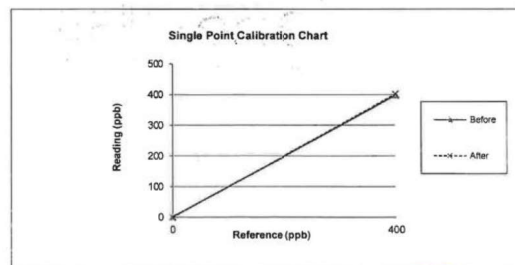
Calibrator Unit	Standard Gas
Dilutor Model: ESA MGC131 S/N: 792 ZERO AIR Generator: ZAG7001 S/N: 644	NO Conc: 44.68 PPM SO2 Conc: 45.34 PPM CO Conc: 4500 PPM Expire Date: Feb 19, 2024 EB0140762

Environment: Temperature: 26.8 °C

Humidity: 50 %RH

#### Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	1.4	1.4	400.0	398.0	-0.3
After	0.0	0.6	0.6	400.0	402.0	0.2



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### SO2 Analyzer Verification Test Report

Calibration Report No.: ES-S6604003

Calibrated Date: 1-Apr-23

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Page: 2/2

Analyzer Signal Values					
Date	1-Apr-23	Time	13:11:00		
Power Supplies					
Option	0.00	mV	+5 V Sensor	5	V
+4 V	4068	mV	+3.3 V	3.3	V
+24 V	24.1	V	+12 V	11.9	V
+5 V	5	V	1 I/V lamp	44.3	mA
+24 V	1.2	A			
Optical Bench					
Dark UV sig.	0	mV	Dark PM sig.	88	mV
UV ref.	0	mV	PM ref.	0	mV
UV sig.	24.1	mV	PM sig.	138.6	mV
Ref ratio	0		Meas ratio	0.34	
Mean sig.	0.7		Raw trend	11	
Raw sig.	24.4	ppb	Inst. meas.	22.8	ppb
I UV Lamp	44.7	mA	hV PM	2626.80	mV
Sample					
Internal Temp.	31.9	deg.C	Chamber T.	50	deg.C
Gas Pr.	970	hPa	Pump Pr.	355.5	hPa
Flow	18.7	l/h			

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### SO2 Analyzer Verification Test Report

Calibration Report No.: ES-S6604002  
Calibrated Date: 1-Apr-23

☒ PM ☐ Onsite

#### Instruments Information

Page:1/2

Analyzer Type: SO2 Analyzer Model: AF22e	Manufacturer: Environnement SA, France S/N: NSOESAAF32E454
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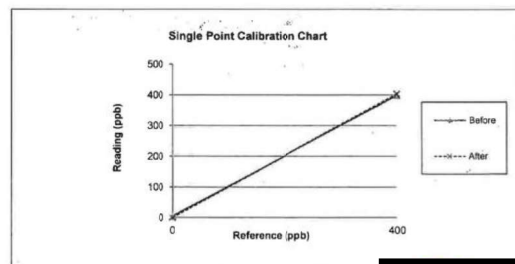
#### Calibration System

Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19, 2024 EB0140782

Environment: Temperature 25.5 °C Humidity 69 %RH

#### Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	4.7	4.7	400.0	398.0	-0.3
After	0.0	0.1	0.1	400.0	403.0	0.4



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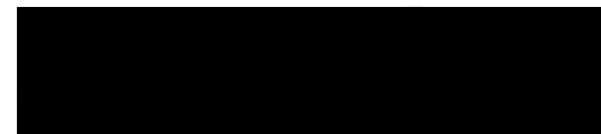
### SO2 Analyzer Verification Test Report

Calibration Report No.: ES-S6604002  
Calibrated Date: 1-Apr-23

☒ PM ☐ Onsite

Page:2/2

Analyzer Signal Values					
Date	1-Apr-23	Time	13:11:00		
Power Supplies					
Option	0.00	mV	+5 V Sensor	5	V
+4 V	4068	mV	+3.3 V	3.3	V
+24 V	24.1	V	+12 V	11.9	V
+5 V	5	V	I I/V Imp	44.3	mA
+24 V	1.2	A			
Optical Bench					
Dark UV sig.	0	mV	Dark PM sig.	88	mV
UV ref.	0	mV	PM ref.	0	mV
I/V sig.	24.1	mV	PM sig.	138.6	mV
Ref ratio	0		Meas ratio	0.34	
Mean sig.	0.7		Raw trend	11	
Raw sig.	24.4	ppb	inst.meas.	22.8	ppb
I UV Lamp	44.7	mA	HV PM	2626.80	mV
Sample					
Internal Temp.	31.9	deg.C	Chamber T.	50	deg.C
Gas Pr.	970	hPa	Pump Pr.	355.5	hPa
Flow	18.7	l/h			



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NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6604007  
Calibrated Date: 1-Apr-23  
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Instruments Information  
Analyzer Type: NO/NO2/NOx Analyzer  
Model: 200E  
Manufacturer API  
S/N: ENOAI200E02788  
Calibration System  
Calibrator Unit  
Dilutor Model ESA MGC131  
S/N: 792  
ZERO AIR Generator ZAG7001  
S/N: 644  
Standard Gas  
NO Conc 44.68 PPM  
SO2 Conc 45.34 PPM  
CO Conc 4500 PPM  
Expire Date: Feb 19,2024 EB0140762  
Environment: Temperature 26.5 °C Humidity: 50 %RH  
Calibration Check ( Before adjust )

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	2.3	0.0	2.3	415.0	400.0	1.8
NO <sub>2</sub>	1.4	0.0	1.4	3.0	0.0	0.4
NOx	3.7	0.0	3.7	418.0	400.0	2.2

Calibration Check ( After adjust )

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.5	0.0	0.5	400.0	400.0	0.0
NO <sub>2</sub>	0.3	0.0	0.3	408.2	0.0	0.3
NOx	0.8	0.0	0.8	402.4	400.0	0.3

Single Point Calibration Chart

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NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6604007  
Calibrated Date: 1-Apr-23  
☒ PM ☐ Onsite  
Page:2/2  
Test Function Value  
Date 1-Apr-23  
Time 10:10  
Range 0.00 - 500.00 PPB  
Stability (Zero Gas) < 0.2  
Sample Flow 500 +/- 50  
Ozone Flow 60-90  
PMT Detector 0-5000  
AZERO -20-150  
H2PER 400-900 constant  
DCPS 2500 +/- 200  
RCCELL TEMP 50 +/- 1  
BOX TEMP 20-35  
PMT TEMP 7 +/- 1  
IZS TEMP 50 +/- 4  
MOLY TEMP 315 +/- 5  
RCCL PRES 4-10 constant  
SAMP PRES 20-30 constant  
NO Slope 1 +/- 0.3  
NOx Slope 1 +/- 0.3  
NO Offset -10 to + 150  
NOx Offset -10 to + 150  
Span and Cal Values  
Zero Value  
Span Value  
NO 0  
NOx 0  
NO 400  
NOx 400  
ppb  
ppb  
ppb  
ppb  
2.3  
3.7  
415.0  
418.0  
0.5  
0.8  
400.0  
402.4

**NOx Analyzer Verification Test Report**

Calibration Report No.: AP-N6804005 Page: 1/1  
 Calibrated Date: 1-Apr-23

☒ PM ☐ Onsite

**Instruments Information**

Analyzer Type: NO/NO2/NOx Analyzer Model: 200A	Manufacturer API S/N: ENOA1200A01679
---	---

**Calibration System**

<b>Calibrator Unit</b> Dilutor Model ESA MGC131 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	<b>Standard Gas</b> NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19, 2024 EB0140762
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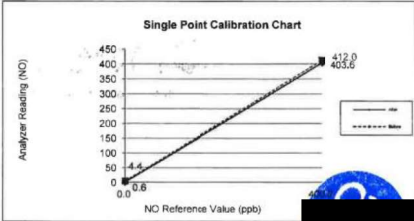
Environment: Temperature 26.5 °C Humidity 50 %RH

**Calibration Check ( Before adjust )**

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	2.6	0.0	2.6	398.5	400.0	-0.2
NO <sub>2</sub>	1.8	0.0	1.8	13.5	0.0	1.7
NOx	4.4	0.0	4.4	412.0	400.0	1.5

**Calibration Check ( After adjust )**

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.2	0.0	0.2	400.9	400.0	0.1
NO <sub>2</sub>	0.4	0.0	0.4	2.7	0.0	0.3
NOx	0.6	0.0	0.6	403.6	400.0	0.4



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**NOx Analyzer Verification Test Report**

Calibration Report No.: AP-N6804005 Page: 1/1  
 Calibrated Date: 1-Apr-23

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Page: 2/2

Test Function Value	Nominal range	Unit	Before	After	Note
Date	1-Apr-23				
Time	10:10				
Range	0.00 - 500.00 PPB	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.4	0.2	
Sample Flow	500 +/- 50	cc/min	482	494	
Ozone Flow	90-90	cc/min	74	77	
PMT Detector	0-5000	mV	51	26	
AZERO	20-150	mV	53.3	33.3	
HVPS	400-900 constant	V	821	821	
DCPS	2500 +/- 200	mV	2550	2556	
RCCELL TEMP	50 +/- 1	Degree C	50	50	
BOX TEMP	20-35	Degree C	30.2	32.8	
PMT TEMP	7 +/- 1	Degree C	7.5	7.5	
IZS TEMP	50 +/- 4	Degree C	-	-	
MOLY Temp	315 +/- 5	Degree C	315.0	314.5	
RCCEL PRES	4-10 constant	IN-Hg-A	8.8	8.8	
GAMP FREQ	20-30 constant	IN-Hg-A	30.2	31.8	
NO Slope	1 +/- 0.3		0.820	0.822	
NOx Slope	1 +/- 0.3		0.854	0.856	
NO Offset	-10 to + 150	mV	17.8	17.8	
NOx Offset	-10 to + 150	mV	5.0	5.0	

**Span and Cal Values**

Zero Value	NO	0	ppb	2.6	0.2
	NOx	0 <td>ppb</td> <td>4.4</td> <td>0.6</td>	ppb	4.4	0.6
Span Value	NO	400 <td>ppb</td> <td>398.5</td> <td>400.9</td>	ppb	398.5	400.9
	NOx	400 <td>ppb</td> <td>412.0</td> <td>403.6</td>	ppb	412.0	403.6

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### CO Analyzer Verification Test Report

Calibration Report No.: ES-C6604005

Calibrated Date: 1-Apr-23

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#### Instruments Information

Page:1/2

Analyzer Type: CO Analyzer Model: CO12E	Manufacturer: Environnement SA, France S/N: NCOESACO12E355
--	---

#### Calibration System

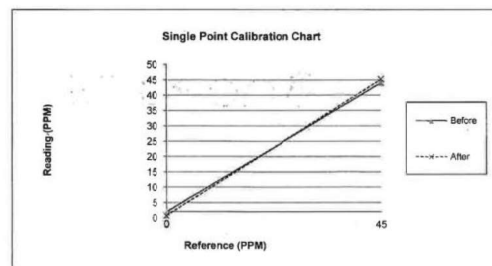
Calibrator Unit	Standard Gas
Diluter Model: ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.68 PPM SO <sub>2</sub> Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19, 2024 EB0140762

Environment: Temperature 26.4 °C

Humidity: 51 %RH

#### Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	1.978	2.0	45.0	44.06	-1.1
After	0.0	0.760	0.8	45.0	45.19	0.2



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### CO Analyzer Verification Test Report

Calibration Report No.: ES-C6604005

Calibrated Date: 1-Apr-23

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Page:2/2

Analyzer Signal Values					
Date	1-Apr-23	Time	10:09:00		
Power Supplies					
Option	0.0	mV	+5 V Sensor	5	V
+3.3 V	3.3	V	+24 V	24.2	V
+12 V	11.8	V	+5 V	5.1	V
+24 V	1.1	mV			
Optical Bench					
IR current ratio	884.7	mA	Pbase current	618.2	mV
Optical T.	46.0	deg.C	Pbase T.	-24.2	deg.C
Measure sig.	506.4	mV	Refer Sig	456.4	mV
Min sig.	945.0	mV	Max Sig.	2840	mV
Sample					
inst. Ratio	1.109		Ratio	1.105	
Ref. ratio	1.109		Internal Temp.	28.9	deg.C
Source Temp.	46.0	deg.C	Gas Pressure	997	hPa
Up Pressure	947.0	hPa	Flow	59	l/h

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### CO Analyzer Verification Test Report

Calibration Report No.: ES-C6604007

Calibrated Date: 1-Apr-23

☒ PM ☐ Onsite

#### Instruments Information

Page:1/2

Analyzer Type: CO Analyzer Model: CO12E	Manufacturer: Environnement SA, France S/N: NCOESACO12E356
--	---

#### Calibration System

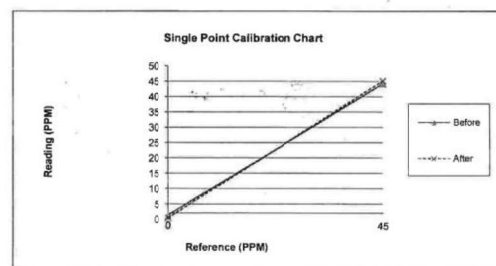
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19, 2024 EB0140762

Environment: Temperature 26.3 °C

Humidity: 50 %RH

#### Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	1.334	1.3	45.0	44.23	-0.9
After	0.0	0.450	0.5	45.0	45.10	0.1



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### CO Analyzer Verification Test Report

Calibration Report No.: ES-C6604007

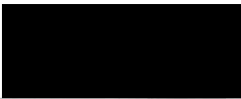
Calibrated Date: 1-Apr-23

☒ PM ☐ Onsite

Page:2/2

Analyzer Signal Values					
Date	1-Apr-23	Time	10:09:00		
Power Supplies					
Option	0.0	mV	+5 V Sensor	5	V
+3.3 V	3.3	V	+24 V	24.2	V
+12 V	11.8	V	+5 V	5.1	V
+24 V	1.1	mV			
Optical Bench					
IR current ratio	884.7	mA	Pose current	618.2	mV
Optical T.	46.0	deg.C	Pose T.	-24.2	deg.C
Measure sig.	506.4	mV	Refer Sig.	456.4	mV
Min sig.	945.0	mV	Max Sig.	2840	mV
Sample					
Inst. Ratio	1.109		Ratio	1.105	
Ref. ratio	1.109		Internal Temp.	28.9	deg.C
Source Temp.	46.0	deg.C	Gas Pressure	997	hPa
Up Pressure	947.0	hPa	Flow	59	l/h

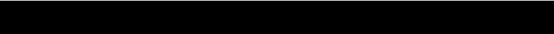
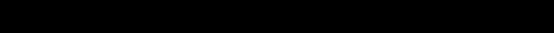
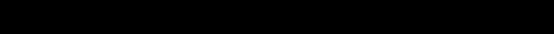
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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

**Request No.** 21-66/0381 **MTC No.** EEL- BP. 70/0366

### CALIBRATION CERTIFICATE

**Submitted by :**   
**Address :**   
**Calibrated at :** 

<b>Instrument Calibrated :</b>	<b>Ambient Environment</b>
Description : Sound Level Calibrator	Temperature : (23 ± 3) °C
Manufacturer : Brüel & Kjær	Relative Humidity : (50 ± 15) %
Model : 4230	Ambient Pressure : (101.325 ± 1.500) kPa
Serial No. : 1351075	

**Standards used :**


- Digital Function Synthesizer NF Electronic DF-193A S/N 122037.
- Measuring Amplifier Brüel&Kjaer 2636 S/N 1537484.
- Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.
- Digital Multimeter Agilent 34401A S/N MY44005560.
- Pressure Transmitter Vaisala PTB202AD S/N T0650001.
- Audio Analyzer Keithley 2015-P S/N 4106495.
- Condenser Microphone Brüel&Kjaer 4180 S/N 2889871.

**Calibration Procedure:** CP-102-04 based on IEC 60942:2003. The sound pressure level of instrument was measured by standard microphone using an insert voltage technique.

This instrument has been calibrated against standards maintained at Electrical and Electronic Standards Laboratory (EEL), which are traceable to the International System of Units through the National Institute of Metrology (Thailand).


The information on actual reading is attached herewith and the uncertainty limits quoted refer to the measured values only.

**Date of Receipt :** 14 Mar. 2023  
**Date of Calibration :** 16 Mar. 2023

  
 Electrical and Electronic Standards Laboratory  
 Industrial Metrology and Testing Service Centre

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FM.BLMTC.002 Rev.4



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

**Request No.** 21-66/0381 **MTC No.** EEL- BP. 70/0366

The reported expanded uncertainty is based upon a standard uncertainty multiplied by a coverage factor  $k = 2$ , providing a level of confidence of approximately 95%.

**Nominal Output of Unit Under Test = 94 dB re 20µPa at 1000 Hz**

**Acoustic Output in dB re 20µPa , Corrected to Reference Conditions : 101.325 kPa , 23.0°C and 50 %RH**

#### 1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Brüel&Kjaer 4180	93.78	-0.22	± 0.10	±0.40 dB

#### 2. Frequency


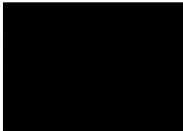
Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Brüel&Kjaer 4180	999.0	-1.0	± 1.5	±1.0%

#### 3. Total distortion

Standard Microphone Type	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Brüel&Kjaer 4180	1.05	± 0.50	±3.0%

**Note :**

- No adjustment.
- The calibrator pressure correction was not included.
- The microphone volume correction was not included.

**Calibrated by :**  **Approved by :** 

Electrical and Electronic Standards Laboratory  
 Industrial Metrology and Testing Service Centre

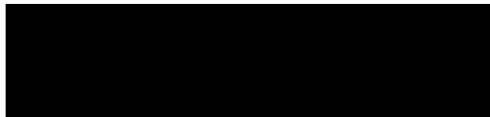
**Date of Calibration :** 16 Mar. 2023  
**Date of Issue :** 17 Mar. 2023

End of Certificate

The results relate only to the items tested/calibrated or verified.  
 Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FM.BLMTC.002 Rev.4





Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 2 September, 2022

Certification No. 314/22

Page : 1 of 6

Object : เครื่องมือตรวจวัดอุตุนิยมวิทยา

Manufacturer : NovaLynx

Type : Data Logger 110-WS-25DL-D

Serial No. : EWSNV110WS2507

Customer :



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)

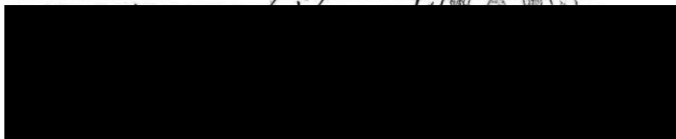
JAPAN QUALITY ASSURANCE ORGANIZATION : Standard Velocity at 0 - 20 m/sec

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

: Thermoschneider No. 9180

STANDARD BAROMETER

: Digital Barometer Vaisala PTB220 No. 1220015



### The Result of Calibration

Sensor model EWSNV110WS2507

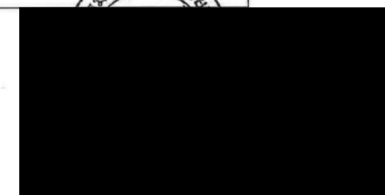
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Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure inches H2O	Vacuum inches H2O	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	0.9	0.10
3.02	-	-	-	2.7	0.32
5.00	-	-	-	4.9	0.10
7.04	-	-	-	7.0	0.04
9.02	-	-	-	8.9	0.12
11.01	-	-	-	11.1	-0.09
13.01	-	-	-	13.2	-0.19
15.01	-	-	-	15.0	0.01
17.02	-	-	-	17.2	-0.18
20.02	-	-	-	20.5	-0.48

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

Sensor model EWSNV110WS2507

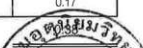
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Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
1010.31	1009.89	0.42
1010.60	1010.16	0.44
1010.38	1009.89	0.49
1010.23	1009.63	0.60
1009.93	1009.34	0.59
1009.66	1009.09	0.57
1009.41	1009.09	0.32
1009.13	1008.83	0.30
1008.96	1008.56	0.40
1008.58	1008.29	0.29
1008.25	1008.03	0.22
1007.57	1007.23	0.34
1007.27	1006.96	0.31
1007.04	1006.70	0.34
1006.63	1006.43	0.20
1010.02	1009.63	0.39
1008.77	1008.29	0.48
1008.67	1008.03	0.64
1007.63	1007.50	0.13
1007.40	1007.23	0.17

Average



### The Result of Calibration

Sensor model EWSNV110WS2507

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Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.5	45.4	0.1
30.5	30.4	0.1
15.2	15.2	0.0

### The Result of Calibration

Sensor model EWSNV110WS2507 Certification No. 314/22  
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Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading % R.H.	Correction % R.H.
85.6	83.4	2.2
60.4	60.0	0.4
42.3	43.4	-1.1

Date of Issue 2 September, 2022

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### ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis แบบ TIPPING BUCKET  
Model 7342.026 ID No.EWSNV110WS2507 ทำการสอบเทียบกับแก้วฝนแบบแก้ว  
ตวง GAUGE DIAMETER 8.0 INCHES , NEGRETTI & ZAMBRA LONDON No  
71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ ( 0.2 mm/  
TIP)

วิศวกรชำนาญการ

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 1 September, 2022

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Object : เครื่องมือตรวจวัดอุตุนิยมวิทยา

Manufacturer : NovaLynx

Type : Data Logger 110-WS-25DL-D

Serial No. : EWSNV110WS2508

Customer :

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1010.1 hPa

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

: HOOK GAGE NO 1425 : Wind Aloft Plotting Board

N.I.S.T. Test Reference Number 731/241460 : 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.9138902  
: Digital Barometer Vaisala type PTB220 No.1220015

STANDARD BAROMETER : Digital Barometer Vaisala type PTB220 No.1220015

### The Result of Calibration

Sensor model

EWSNV110WS2508

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Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
Ultrasonic Anemometer	Pressure	Vacumm	Pressure	Velocity	Correction
m/sec	inches	inches	hPa	m/sec	m/sec
1.00	-	-	-	0.4	0.60
3.02	-	-	-	3.1	-0.08
5.00	-	-	-	5.2	-0.20
7.04	-	-	-	7.4	-0.36
9.02	-	-	-	9.0	0.02
11.01	-	-	-	11.1	-0.09
13.01	-	-	-	13.0	0.01
15.01	-	-	-	15.2	-0.19
17.02	-	-	-	17.2	-0.18
20.02	-	-	-	20.5	-0.48

Wind Aloft Plotting Board.

US.DEPARTMENT OF COMMERCE WEATHER BUREAU

WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	87
180	179
270	

### The Result of Calibration

Sensor model EWSNV110WS2508

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Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
1010.31	1009.62	0.69
1010.60	1010.15	0.45
1010.38	1009.89	0.49
1010.23	1009.62	0.61
1009.93	1009.35	0.58
1009.66	1009.03	0.63
1009.41	1009.09	0.32
1009.13	1008.82	0.31
1008.96	1008.56	0.40
1008.58	1008.29	0.29
1008.25	1008.02	0.23
1007.57	1007.23	0.34
1007.27	1006.96	0.31
1007.04	1006.69	0.35
1006.63	1006.43	0.20
1010.02	1009.62	0.40
1008.77	1008.29	0.48
1008.67	1008.02	0.65
1007.63	1007.23	0.40
1007.40	1006.96	0.44

Average



### The Result of Calibration

Sensor model EWSNV110WS2508

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Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.5	45.4	0.1
30.5	30.5	0.0
15.2	15.4	-0.2

### The Result of Calibration

Sensor model EWSNV110WS2508 Certification No. 311/22  
1 September, 2022 Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading % R.H.	Correction % R.H.
85.6	81.2	4.4
60.4	56.8	3.6
42.3	39.7	2.6

Date of Issue 1 September, 2022

Certification No. 311/22

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### ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis แบบ TIPPING BUCKET  
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วิศวกรชำนาญการ