

ภาคผนวกที่ 5-2

เอกสารผลการสอบเทียบเครื่องมือตรวจวัด
สถานีรถไฟฟ้าชองนนทรี (อาคารโดมอันทาวเวอร์)
และสถานีรถไฟฟ้าศาลาแดง (สถานีอาคารหอแว่น)
ครั้งที่ 3/2568
ตรวจวัดวันที่ 19-24 กุมภาพันธ์ 2569

PM

☐ Onsite

Site: สบต. BTS ศาลายา

UTM: N 1518197 E 665842

Sampler: ETSPK35

Recorder: ECHAN00001070

Date: 3 Oct 25

Technical:

Approval:

Verification Report No.

SO2500250-E001 -TSP 01

CONDITIONS

Barometric Press. (hPa): 1007.5

Corrected Pressure (mm Hg): 754.7

Temperature (deg C): 32.0

Temperature (deg F): 89.6

Corrected Avg Press. (mm Hg): 759.8

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

CALIBRATION OFFICE

Brand: Tish Environmental, Inc

Model: TE-5024A

Serial#: 2067

Date: 03-Mar-26

Old Slope: 2.06933

Old Intercept: -0.02815

Date Certified: 4 Mar 25

Due Date: 03-Mar-26

CALIBRATIONS

Plate or Test #	H2O (in)	Gasd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	10.10	1.527	54.0	53.23	Slope = 40.7713
2	8.50	1.402	50.0	49.28	Intercept = -7.7493
3	6.20	1.200	44.0	43.37	Corr. coeff = 0.9937
4	4.30	1.001	34.0	33.51	
5	2.40	0.752	22.0	21.66	
# of Observations: 5					
Range of Chart: 38					
at 1.1 - 1.7 m3/min, 62					

Calibrated by:

Approved by:

3 Oct 2025

ปิ่นเกล้า 10/06/2568

PM 5000-01-14 Rev.06

PM

☐ Onsite

Site: สบต. BTS ศาลายา

UTM: N 1518197 E 665842

Sampler: EPM10M14

Recorder: NCRT150094855

Date: 3 Oct 25

Technical:

Approval:

Verification Report No.

SO2500250-E001 -PM 01

CONDITIONS

Barometric Press. (hPa): 1007.5

Corrected Pressure (mm Hg): 755.7

Temperature (deg C): 32.0

Temperature (deg F): 89.6

Corrected Avg Press. (mm Hg): 755.9

Average Press. (hPa): 1013.0

Average Temp. (deg C): 30.0

CALIBRATION OFFICE

Brand: Tish Environmental, Inc

Model: TE-5023A

Serial#: 2067

Date: 03-Mar-26

Old Slope: 1.25578

Old Intercept: -0.01772

Date Certified: 4 Mar 25

Due Date: 03-Mar-26

CALIBRATIONS

Plate or Test #	H2O (in)	Gasd (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	11.00	1.840	55.0	54.94	Slope = 28.5429
2	8.40	1.435	52.0	53.04	Intercept = -10.9820
3	6.20	1.234	40.0	35.41	Corr. coeff = 0.9905
4	3.20	0.891	24.0	15.25	SFR = 1.000
5	2.40	0.773	18.0	11.44	SSP = 29.06
# of Observations: 5					
Range of Chart: 25					
at SFR ±10%, 33					

Calibrated by:

Approved by:

3 October 2025

ปิ่นเกล้า 10/06/2568

PM 5000-01-14 Rev.06

PM

Onsite

Site: สถานี BTS สถานนท์
UTM: N 1517740 E 6653508
Sampler: ETS940
Recorder: ECRD5016339509

Date: 3 Oct 25

Technical:

Approval:

Verification Report No.
SC250050-E001 -TSP 02

CONDITIONS

Barometric Press. (hPa): 1007.4
Temperature (deg C): 32.0
Corrected Avg Press. (mm Hg): 759.8
Average Temp. (deg C): 30.0

CALIBRATION OFFICE

Brand: Tech Environmental, Inc
Model: TE-5025A
Serial#: 2087

Cal Slope: 2.06533
Cal Intercept: -0.02615
Date Certified: 4 Mar 25
Due Date: 03-Mar-26

CALIBRATIONS

Plate or Test #	H2O (in)	Gas (m3/min)	I (chart)	IC (corrected)
1	12.20	1.677	96.0	95.19
2	8.80	1.489	52.0	51.25
3	6.40	1.219	44.0	43.37
4	4.30	1.001	34.0	33.51
5	2.20	0.720	24.0	23.65

LINEAR REGRESSION

Slope = 33.7515
Intercept = 0.1752
Corr. coeff = 0.9937

of Observations: 5
Range of Chart: 38
at 1.1 - 1.7 m3/min

Calibrated by: 3 October 2025

Approved by: 3 October 2025

01062568

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PM

Onsite

Site: สถานี BTS สถานนท์
UTM: N 1517740 E 6653508
Sampler: ETS940
Recorder: ECRD5014281033

Date: 3 Oct 25

Technical:

Approval:

Verification Report No.
SC250050-E001 -PM 02

CONDITIONS

Barometric Press. (hPa): 1007.4
Temperature (deg C): 32.0
Corrected Avg Press. (mm Hg): 759.8
Average Temp. (deg C): 30.0

CALIBRATION OFFICE

Brand: Tech Environmental, Inc
Model: TE-5025A
Serial#: 2087

Cal Slope: 1.25578
Cal Intercept: -0.17175
Date Certified: 4 Mar 25
Due Date: 3 Mar 26

CALIBRATIONS

Plate or Test #	H2O (in)	Gas (m3/min)	I (chart)	IC (corrected)
1	12.80	1.768	58.0	35.58
2	10.40	1.595	54.0	34.31
3	7.30	1.336	43.0	27.32
4	4.40	1.042	32.0	20.33
5	2.70	0.819	20.0	12.71

LINEAR REGRESSION

Slope = 24.5513
Intercept = -8.1755
Corr. coeff = 0.9902

of Observations: 5
Range of Chart: 26
at SFR ±10%

Calibrated by: 3 October 2025

Approved by: 3 October 2025

01062568

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ภาควิชาวิทยาศาสตร์สิ่งแวดล้อม คณะสิ่งแวดล้อม ภาควิชาสิ่งแวดล้อมศาสตร์

พ5-44



Verification Test Report

Report No.: SO2500250-E001 / 001
Verification Date : 03 October 2025

Operate Information ☐ PM ☒ Onsite

Site : สถานี BTS ศาตางค์
GPS coordinates : 47Q N 1518196 E 665803

Instrument Information

Equipment : Sound Level Meter
Manufacturer : Pulsar
Model : 44
Serial No : 1799
Scale Rang : 20dB-140dB
Class : 2

Reference Standard

Standard : Acoustic Calibrator Manufacturer : Pulsar Model : 103 S/N : 98971
Certificate No. : EEL BP 65/0168
Date due : 17 January 2026
Traceability : T1STR

Ambient Condition : Temperature 32.60 °C Relative humidity 54.20 %
Atmospheric pressure 1013.3 hpa

Measurement Data

Reference Value (dB)	Correction Value (dB)	Adjustment (dB)	UUR Reading		Error (dB)	Acceptant Criteria (dB)
			Initial	Final		
93.93	-0.3	93.63	93.87	94.03	0.16	±1.0

* UUR = Unit Under Reference flow
Acceptant Criteria : Sound Level Meter Class 1 ±0.5 dB

Calibrated By:  Approved By: 

Date : 03 October 2025 Date : 03 October 2025

The Results shown in this verification report refer only to the equipment verification unless otherwise stated.
This Calibration Certificate cannot be reproduced.

ประกาศใช้ 01/08/2568

Rev.00

Verification Test Report

Report No.: SO2500250-E001 / 001
Verification Date : 03 October 2025

Operate Information ☐ PM ☒ Onsite

Site : สถานี BTS รามเกล้า
GPS coordinates : 47Q N 1517747 E 665342

Instrument Information

Equipment : Sound Level Meter
Manufacturer : Pulsar
Model : 44
Serial No : 1973
Scale Rang : 20dB-140dB
Class : 2

Reference Standard

Standard : Acoustic Calibrator Manufacturer : Pulsar Model : 103 S/N : 98971
Certificate No. : EEL BP 65/0168
Date due : 17 January 2026
Traceability : T1STR

Ambient Condition : Temperature 32.60 °C Relative humidity 54.20 %
Atmospheric pressure 1013.3 hpa

Measurement Data

Reference Value (dB)	Correction Value (dB)	Adjustment (dB)	UUR Reading		Error (dB)	Acceptant Criteria (dB)
			Initial	Final		
93.93	0	93.93	93.27	93.09	-0.18	±1.0

* UUR = Unit Under Reference flow
Acceptant value : Sound Level Meter Class 1 ±0.5 dB
Sound Level Meter Class 2 ±1.0 dB

Calibrated By:  Approved By: 

Date : 03 October 2025 Date : 03 October 2025

The Results shown in this verification report refer only to the equipment verification unless otherwise stated.
This Calibration Certificate cannot be reproduced.

ประกาศใช้ 01/08/2568

Rev.00

รายงานการติดตามตรวจสอบคุณภาพสิ่งแวดล้อมประจำปี 2568
โครงการระบบขนส่งมวลชนกรุงเทพมหานคร (ครั้งที่ 2)

บริษัท ระบบขนส่งมวลชนกรุงเทพ จำกัด (มหาชน)

TISCH

Environmental

RECALIBRATION

DUE DATE:

March 4, 2026

Cal. Date: March 4, 2025

Operator: Jim Tisch

Calibration Model #: TE-5025A

Rootsmeier S/N: 438320

Calibrator S/N: 2067

Ta: 29.4 °K

Pa: 746.0 mm Hg

Calibration Certification Information

Calibration Model #: 2067

Cal. Date: March 4, 2025

Operator: Jim Tisch

Calibration Model #: TE-5025A

Rootsmeier S/N: 438320

Calibrator S/N: 2067

Ta: 29.4 °K

Pa: 746.0 mm Hg

Calibration Certification Information

Calibration Model #: 2067

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4230	3.2	2.00
2	3	4	1	1.0090	6.4	4.00
3	5	6	1	0.9030	8.0	5.00
4	7	8	1	0.8610	8.8	5.50
5	9	10	1	0.7090	12.8	8.00

Data Tabulation			
Vstd (m3)	Qstd (x-axis)	$\sqrt{\Delta H \left(\frac{Pa}{Pstd} \times \frac{Tstd}{Ta} \right)}$ (y-axis)	Qa (x-axis)
0.9507	0.6957	1.4106	0.9957
0.9864	0.9776	1.9949	0.9914
0.9843	1.6800	2.2304	0.9893
0.9832	1.1419	2.3393	0.9882
0.9779	1.3792	2.8213	0.9828
QSTD		m= 2.06933	m= 1.29578
		b= -0.02815	b= -0.01772
		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 $\left(\sqrt{\Delta H \left(\frac{Pa}{Pstd} \times \frac{Tstd}{Ta} \right)} \right) - b$	
Qa= 1/m $\left(\sqrt{\Delta H \left(\frac{Pa}{Pa} \right)} \right) - b$	

Standard Conditions

Tstd: 298.15 °K

Pstd: 760 mm Hg

Key

ΔH: callibrator manometer reading (in H2O)

ΔP: rootsmeier 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

Page : 1 of 2

Certificate No. : 68-200034-1

Submitted by : [REDACTED]

Equipment : Electronic Balance

Manufacturer : Sartorius

Serial No. : 0034803270

Capacity : 220 g

Model : SECURA224-1S

ID No. : ELABBALANCEN04

Resolution : 0.0001 g

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

Ambient Temperature : (20.4 to 21.0) °C

Relative Humidity : (41.9 to 42.9) %

Air Pressure : 1014.0 mbar

Date of Received : 28 January 2025

Date of Calibration : 28 January 2025

Date of Issue : 30 January 2025

Calibrated by : Akaradeth Thippichai

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.

E261-E2624

Cert. No.

C02242009

Due Date

07 Nov 2025

Traceability

National Institute of Metrology (Thailand), (NIMT)

The Uncertainties are for a confidence probability of approximately

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

CAL-F0031-03

ภาควิชาวิทยาศาสตร์สิ่งแวดล้อม คณะสิ่งแวดล้อม วิทยาลัยเกษตรศาสตร์

พ5-46

Certificate of Calibration

Certificate No. : 68-200034-1

Result of Calibration :

UUC Condition As-Received : Good

Departure of indication from nominal value

Nonlinear Value (g)	Correction (g)	Uncertainty $\pm$ (g)
0.01	0.0000	0.00012
0.1	0.0001	0.00012
1	0.0000	0.00013
2	0.0001	0.00013
5	0.0000	0.00013
10	0.0002	0.00013
20	-0.0001	0.00014
50	-0.0001	0.00015
100	-0.0001	0.00020
200	-0.0001	0.00038

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 $k =$

providing a level of confidence of approximately 95%

Eccentric error

Load test :	50 g				
	A	B	C	D	E
0.0004	0.0004	0.0004	0.0005	0.0004	0.0000
0.0005	0.0004	0.0004	0.0005	0.0004	0.0000

Repeatability

Load test	:	200	g
Stdev.	:	0.00005	g

..

CERTIFICATE OF ANALYSIS
Grade of Product: EPA PROTOCOL STANDARD

Customer:

(THAILAND) LTD.

Part Number:

Cylinder Number: EB0170003

Laboratory:

PGVP Numl
Cos Code:

Reference Number: 160-403162930-1

Cylinder Volume: 144.0 CF

Cylinder Pressure: 2015 PSIG

Valve Outlet: 660
Codification Date: Oct 22 2024

123 2027

Expiration Date: Oct 23, 2027

Certification performed in accordance with "EPA Analytical Protocol for Arsenic and Certification of Cassia Calibration Standards (May 2012)" document EPA-600/6-12/031, using the assay procedures listed. Analytical methodology does not require correction for analytical interferences. This cylinder has a total arsenic concentration of 95%. There are no significant impurities which affect the use of this calibration material. All concentrations are on a dry basis unless otherwise noted. The results should not be reproduced except in full without approval of the laboratory. Do not use this cylinder below 100 psig. (i.e. 0.7 megapascals).

ANALYTICAL RESULTS					Assay Dates
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	
NOX	46.00 PPM	46.30 PPM	G1	±1.0% NIST Traceable	10/16/2024, 10/23/2024
NITRIC OXIDE	46.00 PPM	46.00 PPM	G1	±1.0% NIST Traceable	10/16/2024, 10/23/2024
NITROGEN DIOXIDE	46.00 PPM	46.35 PPM	G1	±1.0% NIST Traceable	10/16/2024, 10/23/2024
CARBON MONOXIDE	46.00 PPM	46.00 PPM	G1	±1.0% NIST Traceable	10/16/2024, 10/23/2024
NITROGEN	Balance	4629 PPM	G1	±1.0% NIST Traceable	10/16/2024, 10/23/2024

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No.	Concentration	Uncertainty	Expiration Date
GAS	DCK1091322235	C7569377	48.05 PPM NITRIC DIOXIDE/NITROGEN	+/- 0.5%	May 03, 2026
GAS	126494	APEX 1324257	50.04 PPM NITRIC DIOXIDE/NITROGEN	+/- 0.4%	Dec-22, 2023
GNIS	19246868128	C3322020	4.238 PPM NITROGEN DIOXIDE/NITROGEN	+/- 0.2%	Jun 16, 2027
GNIS	C33220201_1	D135445	8.87 PPM NITROGEN DIOXIDE/NITROGEN	+/- 0.2%	Nov 22, 2024
GNIS	07122320310	C09464279	48.92 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.7%	Jun 15, 2027
GNIS	18934	F725467	50.33 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.7%	Jun 17, 2025
SAN	19017010	F725467	50.33 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	PAB 201, 2030

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 8 N100020	NDR	Oct 06, 2024
Nordisk ISSO FTIR AUF2010245 NO	FTIR	Oct 17, 2024
Nordisk ISSO FTIR AUF2010245 NO2	FTIR	Oct 03, 2024
Nordisk ISSO FTIR AUF2010245 SO2	FTIR	Sep 26, 2024

SO2 Analyzer Verification Test Report

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Calibration Report No.: API-6810001
Calibrated Date: 1-Oct-68

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: SO2 Analyzer Model: T100	Manufacturer API SIN: 2032
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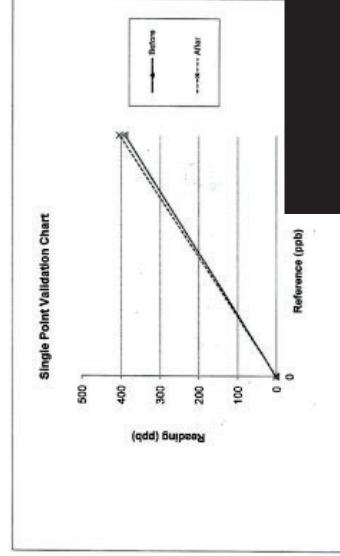
Calibration System

Calibrator Unit	Standard Gas
Dilutor Model ESA MSG101 SIN: 792	NOx Conc 45.30 PPM
ZERO AIR Generator ZAG7001 SIN: 644	NO Conc 45.30 PPM
	SO2 Conc 45.05 PPM
	CO Conc 4528 PPM
	Expire Date: OCT 23,2027
	EB0170003

Environment: Temperature 25.1 °C Humidity 59 %RH

Validation Report

Status	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	1.2	1.2	400.0	391.0	-1.1
After	0.0	0.8	0.8	400.0	405.0	0.6



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Calibration Report No.: API-6810001
Calibrated Date: 1-Oct-68

☒ PM ☐ Onsite

Test Function Value	Nominal range	Unit	Before	After	Note
Time	1-Oct-68				
Range	50 - 20000	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.4	0.2	
Sample Flow	850 (+/- 50)	cc/min	865	862	
PMT Detector	9 - 5000	mV	24.3	28.2	
Norm PMT Detector	9 - 5000	mV	31.4	34.3	
HVPS	400-900 constant	V	725	725	
DCPS	2500 (+/- 200)	mV	-	-	
RCCELL TEMP	50 (+/- 1)	Degrees C	50	50	
BOX TEMP	30-40	Degrees C	32.6	35.1	
PMI TEMP	7 (+/- 1)	Degrees C	8.3	8.3	
UV lamp	1000-4500	mV	3251	3251	
Lamp Radio	30-120	%	87.4	87.4	
STR Light (Zero Gas)	<100	PPB	38.5	38.5	
Dark PMT	(-50) - (1-200)	mV	27.6	27.6	
Dark lamp	(-50) - (1-200)	mV	3.6	3.6	
SAMP PRESS	26-30 constant	IN-Hg-A	28.9	27.3	
Electric Test/Cycle Test					
PMI Volt	2000 (+/- 500)	mV	2010	2008	
SO2 Conc	1000 (+/- 250)	PPB	1005	1003	
SO2 Slope	1 (+/- 0.3)	-	1.054	1.053	
SO2 Offset	< 250	mV	94.7	90.4	
Stability at Zero	< 0.2	PPB	0.1	0.1	
Stability at Span	< 2 ppb @ 400 ppb	PPB	0.4	0.2	
Gas Test Response					
Zero Gas (0.00 PPB)	0	ppb	1.2	0.8	
Span Gas (400 PPB)	400	ppb	391.0	405.0	± 5% of Range

Calibrate By:
Date: 1-Oct-68

Approve By:
Date: 1-Oct-68

neediss
Needless Supply Instrument Co., Ltd

ประกาศใช้ 01/08/2568

SO2 Analyzer Verification Test Report

Calibration Report No.: API-6810002
Calibrated Date: 1-Oct-68

☐ PM ☐ Onsite

Instruments Information

Analyzer Type: SO2 Analyzer Model: T100	Manufacturer API S/N: 2033
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Calibration System

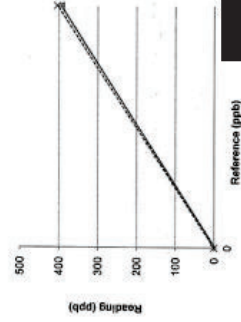
Calibrator Unit Dilutor Model ESA MGC101 S/N: 792	Standard Gas NOx Conc 45.30 PPM NO Conc 45.30 PPM SO2 Conc 45.05 PPM CO Conc 4528 PPM
ZERO AIR Generator ZAG7001 S/N: 644	Expire Date: OCT 23, 2027 EB0170003

Environment: Temperature 25.1 °C Humidity 59 %RH

Validation Report

Status	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	-2.4	-2.4	400.0	395.2	-0.6
After	0.0	0.5	0.5	400.0	404.3	0.5

Single Point Validation Chart



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Calibration Report No.: API-6810002
Calibrated Date: 1-Oct-68

☒ PM ☐ Onsite

Test Function Value	Normal range	Unit	Before	After	Note
Date	1-Oct-68				
Time	8:30				
Range	50 - 20000	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.4	0.2	
Sample Flow	950 (± 50)	cc/min	666	662	
PMT Detector	0 - 5000	mV	24.3	28.2	
Norm PMT Detector	0 - 5000	mV	31.4	34.3	
MPPS	400-800 constant	V	725	725	
DCPS	2500 (± 200)	mV	-	-	
RC-CELL TEMP	50 (± 1)	Degrees C	50	50	
BOX TEMP	20-40	Degrees C	32.6	35.1	
PMT TEMP	7 (± 1)	Degrees C	8.3	8.3	
UV Lamp	1000-4000	mV	3251	3251	
Lamp Ratio	36-720	%	87.4	87.4	
STR. Light (Zero Gas)	< 100	PPB	38.5	38.5	
Dark PMT	(-500) - (1200)	mV	27.6	27.6	
Dark Lamp	(-500) - (1200)	mV	3.6	3.6	
SAMP PRES	20-30 constant	IN-Hg A.	28.9	27.3	
Electrode Test/Optic Test					
PMT (Volts)	2000 (± 500)	mV	2010	2008	
SO2 Conc	1000 (± 250)	PPB	1005	1003	
SO2 Slope	1 (± 0.3)	-	1.084	1.063	
SO2 Offset	< 250	mV	94.7	90.4	
Stability at Zero	< 0.2	PPB	0.1	0.1	
Stability at Span	< 2 ppb @ 400 ppb	PPB	0.4	0.2	
Gas Test Response					
Zero Gas (0.00 PPB)	0	ppb	-2.4	0.5	
Span Gas (400 PPB)	400	ppb	395.2	404.3	± 5% of Range

Calibrate By: [Redacted]

Date: 1-Oct-68

Approve By: [Redacted]

Date: 1-Oct-68



CO Analyzer Verification Test Report

Page:1/2

Validation Report No.: API-6810002

Validation Date: 1-Oct-25

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: CO Analyzer Model: 300T	Manufacturer API SIN: 98
---	-----------------------------

Calibration System

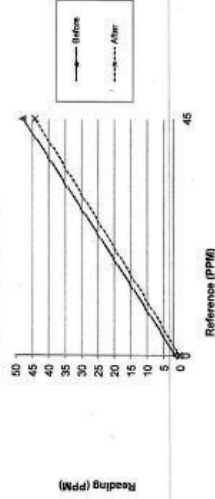
Dilutor Model ESA MGC101 SIN: 762 ZERO AIR Generator ZAG7001 SIN: 644	Standard Gas NOx Conc 45.30 PPM NO Conc 45.30 PPM SO2 Conc 45.05 PPM CO Conc 4528 PPM Expire Date: OCT 23 2027 EBO170003
--	---

Environment: Temperature: 25.9 °C Humidity: 60 %RH

Validation Report

Status	Reference (ppm)	Reading (ppm)	Drift (ppm)	Reference (ppm)	Span Reading (ppm)	Drift%
Before	0.0	1.60	1.5	45.0	47.9	3.1
After	0.0	0.17	0.2	45.0	44.2	-0.9

Single Point Validation Chart



ประกาศใช้ 01/08/2568

Page:2/2

Validation Report No.: API-6810002

Validation Date: 1-Oct-25

☒ PM ☐ Onsite

Detail	Range	Unit	Before	After	Note
Date	1-Oct-25				
Time	11:00				
Range	0.1-1000 PPM	PPM	50	50	
Stability	(0.1-2PPB)	ppb	0.73	1.11	
CO Measure	2500 - 4800 mV	mV	2913.3	2923.5	
CO Reference	2500 - 4800 mV	mV	2444.3	2421.4	
MR Ratio	1.2 +/- 0.5		1.18	1.21	
Sample Pressure	26 - 30 in-Hg-A	in-Hg-A	29.1	29	
Sample Flow	720 - 880 cc/min	cc/min	890	866	
Sample Temp	44 - 62 deg.C	deg.C	50.3	50.4	
Bench Temp	47 - 49 deg.C	deg.C	48	48	
Wheel Temp	66 - 70 deg.C	deg.C	66.3	68.4	
Box Temp	27 - 50 deg.C	deg.C	35.2	35.1	
PHT drive	250 - 4750 mv	mV	3323.4	3353.6	
Slope	0.800 - 1.200		1.051	1.112	
Offset	0.05 +/- 0.2		0.088	0.088	
Gas Test Response					
Zero Gas	0	PPM	1.5	0.2	
Span Gas	45	PPM	47.8	44.2	± 5% of Range

Validation By : _____

Korakot Ruangsri

Approve By : _____

Date: 1-Oct-25

Date: 1-Oct-25

ประกาศใช้ 01/08/2568

CO Analyzer Verification Test Report

Page:1/2

Validation Report No.: API-6810003

Validation Date: 1-Oct-25

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: CO Analyzer Model: 300T	Manufacturer API SIN: 99
---	-----------------------------

Calibration System

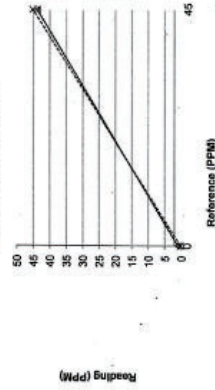
Calibrator Unit Dilutor Model ESA MGC101 SIN: 792 ZERO AIR Generator ZAG7001 SIN: 844	Standard Gas NOx Conc 45.30 PPM NO Conc 45.30 PPM SO2 Conc 45.05 PPM CO Conc 4628 PPM Expire Date: OCT 23,2027 EB0170003
---	---

Environment: Temperature 25.9 °C Humidity 60 %RH

Validation Report

Status	Reference (ppm)	Reading (ppm)	Drift (ppm)	Span Reference (ppm)	Span Reading (ppm)	Drift%
Before	0.0	0.38	1.0	45.0	43.9	-1.2
After	0.0	0.22	0.2	45.0	45.2	0.2

Single Point Validation Chart



ประกาศใช้ 01/08/2568

FN-SVM-05-10 Rev.00

Validation Report No.: API-6810003

Validation Date: 1-Oct-25

☒ PM ☐ Onsite

Detail	Range	Unit	Before	After	Note
Date	1-Oct-25				
Time	11:00				
Range	0.1-1000 PPM	PPM	50	50	
Stability	(0.1-2PPB)	ppb	0.73	1.11	
CO Measure	2500 - 4800 MV.	mV	2913.3	2823.5	
CO Reference	2500 - 4800 MV.	mV	2444.3	2421.4	
MIR Ratio	1.2 +/- 0.5		1.18	1.21	
Sample Pressure	28 - 30 In-Hg-A	In-Hg-A	28.1	29	
Sample Flow	720 - 880 cc/min	cc/min	860	866	
Sample Temp	44 - 52 deg.C	deg.C	50.3	50.4	
Bench Temp	47 - 49 deg.C	deg.C	48	48	
Wheel Temp	66 - 70 deg.C	deg.C	68.3	68.4	
Box Temp	27 - 50 deg.C	deg.C	35.2	35.1	
PHIT drive	250 - 4750 mV.	mV	3323.4	3353.6	
Slope	0.600 - 1.200		1.051	1.112	
Offset	0.05 +/- 0.2		0.088	0.088	
Gas Test Response					
Zero Gas	0	PPM	1.0	0.2	
Span Gas	45	PPM	43.9	45.2	± 5% of Range

Validation By : [Redacted]

Approve By : [Redacted]

Date:

1-Oct-25

Date:

1-Oct-25



ประกาศใช้ 01/08/2568

NOx Analyzer Verification Test Report

Page:1/2

Validation Report No.: API-6810003

Validation Date: 1-Oct-25

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: NO/NO2/NOx Analyzer	Manufacturer API
Model: T200	SIN: 2469

Calibration System

Dilutor Model ESA MSG101	Standard Gas
SIN: 792	NO Conc 45.30 PPM
ZERO AIR Generator ZAG7001	NO Conc 45.30 PPM
SIN: 644	SO2 Conc 45.05 PPM
	CO Conc 4528 PPM
	Expire Date: OCT 23 2027
	EB0170003

Environment: Temperature 24.9 °C Humidity: 60 %RH

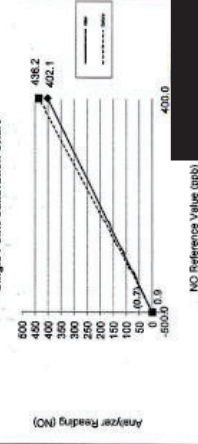
Validation Check (Before adjust)

Zero				
GAS	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Drift%
NO	-0.95	0.0	-1.0	-4.3
NO ₂	-0.22	0.0	-0.2	0.1
NOx	-0.73	0.0	-0.7	4.3

Validation Check (After adjust)

Span				
GAS	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Drift%
NO	0.42	0.0	0.4	0.0
NO ₂	0.49	0.0	0.5	0.0
NOx	0.81	0.0	0.9	0.3

Single Point Calibration Chart



ประกาศใช้ 01/08/2568

NOx Analyzer Verification Test Report

Page:1/2

Validation Report No.: API-8810005

Validation Date: 1-Oct-25

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: NONOX2NOx Analyzer Model: T200	Manufacturer API SIN: 2470
--	-------------------------------

Calibration System

Calibrator Unit Dilutor Model ESA MGC101 SIN: 792	Standard Gas NOx Conc 45.30 PPM NO Conc 45.30 PPM SO2 Conc 45.05 PPM CO Conc 4526 PPM Expire Date: OCT 23,2027 E80170003
ZERO AIR Generator ZAG7001 SIN: 644	

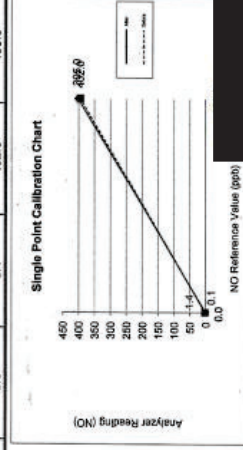
Environment: Temperature 24.9 °C Humidity 60 %RH

Validation Check (Before adjust)

Zero				
GAS	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Drift%
NO	0	0.0	395.0	-0.6
NO ₂	1.4	0.0	0.0	0.0
NOx	1.4	0.0	395.0	-0.6

Validation Check (After adjust)

Span				
GAS	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Drift%
NO	0.3	0.0	0.3	0.4
NO ₂	0.2	0.0	0.2	-0.1
NOx	0.1	0.0	0.1	0.2



ประกาศใช้ 01/08/2568

FN-SVM-05-08 Rev.00

Page:2/2

Validation Report No.: API-8810005

Validation Date: 1-Oct-25

☒ PM ☐ Onsite

Analyzer Signal Values				
Date	1-Oct-25	Time	14:14	
Power Supplies				
Option	-13.52	mV	+5 V Sensor	4.99
+3.3 V	3.3	V	+24 V	23.96
+5 V	11.88	V	+5 V	4.99
+12 V	3974.3	mV	+24V	2.4
+4 V	927.4	mA		
Optical Bench				
Dark PM sig.	0.0	mV	PM NO sig.	84.28
PM Max sig.	107.0	mV	PM Ny sig.	86.71
Sample				
Chamber T	60	deg.C	Internal Temp.	33.33
Chamber P	1720.8	hPa	PM T.	1.46
Flow	47.21	Nlh	Sample Pr.	993.2
				hPa

Validation By: [Redacted]

Date: 1-Oct-25

Approve By: [Redacted]

Date: 1-Oct-25

neediss
Nearliss Supply Instrument Co.,Ltd.

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 8 July, 2025

Certification No. 33225

Page : 1 of 6

Object : เครื่องมือวัดอุตุนิยมวิทยา

Manufacturer : NovaLynx

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

Serial No. : EWSNV110WS2506

Customer :

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1006.6 hPa

NATIONAL STANDARD WIND TUNNEL : Vane Angel Bench Stand Model 18112

: Micromanometer Theodor Friedrichs FC014 Serial No. 8310119 : HOOK GAGE NO 1425

N.I.S.T. Test Reference Number 731241460 : Standard Velocity at 20 - 30 m/sec

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

Serial Number 110730029 (sensor 120620586)

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

STANDARD THERMOMETER : Theodor Friedrich : Dry No.8350/94 Wet No. 8369/94

Thermochamber Model No. Q483 : Instr. Instr. EWS Serial No. 02640057

The Result of Calibration

Sensor model EWSNV110WS2506

Certification No. 33225

8 July, 2025

Page : 2 of 6

Standard	HOOK GAGE NO. 1425		TESTED ANEMOMETER	
	Pressure Inches H2O	Vacuum Inches H2O	Velocity m/sec	Correction m/sec
Ultrasonic Anemometer				
m/sec				
1.00	-	-	0.8	0.20
3.02	-	-	3.0	0.02
5.00	-	-	4.9	0.10
7.04	-	-	7.0	0.04
9.02	-	-	9.0	0.02
11.01	-	-	10.1	0.91
13.01	-	-	13.0	0.01
15.01	-	-	15.1	-0.09
17.02	-	-	17.0	0.02
20.02	-	-	20.1	-0.08

Vane Angel Bench Stand Model 18112

Young Meteorological Instruments

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



The Result of Calibration

Sensor model EWSNV110WS2506
Certification No. 332/25
8 July, 2025 Page : 3 of 6

Standard Barometer	Tested Barometer	Correction
Pressure	Pressure	
1011.60	1012.52	-0.92
1011.24	1012.05	-0.81
1010.88	1011.64	-0.78
1010.21	1011.03	-0.82
1009.82	1010.64	-0.82
1009.45	1010.25	-0.80
1009.06	1010.02	-0.96
1008.83	1009.61	-0.78
1008.43	1009.12	-0.69
1008.22	1009.14	-0.92
1007.75	1008.61	-0.86
1007.37	1008.15	-0.77
1007.17	1008.15	-0.98
1006.84	1007.79	-0.95
1010.63	1011.61	-0.98
1010.09	1010.86	-0.76
1009.77	1010.63	-0.86
1008.97	1008.86	-0.91
1008.24	1008.13	-0.89
1007.23	1008.06	-0.83
Average		



The Result of Calibration

Sensor model EWSNV110WS2506
Certification No. 332/25
8 July, 2025 Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.7	46.0	-0.3
30.4	30.5	-0.1
15.6	15.7	-0.1





The Result of Calibration

8 July, 2025 Sensor model EWSNV110WS2507 Certification No. 333/25 Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor	
	Reading % R.H.	Correction % R.H.
67.5	92	-4.5
63.2	67	-3.8
45.1	47	-1.9



Date of Issue 8 July, 2025

Certification No. 333/25

Page: 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ชื่อ Davis Instruments แบบ TIPPING BUCKET Product No. [REDACTED] ทำการสอบเทียบกับแก้ววัดฝน แบบแก้ววง GAUGE DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA LONDON No. 71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (0.2 mm./TIP)



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0152

MTC No. EEL-BP. 65/0168

Submitted by

Address

Calibrated at

Instrument Calibrated :

Description : Acoustic Calibrator

Manufacturer : Pulsar

Model : 103

Serial No. : 98971

Ambient Environment

Temperature : (23 ± 3) °C

Relative Humidity : (50 ± 15) %

Ambient Pressure : (101.325 ± 1.500) kPa

Standards used :

1. Digital Function Synthesizer NF Electronic DF-193A SN 122037.

2. Measuring Amplifier Brüel&Kjær 2636 SN 1537484.

3. Programmable Attenuator Tunagawa TPA-303A SN OF 2214.

4. Digital Multimeter Agilent 34401A SN NY44005560.

5. Pressure Transmitter Vaisala PTB202AD SN T0650001.

6. Audio Analyzer Panasonic VP-7722A SN 041477D122.

7. Condenser Microphone B&K 4180 SN 2889871.

Calibration Procedure:

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

Date of Calibration

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-68/0152

MTC No. EEL-BP. 65/0168

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 I
1/2 inch Brüel&Kjær 4180	93.93	-0.07	± 0.10	±0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class I
1/2 inch Brüel&Kjær 4180	1000.4	0.4	± 1.5	±1.0%

3. Total distortion

Standard Microphone Type	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class I
1/2 inch Brüel&Kjær 4180	1.40	± 0.50	±3.0%

Note :

The calibrator pressure correction was not included.

The microphone volume correction was not included.

Date of Calibration

2 / 3

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

Request No. 21-680152

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

MTC No. EEL. BP. 65/0168

Nominal Output of Unit Under Test = 114 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 Briel&Kjaer 4180	114.01	0.01	± 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 Briel&Kjaer 4180	1000.3	0.3	± 1.5	±3.0%

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 1
1/2 inch Briel&Kjaer 4180	2.05	± 0.50	±3.0%

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphones volume correction was not included.

Calibrated by : [Redacted]

[Redacted]

Date of Calibration : 17 Jan. 2025

Date of Issue : 20 Jan. 2025

End of Certificate

Industrial Metrology and Testing Service Centre

Ref : 201126801000116001

3 / 3

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

FNBL-MTC-002 Rev.5

เอกสารผลการสอบเทียบเครื่องมือตรวจวัด
สถานีรถไฟฟ้าช่องนนทรี (อาคารโดมอันทาวเวอร์)
สถานีรถไฟฟ้าศาลาแดง (สถานีอาคารหอแว่น)
ครั้งที่ 4/2568
ตรวจวัดวันที่ 2-7 เมษายน 2569

TSP High Volume Sampler Calibration

Verification Report No.
SO2500304-E001-TSP 01

☐ PM

☒ Onsite

Site: สถานี BTS บางซื่อ

UTM: N 1516175 E 655348

Sampler: TSP9037

Recorder: ECHAM00031072

Date: 3 Dec 25

Technical Approval:

Barometric Press. (hPa): 1007.5

Temperature (deg C): 32.0

Corrected Avg. Press. (mm Hg): 755.8

Average Temp. (deg C): 30.0

Barometric Press. (hPa): 1007.4

Temperature (deg C): 32.0

Corrected Avg. Press. (mm Hg): 755.9

Average Temp. (deg C): 30.0

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 2057

Qtd Scope: 2.06933

Qtd Intercept: -0.02815

Date Certified: 4 Mar 25

Due Date: 03-Mar-26

Phase or Test #

H2O (in)

Qtd (m3/min)

I (chart)

IC (corrected)

LINEAR REGRESSION

1

10.10

1.527

54.0

53.23

40.7713

2

8.50

1.402

50.0

49.28

-7.7453

3

6.20

1.200

44.0

43.37

0.9937

4

4.30

1.001

34.0

33.51

5

2.40

0.752

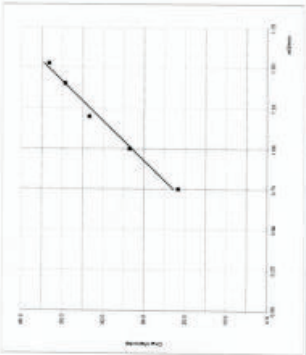
22.0

21.68

of Observations: 5

Range of Chart: 38

at 1.1 - 1.7 m3/min: 62



Calibrated by:

Approved by:

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วันที่ 11/09/2568

ภาควิชาวิทยาศาสตร์สิ่งแวดล้อม คณะสิ่งแวดล้อม วิทยาลัยเกษตรศาสตร์

TSP High Volume Sampler Calibration

Verification Report No.
SO2500304-E001-TSP 02

☐ PM

☒ Onsite

Site: สถานี BTS บางซื่อ

UTM: N 1517744 E 655365

Sampler: TSP9037

Recorder: ECHAM01635607

Date: 3 Dec 25

Technical Approval:

Barometric Press. (hPa): 1007.4

Temperature (deg C): 32.0

Corrected Avg. Press. (mm Hg): 755.9

Average Temp. (deg C): 30.0

Barometric Press. (hPa): 1007.4

Temperature (deg C): 32.0

Corrected Avg. Press. (mm Hg): 755.9

Average Temp. (deg C): 30.0

Brand: Tisch Environmental, Inc

Model: TE-5025A

Serial#: 2067

Qtd Scope: 2.06933

Qtd Intercept: -0.02815

Date Certified: 4 Mar 25

Due Date: 03-Mar-26

Phase or Test #

H2O (in)

Qtd (m3/min)

I (chart)

IC (corrected)

LINEAR REGRESSION

1

12.20

1.677

56.0

55.19

Slope = 33.7515

2

9.60

1.469

52.0

51.25

Intercept = 0.1752

3

8.40

1.219

44.0

43.37

Corr. coeff = 0.9937

4

6.20

1.001

34.0

33.51

5

2.20

0.720

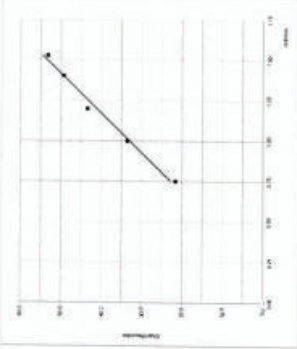
24.0

23.65

of Observations: 5

Range of Chart: 38

at 1.1 - 1.7 m3/min: 58



Calibrated by:

Approved by:

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วันที่ 11/09/2568

พ5-63

PM10 High Volume Sampler Calibration

Verification Report No.
SO250304-E001 -PM 01

PM ☐ Ovale
Site: 40-0 BTS สถานี
UTM: N 1518175 E 605048
Sampler: EPM1040
Recorder: ECHD5019075270
Date: 3 Dec 25
Technical Approval: [Signature]

CONDITIONS

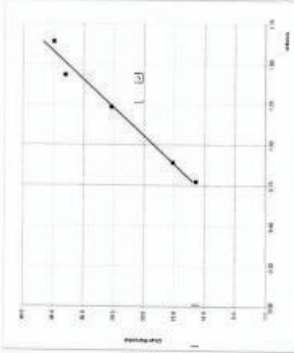
Barometric Press. (hPa): 1007.5
Corrected Pressure (mm Hg): 755.7
Temperature (deg C): 32.0
Average Press. (hPa): 1013.0
Average Temp. (deg C): 30.0

CALIBRATION ORIFICE

Brand: Tech Environmental, Inc
Model: TE-4025A
Serial#: 2067
Scope: 1.29578
Intercept: -0.01772
Date Certified: 4 Mar 25
Due Date: 3 Mar 26

CALIBRATIONS

Plate or Test #	H ₂ O (in)	Q _a (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	11.00	1.640	56.0	34.94	Slope = 28.5429
2	8.40	1.435	52.0	33.04	Intercept = -10.9803
3	8.20	1.234	40.0	25.41	Cur. coef. = 1.000
4	3.20	0.891	24.0	15.25	SFR = 1.000
5	2.40	0.773	18.0	11.44	SSP = 29.06
# of Observations					5
Range of Chart at SFR ±10%					25 33



Calibrated by: [Signature]

Approved by: [Signature]

วันที่ 15 ธันวาคม 2568

PM10 High Volume Sampler Calibration

Verification Report No.
SO250304-E001 -PM 02

PM ☐ Ovale
Site: 40-0 BTS สถานี
UTM: N 1517744 E 605365
Sampler: EPM1041
Recorder: ECHD5019027165
Date: 3 Dec 25
Technical Approval: [Signature]

CONDITIONS

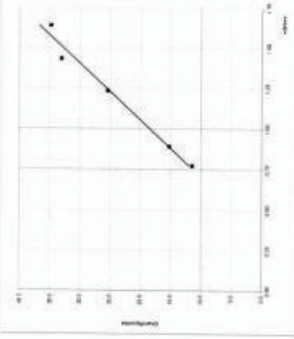
Barometric Press. (hPa): 1007.4
Corrected Pressure (mm Hg): 755.6
Temperature (deg C): 32.0
Average Press. (hPa): 1013.0
Average Temp. (deg C): 30.0

CALIBRATION ORIFICE

Brand: Tech Environmental, Inc
Model: TE-4025A
Serial#: 2067
Scope: 1.29578
Intercept: -0.01772
Date Certified: 4 Mar 25
Due Date: 3 Mar 26

CALIBRATIONS

Plate or Test #	H ₂ O (in)	Q _a (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	12.80	1.768	56.0	35.58	Slope = 24.5573
2	10.40	1.595	54.0	34.31	Intercept = -6.1756
3	7.30	1.338	43.0	27.32	Cur. coef. = 0.9902
4	4.40	1.042	32.0	20.33	SFR = 1.000
5	2.70	0.819	20.0	12.71	SSP = 28.92
# of Observations					5
Range of Chart at SFR ±10%					26 32



Calibrated by: [Signature]

Approved by: [Signature]

วันที่ 15 ธันวาคม 2568

Verification Test Report

Report No.: SO2500304-E001 / 001
Verification Date : 03 December 2025

Operate Information ☐ PM ☒ Onsite

Site : สถานี BTS ศาลาแดง

GPS coordinates : 47P N 1518175 E 665648

Instrument Information

Equipment : Sound Level Meter

Manufacturer : Pulsar

Model : 44

Serial No : 1977

Scale Rang : 20dB-140dB

Class : 2

Reference Standard

Standard : Acoustic Calibrator Manufacturer : Pulsar Model : 103 S/N : 98971

Certificate No. : EEL BP 65/0168

Date due : 17 January 2026

Traceability : TISTR

Ambient Condition : Temperature 32.60 °C Relative humidity 54.20 %

Atmospheric pressure 1013.3 hpa

Measurement Data

Reference Value (dB)	Correction Value (dB)	Adjustment (dB)	UUR Reading		Error (dB)	Acceptant Criteria (dB)
			Initial	Final		
93.93	-0.3	93.63	93.87	94.03	0.16	±1.0

* UUR = Unit Under Reference flow

Acceptant Criteria : Sound Level Meter Class 1 ±0.5 dB

Sound Level Meter Class 2 ±1.0 dB

Calibrated By: [Redacted]

Approve By: [Redacted]

Date : 03 December 2025

Date : 03 December 2025

The Results shown in this verification report refer only to the equipment used in this verification.
This Calibration Certificate cannot be reproduced, except in full.

ประกาศใช้ 01/08/2568

Rev.00

Verification Test Report

Report No.: SO2500304-E001 / 001
Verification Date : 03 December 2025

Operate Information ☐ PM ☒ Onsite

Site : สถานี BTS ชลบุรี

GPS coordinates : 47P N 1517744 E 665365

Instrument Information

Equipment : Sound Level Meter

Manufacturer : Pulsar

Model : 44

Serial No : 2205

Scale Rang : 20dB-140dB

Class : 2

Reference Standard

Standard : Acoustic Calibrator Manufacturer : Pulsar Model : 103 S/N : 98971

Certificate No. : EEL BP 65/0168

Date due : 17 January 2026

Traceability : TISTR

Ambient Condition : Temperature 32.60 °C Relative humidity 54.20 %

Atmospheric pressure 1013.3 hpa

Measurement Data

Reference Value (dB)	Correction Value (dB)	Adjustment (dB)	UUR Reading		Error (dB)	Acceptant Criteria (dB)
			Initial	Final		
93.93	0	93.93	93.27	93.09	-0.18	±1.0

* UUR = Unit Under Reference flow

Acceptant Criteria : Sound Level Meter Class 1 ±0.5 dB

Sound Level Meter Class 2 ±1.0 dB

Calibrated By: [Redacted]

Approve By: [Redacted]

Date : 03 December 2025

Date : 03 December 2025

The Results shown in this verification report refer only to the equipment used in this verification.
This Calibration Certificate cannot be reproduced.

ประกาศใช้ 01/08/2568

Rev.00

รายงานการติดตามตรวจสอบคุณภาพสิ่งแวดล้อมประจำปี 2568
โครงการระบบขนส่งมวลชนกรุงเทพมหานคร (ครั้งที่ 2)

บริษัท ระบบขนส่งมวลชนกรุงเทพ จำกัด (มหาชน)

Certificate of Calibration

Calibration Certification Information			
Cal. Date:	March 4, 2025	Roommeter S/Ni:	438320
Operator:	Jim Tisch	Ta:	294
Calibration Model #:	TE-5025A	Pa:	746.0
			mm Hg
		Calibrator S/Ni:	2067
			K

Run	Vol. Init (m3)	Vol. Final (m3)	ΔVol. (m3)	ΔTime (min)	ΔP (mm Hg)	ΔH (in H2O)
1	1	2	1	1.4220	3.2	2.00
2	3	4	1	1.0090	6.4	4.00
3	5	6	1	0.9030	8.0	5.00
4	7	8	1	0.8510	8.8	5.50
5	9	10	1	0.7090	12.8	8.00

Data Tabulation			
Void (m3)	Quid (Pa-ΔP) (Pa)	√ΔH (Pa-ΔP) (Pa)	Qa (Pa-ΔP) (Pa)
0.9907	0.6967	1.4106	0.9957
0.9864	0.9716	1.9949	0.9914
0.9843	1.0900	2.3304	0.9893
0.9832	1.1419	2.3393	0.9882
0.9779	1.3792	2.8212	0.9828
QA	2.06933	QA	1.39578
QA	-0.02815	QA	-0.01772
QA	0.99997	QA	0.99997

Calculations	
Void= (ΔVol(Pa-ΔP)/Pa) (Pa)	Va= (ΔVol(Pa-ΔP)/Pa) (Pa)
Qa= Void/ΔTime	Qa= Va/ΔTime
For subsequent flow rate calculations:	
Qstd= 1/m (√ΔH (Pa-ΔP) (Pa))	Qa= 1/m (√ΔH (Pa-ΔP) (Pa))

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

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

www.tisch-env.com
TOLL FREE: (877)263-76
FAX: (513)467-9

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, 9.3.17, page 30

Certificate of Calibration

Certificate No.: 68-200034-1 Page: 1 of 2

Submitted by:

Equipment:

Electronic Balance

Manufacturer: Sartorius
Model: SECURA224-1S
Serial No.: 0034803270
ID No.: ELABBALANCEN04
Capacity: 220 g
Resolution: 0.0001 g

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

Ambient Temperature: (20.4 to 21.0) °C

Relative Humidity: (41.9 to 42.9) %

Air Pressure: 1014.0 mbar

Date of Received: 28 January 2025

Date of Calibration: 28 January 2025

Date of Issue: 30 January 2025

Calibrated by: Akangadith Thirupichai

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. E261-E2624

Cert. No. C02342009

Due Date 07 Nov 2025

Traceability National Institute of Metrology (Thailand), (NIMT)

Approved by:



Verification/Calibration Test Report

Report No.: APH-6812006
Verification Date: 01 December 2025
Page: 1/2

Operate Information ☒ PM ☐ Onsite

Site: Enviro Co., Ltd.

GPS coordinates: 47P N 1514454 E 654233

Instrument Information

Equipment: CO Analyzer

Model: CO12e

Manufacturer: ESA

Serial No: 1204

Reference Standard

Standard Gas		Calibrator Unit	
Cylinder No:	EB0170003	ZERO AIR Generator	Model: ZAG7001
Certificate No:	2015 FQ.G		SN: 844
Date Due:	OCT 23,2027	Dilutor	Model: ESA MGC101
Traceability:	Air Liquide		SN: 712

Ambient Condition: Temperature 25.00 °C Relative humidity 56.30 %
Atmospheric pressure 1011.0 hpa

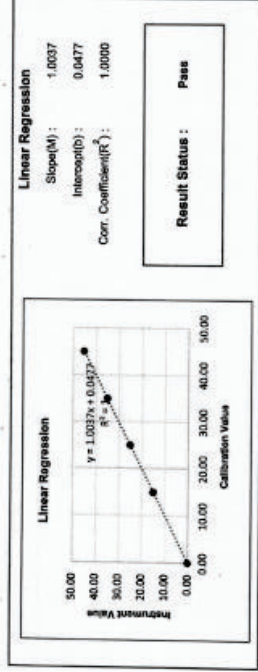
Measurement Data

Calibration Gas Level	Zero Conc. (Indicate Unit) ☐ ppb ☒ ppm	Level 1 Conc. (Indicate Unit) ☐ ppb ☒ ppm	Level 2 Conc. (Indicate Unit) ☐ ppb ☒ ppm	Level 3 Conc. (Indicate Unit) ☐ ppb ☒ ppm	Level 4 Conc. (Indicate Unit) ☐ ppb ☒ ppm
Calibrator Value (X)	0.00	15.00	25.00	35.00	45.00
	0.15	15.11	25.14	35.12	45.05
	0.14	14.97	25.14	35.09	45.55
Instrument Value (Y)	0.13	14.97	25.14	34.99	45.55
	0.13	14.97	25.10	35.12	44.99
	0.15	14.99	25.14	35.12	44.99
Ins Value Average	0.14	15.00	25.13	35.09	45.33
Best Fit Concentration (Y=mx+b)		15.10	25.14	35.16	45.22
Point Difference(Best Fit - Average)		0.10	0.01	0.09	-0.11
Percent difference (Best fit vs Ins.(Y) Value		-0.67%	-0.04%	-0.26%	0.24%
Result Status (Pass/Fail)		Pass	Pass	Pass	Pass

Note:

1. Calibrator Value(X) is concentration points were evenly spaced across that range, with the highest test concentration generated approximately 80% full scale.
2. Instrument Value(Y) is Concentration values from instrument. The worksheet allow

เอกสาร 01/08/2568



Acceptance Criteria

For the gaseous pollutants, the calibration (including the multi-point verification) is considered acceptable if all test concentrations fall within 2%, or an absolute difference of 1.5 ppb for O₃, SO₂ and NO₂ and 0.03 ppm for CO, of the calibration scale, best-fit straight line. Which acceptance criteria (percent or absolute difference) is used depends on the concentration of the calibration points. It is also recommended that the slope is within ± 0.05 . See QA Handbook for Air Pollution Measurement Systems Volume II Ambient Air Quality Monitoring Program

Calibrated By

neediss
Supply Instrument & Service

By :

Date : 01 December 2025

Date : 01 December 2025

The Results shown in this verification report refer only to the equipment verification unless otherwise stated
This Calibration Certificate cannot be reproduced, except in full, without permission of company.

** End Verification/Calibration Test Report **

วันที่ 01/08/2568

Verification/Calibration Test Report

Report No.: APF-6812007
Verification Date : 01 December 2025
Page : 1/2

Operate Information ☒ PM ☐ Ozone

Site :
GPS coordinates : 47P N 1514454 E 654233

Instrument Information
Equipment : CO Analyzer
Model : CO12a

Manufacturer : ESA
Serial No : 1205

Reference Standard

Standard Gas	Calibrator Unit
Cylinder No : EB0170003	Model : ZAG7001
Certificate No : 2015 FO.G	SIN : 644
Date Due : OCT 23,2027	Model : ESA MOC101
Traceability : Air Liquide	SIN : 792

Ambient Condition : Temperature 25.00 °C Relative humidity 56.30 %
Atmospheric pressure 1011.0 hpa

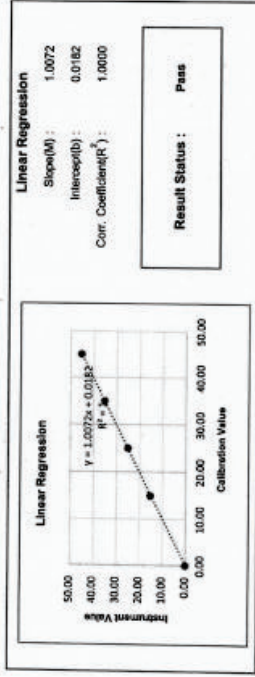
Measurement Data

Calibration Gas Level	Zero Conc. (Indicate Unit) ☐ ppb ☒ ppm	Level 1 Conc. (Indicate Unit) ☐ ppb ☒ ppm	Level 2 Conc. (Indicate Unit) ☐ ppb ☒ ppm	Level 3 Conc. (Indicate Unit) ☐ ppb ☒ ppm	Level 4 Conc. (Indicate Unit) ☐ ppb ☒ ppm
Calibrator Value (X)	0.00	15.00	25.00	35.00	45.00
Instrument Value (Y)	0.15	15.11	25.14	35.42	45.55
	0.14	14.97	25.14	35.42	45.55
	0.13	14.97	25.10	35.12	45.54
	0.11	14.89	25.14	35.42	45.55
Ins. Value Average	0.13	15.00	25.13	35.26	45.43
Best Fit Concentration (Y=Me+b)	15.13	25.20	35.27	45.34	
Point Difference(Best Fit - Average)	0.12	0.07	0.01	-0.08	
Percent difference (Best Fit vs Ins.(Y) Value)	-0.82%	-0.26%	-0.02%	0.18%	
Result Status (Pass/Fail)	Pass	Pass	Pass	Pass	Pass

Note :

1. Calibrator Value(X) is concentration points were evenly spaced across the range with the highest test concentration generated approximately 80% full scale.
2. Instrument Value(Y) is Concentration values from instrument. The worksheet

วันที่ 01/08/2568



Acceptance Criteria

For the gaseous pollutants, the calibration (including the multi-point verification) is considered acceptable if all test concentrations fall within 2%, or an absolute difference of 1.5 ppb for O₃, SO₂ and NO₂ and 0.03 ppm for CO of the calibration scale, best-fit straight line (which acceptance criteria (percent or absolute difference) is used depends on the concentration of the calibration points. It is also recommended that the slope is within ± 0.05 . See QA Handbook for Air Pollution Measurement Systems Volume II Ambient Air Quality Monitoring Program



Calibrated By: [Redacted]

Date :

Date : 01 December 2025

The Results shown in this verification report refer only to the equipment verification unless otherwise stated
This Calibration Certificate cannot be reproduced, except in full, without permission of company.

** End Verification/Calibration Test Report **

หมายเลข 01/08/2568

Verification/Calibration Test Report

Report No.: ESA-6612004

Verification Date : 01 December 2025

Page : 1/2

Operate Information ☒ PM ☐ Onsite

Site : [Redacted]

GPS coordinates : 47P N 1514434 E 654233

Instrument Information

Equipment : NO2 Analyzer

Manufacturer : ESA

Model : AC320

Serial No : 2401

Reference Standard

Standard Gas		Calibrator Unit	
Cylinder No :	EB9170003	Model :	ZAG7001
Certificate No :	2015 FQ.G	SIN :	644
Date Due :	OCT 23,2027	Model :	ESA MGC101
Traceability :	Air Liquide	Dilutor	SIN : 792

Ambient Condition : Temperature 25.00 °C Relative humidity 96.30 %

Atmospheric pressure 1011.0 hpa

Measurement Data

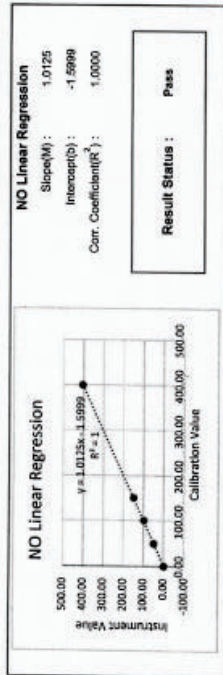
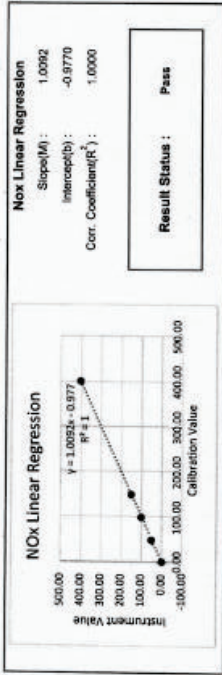
Calibration Gas Level	Zero Conc.		Level 1 Conc.		Level 2 Conc.		Level 3 Conc.		Level 4 Conc.	
	(Indicate Unit)	(Indicate Unit)	(Indicate Unit)	(Indicate Unit)	(Indicate Unit)	(Indicate Unit)	(Indicate Unit)	(Indicate Unit)	(Indicate Unit)	(Indicate Unit)
Calibrator Value (X)	ppb	ppm	ppb	ppm	ppb	ppm	ppb	ppm	ppb	ppm
	Nox	NO	Nox	NO	Nox	NO	Nox	NO	Nox	NO
Instrument Value (Y)	0.00	0.00	50.00	50.00	100.00	100.00	150.00	150.00	400.00	400.00
	0.11	-0.15	49.64	49.30	100.19	99.29	149.86	148.16	402.73	402.40
	0.12	-1.13	49.72	49.03	100.47	99.37	148.25	150.58	405.20	405.20
Ins Value Average	0.13	-1.13	49.51	49.28	99.92	99.06	147.43	149.42	403.1	403.1
	0.14	-0.47	49.11	49.57	100.39	99.08	147.61	152.44	402.50	402.40
Best Fit Concentration (Y=Me+by)	0.13	-0.80	49.89	49.30	99.66	99.72	148.68	149.73	403.38	403.80
	Point Difference(Best Fit - Average)	-0.20	-0.26	0.28	0.93	1.71	0.54	-0.69	-0.40	
Percent difference (Best Fit vs Ins.(Y) Value)		0.56%	-0.26%	-0.93%	-1.14%	-0.36%	0.17%	0.10%		
Result Status (Pass/Fail)		Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass

Note :

1. Calibrator Value(X) is concentration points were evenly spaced across that range generated approximately 80% full scale.

2. Instrument Value(Y) is Concentration values from instrument. The worksheet allow

หมายเลข 01/08/2568



Acceptance Criteria

For the gaseous pollutants, the calibration (including the multi-point verification) is considered acceptable if all test concentrations fall within 2%, or an absolute difference of 1.5 ppb for O₃, SO₂ and NO₂ and 0.03 ppm for CO of the calibration scale, best-fit straight line Which acceptance criteria (percent or absolute difference) is used depends on the concentration of the calibration points. It is also recommended that the slope is within ± 0.5 . See QA Handbook for Air Pollution Measurement Systems Volume II Ambient Air Quality Monitoring Program

Calibrated By:
Date : 01 December 2025

neediss
Supply Instrument Co., Ltd.

Approve By:
Date : 01 December 2025

The Results shown in this verification report refer only to the equipment verification unless otherwise stated
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-- End Verification/Calibration Test Report

รณชาติ 01/08/2568

Verification/Calibration Test Report

Report No.: ESA-8812006
Verification Date : 06 December 2025
Page : 1/2

Operator Information ☒ PM ☐ Ozone

Site :

GPS coordinates : 47P N 1514654 E 854233

Instrument Information

Equipment : NO2 Analyzer

Model : AC32e

Manufacturer : ESA

Serial No : 2403

Reference Standard

Standard Gas		Calibrator Unit	
Cylinder No :	EB0170003	ZERO AIR Generator	Model : ZAG7001
Certificate No :	2015 F.O.G		SIN : 644
Date Due :	OCT 23,2027	Dilutor	Model : ESA MGCW01
Traceability :	Air Liquide		SIN : 792

Ambient Condition : Temperature 25.00 °C Relative humidity 56.30 %

Atmospheric pressure 1011.0 hpa

Measurement Data

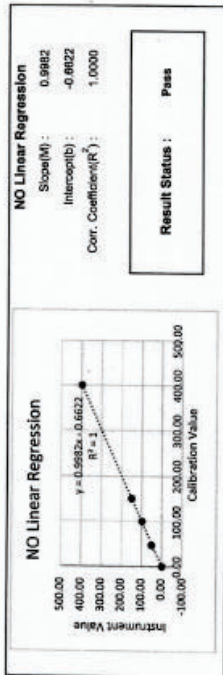
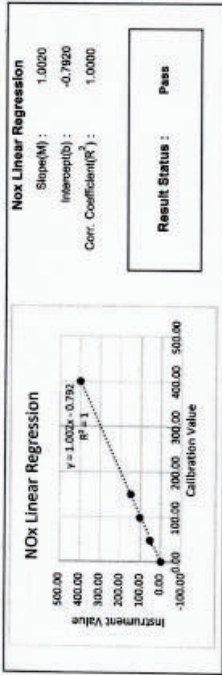
Calibration Gas Level	Zero Conc.		Level 1 Conc.		Level 2 Conc.		Level 3 Conc.		Level 4 Conc.	
	(Indicate Unit)	(Indicate Unit)	(Indicate Unit)	(Indicate Unit)	(Indicate Unit)	(Indicate Unit)	(Indicate Unit)	(Indicate Unit)	(Indicate Unit)	(Indicate Unit)
	ppb	ppm	ppb	ppm	ppb	ppm	ppb	ppm	ppb	ppm
Calibrator Value (X)	NOx	NO	NOx	NO	NOx	NO	NOx	NO	NOx	NO
	0.00	0.00	50.00	50.00	100.00	100.00	150.00	150.00	400.00	400.00
	-0.15	-0.15	49.84	49.30	100.19	98.29	148.08	148.16	402.73	397.31
Instrument Value (Y)	-1.13	-1.13	48.72	48.03	100.47	98.37	148.25	150.58	399.76	397.31
	-1.13	-1.13	49.51	49.28	98.82	96.66	147.43	149.42	398.27	398.05
	-1.13	-1.13	48.11	48.57	100.38	98.08	147.61	152.44	399.78	399.79
	-0.47	-0.47	50.46	50.32	98.42	96.19	151.27	147.07	400.45	398.79
In Value Average	-0.80	-0.80	48.88	49.30	99.68	98.72	148.69	149.73	400.20	398.45
Best Fit Concentration (Y=Max+b)	49.31	49.25	99.41	98.15	149.51	149.06	400.00	398.60		
Point Difference(Best Fit - Average)	-0.38	-0.05	-0.25	0.44	0.82	-0.87	-0.20	0.15		
Percent difference (Best Fit vs Ins.(Y) Value	0.77%	0.11%	0.25%	-0.44%	-0.55%	0.45%	0.05%	-0.04%		
Result Status (Pass/Fail)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass

Note :

1. Calibrator Value(X) is concentration points were evenly spaced across that range generated approximately 80% full scale.

2. Instrument Value(Y) is Concentration values from Instrument The worksheet also

รณชาติ 01/08/2568



Acceptance Criteria

For the gaseous pollutants, the calibration (including the multi-point verification) is considered acceptable if all test concentrations fall within 2%, or an absolute difference of 1.5 ppb for O₃, SO₂ and NO₂ and 0.03 ppm for CO of the calibration scale, best-fit straight line Which acceptance criteria (percent or absolute difference) is used depends on the concentration of the calibration points. It is also recommended that the slope is within ± 0.05 . See QA Handbook for Air Pollution Measurement Systems Volume II Ambient Air Quality Monitoring Program

Calibrated By: [Redacted]

Date : 06 December 2025

Date : 06 December 2025

The Results shown in this verification report refer only to the equipment verification unless otherwise stated
This Calibration Certificate cannot be reproduced, except in full, without permission of company.

*** End Verification/Calibration Test Report ***

วันที่ 01/08/2568

Verification/Calibration Test Report

Report No.: API-6812002
Verification Date : 01 December 2025
Page : 1/2

Operate Information ☒ PM ☐ OnSite

Site : [Redacted]
GPS coordinates : 47P N 1514454 E 654233

Instrument Information

Equipment : SO2 Analyzer
Model : T100
Manufacturer : API
Serial No : 20333

Reference Standard

Standard Gas		Calibrator Unit	
Cylinder No :	EB0170003	Model :	ZA07001
Certificate No :	2015 FO.G	SIN :	644
Date Due :	OCT 23,2027	Model :	ESA MGCI01
Traceability :	Air Liquide	SIN :	792

Ambient Condition : Temperature 25.00 °C Relative humidity 59.30 %
Atmospheric pressure 1011.0 hpa

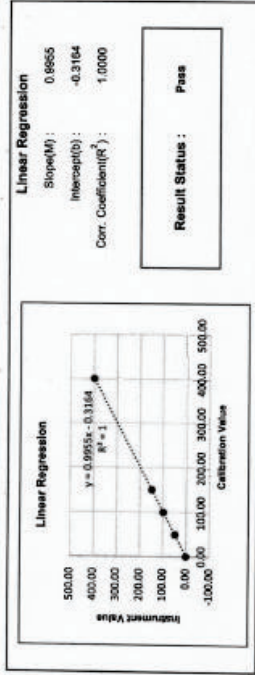
Measurement Data

Calibration Gas Level	Zero Conc. (Indicate Unit)	Level 1 Conc. (Indicate Unit)	Level 2 Conc. (Indicate Unit)	Level 3 Conc. (Indicate Unit)	Level 4 Conc. (Indicate Unit)
Calibrator Value (X)	0.00	50.00	100.00	150.00	400.00
Instrument Value (Y)	1.10	49.15	97.13	147.87	388.40
Ins Value Average	1.20	47.86	95.19	143.32	389.50
	1.20	48.98	99.19	149.32	397.10
	1.20	47.98	98.19	148.32	388.40
	1.20	48.82	96.12	149.11	388.40
	1.20	48.80	96.36	148.55	390.36
Best Fit Concentration (Y=Me+b)	49.40	99.23	149.01	197.89	
Point Difference(Best Fit - Average)	0.66	0.67	0.48	-0.47	
Percent difference (Best Fit vs Ins(Y) Value)	-1.33%	-0.86%	-0.31%	0.12%	
Result Status (Pass/Fail)	Pass	Pass	Pass	Pass	

Note :

1. Calibrator Value(X) is concentration points were evenly spaced across that range generated approximately 80% full scale.
2. Instrument Value(Y) is Concentration values from Instrument.The worksheet allow

วันที่ 01/08/2568



Acceptance Criteria

For the gaseous pollutants, the calibration (including the multi-point verification) is considered acceptable if all test concentrations fall within 2%, or an absolute difference of 1.5 ppb for O₃, SO₂ and NO₂, and 0.03 ppm for CO, of the calibration scale, best-fit straight line (Which acceptance criteria (percent or absolute difference) is used depends on the concentration of the calibration points. It is also recommended that the slope is within ± 0.05 . See QA Handbook for Air Pollution Measurement Systems Volume II Ambient Air Quality Monitoring Program

Calibrated By : 
neediss
Gas Supply Instrument Co., Ltd.
Approved By : 

Date : 01 December 2025

Date : 01 December 2025

The Results shown in this verification report refer only to the equipment verification unless otherwise stated
This Calibration Certificate cannot be reproduced, except in full, without permission of company.

** End Verification/Calibration Test Report **

หมายเลข 01/08/2568

Verification/Calibration Test Report

Report No. : AP-6811005

Verification Date : 01 November 2025

Page : 1/2

Operate Information ☒ PM ☐ Onsite

Site : 

GPS coordinates : 47P N 1514454 E 654233

Instrument Information

Equipment : SCZ Analyzer

Manufacturer : ESA

Model : AF22a

Serial No : 2485

Reference Standard

Standard Gas

Cylinder No : EB0170003

Certificate No : 2015 FO.G

Date Due : OCT 23,2027

Traceability : Air Liquide

Dilutor

Model : ZAG7001

SN : 844

Model : ESA MGC101

SN : 792

Ambient Condition : Temperature 25.00 °C Relative humidity 56.30 %

Atmospheric pressure 1011.0 hpa

Measurement Data

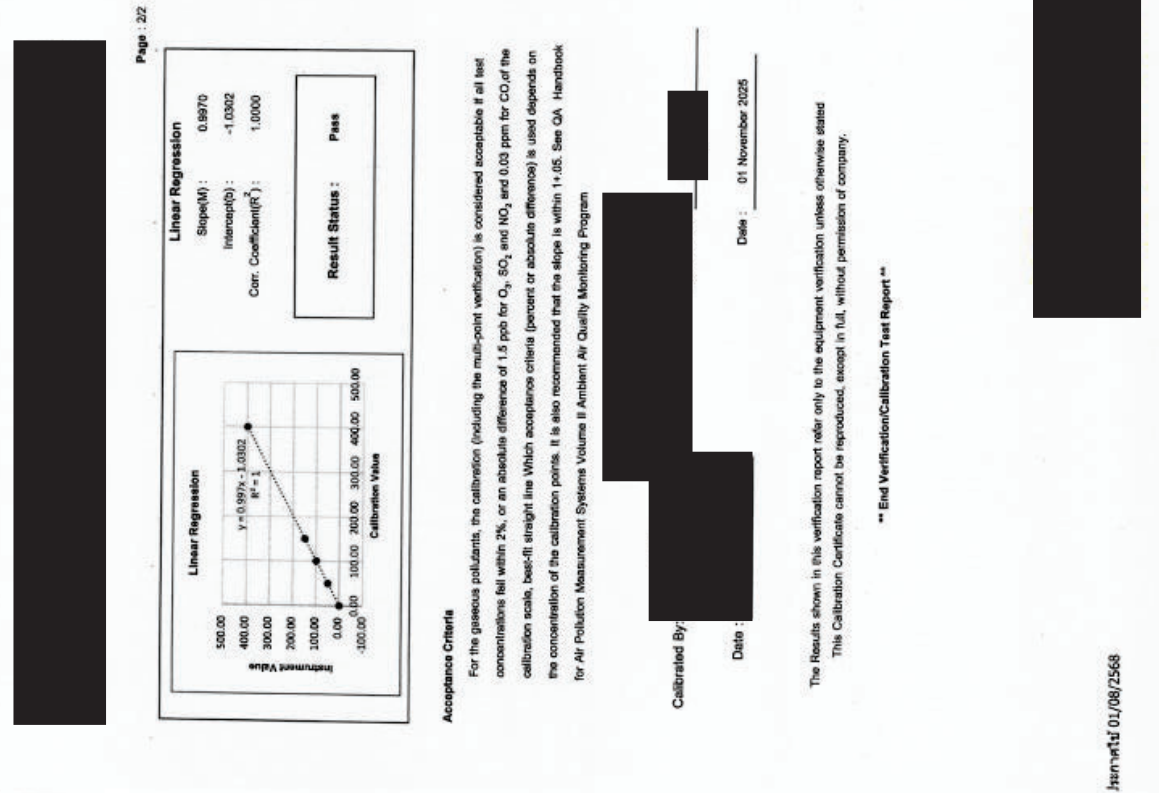
Calibration Gas Level	Zero Conc. (Indicate Unit) ☐ ppb ☐ ppm	Level 1 Conc. (Indicate Unit) ☒ ppb ☐ ppm	Level 2 Conc. (Indicate Unit) ☒ ppb ☐ ppm	Level 3 Conc. (Indicate Unit) ☐ ppb ☐ ppm	Level 4 Conc. (Indicate Unit) ☒ ppb ☐ ppm
Calibrator Value (X)	0.00	50.00	100.00	150.00	400.00
Instrument Value (Y)	-1.13	48.15	97.13	147.87	398.40
Ins Value Average	-1.13	49.96	98.19	148.32	398.50
Best Fit Concentration (Y=MX+b)	-1.13	47.98	98.19	148.32	397.10
Point Difference(Best Fit - Average)	-0.47	48.92	98.12	148.11	397.10
Percent difference (Best fit vs Ins(Y) Value)	-0.80	48.80	98.36	148.55	397.84
Result Status (Pass/Fail)	Pass	Pass	Pass	Pass	Pass

Note :

1. Calibrator Value(X) is concentration points were evenly spaced across that range, with the highest test concentration generated approximately 80% full scale.

2. Instrument Value(Y) is Concentration values from Instrument. The worksheet all

หมายเลข 01/08/2568



Request No.21-680152

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

MTC No. EEL. BP. 650168

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 I
1/2 inch Bruel&Kjaer 4180	93.93	-0.07	± 0.10	±0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class I
1/2 inch Bruel&Kjaer 4180	1000.4	0.4	± 1.5	±1.0%

3. Total distortion

Standard Microphone Type	Measured Total distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class I
1/2 inch Bruel&Kjaer 4180	1.40	± 0.50	±3.0%

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Date of Calibration17 Jan. 2025

2 / 3

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.

Request No.21-680152

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

MTC No. EEL. BP. 650168

Nominal Output of Unit Under Test = 114 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 I
1/2 inch Bruel&Kjaer 4180	114.01	0.01	± 0.10	±0.40 dB

2. Frequency

Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class I
1/2 inch Bruel&Kjaer 4180	1000.3	0.3	± 1.5	±3.0%

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class I
1/2 inch Bruel&Kjaer 4180	2.05	± 0.50	±3.0%

Note : 1. No adjustment.

2. The calibrator pressure correction was not included.

3. The microphone volume correction was not included.

Calibrated by :

Date of Calibration17 Jan. 2025

3 / 3

The results relate only to the items tested/calibrated or value assigned.

Advertising the Report/Certificate and publicity of the results except in full are prohibited unless written permission is obtained from the governor of TISTR.



The Result of Calibration

23 June, 2025
Sensor model EWSNV110WS2501 Certification No. 300/25
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Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading % R.H.	Correction % R.H.
86.4	93.3	-6.9
66.3	69.4	-4.1
42.2	44.6	-2.4



Date of Issue 23 June, 2025

Certification No. 300/25

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ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ชื่อ Davis Instruments แบบ TIPPING
BUCKET Product No. [REDACTED] ทำการสอบเทียบกับแก้ววัดฝน
แบบแก้ววง 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 23 June, 2025

Certification No. 301/25

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Object : เครื่องมือวัดอุณหภูมิ

Manufacturer : NovaLynx

Type : Data Logger 110-WS-26DL-D

Serial No. : EWSNV110WS2503

Customer :

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1006.6 hPa

NATIONAL STANDARD WIND TUNNEL : Vane Angel Bench Stand Model 18112

: Micromanometer Theodor Friedrich FC014 Serial No. 9310119 : HOOK GAGE NO 1425

N.I.S.T. Test Reference Number 731241460 : Standard Velocity at 20 - 30 m/sec

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

Serial Number 110730029 (sensor 120629586)

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

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

: Thermochrysler No.9188 : Serial No. 645 Serial No. 02948207

The Result of Calibration

Sensor model EWSNV110WS2503

Certification No. 301/25

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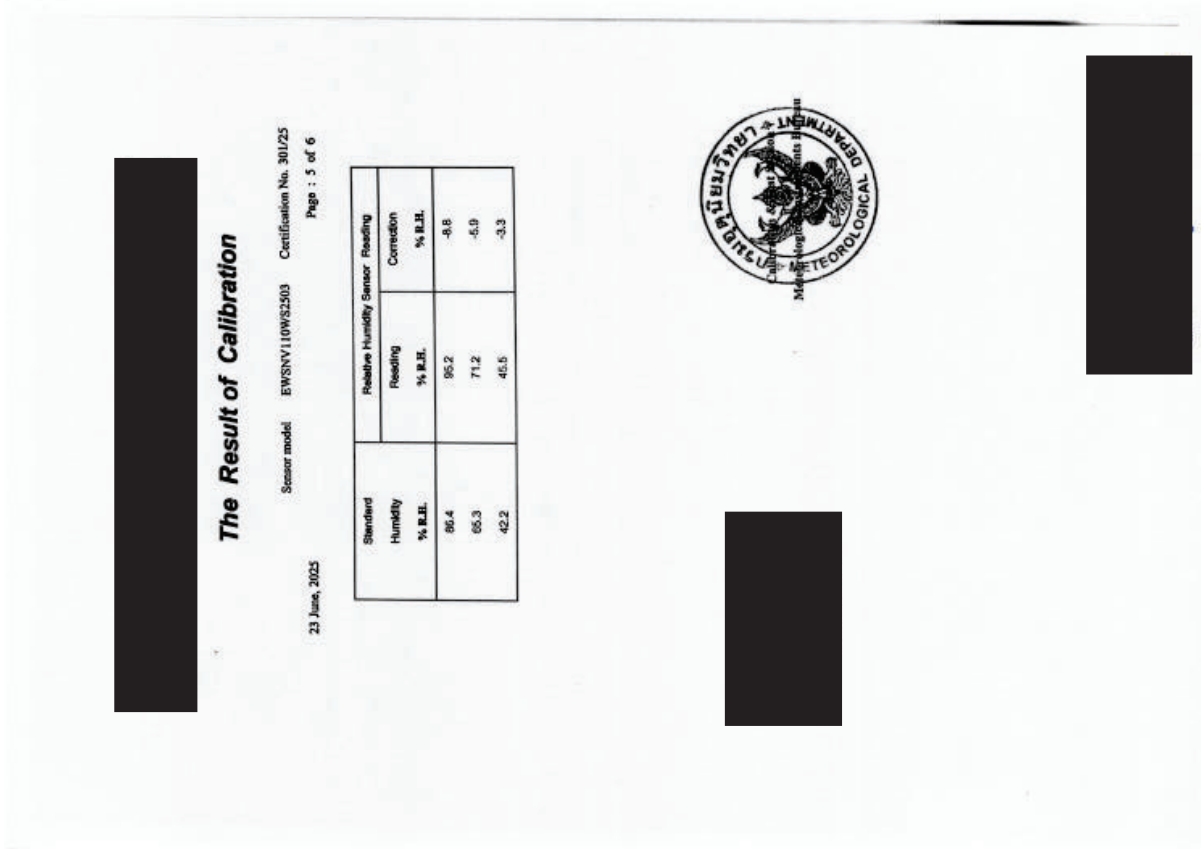
Standard	HOOK GAGE NO. 1425		TESTED ANEMOMETER	
	Pressure	Vacuum	Velocity	Correction
Ultrasonic Anemometer	inches H2O	inches H2O	m/sec	m/sec
1.00	-	-	0.3	0.70
3.02	-	-	2.4	0.62
5.00	-	-	4.3	0.70
7.04	-	-	6.8	0.24
9.02	-	-	8.8	0.22
11.01	-	-	11.1	-0.09
13.01	-	-	12.8	0.21
15.01	-	-	15.1	-0.09
17.02	-	-	16.8	0.22
20.02	-	-	20.1	-0.08

Vane Angel Bench Stand Model 18112

Young Meteorological Instruments

WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	92
180	181
270	

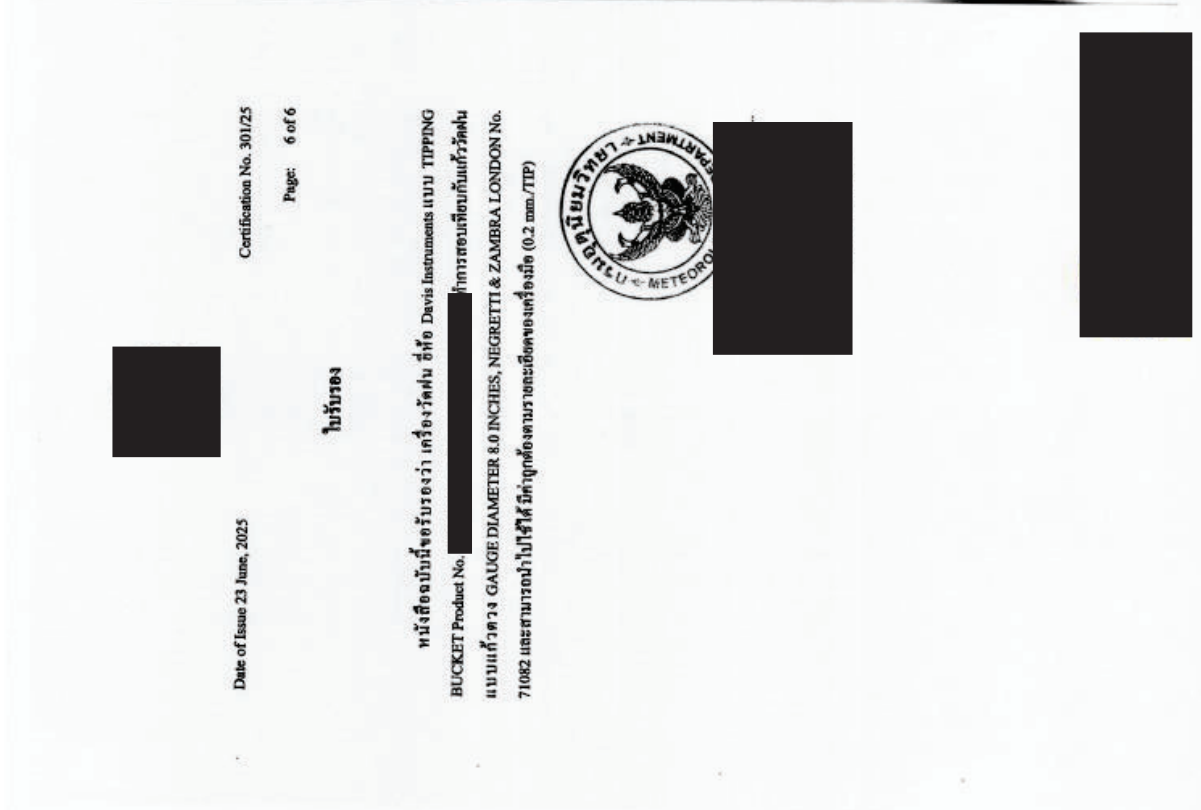
Calibration



The Result of Calibration

Sensor model EWSNV110W82503 Certification No. 301/25
23 June, 2025 Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor	
	Reading % R.H.	Correction % R.H.
86.4	95.2	-8.8
65.3	71.2	-6.9
42.2	46.6	-3.3



Date of Issue 23 June, 2025

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ใบรับรอง

หนังสือใบนี้ขอรับรองว่า เครื่องวัดฝน ชีฟส์ Davis Instruments แบบ TIPPING BUCKET Product No. [REDACTED] มีการสอบเทียบกับแก้ววัดฝน แบบแก้วดวง GAUGE DIAMETER 8.0 INCHES, NEGRETTI & ZAMBRA LONDON No. 71082 และสามารถนำไปใช้ได้ มีค่าคลาดเคลื่อนตามรายละเอียดของเครื่องมือ (0.2 มม./TIP)

