

ภาคผนวกที่ 5-3
เอกสารผลการสอบเทียบเครื่องมือตรวจวัด
ครั้งที่ 3/2565
สถานีเรียนกรุงเทพคริสเตียนวิทยาลัย
สถานีโรงพยาบาลเซนต์หลุยส์
วันที่ตรวจวัดวันที่ 20-25 มกราคม 2566



TSP High Volume Sampler Calibration

Verification Report No.
SO2200264-E001 -TSP 01

☐ PM ☒ Onsite
Site: กรุงเทพมหานคร
UTM : 47P N 1517398 E 664626
Sampler: ETS#41
Recorder: ECRANG15315230
Date: 20 Jan 23
Technical:
Approval:

CONDITIONS

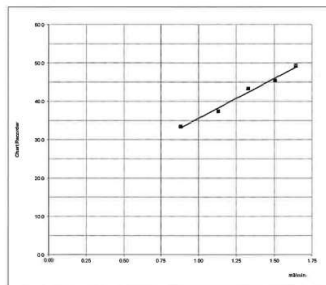
Barometric Press. (hPa): 1010.0 Corrected Pressure (mm Hg): 757.6
Temperature (deg C): 32.0 Temperature (deg K): 305.0
Average Press. (hPa): 1013.0 Corrected Avg.Press. (mm Hg): 759.8
Average Temp. (deg C): 30.0 Average Temp. (deg K): 303.0

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	11.25	1.643	50.0	49.34	Slope = 20.7889
2	9.42	1.505	46.0	45.40	Intercept = 14.8442
3	7.33	1.330	44.0	43.42	Corr. coeff = 0.9923
4	5.29	1.132	38.0	37.50	
5	3.19	0.883	34.0	33.55	
# of Observations: 5					
Range of Chart: 39					
at 1.1 - 1.7 m3/min: 50					



Calibrated by:
20 January 2023

Approved by:
20 January 2023

www.evltesting.com

Environmental responsibility with accuracy measurement

EE-0007-23 Rev 00-01/2023



TSP High Volume Sampler Calibration

Verification Report No.
SO2200264-E001 -TSP 02

☐ PM ☒ Onsite
Site: กรุงเทพมหานคร
UTM : 47P N 1517277 E 664493
Sampler: ETS#47
Recorder: ECRANG15315228
Date: 20 Jan 23
Technical:
Approval:

CONDITIONS

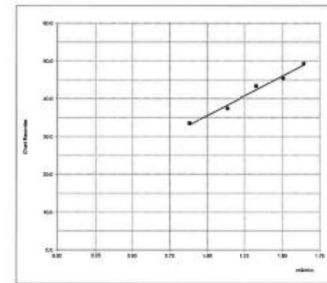
Barometric Press. (hPa): 1010.0 Corrected Pressure (mm Hg): 757.6
Temperature (deg C): 32.0 Temperature (deg K): 305.0
Average Press. (hPa): 1013.0 Corrected Avg.Press. (mm Hg): 759.8
Average Temp. (deg C): 30.0 Average Temp. (deg K): 303.0

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	11.24	1.642	50.0	49.34	Slope = 20.8324
2	9.42	1.505	46.0	45.40	Intercept = 14.6557
3	7.33	1.330	42.0	41.45	Corr. coeff = 0.9940
4	5.29	1.132	38.0	37.50	
5	3.19	0.883	34.0	33.55	
# of Observations: 5					
Range of Chart: 38					
at 1.1 - 1.7 m3/min: 50					



Calibrated by:
20 January 2023

Approved by:
20 January 2023

www.evltesting.com

Environmental responsibility with accuracy measurement

EE-0007-23 Rev 00-01/2023

PM10 High Volume Sampler Calibration

Verification Report No. SO2200264-E001 -PM 01

L. PM ☐ Onsite
Site: กรุงเทพมหานคร
UTM : 47P N 1517388 E 664626
Sampler: EPM#30
Recorder: ECR0501618124
Date: 20 Jan 23
Technical:
Approval:

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: 1.27576
Model: TE-5025A Qstd Intercept: -0.02337
Serial#: 759 Date Certified: 18 Jan 23

CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	10.67	1.843	52.0	32.99	Slope = 15.8230 Intercept = 7.0708 Corr. coeff = 0.9969 SFR = 1.141 SSP = 36.59 # of Observations: 5 Range of Chart at SFR ±10% 38 42
2	8.45	1.464	48.0	30.46	
3	6.72	1.308	44.0	27.92	
4	4.87	1.116	38.0	24.11	
5	3.12	0.897	34.0	21.57	

Calibrated by:
20 January 2023
Approved by:
20 January 2023

This report shall not be reproduced except in full, without the written approval of Evltest Co., Ltd.

www.evltesting.com Environmental responsibility with accuracy measurement

PM10 High Volume Sampler Calibration

Verification Report No. SO2200264-E001 -PM 02

L. PM ☐ Onsite
Site: กรุงเทพมหานคร
UTM : 47P N 1517277 E 664893
Sampler: EPM#38
Recorder: ECR05016181233
Date: 20 Jan 23
Technical:
Approval:

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: 1.27576
Model: TE-5025A Qstd Intercept: -0.02337
Serial#: 759 Date Certified: 18 Jan 23

CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)	LINEAR REGRESSION
1	11.00	1.668	50.0	31.73	Slope = 14.9210 Intercept = 7.3633 Corr. coeff = 0.9925 SFR = 1.141 SSP = 38.43 # of Observations: 5 Range of Chart at SFR ±10% 37 40
2	9.45	1.547	48.0	30.46	
3	6.85	1.320	44.0	27.92	
4	4.82	1.110	38.0	24.11	
5	3.16	0.902	32.0	20.30	

Calibrated by:
20 January 2023
Approved by:
20 January 2023

This report shall not be reproduced except in full, without the written approval of Evltest Co., Ltd.

www.evltesting.com Environmental responsibility with accuracy measurement



Verification Test Report

Report No.:

SO2200266-E001 -SLM 01

☐ PM ☒ Onsite UTM : 47P N 1517398 E 664626

Calibrated Date: 20 January 2023

Site : โรงพยาบาลเซนต์หลุยส์

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 44

Serial : 1973

Environment: Temperature 25 °C Humidity 72 %RH

Reference Standard: Acoustic Calibrator Class 1 Model 4230, Bruel&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	93.57	-0.09	93.66

Calibrated By:

Date: 20 January 2023

Approve By:

Date: 20 January 2023

This report shall not be reproduced except in full, without the written

! www.evltesting.com



Verification Test Report

Report No.:

SO2200266-E001 -SLM 02

☐ PM ☒ Onsite UTM : 47P N 1517260 E 664912

Calibrated Date: 20 January 2023

Site : โรงพยาบาลเซนต์หลุยส์

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 44

Serial : 2197

Environment: Temperature 25 °C Humidity 72 %RH

Reference Standard: Acoustic Calibrator Class 1 Model 4230, Bruel&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:

Date: 20 January 2023

Approve By:

Date: 20 January 2023

This report shall not be reproduced except in full, without the written

! www.evltesting.com



SO2 Analyzer Verification Test Report

Calibration Report No.: ES-S6601007
Calibrated Date: 5-Jan-23

☒ PM ☐ Onsite

Instruments Information

Page: 1/2

Analyzer Type: SO2 Analyzer Model: AF22e	Manufacturer: Environnement SA, France S/N: NSCESAAF32E454
---	---

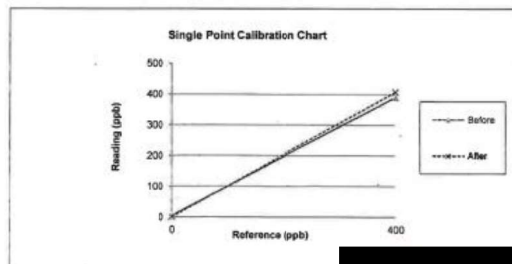
Calibration System

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 25.5 °C Humidity 69 %RH

Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	5.1	5.1	400.0	390.0	-1.3
After	0.0	0.8	0.8	400.0	407.0	0.9



This report shall not be reproduced except in full without the written



SO2 Analyzer Verification Test Report

Calibration Report No.: ES-S6601007
Calibrated Date: 5-Jan-23

☒ PM ☐ Onsite

Page: 2/2

Analyzer Signal Values					
Date	5-Jan-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	UV 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
UV Lamp	44.7	mA	UV 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			

This report shall not be reproduced except in full without the written



SO2 Analyzer Verification Test Report

Calibration Report No.: ES-S6601004
Calibrated Date: 5-Jan-23

☒ PM ☐ Onsite

Instruments Information

Page: 1/2

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

Calibration System

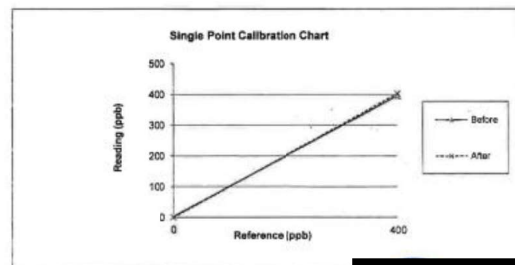
Calibrator Unit	Standard Gas
Dilutor Model: ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc: 44.68 PPM SO2 Conc: 45.34 PPM CO Conc: 4500 PPM Expire Date: Feb 19, 2024 EB0140762

Environment: Temperature 25.5 °C

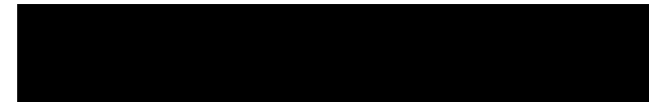
Humidity: 70 %RH

Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	3.7	3.7	400.0	396.0	-0.5
After	0.0	0.4	0.4	400.0	403.0	0.4



This report shall not be reproduced except in full without the written approval of Hecades Supply Instrument Co., Ltd.



SO2 Analyzer Verification Test Report

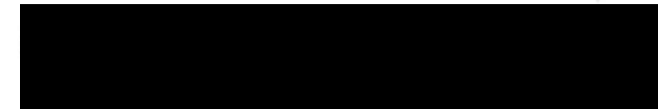
Calibration Report No.: ES-S6601004
Calibrated Date: 5-Jan-23

☒ PM ☐ Onsite

Page: 2/2

Analyzer Signal Values					
Date	5-Jan-23	Time	13:11:00		
Power Supplies					
Option	0.00	mV	+5 V Sensor	5	V
+4 V	4088	mV	+3.3 V	3.3	V
+24 V	24.1	V	+12 V	11.9	V
+5 V	5	V	UV 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
UV Lamp	44.7	mA	UV 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			

This report shall not be reproduced except in full without the written approval of Hecades Supply Instrument Co., Ltd.



NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6801008

Page: 1/1

Calibrated Date: 5-Jan-23

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: NO/NO2/NOx Analyzer Model: T200	Manufacturer API S/N: ENOAIT20000108
---	---

Calibration System

Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.65 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19, 2024 EB0140762

Environment: Temperature 25.6 °C

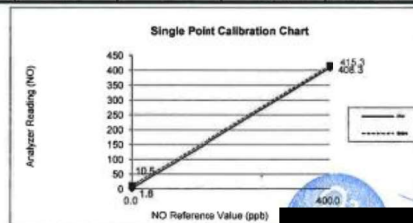
Humidity 57 %RH

Calibration Check (Before adjust)

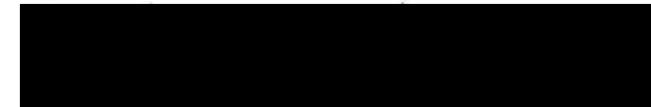
GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	8.4	0.0	8.4	412.1	400.0	1.5
NO ₂	2.1	0.0	2.1	3.2	0.0	0.4
NOx	10.5	0.0	10.5	415.3	400.0	1.9

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.8	0.0	0.8	405.1	400.0	0.6
NO ₂	0.8	0.0	0.8	3.2	0.0	0.4
NOx	1.6	0.0	1.6	408.3	400.0	1.0



his report shall not be reproduced except in full without the written approval of



NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6801008

Page: 1/1

Calibrated Date: 5-Jan-23

☒ PM ☐ Onsite

Page: 2/2

Test Function Value	Nominal range	Unit	Before	After	Note
Date	5-Jan-23				
Time	10:10				
Range	0.00 - 500.00 PPB	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.5	0.2	
Sample Flow	500 +/- 50	cc/min	511	532	
Ozone Flow	80-90	cc/min	80	80	
PMT Detector	0-5000	mV	27.4	18.4	
AZERO	-20-150	mV	54.2	54.2	
HVPS	400-900 constant	V	819	819	
DCPS	2500 +/- 200	mV	-	-	
RCCELL TEMP	50 +/- 1	Degree C	50	50	
BOX TEMP	20-35	Degree C	33.7	32.9	
PMT TEMP	7 +/- 1	Degree C	7.1	7.1	
IS TEMP	50 +/- 4	Degree C	-	-	
MOLY Temp	315 +/- 5	Degree C	314.4	315.0	
RCCEL 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		0.820	0.801	
Nox Slope	1 +/- 0.3		0.848	0.813	
NO Offset	-10 to + 150	mV	10.2	15.3	
NOx Offset	-10 to + 150	mV	-2.0	-3.4	
Span and Cal Values					
Zero Value	NO	0	ppb	8.4	0.8
	NOx	0	ppb	10.5	1.6
Span Value	NO	400	ppb	412.1	405.1
	NOx	400	ppb	415.3	408.3

his report shall not be reproduced except in full without the written approval of Nucon Supply Instrument Co.,L



NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6801007

Page: 1/1

Calibrated Date: 5-Jan-23

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: NO/NO2/NOx Analyzer Model: T200	Manufacturer API S/N: ENOAIT20002467
---	---

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

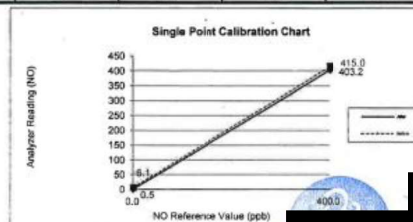
Humidity 68 %RH

Calibration Check (Before adjust)

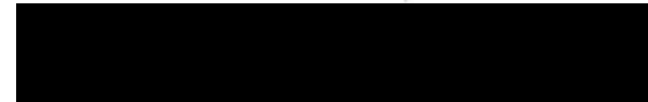
GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	4.4	0.0	4.4	412.0	400.0	1.5
NO ₂	1.7	0.0	1.7	3.0	0.0	0.4
NOx	6.1	0.0	6.1	415.0	400.0	1.8

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.3	0.0	0.3	401.5	400.0	0.2
NO ₂	0.2	0.0	0.2	1.7	0.0	0.2
NOx	0.5	0.0	0.5	403.2	400.0	0.4



This report shall not be reproduced except in full without the written approval of Needles Supply Instrument Co., Ltd.



NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6801007

Page: 1/1

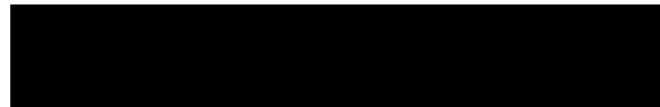
Calibrated Date: 5-Jan-23

☒ PM ☐ Onsite

Page: 2/2

Test Function Value	Nominal range	Unit	Before	After	Note
Date	5-Jan-23				
Time	13:20				
Range	0.00 - 500.00 PPB	PPB	500.0	500.0	
Stability (Zero Gas)	< 0.2	PPB	0.5	0.2	
Sample Flow	500 +/- 50	cc/min	474.0	441.0	
Ozone Flow	80-90	cc/min	76.0	76.0	
PMT Detector	0-5000	mV	24.5	62.2	
AZERO	-20-150	mV	6.6	67.5	
HVPS	400-900 constant	V	639.0	636.0	
DCPS	2500 +/- 200	mV	-	-	
RCCELL TEMP	50 +/- 1	Dreagee C	50.0	50.0	
BOX TEMP	20-35	Dreagee C	34.5	30.5	
PMT TEMP	7 +/- 1	Dreagee C	7.0	7.1	
JS TEMP	50 +/- 4	Dreagee C	-	-	
MOLY Temp	315 +/- 5	Dreagee C	315.0	314.4	
RCCL PRES	4-10 constant	In-Hg-A	4.20	7.90	
SAMP PRES	20-30 constant	In-Hg-A	29.9	28.6	
NO Slope	1 +/- 0.3		1.256	1.032	
NOx Slope	1 +/- 0.3		1.232	1.048	
NO Offset	-10 to + 150	mV	4.50	6.90	
NOx Offset	-10 to + 150	mV	-5.00	-1.50	
Span and Cal Values					
Zero Value	NO	0	ppb	4.4	0.3
	NOx	0	ppb	6.1	0.5
Span Value	NO	400	ppb	412.0	401.5
	NOx	400	ppb	415.0	403.2

This report shall not be reproduced except in full without the written approval of Needles Supply Instrument Co., Ltd.



CO Analyzer Verification Test Report

Calibration Report No.: ES-C6601004
Calibrated Date: 5-Jan-23

☒ PM ☐ Onsite

Instruments Information

Page: 1/2

Analyzer Type: CO Analyzer Model: CO12E	Manufacturer: Environnement SA, France S/N: ECOESACO12E204
--	---

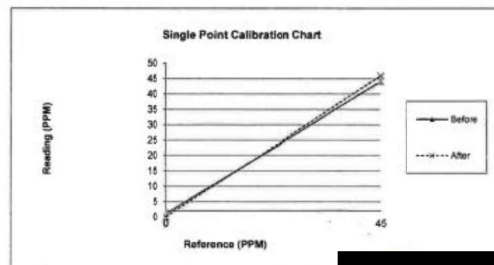
Calibration System

Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.66 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19, 2024 EB0140762

Environment: Temperature 25.5 °C Humidity: 69 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	0.982	1.0	45.0	44.07	-1.0
After	0.0	0.001	0.0	45.0	45.90	1.0



This report shall not be reproduced except in full without the written approval of Needles Supply Instrument Co.L.



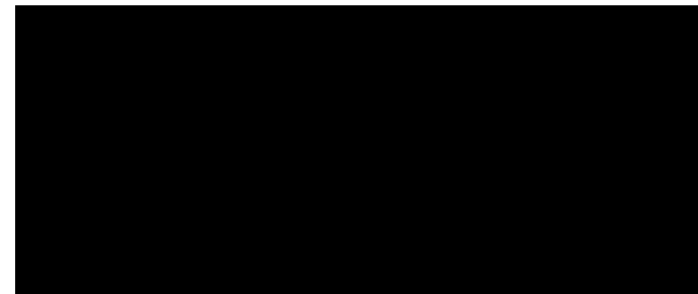
CO Analyzer Verification Test Report

Calibration Report No.: ES-C6601004
Calibrated Date: 5-Jan-23

☒ PM ☐ Onsite

Page: 2/2

Analyzer Signal Values					
Date	5-Jan-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	Pbse current	618.2	mV
Optical T.	46.0	deg.C	Pbse 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





CO Analyzer Verification Test Report

Calibration Report No.: ES-C6601005
Calibrated Date: 5-Jan-23

☒ PM ☐ Onsite

Instruments Information

Page:1/2

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

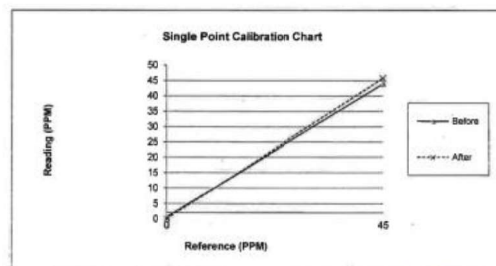
Calibration System

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

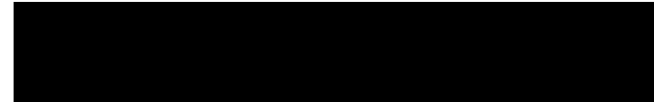
Environment: Temperature 25.7 °C Humidity 71 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	0.687	0.7	45.0	44.00	-1.1
After	0.0	0.057	0.1	45.0	45.80	0.9



This report shall not be reproduced except in full without the written approval of Needaas Supply Instrument Co., Ltd.



CO Analyzer Verification Test Report

Calibration Report No.: ES-C6601005
Calibrated Date: 5-Jan-23

☒ PM ☐ Onsite

Page:2/2

Analyzer Signal Values					
Date	5-Jan-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	Pbse current	618.2	mV
Optical T.	46.0	deg.C	Pbse 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

This report shall not be reproduced except in full without the written approval of Needaas Supply Instrument Co., Ltd.

รายงานการติดตามตรวจสอบคุณภาพสิ่งแวดล้อมประจำปี 2565

โครงการระบบขนส่งมวลชนกรุงเทพมหานคร (ครั้งที่ 2)

บริษัท ระบบขนส่งมวลชนกรุงเทพ จำกัด (มหาชน)

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04N99E15A00V3
Cylinder Number: EB0140762
Laboratory: 124 - Plumsteadville - PA
PGVP Number: A12021
Gas Code: CO,NO,NOX,SO2,BALN

Reference Number: 160-402021734-1
Cylinder Volume: 144.4 Cubic Feet
Cylinder Pressure: 2015 PSIG
Valve Outlet: 600
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 800H-12/251, 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, 14.7 mmHg, or 0.7 mmHg.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	45.00 PPM	44.88 PPM	G1	+/- 1.4% NIST Traceable	02/12/2021, 02/19/2021
NITRIC OXIDE	45.00 PPM	44.52 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	CC707868	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
GMS	124206886	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	+/- 0.5%	Jun 07, 2024

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

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 6 NTKD579	NDIR	Jan 27, 2021
Nicolet iS80 FTIR AJP2010245 NO	FTIR	Feb 11, 2021
Nicolet iS80 FTIR AJP2010245 NO2	FTIR	Jan 21, 2021
Nicolet iS80 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

RECALIBRATION

DUE DATE:

January 18, 2024

Certificate of Calibration

Calibration Certification Information

Cal. Date: January 18, 2023
Operator: [REDACTED]
Calibration Model #: TE-5025A

Rootsmer 5/N: 438320

Ta: 294 °K

Pa: 750.1 mm Hg

Calibrator 5/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)	$\sqrt{\Delta H \left(\frac{Pa}{Pstd} \times \frac{Tstd}{Ta} \right)}$ (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		m= 2.03736 b= -0.03733 r= 0.99997	QA		m= 1.27576 b= -0.02337 r= 0.99997

Calculations

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

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

Tisch Environmental, Inc.

145 South Miami Avenue

Village of Cleves, OH 45002

Accuracy Calibration Certificate

Customer

Company: [REDACTED]
 Address: [REDACTED]
 City: Bangkok
 Zip / Postal: 10160
 State / Province: Bangkok
 Order Number: [REDACTED]

Weighing Device

Manufacturer: Mettler Toledo Instrument Type: Weighing Instrument
 Model: XSR205DUJ Asset Number: N/A
 Serial No.: B911363567 Terminal Model: SRAT
 Building: N/A Terminal Serial No.: B911363567
 Floor: 3 Terminal Asset No.: N/A
 Room: B304

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

Procedure

Calibration Guideline: EURAMET cp-18 v. 4.0 (11/2015)
 METTLER TOLEDO Work Instruction: CPW000/20

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/lepan 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 Calibrator: [REDACTED]
 As Left Calibration Date: N/A
 Issue Date: 03-Mar-2022 Approved Signatory: [REDACTED]

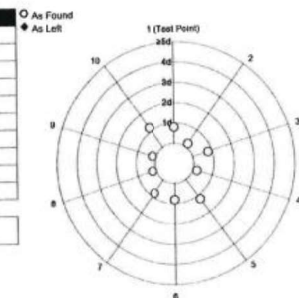
Software Version: 1.23.0.280 © METTLER TOLEDO
 Report Version: 2.16.12 This is an original document and may not be partially reproduced without permission of the issuing calibration laboratory.
 Form Number: F103C

Measurement Results

Repeatability

Test Load: 70 g

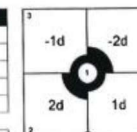
	As Found	As Left
1	70.00001 g	N/A
2	70.00002 g	N/A
3	70.00001 g	N/A
4	70.00002 g	N/A
5	70.00003 g	N/A
6	70.00001 g	N/A
7	70.00001 g	N/A
8	70.00002 g	N/A
9	70.00002 g	N/A
10	70.00003 g	N/A
Standard Deviation	0.000008 g	N/A



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
Maximum Deviation	0.0002 g	N/A

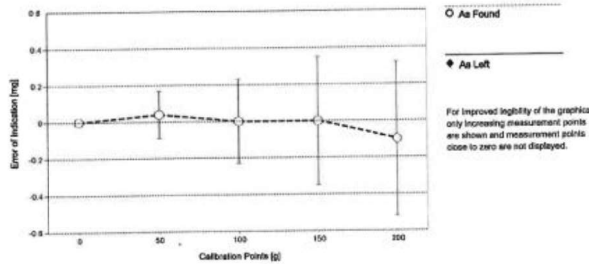


As Found

The '1' in the graph represents the readability of the range interval in which the test was performed.

Error of Indication

As Found	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.00000 g	0.00000 g	0.00000 g	0.017 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



The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor $k = 2$ 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.: WS27 Date of Issue: 05-Jan-2022
Certificate Number: 177036 Calibration Due Date: 03-Jul-2023

Weight Set 2: OIML E2

Weight Set No.: WS76 Date of Issue: 31-Jan-2022
Certificate Number: C205470237 Calibration Due Date: 12-Jul-2023

Thermo Hygrometer

Equipment No.: IN191 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

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: $3 K$

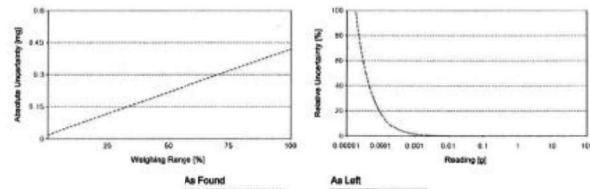
Linearization of Uncertainty Equation

Range			As Found	As Left
	d	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 (Example)

Net Indication	As Found	As Found	As Left	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	0.018 mg	0.0082%	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



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 Certificate No. : L2203-290
Customer : [REDACTED] Page 1 of 2

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

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

Calibrated by : Mr. Nattawut Reangdech

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	QR21-0651	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 %

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

Certificate No. : L2203-290 Page 2 of 2

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	0.35

Resolution : 0.1 (°C) , 0.1 % RH
STD= Standard
UUC= Unit Under Calibration

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

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.
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. 21-65/0383 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 μ Pa at 1000 Hz

Acoustic Output in dB re 20 μ 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	± 0.10	± 0.40 dB


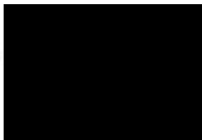
2. Frequency

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

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

FMBL/MTC.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 : เครื่องมือตรวจวัดอุณหภูมิ

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 Type PTB220 No. 220015

The Result of Calibration

Sensor model EWSNV110WS2507 Certification No. 314/22

2 September, 2022 Page : 2 of 6

Standard Ultrasonic Anemometer	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Velocity	Velocity	Correction
	inches H ₂ O	inches H ₂ O	m/sec	m/sec	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

Certification No. 314/22

2 September, 2022

Page : 3 of 6

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 Certification No. 314/22
2 September, 2022 Page : 4 of 6

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
2 September, 2022 Page : 5 of 6

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

Certification No. 314/22

Page : 6 of 6

ใบรับรอง

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

วิศวกรชำนาญการ

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue 1 September, 2022

Certification No. 311/22

Page : 1 of 6

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.918902

STANDARD BAROMETER : Digital Barometer Vaisala : PTB220 No. 17320015

The Result of Calibration

Sensor model EWSNV110WS2508 Certification No. 311/22
1 September, 2022 Page : 2 of 6

Standard Ultrasonic Anemometer	HOOK GAGE NO. 1425		TESTED ANEMOMETER		
	Pressure inches	Vacuum inches	Pressure hPa	Velocity m/sec	Correction 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

Certification No. 311/22

1 September, 2022

Page : 3 of 6

Standard Barometer Pressure	Tested Barometer Pressure	Correction
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	1009.36	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 Certification No. 311/22
1 September, 2022 Page : 4 of 6

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

Page : 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ชื่อ Davis แบบ TIPPING BUCKET
Model 7342.026 ID No.EWSNV110WS2508 ทำการสอบเทียบกับแก้วฝนแบบแก้ว
ทอง GAUGE DIAMETER 8.0 INCHES , NEGRETTI & ZAMBRA LONDON No
71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องวัด (Gauge, TYP)

วิศวกรชำนาญการ

เอกสารผลการสอบเทียบเครื่องมือตรวจวัด

สถานีโรงพยาบาลเซนต์หลุยส์

สถานีโรงเรียนกรุงเทพคริสเตียนวิทยาลัย

ครั้งที่ 4/2565

วันที่ตรวจวัดวันที่ 21-26 เมษายน 2566

EVIL

TSP High Volume Sampler Calibration

Verification Report No.
SO2300077-E001 -TSP 01

☐ PM ☒ Onsite
Site: แขวงบางพลัดใหญ่
UTM: 47P N 1517393 E 664631
Sampler: ETS#18
Recorder: ECRDCPR4169240
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 ORIFICE

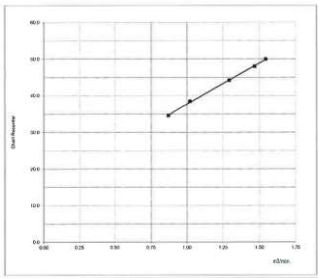
Brand: Tisch Environmental, Inc Qstd Slope: 2.03736
Model: TE-5025A Qstd Intercept: -0.03733
Serial#: 759 Date Certified: 18 Jan 23

CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)
1	10.46	1.543	52.0	49.96
2	9.45	1.458	50.0	48.04
3	7.31	1.293	46.0	44.20
4	4.52	1.021	40.0	38.43
5	3.26	0.870	36.0	34.59

LINEAR REGRESSION
Slope = 22.4116
Intercept = 15.2723
Corr. coeff. = 0.9996
of Observations: 5
Range of Chart at 1.1 - 1.7 m3/min: 42
55

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



This report shall not be reproduced except in full, without the written approval of Enviro-Test Co., Ltd.
www.evltesting.com Environmental responsibility with accuracy measurement
EV-001-23 Rev.002/002

EVIL

TSP High Volume Sampler Calibration

Verification Report No.
SO2300077-E001 -TSP 02

☐ PM ☒ Onsite
Site: กรุงเทพมหานคร
UTM: 47P N 1517261 E 664905
Sampler: ETS#23
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 ORIFICE

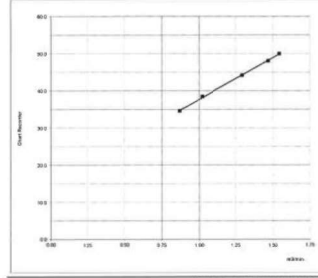
Brand: Tisch Environmental, Inc Qstd Slope: 2.03736
Model: TE-5025A Qstd Intercept: -0.03733
Serial#: 759 Date Certified: 18 Jan 23

CALIBRATIONS

Plate or Test #	H2O (in)	Qstd (m3/min)	I (chart)	IC (corrected)
1	10.48	1.545	52.0	49.96
2	9.12	1.442	48.0	46.12
3	7.35	1.297	46.0	44.20
4	4.55	1.024	40.0	38.43
5	3.26	0.870	36.0	34.59

LINEAR REGRESSION
Slope = 21.5576
Intercept = 16.0207
Corr. coeff. = 0.9947
of Observations: 5
Range of Chart at 1.1 - 1.7 m3/min: 42
54

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



This report shall not be reproduced except in full, without the written approval of Enviro-Test Co., Ltd.
www.evltesting.com Environmental responsibility with accuracy measurement
EV-001-23 Rev.002/002

PM10 High Volume Sampler Calibration

Verification Report No. SO2300077-E001 -PM 01

L PM ☒ Onsite
Site: กรุงเทพมหานคร
UTM: 47P N 1517393 E 664631
Sampler: EPMW15
Recorder: ECRD01618124
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 ORIFICE

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

CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)
1	7.22	1.391	46.0	29.98
2	6.85	1.355	44.0	28.68
3	5.32	1.197	40.0	26.07
4	4.76	1.133	38.0	24.77
5	3.86	1.022	36.0	23.46

LINEAR REGRESSION
Slope = 17.4113
Intercept = 5.3556
Corr. coeff = 0.9922
SFR = 1.204
SSP = 40.37
of Observations: 5
Range of Chart at SFR ±10%: 38 / 43

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

This report shall not be reproduced except in full, without the written approval of Evltest Co., Ltd.
www.evltesting.com Environmental responsibility with accuracy measurement
10-0011-00 Rev. 02/20/2024

PM10 High Volume Sampler Calibration

Verification Report No. SO2300077-E001 -PM 02

L PM ☒ Onsite
Site: กรุงเทพมหานคร
UTM: 47P N 1517261 E 664905
Sampler: EPMW17
Recorder: ECRD016 8125
Date: 21 Apr 23
Technical:
Approval:

CONDITIONS

Barometric Press. (hPa): 945.7 Corrected Pressure (mm Hg): 709.3
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 Slope: 1.27576
Model: TE-5025A Intercept: -0.02337
Serial#: 759 Date Certified: 18 Jan 23

CALIBRATIONS

Plate or Test #	H2O (in)	Qa (m3/min)	I (chart)	IC (corrected)
1	7.40	1.417	46.0	30.16
2	6.28	1.306	44.0	28.85
3	5.22	1.193	40.0	26.23
4	4.22	1.074	38.0	24.92
5	3.25	0.945	34.0	22.29

LINEAR REGRESSION
Slope = 16.7518
Intercept = 6.6082
Corr. coeff = 0.9948
SFR = 1.218
SSP = 41.20
of Observations: 5
Range of Chart at SFR ±10%: 39 / 43

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

This report shall not be reproduced except in full, without the written approval of Evltest Co., Ltd.
www.evltesting.com Environmental responsibility with accuracy measurement
10-0011-00 Rev. 02/20/2024



Verification Test Report

Report No.:

SO2300077-E001 -SLM 01

☐ PM ☒ Onsite UTM : 47P N 1517400 E 664651

Calibrated Date: 21 April 2023

Site : โรงเรียนกรุงเทพคริสเตียน

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 44

Serial : 2124

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:

Date: 21 April 2023

Approve By:

Date: 21 April 2023

This report shall not be reproduced except in full, without the written approval of the company.

ประกาศใช้ 01/02/2566

www.evltesting.com

Environmental responsibility



Verification Test Report

Report No.:

SO2300077-E001 -SLM 02

☒ PM ☐ Onsite UTM : 47P N 1517253 E 664910

Calibrated Date: 21 April 2023

Site : โรงพยาบาลเซนต์หลุยส์

Equipment: Sound Level Meter

Manufacturer: PULSAR

Model: 44

Serial : 2118

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:

Date: 21 April 2023

Approve By:

Date: 21 April 2023

This report shall not be reproduced except in full, without the written approval of the company.

ประกาศใช้ 01/02/2566

www.evltesting.com

Environmental responsibility

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

Certificate of Calibration

Calibration Certification Information					
Cal. Date: January 18, 2023	Rootsmeier 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		m= 2.03736	QA		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:	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

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

Submitted by : [REDACTED]

Equipment : Electronic Balance

Manufacturer : Sartorius Model : SECURA125-1S

Serial No. : 0034606552 ID No. : ELABBALANC05

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 : Akaradath 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

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%

This certificate may not be reproduced other than in full except with the prior written permission of the issuing authority.

CAL-P0031-003

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	0.000089
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	0.00038

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 $k = 2.00$, 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 -

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 : Chortip Samchusri

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-0002166	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 approval

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%

- 000 -

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 2017) document EPA 820-R-12-031, using the assay procedures listed. Analytical Metrology 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. 6.7 megapascals.

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	45.00 PPM	44.65 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				

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	200511-04	CC707368	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	194206889	CC323707	4.028 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Aug 15, 2021
NTRM	1141709	KAL003190	49.67 PPM SULFUR DIOXIDE/NITROGEN	±1.0%	Jun 20, 2022
NTRM	18012341	KAL004716	4857 PPM CARBON MONOXIDE/NITROGEN	±1.0%	Jun 07, 2024

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

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
SIEMENS ULTRAMAT 8 NTRD579	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.: AP-S6604006

Calibrated Date: 1-Apr-23

☒ PM ☐ Onsite

Instruments Information

Page: 1/2

Analyzer Type: SO2 Analyzer Model: 100A	Manufacturer API S/N: ESOAH100E01002
--	---

Calibration System

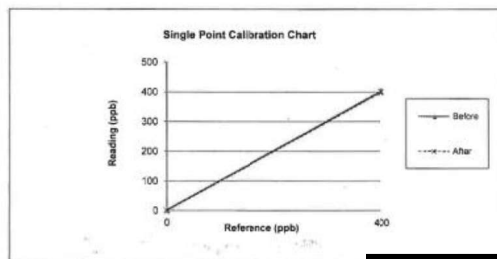
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc 44.68 PPM SO2 Conc 45.34 PPM CO Conc 4500 PPM Expire Date: Feb 19, 2024 EB0140762

Environment: Temperature 26.4 °C

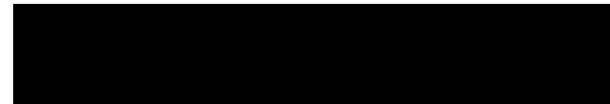
Humidity 49 %RH

Calibration Report

Status	Zero			Span		
	Reference (ppb)	Reading (ppb)	Drift (ppb)	Reference (ppb)	Reading (ppb)	Drift%
Before	0.0	1.5	1.5	400.0	403.0	0.4
After	0.0	0.2	0.2	400.0	400.0	0.0



This report shall not be reproduced except in full without the written approval of the company.



SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6604006

Calibrated Date: 1-Apr-23

☒ PM ☐ Onsite

Page: 2/2

Test Function Value	Nominal range	Unit	Before	After	Note
Date	1-Apr-23				
Time	13:45				
Range	50 - 20000	PPB	500.0	500.0	
Stability (Zero Gas)	< 0.2	PPB	0.2	0.1	
Sample Flow	650 (+/- 50)	ml/min	592.0	591.0	
PMT Detector	0 - 5000	mV	255.6	61.0	
Num PMT Detector	0 - 5000	mV	59.7	65.2	
HVPS	400-600 constant	V	607.0	607.0	
DCPS	2500 (+/- 200)	mV	-	-	
PCELL TEMP	50 (+/- 1)	Deegae C	50.0	50.0	
BOX TEMP	20-40	Deegae C	34.0	34.1	
PMT TEMP	7 (+/- 1)	Deegae 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	3.8	3.6	
Dark lamp	(-50) - (+200)	mV	56.5	57.0	
SAMP PRES	20-30 constant	N-Hg-A	29.3	29.3	
Electric Test/Optic Test					
PMT Volts	2000 (+/- 500)	mV	1682.0	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	
Gas Test Response					
Zero Gas (0.00 PPB)	0	ppb	1.5	0.2	
Span Gas (400 PPB)	400	ppb	403.0	400.0	± 5% of Range

This report shall not be reproduced except in full without the written approval of the company.



SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6604004

Calibrated Date: 1-Apr-23

☒ PM ☐ Onsite

Instruments Information

Page: 1/2

Analyzer Type: SO2 Analyzer Model: 100A	Manufacturer API S/N: NSOA100A00632
--	--

Calibration System

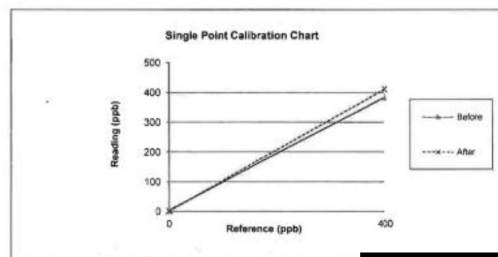
Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792	NO Conc 44.68 PPM
ZERO AIR Generator ZAG7001 S/N: 644	SO2 Conc 45.34 PPM
	CO Conc 4500 PPM
	Expire Date: Feb 19, 2024 EB0140762

Environment: Temperature 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	3.9	3.9	400.0	385.0	-1.9
After	0.0	1.3	1.3	400.0	412.0	1.5



This report shall not be reproduced except in full without the written approval of the issuing authority.



SO2 Analyzer Verification Test Report

Calibration Report No.: AP-S6604004

Calibrated Date: 1-Apr-23

☒ PM ☐ Onsite

Page: 2/2

Test Function Value	Nominal range	Unit	Before	After	Note
Date	1-Apr-23				
Time	13:10				
Range	50 - 20000	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.6	0.2	
Sample Flow	850 (+/- 50)	cc/min	663	659	
PMT Detector	0 - 5000	mV	36.5	34.5	
Non-PMT Detector	0 - 5000	mV	34.1	32.5	
µV/PPS	400-900 constant	V	719	648	
DCPS	2500 (+/- 200)	mV	-	-	
PCELL TEMP	50 (+/- 1)	Degree C	50	50	
BOX TEMP	20-40	Degree C	34.1	32.7	
PMT TEMP	7 (+/- 1)	Degree C	8.0	8.0	
UV lamp	1000-4900	mV	4034.0	4034.0	
Lamp Ratio	30-120	%	114.0	114.0	
STR Light (Zero Gas)	<100	PPB	29	29	
Dark PMT	(-50) - (+200)	mV	44.7	44.7	
Dark Lamp	(-50) - (+200)	mV	5.1	5.1	
SAMP PRES	20-30 constant	IN-HgA	28.1	27.8	
Electric Test/Optic Test					
PMT Volts	2000 (+/- 500)	mV	2004	2020	
SO2 Conc	1000 (+/- 250)	PPB	1002	1010	
SO2 Slope	1 (+/- 0.3)	-	0.920	0.886	
SO2 Offset	< 250	mV	65	130.1	
Stability at Zero	< 0.2	PPB	0.1	0.1	
Stability at Span	< 2 ppb @ 400 ppb	PPB	0.6	0.2	
Gas Test Response					
Zero Gas (0.00 PPB)	0	ppb	3.9	1.3	
Span Gas (400 PPB)	400	ppb	385.0	412.0	± 5% of Range

This report shall not be reproduced except in full without the written approval of the issuing authority.



NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6604001

Page:1/1

Calibrated Date: 1-Apr-23

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: NO/NO2/NOx Analyzer
Model: T200

Manufacturer: API
S/N: ENOAIT20002470

Calibration System

Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 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 26.5 °C

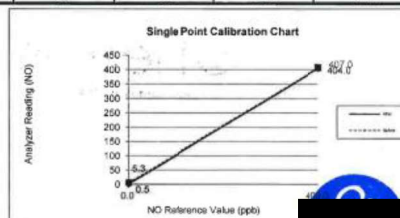
Humidity 50 %RH

Calibration Check (Before adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	3.2	0.0	3.2	389.5	400.0	-1.3
NO ₂	2.1	0.0	2.1	17.5	0.0	2.2
NOx	5.3	0.0	5.3	407.0	400.0	0.9

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	401.0	400.0	0.1
NO ₂	0.3	0.0	0.3	3.0	0.0	0.4
NOx	0.5	0.0	0.5	404.0	400.0	0.5



This report shall not be reproduced except in full without the written approval



NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6604001

Page:1/1

Calibrated Date: 1-Apr-23

☒ PM ☐ Onsite

Page:2/2

Test Function Value	Nominal range	Unit	Before	After	Note
Date	1-Apr-23				
Time	10:13				
Range	0.00 - 500.00 PPB	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.5	0.2	
Sample Flow	500 +/- 50	cc/min	511	532	
Ozone Flow	60-80	cc/min	80	80	
PMT Detector	0-5000	mV	27.4	16.4	
ZERO	-20-150	mV	54.2	54.2	
WPS	400-800 constant	V	819	819	
DCPS	2500 +/- 200	mV	-	-	
CELL TEMP	50 +/- 1	Dewgee C	50	50	
BOX TEMP	20-35	Dewgee C	33.7	32.9	
PMT TEMP	7 +/- 1	Dewgee C	7.1	7.1	
IZS TEMP	50 +/- 4	Dewgee C	-	-	
MOLY Temp	315 +/- 5	Dewgee C	314.4	315.0	
RCEL 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		0.820	0.801	
NOx Slope	1 +/- 0.3		0.848	0.813	
NO Offset	-10 to + 150	mV	10.2	15.3	
NOx Offset	-10 to + 150	mV	-2.0	-3.4	
Span and Cal Values					
Zero Value	NO	0	ppb	3.2	0.2
	NOx	0	ppb	5.3	0.5
Span Value	NO	400	ppb	389.5	401.0
	NOx	400	ppb	407.0	404.0

This report shall not be reproduced except in full without the written approval



NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6604008

Page: 1/1

Calibrated Date: 1-Apr-23

☒ PM ☐ Onsite

Instruments Information

Analyzer Type: NO/NO2/NOx Analyzer Model: T200	Manufacturer API S/N: ENOAIT20000108
---	---

Calibration System

Calibrator Unit	Standard Gas
Dilutor Model ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc: 44.08 PPM SO2 Conc: 45.34 PPM CO Conc: 4500 PPM Expire Date: Feb 19, 2024 EBC140762

Environment: Temperature 26.5 °C

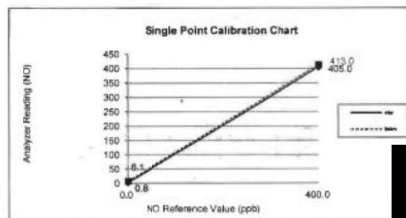
Humidity 50 %RH

Calibration Check (Before adjust)

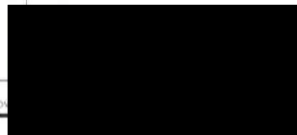
GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	3.3	0.0	3.3	410.0	400.0	1.2
NO ₂	2.8	0.0	2.8	3.0	0.0	0.4
NOx	6.1	0.0	6.1	413.0	400.0	1.6

Calibration Check (After adjust)

GAS	Zero			Span		
	Reading Value (ppb)	Expected Value (ppb)	Drift (ppb)	Reading Value (ppb)	Expected Value (ppb)	Drift%
NO	0.3	0.0	0.3	402.0	400.0	0.2
NO ₂	0.5	0.0	0.5	3.0	0.0	0.4
NOx	0.8	0.0	0.8	405.0	400.0	0.6



This report shall not be reproduced except in full without the written approval of the company.



NOx Analyzer Verification Test Report

Calibration Report No.: AP-N6604008

Page: 1/1

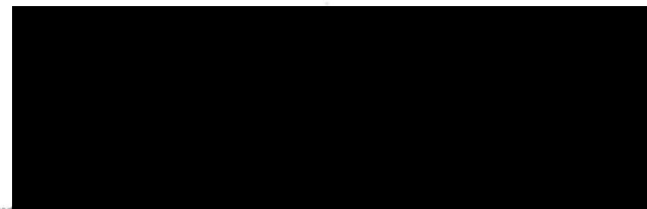
Calibrated Date: 1-Apr-23

☒ PM ☐ Onsite

Page: 2/2

Test Function Value	Normal range	Unit	Before	After	Note
Date	1-Apr-23				
Time	10:10				
Flange	0.00 - 500.00 PPB	PPB	500	500	
Stability (Zero Gas)	< 0.2	PPB	0.5	0.2	
Sample Flow	500± 50	cc/min	511	532	
Decom Flow	80-80	cc/min	80	80	
PMT Detector	0-5000	mV	27.4	16.4	
AZERO	20-150	mV	54.2	54.2	
HYPS	400-900 constant	V	819	819	
DCPS	2500 ±1-200	mV	-	-	
PCELL TEMP	50±1	Procege C	50	50	
BOX TEMP	20-35	Dreagee C	33.7	32.9	
PMT TEMP	7 ±1	Dreagee C	7.1	7.1	
ICS TEMP	50±1-4	Dreagee C	-	-	
MOLY Temp	315 ±1-5	Dreagee C	314.4	315.0	
PCEL PRES	4-10 constant	IN-Hg-A	10	10	
SAMP PRES	20-30 constant	IN-Hg-A	29.0	29.4	
NO Slope	1 ±1-0.3		0.820	0.801	
NOx Slope	1 ±1-0.3		0.848	0.813	
NO Offset	-10 to + 150	mV	19.2	15.3	
NOx Offset	-10 to + 150	mV	-2.0	-3.4	
Span and Cal Values					
Zero Value	NO	0	ppb	3.3	0.3
	NOx	0	ppb	6.1	0.8
Span Value	NO	400	ppb	410.0	402.0
	NOx	400	ppb	413.0	405.0

This report shall not be reproduced except in full without the written approval of the company.





CO Analyzer Verification Test Report

Calibration Report No.: ES-C6604004

Calibrated Date: 1-Apr-23

☒ PM ☐ Onsite

Instruments Information

Page: 1/2

Analyzer Type: CO Analyzer Model: CO12E	Manufacturer: Environnement SA, France S/N: ECOESACO12E204
--	---

Calibration System

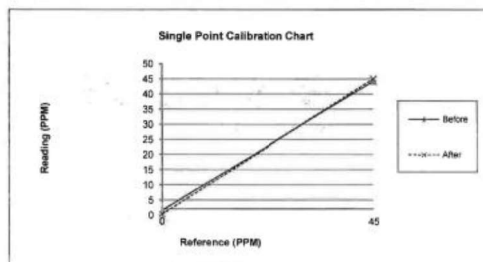
Calibrator Unit	Standard Gas
Dilutor Model: ESA MGC101 S/N: 792 ZERO AIR Generator ZAG7001 S/N: 644	NO Conc: 44.68 PPM SO2 Conc: 45.34 PPM CO Conc: 4500 PPM Expire Date: Feb 19, 2024 EB0140762

Environment: Temperature 26.4 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	1.563	1.6	45.0	44.23	-0.9
After	0.0	0.274	0.3	45.0	45.01	0.0



This report shall not be reproduced except in full without the written approval



CO Analyzer Verification Test Report

Calibration Report No.: ES-C6604004

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	Pulse current	618.2	mV
Optical T.	46.0	deg.C	Pulse 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

This report shall not be reproduced except in full without the written approval

CO Analyzer Verification Test Report

Calibration Report No.: ES-C6604006
Calibrated Date: 1-Apr-23
☒ PM ☐ Onsite

Instruments Information Page: 1/2

Analyzer Type: CO Analyzer Model: CO12E	Manufacturer: Environnement SA, France S/N: ECOESACO12E205
--	---

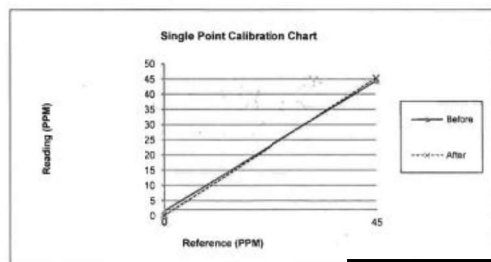
Calibration System

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: 26.4 °C Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	1.543	1.5	45.0	44.50	-0.6
After	0.0	0.087	0.1	45.0	45.36	0.4



This report shall not be reproduced except in full without the written approval of the calibration laboratory.

CO Analyzer Verification Test Report

Calibration Report No.: ES-C6604006
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	864.7	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

Int. 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

This report shall not be reproduced except in full without the written approval of the calibration laboratory.

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

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

CALIBRATION CERTIFICATE

Submitted by: [REDACTED]
Address: [REDACTED]
Calibrated at: [REDACTED]

Instrument Calibrated:
Description: Sound Level Calibrator
Manufacturer: Bruel & Kjaer
Model: 4230
Serial No.: 1351075

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 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 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

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

FMBL-MTC.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 Bruel&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 Bruel&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 Bruel&Kjaer 4180	1.05	± 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: [REDACTED] Approved by: [REDACTED]

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

FMBL-MTC.002 Rev.4

Issued by : Calibration & Test Section : Meteorological Instruments Bureau

Date of Issue : 30 June, 2022

Certification No. 255/22

Page : 1 of 6

Object : เครื่องมือตรวจวัดอุตุนิยมวิทยา

Manufacturer : Novalynx

Type : Data Logger NDWD100

Serial No. : EWSNV110WS2505

Customer :

Calibration Condition : Temperature 25.1 °C Barometric Pressure 1003.8 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)
Serial Number 110730029 (sensor 120629586)

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

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

: Thermoschneider No.918802

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB220 No. IV1220015

The Result of Calibration

Sensor model

EWSNV110WS2505

Certification No. 255/22

30 June, 2022


Page : 2 of 6

Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure	Vacuum	Velocity	Velocity	Correction
Ultrasonic Anemometer	inches H ₂ O	inches H ₂ O	m/sec	m/sec	m/sec
1.00	-	-	-	0.4	0.60
3.02	-	-	-	2.4	0.62
5.00	-	-	-	4.7	0.30
7.04	-	-	-	6.9	0.14
9.02	-	-	-	8.9	0.12
11.01	-	-	-	10.9	0.11
13.01	-	-	-	13.1	-0.09
15.01	-	-	-	14.9	0.11
17.02	-	-	-	17.1	-0.08
20.02	-	-	-	20.3	-0.28

Wind Aloft Plotting Board.

US DEPARTMENT OF COMMERCE WEATHER BUREAU

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

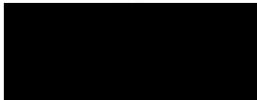




The Result of Calibration

Sensor model EWSNV110WS2505 Certification No. 255/22

30 June, 2022 Page : 3 of 6

Standard Barometer Pressure	Tested Barometer Pressure	Correction
1001.48	1002.42	-0.94
1001.87	1002.92	-1.05
1002.41	1003.79	-1.38
1003.52	1004.67	-1.15
1004.06	1004.96	-0.90
1003.57	1004.38	-0.81
1003.92	1005.54	-1.62
1003.80	1005.22	-1.42
1003.76	1004.96	-1.20
1003.18	1004.67	-1.49
1003.38	1004.96	-1.58
1003.83	1005.54	-1.71
1004.26	1005.83	-1.57
1001.77	1002.92	-1.15
1001.35	1002.92	-1.57
1002.29	1003.50	-1.21
1002.77	1003.92	-1.15
1003.49	1004.50	-1.01
1004.14	1005.25	-1.11
1004.00	1004.79	-0.79
Average		-1.24

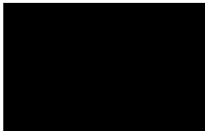


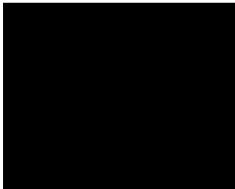
The Result of Calibration

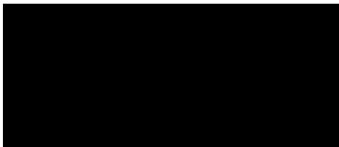
Sensor model EWSNV110WS2505 Certification No. 255/22

30 June, 2022 Page : 4 of 6

Standard Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.7	45.8	-0.1
30.4	30.6	-0.2
15.6	15.7	-0.1







The Result of Calibration

Sensor model EWSNV110WS2505 Certification No. 255/22
30 June, 2022 Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading % R.H.	Correction % R.H.
85.20	79	6.2
64.10	60	4.1
45.20	42	3.2

Date of Issue 30 June, 2022

Certification No. 255/22

Page : 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ชื่อ Davis แบบ TIPPING BUCKET
Model 7342.026 ID No.EWSNV110WS2505 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 : 30 June, 2022 Certification No. 254/22
Page : 1 of 6

Object : เครื่องมือตรวจวัดอุตุนิยมวิทยา

Manufacturer : Novalynx

Type : Data Logger NDWD100

Serial No. : EWSNV110WS2506

Customer :



Calibration Condition : Temperature 25.1 °C Barometric Pressure 1004.6 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.918802

STANDARD BAROMETER : Digital Barometer Vaisala Type PTB220 No. V1220015



The Result of Calibration

Sensor model EWSNV110WS2506 Certification No. 254/22

30 June, 2022

Page : 2 of 6

Standard	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
Ultrasonic Anemometer	Pressure	Vacuum	Velocity	Velocity	Correction
m/sec	inches H2O	inches H2O	m/sec	m/sec	m/sec
1.00	+	+	+	0.7	0.30
3.02	+	+	+	2.8	0.22
5.00	+	+	+	4.9	0.10
7.04	+	+	+	7.1	-0.06
9.02	+	+	+	9.1	-0.08
11.01	+	+	+	10.1	0.91
13.01	+	+	+	13.1	-0.09
15.01	+	+	+	14.9	0.11
17.02	+	+	+	17.0	0.02
20.02	+	+	+	20.2	-0.18

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 EWSNV110WS2506

Certification No. 254/22

30 June, 2022

Page : 3 of 6

Standard Barometer Pressure	Tested Barometer Pressure	Correction
1001.48	1002.72	-1.24
1001.67	1003.01	-1.14
1002.41	1003.59	-1.18
1003.52	1004.76	-1.24
1004.06	1005.34	-1.28
1003.57	1004.47	-0.90
1003.92	1004.76	-0.84
1003.80	1004.47	-0.67
1003.76	1004.47	-0.71
1003.18	1003.89	-0.71
1003.38	1004.16	-0.80
1003.83	1004.47	-0.64
1004.26	1005.05	-0.79
1001.77	1002.43	-0.66
1001.35	1002.72	-1.37
1002.29	1003.30	-1.01
1002.77	1003.59	-0.82
1003.49	1004.16	-0.69
1004.14	1004.76	-0.62
1004.00	1003.30	0.70

Average

-0.83

The Result of Calibration

Sensor model EWSNV110WS2506

Certification No. 254/22

30 June, 2022

Page : 4 of 6

Standards Temp. °C	Temperature Sensor Reading	
	Reading °C	Correction °C
45.7	45.9	-0.2
30.4	30.6	-0.2
15.6	15.7	-0.1

The Result of Calibration

Sensor model EWSNV110WS2506 Certification No. 254/22
30 June, 2022 Page : 5 of 6

Standard Humidity % R.H.	Relative Humidity Sensor Reading	
	Reading % R.H.	Correction % R.H.
85.20	81	4.2
64.10	62	2.1
45.20	44	1.2

Date of Issue 30 June,2022

Certification No. 254/22

Page : 6 of 6

ใบรับรอง

หนังสือฉบับนี้ขอรับรองว่า เครื่องวัดฝน ยี่ห้อ Davis แบบ TIPPING BUCKET
Model 7342.026 ID No.EWSNV110WS2506 ทำการสอบเทียบกับแก้วฝนแบบแก้ว
ควง GAUGE DIAMETER 8.0 INCHES , NEGRETTI & ZAMBRA LONDON No
71082 และสามารถนำไปใช้ได้ มีค่าถูกต้องตามรายละเอียดของเครื่องมือ (-0.2 mm/
TIP)

วิศวกรชำนาญการ