

ภาคผนวก ง

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เอกสารสอบเทียบเครื่องมือ





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES: EQUIPMENT CALIBRATION AND TESTING SERVICES  
534/4 PATTANAKARN ROAD SOI 18, SATHUANG, SATHUANG, BANGKOK 10110  
TEL: 02-713-3005, FAX: 02-713-4384

## Certificate of Calibration

Certificate No.: 22P067  
Page: 1 of 2

Equipment: U Tube Manometer  
Manufacturer: Dwyer  
Model: 1221-38-W/M  
Serial No.: UAE.EFM.178.2561  
Condition As-Received: Used Item  
Received Date: 03 August 2022  
Calibration Date: 12 August 2022  
Reference: 2208-0131WSC  
Ambient Temperature: ( 23 ± 2 ) °C  
Relative Humidity: ( 50 ± 15 ) %  
Atmospheric Pressure: 1010 mbar

Submitted by: United Analyst and Engineering Consultant Co., Ltd.  
31 Soi Udonnuk 41, Sukhumvit Road, Bangkok,  
Phrakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments.  
Standard according to in-house calibration procedure CP-P04, using "DKD-R 6-1 : Calibration of Pressure  
Gauges, Edition 03/2014 " as a guidelines.

### Condition of this result of calibration

1. Reference standards instruments :

Instrument: Pressure Calibrator Model: FC106P Serial No: 11893 Certificate No: MP-0113-22 Due Date: 14 Jul 2023

2. This result of calibration was made on requested at the point specified by customer.

3. Scale and conversion factor is 1 kPa = 4.0146293 mH<sub>2</sub>O

4. This instrument was used clean air as pressure media.

5. This instrument was calibrated by applied pressure to high-port (+) side and low-port (-) side open to atmospheric pressure.

6. This instrument was installed in vertical orientation and top of the pressure port was used as the reference level

7. The certificate is valid only to the item calibrated on date and place of calibration.

8. This Certificate is traceable to the International System of Unit maintained at-

National Institute of Metrology Thailand (NIMT)

Calibrated by: Suvit Aussaree  
Issue Date: 14 August 2022

Approved Signatory :  
[Signature] Phalinee Pradyajalai  
[Signature] Eura Suwanman  
[Signature] Atsapol Panurach

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Cert.No.: 22P067  
Page: 2 of 2

Result of calibration: Without adjustment  
Function: Pressure Measurement  
Range: 0 mH<sub>2</sub>O to 35 mH<sub>2</sub>O  
Scale Interval: 0.1 mH<sub>2</sub>O (The Fifth Estimate)

Applied Pressure (mH <sub>2</sub> O)	UUC Indication		Error (mH <sub>2</sub> O)
	High-port side (mH <sub>2</sub> O)	Low-port side (mH <sub>2</sub> O)	
0.00	0.00	0.00	0.00
2.00	0.98	-0.94	-0.03
4.00	2.00	-1.98	-0.02
6.00	3.00	-2.98	-0.02
8.00	4.00	-3.98	-0.02
10.00	5.00	-4.98	-0.02
12.00	6.02	-5.96	-0.02
14.00	7.02	-6.95	-0.02
16.00	8.04	-7.98	0.02
18.00	9.04	-8.98	0.02
20.00	10.04	-9.98	0.02
22.00	11.03	-10.98	0.04
24.00	12.06	-12.00	0.06
26.00	13.08	-13.00	0.08
28.00	14.08	-14.02	0.10
30.00	15.08	-15.02	0.10
32.00	16.08	-16.04	0.12
34.00	17.10	-17.04	0.14
35.80	17.90	-17.86	-0.04

The uncertainty of measurement was ± 0.11 mH<sub>2</sub>O

\* UUC = Unit Under Calibration

\* AP = High-port side - Low-port side

The 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 %.

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B 1093525



TECHNOLOGY PROMOTION ASSOCIATION (THAI AND JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
55/41 RATANAU-THAI ROAD SRI KHAMFAENG SUBURBAN BANGKOK 10241  
TEL. 02-71773000 FAX. 02-7189743



THAI CALIBRATION CENTER  
CALIBRATION CENTER

## Certificate of Calibration

Certificate No. : 22P1169

Page : 1 of 2

Equipment : Aneroid Barometer  
Manufacturer : Barigo  
Model :  
Serial No. :  
ID No. : UAE-EMA2-109-2656

Condition As-Received: Used Item  
Received Date: 30 March 2022  
Calibration Date: 06 April 2022

Reference: Z203-112SW5C  
Ambient Temperature:  $(23 \pm 2) ^\circ\text{C}$   
Relative Humidity:  $(50 \pm 5) \%$   
Atmospheric Pressure: 1010 mbar  
Submitted by: United Analyst and Engineering Consultant Co., Ltd.  
81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,  
Prakhanong, Bangkok 10260

Procedure used: The calibration was conducted by direct comparison method against Pressure Measuring Instruments,  
Standard according to in-house calibration procedure CP-P10, using : DKD-R 6-1 ; Calibration of Pressure  
Gauges, Edition 03/2014 - as a guidelines.

### Condition of this result of calibration

1. Reference standards instruments :  
Instrument  
1) Standard Barometer  
Model DP142  
Serial No. 1422505046  
Certificate No. MP-0053-21  
Due Date 08 Apr 2022
2. This instrument was installed in vertical orientation and center of the dial was used as the reference level.
3. This result of calibration was made on requested at the point specified by customer.
4. Scale and conversion factor as 1 MPa = 7.50062 mmHg
5. This result of calibration instrument was in absolute pressure.
6. This instrument was used clean air as pressure media.
7. This certificate is valid only to the item calibrated on date and place of calibration
8. This Calibration is traceable to the International System of Unit maintained at:  
- National Institute of Metrology Thailand (NIMT)

Calibrated by : Suwit Auearnma  
Issue Date : 05 April 2022

Approved Signatory

[ ] Phaihee Probhupol  
[x] Sira Suwanasri  
[ ] Alepd Panuach

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เลข 0283994



### Result of calibration: Without adjustment

Function : Absolute Pressure Measurement  
Range : 720 mmHg to 770 mmHg  
Scale Interval : 1 mmHg (The Fth Estimate)

Applied Pressure (mmHg)	717.30	728.57	738.79	749.10	759.31	769.93
UUC* Indication (mmHg)	720.0	730.0	740.0	750.0	760.0	770.0
Error (mmHg)	2.70	1.43	1.21	0.90	0.67	0.07

### Decreasing Pressure

Applied Pressure (mmHg)	769.92	759.32	749.09	738.79	728.56	717.25
UUC* Indication (mmHg)	770.0	760.0	750.0	740.0	730.0	720.0
Error (mmHg)	0.08	0.68	0.91	1.21	1.44	2.71

The uncertainty of measurement was  $\pm 0.24$  mmHg

\* UUC : Unit Under Calibration

The 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 %.

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TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)  
CORPORATE SERVICES & EQUIPMENT CALIBRATION AND TESTING SERVICES  
57/41 PATEKARN ROAD SOI 3 SUKHUMVIT 21, KJANG BANGKOK 10110



TEL: 02-277-9902 FAX: 02-277-9984

## Certificate of Calibration

Certificate No.: ZH768  
Page: 1 of 2

Equipment: Dai Tharns-Hygrometer

Manufacturer: Sanyo

Model: -

Serial No.: -

ID No.: UAE ANV/1302450

Condition As-Received: Used Item

Received Date: 30 March 2022

Calibration Date: 01 April 2022

Reference: to 05 April 2022

Ambient Temperature: 22/23-11/24W5C

Relative Humidity: ( 25 ± 3 ) °C

Relative Humidity: ( 50 ± 20 ) %

Submitted by: United Analyser and Engineering Consultant Co., Ltd

81 Soi Udomsuk 41, Sukhumvit Road, Bangkok,  
Phrakhanong, Bangkok 10260

### Procedure used:

Calibration was conducted using in-house calibration procedure CP-H02 according to comparison with standard chilled mirror sensor for humidity measurement function and comparison with standard temperature probe for temperature measurement function into humidity / temperature chamber.

### Condition of this result of calibration

1. Reference standards instrument:

Instrument	Model	Serial No.	Certificate No.	Due Date
1) Standard Chilled Mirror Hygrometer Sensor	Dew Point II	31863	19714	17 Sep 2022
2) Standard Humidity/Temperature Mixer	400	10203027	TH-0088-21	01 Jul 2022

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

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

-National Institute of Standards and Technology (NIST) The United States of America

-National Institute of Metrology (NIMT)

Calibrated by: Somchai Dumnong  
Issue Date: 08 April 2022

Approved Signatory:

1/ Chakrit W...  
2/ Penthippa Tameyakul  
3/ Viporn Tanyawatt

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Cert No.: ZH768  
Page: 2 of 2

Result of Calibration:-  
Function: Humidity measurement,  
Without Adjustment

Reference Temperature (°C)	Standard Humidity (%RH)	UUC* Reading (%RH)	Error (%RH)	Uncertainty of Measurement (%RH)
25.0	40.1	48	7.9	1.6
25.0	60.0	62	2.0	1.8
25.0	80.0	76	-4.0	2.0

Result of Calibration:-  
Function: Temperature measurement,  
Without Adjustment

Standard Temperature (°C)	UUC* Reading (°C)	Error (°C)	Uncertainty of Measurement (°C)
20.02	20.0	-0.02	0.72
29.89	30.0	0.02	0.72
40.03	39.5	-0.53	0.72

UUC\*: Unit Under Calibration

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

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B 1104144



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### MULTI-POINT GAS TEST REPORT

Test Date : June 23, 2022

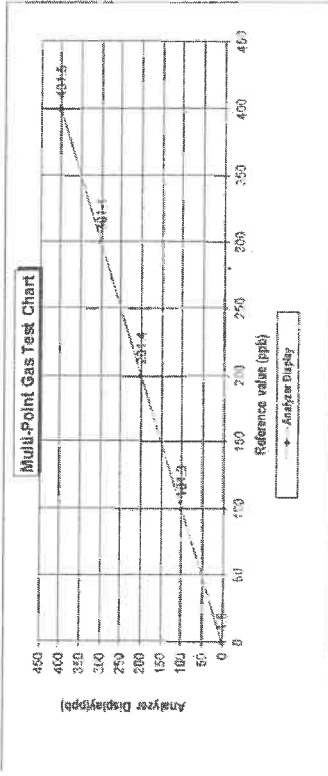
Equipment : Gas Analyzer (NO<sub>x</sub>) Model : 421  
Manufacturer : Thermo Scientific Serial Number : 1191503036

**Standard Gas Concentration**  
Sulphur Dioxide (SO<sub>2</sub>) 44.75 PPM  
Nitric Oxide (NO) 45.35 PPM  
Methane (CH<sub>4</sub>) 1007 PPM  
Carbon Monoxide (CO) CCL59599  
Cylinder No. :  
Expiration Date : Jul 30, 2022

**Dilutor Detail**  
Manufacturer : Thermo Scientific  
Model : 1461  
Serial Number : 1180540071

### Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	% Error
Level 1 Zero	0.0	1.50	1.50	1.50
Level 2 20.00%	100.0	1.30	1.28	1.28
Level 3 40.00%	201.4	1.40	0.70	0.70
Level 4 60.00%	301.4	1.40	0.46	0.46
Level 5 80.00%	401.5	1.50	0.37	0.37
Remark : Measuring Range 500.0 ppb		Average Difference (%)		
		Acceptable Limit $\pm 5\%$		



Unit: PPM

23 June 2022

Thermo Scientific



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### MULTI-POINT GAS TEST REPORT

Test Date : Oct 19, 2022

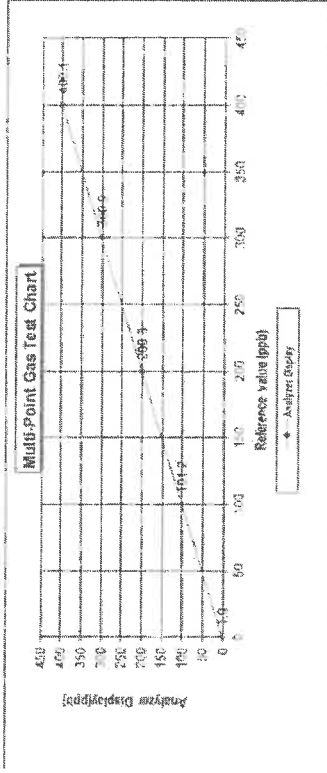
Equipment : Gas Analyzer (NO<sub>x</sub>) Model : 421  
Manufacturer : Thermo Scientific Serial Number : 1191503036

**Standard Gas Concentration**  
Sulphur Dioxide (SO<sub>2</sub>) 44.66 PPM  
Nitric Oxide (NO) 45.94 PPM  
Methane (CH<sub>4</sub>) 984.8 PPM  
Carbon Monoxide (CO) F80143262  
Cylinder No. :  
Expiration Date : Jun 24, 2024

**Dilutor Detail**  
Manufacturer : Thermo Scientific  
Model : 1461  
Serial Number : 1180540071

### Multi-point gas test data

Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	% Error
Level 1 Zero	0.0	1.00	1.00	1.00
Level 2 20.00%	100.0	1.20	1.19	1.19
Level 3 40.00%	200.3	0.30	0.15	0.15
Level 4 60.00%	300.9	0.90	0.30	0.30
Level 5 80.00%	400.1	0.10	0.02	0.02
Remark : Measuring Range 500.0 ppb		Average Difference (%)		
		Acceptable Limit $\pm 5\%$		



Unit: PPM

19 Oct 2022

Thermo Scientific



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UAE ANALYST AND ENGINEERING CONSULTANT CO., LTD.

### MULTI-POINT GAS TEST REPORT

Test Date : Oct 10, 2022

Equipment : Gas Analyzer (NO<sub>2</sub>)  
Manufacturer : Thermo Scientific

Model : 42i  
Serial Number : 179140775

#### Standard Gas Concentration

Sulphur Dioxide (SO<sub>2</sub>) : 44.68  
Nitric Oxide (NO) : 45.94  
Methane (CH<sub>4</sub>) : 984.8  
Carbon Monoxide (CO) : 9801.43262  
Cylinder No. :  
Expiration Date : Jun 24, 2024

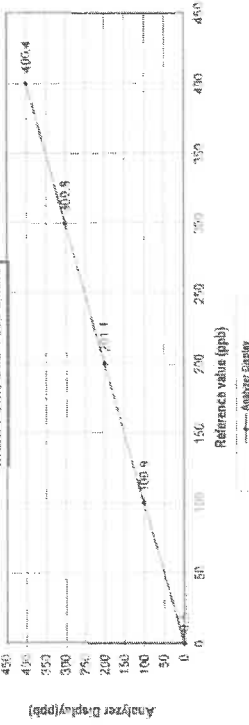
#### Dilutor Detail

PPM :  
Manufacturer : Thermo Scientific  
Model : 146i  
Serial Number : 1180540071

#### Multi-point gas test data

Reference Value (ppb)		Analyzer Display (ppb)	Difference Error	Percent Error	[% Error ]
Level 1	Znco	0.0	0.50	0.50	0.50
Level 2	20.00%	100.0	0.90	0.69	0.69
Level 3	40.00%	200.0	1.10	0.55	0.55
Level 4	60.00%	300.8	0.80	0.27	0.27
Level 5	80.00%	400.4	0.40	0.10	0.10
Remark : Measuring Range		500.0 ppb	Average Difference (%)		0.46

#### Multi-Point Gas Test Chart



10/10/2022  
10/10/2022

10/10/2022  
10/10/2022



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UAE ANALYST AND ENGINEERING CONSULTANT CO., LTD.

### MULTI-POINT GAS TEST REPORT

Test Date : June 30, 2022

Equipment : Gas Analyzer (NO<sub>2</sub>)  
Manufacturer : Thermo Scientific

Model : 42i  
Serial Number : 120178105

#### Standard Gas Concentration

Sulphur Dioxide (SO<sub>2</sub>) : 44.75  
Nitric Oxide (NO) : 45.35  
Methane (CH<sub>4</sub>) :  
Carbon Monoxide (CO) : 1007  
Cylinder No. : CC159599  
Expiration Date : Jul 30, 2022

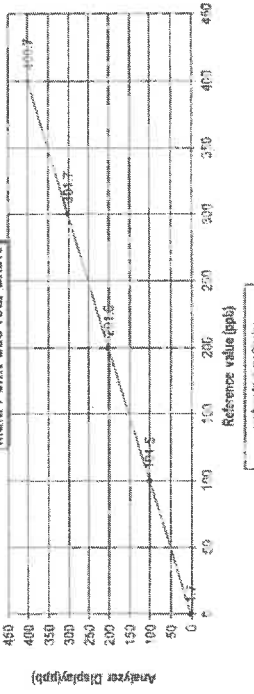
#### Dilutor Detail

PPM :  
Manufacturer : Thermo Scientific  
Model : 146i  
Serial Number : 1180540071

#### Multi-point gas test data

Reference Value (ppb)		Analyzer Display (ppb)	Difference Error	Percent Error	% Error ]
Level 1	Zero	0.0	1.70	1.70	1.70
Level 2	20.00%	100.0	1.50	1.48	1.48
Level 3	40.00%	201.6	1.60	0.79	0.79
Level 4	60.00%	300.0	1.70	0.56	0.56
Level 5	80.00%	400.7	0.70	0.17	0.17
Level 6 : Measuring Range : 500.0 ppb			Average Difference (%) : 0.94		
Acceptable Limit $\pm$ 5%					

#### Multi-Point Gas Test Chart



30/06/2022  
30/06/2022

30/06/2022  
30/06/2022



Airgas Specialty Gases  
Airgas USA, LLC  
630 United Drive  
Durham, NC 27713  
Airgas.com

Airgas.  
an Air Liquide company

## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA Protocol

Part Number: E04N189E15A01D3  
Cylinder Number: E80143262  
Laboratory: 124 - Durham (SAP) - NC  
PGVP Number: B22021  
Gas Code: CO, NO, NOX, SO2, BALN  
Reference Number: 122-402135167-1  
Cylinder Volume: 144.4 CF  
Cylinder Pressure: 2015 PSIG  
Valve Outlet: 560  
Certification Date: Jun 21, 2021  
Expiration Date: Jun 21, 2024

Certification performed in accordance with EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2020) Document EPA 820-P-20-001. The assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total and total 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 Do Not Use. This Cylinder below 100 ppm, 1.0% or 0.2% impurities.

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Protocol Method	Assay Dates
NOX	45.00 PPM	45.98 PPM	G1	08/14/2021, 08/21/2021
NITRIC OXIDE	45.00 PPM	45.94 PPM	G1	08/14/2021, 08/21/2021
SULFUR DIOXIDE	45.00 PPM	44.88 PPM	G1	08/14/2021, 08/21/2021
CARBON MONOXIDE	1000 PPM	984.3 PPM	G1	08/14/2021
NITROGEN	Balance			

CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Uncertainty
NTRM	20081120	CC700608	49.82 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%
PRM	12386	D685026	9.91 PPM NITROGEN DIOXIDE/AIR	+/- 2.0%
GMS	401428838102	CC905981	4.348 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.0%
NTRM	18011543	CC473277	49.02 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.5%
NTRM	14080119	CC434277	990.9 PPM CARBON MONOXIDE/NITROGEN	+/- 0.5%
The SRM, PRM or RGM listed 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		
Nicolet 6700 AHR0801333 CO	FTIR	Jun 03, 2021		
Nicolet 6700 AHR0801333 NO	FTIR	Jun 03, 2021		
Nicolet 6700 AHR0801333 NO2	FTIR	Jun 03, 2021		
Nicolet 6700 AHR0801333 SO2	FTIR	Jun 03, 2021		

Triad Data Available Upon Request  
NOTES: PO #5221002807  
GROSS WT: 28.40kg  
NET WT: 4.73kg



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The analytical test results reported on this certificate relate only to the cylinder above. This concludes the test report.

Release

### MULTI-POINT GAS TEST REPORT

Test Date : Oct 25/2022

Equipment : Gas Analyzer (SO<sub>2</sub>)  
Manufacturer : Thermo SCIENTIFIC  
Model : 43  
Serial Number : 1180540956

#### Standard Gas Concentration

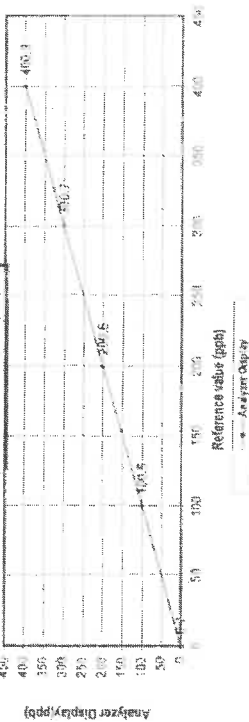
Sulfur Dioxide (SO<sub>2</sub>) : 44.69 PPM  
Nitric Oxide (NO) : 45.94 PPM  
Methane (CH<sub>4</sub>) : 984.3 PPM  
Carbon Monoxide (CO) : 984.3 PPM  
Cylinder No. : E80143262  
Expiration Date : Jun 21/2024

#### Multi-point gas test data

Level	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	20.0	0.7	0.70	0.70	0.70
Level 2	20.05%	100.5	0.50	0.50	0.50
Level 3	40.00%	200.6	0.60	0.30	0.30
Level 4	60.00%	300.7	0.70	0.23	0.23
Level 5	80.00%	400.3	0.30	0.07	0.07
Average Difference (%)					0.36

Remark : Measuring Range : 500.3 ppb  
Acceptable Limit : ± 5%

#### Multi-Point Gas Test Chart







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### MULTI-POINT GAS TEST REPORT

Test Date : Apr 8, 2022

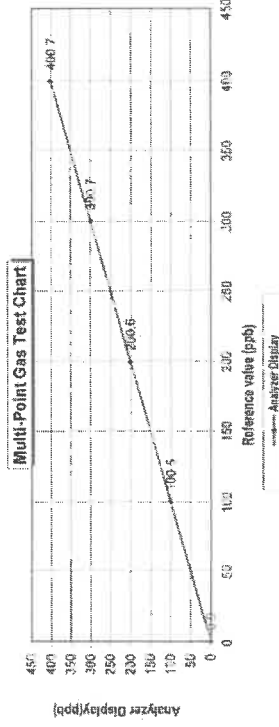
Equipment : Gas Analyzer (SO<sub>2</sub>) Model : 431  
Manufacturer : Thermo SCIENTIFIC Serial Number : 1201779112

**Standard Gas Concentration**  
Sulphur Dioxide (SO<sub>2</sub>) 44.75 PPM Manufacturer : Thermo SCIENTIFIC  
Nitric Oxide (NO) 45.35 PPM Model : 1461  
Methane (CH<sub>4</sub>) 1007 PPM Serial Number : 1180540071

Carbon Monoxide (CO) 1007 PPM  
Cylinder No. : CC159599  
Expiration Date : Jul 30, 2022

### Multi-point gas test data

Level	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.9	0.90	0.90	0.90
Level 2	20.00%	100.0	0.50	0.50	0.50
Level 3	40.00%	200.6	0.60	0.30	0.30
Level 4	60.00%	300.7	0.70	0.23	0.23
Level 5	80.00%	400.7	0.70	0.17	0.17
Remark : Measuring Range 500.0 ppb					0.42
Acceptable Limit $\pm 5\%$					



8 April 2022



United Analyst and Engineering Consultant Co., Ltd.  
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### MULTI-POINT GAS TEST REPORT

Test Date : Oct 27, 2022

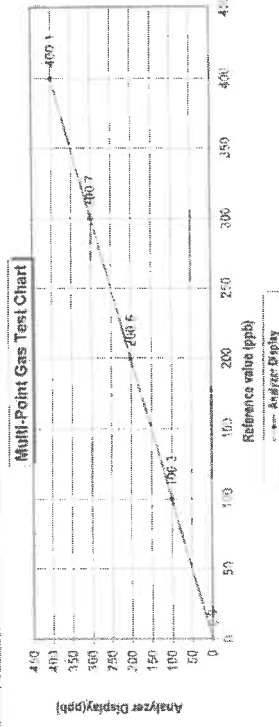
Equipment : Gas Analyzer (SO<sub>2</sub>) Model : 431  
Manufacturer : Thermo SCIENTIFIC Serial Number : 1201779116

**Standard Gas Concentration**  
Sulphur Dioxide (SO<sub>2</sub>) 44.68 PPM Manufacturer : Thermo SCIENTIFIC  
Nitric Oxide (NO) 45.94 PPM Model : 1461  
Methane (CH<sub>4</sub>) 984.8 PPM Serial Number : 1180540071

Carbon Monoxide (CO) 984.8 PPM  
Cylinder No. : EB0143262  
Expiration Date : Jun 24, 2024

### Multi-point gas test data

Level	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error	Percent Error	[% Error]
Level 1	Zero	0.9	0.90	0.90	0.90
Level 2	20.00%	100.3	0.30	0.30	0.30
Level 3	40.00%	200.5	0.50	0.25	0.25
Level 4	60.00%	300.7	0.70	0.23	0.23
Level 5	80.00%	400.1	0.10	0.02	0.02
Remark : Measuring Range 500.0 ppb					0.34
Acceptable Limit $\pm 5\%$					



27 Oct 2022

**MULTI-POINT GAS TEST REPORT**

Test Date : Apr 22, 2022

Equipment : Gas Analyzer (SO<sub>2</sub>)  
Manufacturer : Thermo Scientific

Model : 43i  
Serial Number : JC1606001758

**Standard Gas Concentration**

Sulphur Dioxide (SO<sub>2</sub>) 44.75  
Nitric Oxide (NO) 45.35  
Methane (CH<sub>4</sub>)  
Carbon Monoxide (CO) 1007  
Cylinder No. : GC159599  
Expiration Date : Jul 30, 2022

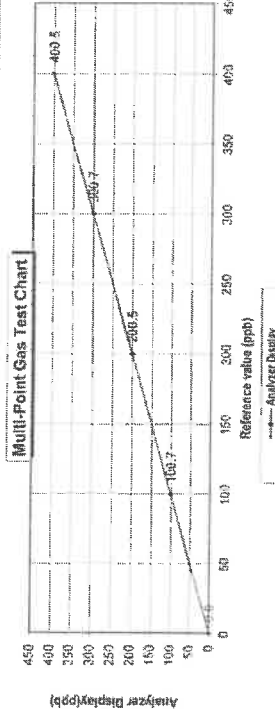
**Dilutor Detail**

Manufacturer : Thermo Scientific  
Model : 146i  
Serial Number : 1180540071

**Multi-point gas test data**

Level	Reference Value (ppb)	Analyzer Display (ppb)	Difference Error (ppb)	Percent Error (%)	% Error
Level 1	Zero	0.6	0.60	0.60	0.60
Level 2	20.00%	100.7	0.70	0.70	0.70
Level 3	40.00%	200.5	0.50	0.25	0.25
Level 4	60.00%	300.7	0.70	0.23	0.23
Level 5	80.00%	400.5	0.50	0.12	0.12
Average Difference (%)					0.38

Remark : Measuring Range 500.0 ppb  
Acceptable Limit  $\pm 5\%$



Signature: [Redacted]  
Date: 22 April 2022

**CERTIFICATE OF ANALYSIS**  
**Grade of Product: EPA Protocol**

Part Number: E04NI98E16A01D3  
Cylinder Number: E90143282  
Laboratory: 124 - Durham (SAP) - NC  
PGVP Number: B22021  
Gas Code: CO, NO, NO<sub>2</sub>, SO<sub>2</sub>, BALN  
Reference Number: 122-4021316167-1  
Cylinder Volume: 144.4 CF  
Cylinder Pressure: 2016 PSIG  
Valve Outlet: 660  
Certification Date: Jun 21, 2021  
Expiration Date: Jun 21, 2024

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

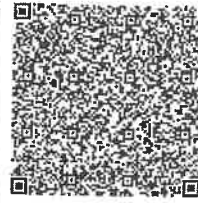
ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
NOX	45.00 PPM	45.95 PPM	G1	$\pm 1.4\%$ NIST Traceable
NITRIC OXIDE	45.00 PPM	45.94 PPM	G1	$\pm 1.4\%$ NIST Traceable
SULFUR DIOXIDE	45.00 PPM	44.85 PPM	G1	$\pm 1.0\%$ NIST Traceable
CARBON MONOXIDE	1000 PPM	984.8 PPM	G1	$\pm 0.7\%$ NIST Traceable
NITROGEN	Balance			
CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Uncertainty
NTRM	20061120	CCT00059	49.92 PPM NITRIC OXIDE/NITROGEN	$\pm 1.0\%$
PMIS	12386	D860026	9.91 PPM NITROGEN DIOXIDE/AIR	$\pm 2.0\%$
GMIS	401423838102	CQ505881	4.348 PPM NITROGEN DIOXIDE/NITROGEN	$\pm 2.1$
NTRM	16011043	CC473277	49.02 PPM SULFUR DIOXIDE/NITROGEN	$\pm 0.5\%$
NTRM	14060119	CC434277	990.8 PPM CARBON MONOXIDE/NITROGEN	$\pm 0.5\%$
The SRM, PMIS or GMIS noted above is only in reference to the GMIS used in the assay and not part of the analysis.				
ANALYTICAL EQUIPMENT				
Instrument/Make/Model	Last Multipoint Calibration			
Nicola 8700 AHR001333 CO	FTIR			
Nicola 8700 AHR001333 NO	FTIR			
Nicola 8700 AHR001333 NO <sub>2</sub>	FTIR			
Nicola 8700 AHR001333 SO <sub>2</sub>	FTIR			

Triad Data Available Upon Request

NOTES: PO #5221002807

GROSS WT: 28.40kg

NET WT: 4.73kg



CERT 3092.01

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The analytical test results reported on this certificate relate only to the cylinder number specified above. This concludes the test report.

Signature: [Redacted]

## THAI METEOROLOGICAL DEPARTMENT

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

## Calibration Certificate



Issued by : Calibration &amp; Test Section : Meteorological Instruments Bureau

Date of Issue : 7 April, 2022 Certification No. 14822

Page : 1 of 6

Object : เครื่องวัดความเร็วลมและทิศทาง

Manufacturer : LSI

Type : Data Logger E-LOG 305 Wind speed and wind direction DNA 927

Translogometers DMA975 Barometer DCA 901

Mfg Code : Data Logger 19013405 wind speed and wind direction 19050224

Thermistors 19050006 Barometer 19040218

Customer : United Analyst and Engineering Consultant Co., Ltd.

81 Soi Udomsuk 41, Sukhumvit Road,

Bangchak Prakanong, Bangkok 10260.

Calibration Condition : Temperature 23.1 °C Barometric Pressure 1014.1 hPa

NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 SN 91563

HOOK GAGE NO 1425 : Wind Anemometer Board

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

Model DA-650-3TV (Sensor TR-90AH)

Serial Number 110730029 (Sensor 121629886)

JAPAN QUALITY ASSURANCE ORGANIZATION

STANDARD THERMOMETER : Thermo Electric Dry No. B330094 Wet No. B330094

: Data Logger No. 0204007 : Thermistor No. 918802

STANDARD BAROMETER

Digital Barometer Vacula Type PTB224 No. V19220110

Bar Vacula Type PTB330 No. 84320001

Calibrated by

Mr. Wachampol Suwan

Mechanical Engineer

(Authorized Signatory)

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Sub-Standard Instrument

## THAI METEOROLOGICAL DEPARTMENT

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

## The Result of Calibration

Certification No. 14822

Page : 2 of 6

7 April, 2022

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO. 1425			TESTED ANEMOMETER	
	Pressure mbar	Velocity m/sec	Velocity m/sec	Velocity m/sec	Correction m/sec
1.00	-	-	-	1.0	
3.02	-	-	-	2.9	0.12
5.00	-	-	-	4.7	0.30
7.04	-	-	-	6.9	0.14
9.02	-	-	-	8.7	0.32
11.02	-	-	-	10.8	0.22
13.01	-	-	-	12.7	0.31
15.01	-	-	-	14.8	0.21
17.02	-	-	-	16.7	0.32
20.02	-	-	-	19.8	0.22

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

Calibrated by

Mr. Wachampol Suwan

Mechanical Engineer

Calibration &amp; Test Section

Meteorological Instruments Bureau

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# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Sathorn Rd, Bangkok 10700 THAILAND.  
Tel.: 2435 3300 Fax: 0-2433-1679 e-mail: cal-center@sithiporn.com http://www.sithiporn.com



Cert. No. : ACL22081  
Pages : 1 of 8

## Calibration Certificate

**Equipment :** SOUND LEVEL METER  
**Manufacturer :** LARSON DAVIS  
**Model :** 1x12/ Microphone 375B02 / Pre-amplifier PRM1 x 12B  
**Serial No.:** 005286 / 011740 / 056087  
**ID No.:** -

**Condition As Found :** GOOD

**Customer :** UNITED ANALYST AND ENGINEERING CONSULTANT (UAE)  
81 SOI UDONSUK 41, SUKHUMVIT ROAD,  
BANGCHAK SUB-DISTRICT,  
PHRAKHAMONG DISTRICT, BANGKOK 10260  
THAILAND.

**Location :**

**Ambient Temperature :** ( 23.0 ± 3 ) °C  
**Pressure :** ( 101.3 ± 0.3 ) kPa  
**Relative Humidity :** ( 50.0 ± 30 ) %

**Received Date :** 18 JANUARY 2022  
**Calibration Date :** 26 JANUARY 2022  
**Date of Issue :** 28 JANUARY 2022

**Calibrated by :** Nattakorn Pitsulpisan

**Approved by :**

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

QF-TS12-01-04-02-0664

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# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : ACL22081  
Job No. : VC65AC0044  
Pages : 2 of 8

**Calibration Procedure :** CP-AC-02

### Calibration Method :

This equipment was calibrated by based on IEC 61672-3 (2013) Standard for sound level meter (SL M).

The SL M had tests to Acoustical and Electrical signal levels of frequency weighting with Anechoic chamber and Reference Standard Instruments.  
For tests results of each items were made by observation of each Instruments display and also with SL M's display.

### Condition of this result of calibration :

1. Reference Standard Instruments :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	FI-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	LI-0011-21	10-Feb-22
Digital Multimeter	34461A	MY5320104	FEI-BP-03/0264	10-Feb-22
Digital Multimeter	34461A	MY5320076	LFL-BP-03/0264	08-Feb-22
Digital Multimeter	34461A	MY60024273	1-15180725251-1	15-Sep-22
Programmable Attenuator	MA1-1070	62100114	1509-07779E	08-Mar-22
Condenser Microphone	4180	2977909	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KA1	34560495	AA-3003-21	16-Feb-22

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the International system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).

QF-TS12-01-04-02-0664

เอกสารไม่ควบคุม

Continuation of Calibration Certificate

Cert. No. : AC L22081  
Job No. : VC65AC0044  
Pages : 3 of 8

Summary of Measurement Result :

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	✓	-	0.3	1.0
5. Frequency and time weightings at 1 kHz	✓	-	0.2	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

เอกสารไม่ควบคุม

QT-TS12-04-04-020664

Continuation of Calibration Certificate

Cert. No. : AC L22081  
Job No. : VC65AC0044  
Pages : 4 of 8

Result of calibration :

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	94.0	0.0	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
31.0

2.2 The microphone of the sound level meter was replaced by electrical signal input device.

Frequency Weighting	Measured value (dB)
A-weight	30.8
C-weight	30.6
Flat	36.8

3. Acoustical signal tests of frequency weightings

Meter free-field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)		
	Flat	C-weight	A-weight
125	-0.1	0.1	0.0
1000	-0.2	-0.2	-0.2
8000	3.1	3.2	3.2
			Acceptance Limits
			+1.5
			±1.0
			±5.0

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Continuation of Calibration Certificate

Cert. No. : ACL22081  
Job No. : VC65AC0044  
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)		
	Flat	C-weight	A-weight
63	0.0	0.0	0.0
125	0.0	0.0	0.0
250	0.0	0.0	0.0
500	0.0	0.0	0.0
1000	0.0	0.0	0.0
2000	0.0	0.1	0.0
4000	0.0	0.0	0.0
8000	0.0	0.0	0.0
16000	-0.1	0.0	0.1

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	0.0	-
C - weight	94.0	0.0	± 0.2
Flat	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	94.0	0.0	-
Slow	94.0	0.0	± 0.1
1 eq	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SIM Display at initial ( dB )	SIM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.0	0.0	± 0.3

Continuation of Calibration Certificate

Cert. No. : ACL22081  
Job No. : VC65AC0044  
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
135.0	135.1	0.1	± 1.1
134.0	134.1	0.1	± 1.1
133.0	133.1	0.1	± 1.1
132.0	132.1	0.1	± 1.1
131.0	131.1	0.1	± 1.1
129.0	129.1	0.1	± 1.1
124.0	124.1	0.1	± 1.1
119.0	119.1	0.1	± 1.1
114.0	114.1	0.1	± 1.1
109.0	109.1	0.1	± 1.1
104.0	104.1	0.1	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.1	0.1	± 1.1
44.0	44.2	0.2	± 1.1
39.0	39.6	0.6	± 1.1

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
140	94.0	94.0	0.0	±0.5

9. Tone burst response

Time Weighting	Tone burst duration, 1b (ms)	(cycle)	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.8	-0.2	1.5 ; -5.0
	2	5	117.0	116.7	-0.3	1.0 ; -2.5
	200	800	134.0	133.9	-0.1	±1.0
Slow	2	8	108.0	107.8	-0.2	1.5 ; -5.0
	200	800	127.6	127.5	-0.1	±1.0
	0.25	1	N/A	N/A	N/A	1.5 ; -5.0
SEL	2	8	N/A	N/A	N/A	1.0 ; -2.5
	200	800	N/A	N/A	N/A	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L peak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	135.7	-0.7	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
Positive half cycle	135.4	135.2	-0.2	±2.0
Negative half cycle	135.4	135.2	-0.2	±2.0

Continuation of Calibration Certificate

11. Overload indication

Measured value (dB)		Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	89.4	0.2	±1.5
Negative one-half cycle	89.4	0.2	±1.5

12. High level stability

Frequency Weighting	SIM Display at initial (dB)	SIM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A-weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor  $k = 2$  or any value following calculation providing a level of confidence of approximately 95 %

End of Calibration Certificate



# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

451-451/1 Jirinthorn Rd, Bangjumru, Bangkok 10700 THAILAND.  
Tel: 02-2535-3809 Fax: 02-433-1679 e-mail: calcenter@sithiporn.com http://www.sithiporn.com



ISO-TS-17025  
CALIBRATION 0394

Cert. No. : AC122082  
Pages : 1 of 8

## Calibration Certificate

**Equipment :** SOUND LEVEL METER  
**Manufacturer :** LARSON DAVIS  
**Model :** LX727 Microphone 375B02 / Preamplifier PRM1 x 12B  
**Serial No.:** 0005289 / 011732 / 056076  
**ID No.:**

**Condition As Found :** GOOD

**Customer :** UNITED ANALYST AND ENGINEERING CONSULTANT (UAE)  
81 SOI UDOMSUK 41, SUKHUMVIT ROAD,  
BANGCHAK SUB-DISTRICT,  
PHRAKHANG DISTRICT, BANGKOK 10260  
THAILAND.

**Location :**  
**Ambient Temperature :** ( 23.0 ± 3 ) °C  
**Pressure :** ( 101.3 ± 3 ) kPa  
**Relative Humidity :** ( 50.0 ± 20 ) %

**Received Date :** 18 JANUARY 2022  
**Calibration Date :** 26 JANUARY 2022  
**Date of Issue :** 28 JANUARY 2022

**Calibrated by :** Nathakorn Pisutpaisan

**Approved by :**

This certificate is issued in accordance with the requirements of ISO/IEC 17025 standard, may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

QF-TS12-04-04-02064

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# SITHIPORN ASSOCIATES CO.,LTD. CALIBRATION LABORATORY

## Continuation of Calibration Certificate

Cert. No. : AC122082  
Job No. : VC65AC0044  
Pages : 2 of 8

**Calibration Procedure :** CP-AC-02

### Calibration Method :

This equipment was calibrated by based on IEC-61672-3 (2013) Standard for sound level meter (SLM).

The SLM had tests to Acoustical and Electrical signal tests of frequency weighting with Anechoic chamber and Reference Standard Instruments.

For tests results of each items were made by observation of each Instruments display and also with SLM's display.

### Condition of this result of calibration :

1. Reference Standard Instrument :

Instrument	Model	Serial No.	Cert. No.	Due Date
Waveform Generator	33210A	MY48017076	FI-0012-21	10-Feb-22
Waveform Generator	33511B	MY52302742	FI-0011-21	10-Feb-22
Digital Multimeter	33461A	MY53220104	LEL.BP. 050264	10-Feb-22
Digital Multimeter	33461A	MY53220076	LEL.BP. 030264	08-Feb-22
Digital Multimeter	34461A	MY60024273	1-15180725251-1	15-Sep-22
Programmable Attenuator	MA1-1070	62100114	1500-07774E	08-Mar-22
Condenser Microphone	4180	2977900	AA-1008-21	05-Feb-22
Measuring Amplifier	NA-42KA1	3456040S	AA-3003-21	16-Feb-22

2. This result of calibration was found accurate as shown on date and place of calibration for this calibrated item only.

3. This certificate is traceable to the international system of unit maintained at :

- 3.1 National Institute of Metrology (Thailand).
- 3.2 Thailand Institute of Scientific and Technological Research (TISTR).

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QF-TS12-04-04-02064

Continuation of Calibration Certificate

Cert. No. : ACL22082  
Job No. : VC65AC0044  
Pages : 3 of 8

Summary of Measurement Result:

Parameter	Pass	Fail	Uncertainty (dB)	Maximum-permitted uncertainty of measurement (dB)
1. Absolute sensitivity	✓	-	0.2	N/A
2. Self-generated noise	✓	-	0.2	N/A
3. Acoustical signal tests of frequency weightings				
125 Hz	✓	-	0.3	0.6
1000 Hz	✓	-	0.3	0.6
8000 Hz	✓	-	0.3	0.7
4. Electrical signal tests of frequency weightings				
For 10 Hz to 4 kHz	✓	-	0.3	0.6
For > 4 kHz to 10 kHz	✓	-	0.3	0.7
For > 10 kHz to 20 kHz	✓	-	0.3	1.0
5. Frequency and time weighting at 1 kHz	✓	-	0.7	0.2
6. Long-term stability	✓	-	0.1	0.1
7. Level linearity on the reference level range	✓	-	0.2	0.3
8. Level linearity including the level range control	✓	-	0.2	0.3
9. Tone burst response	✓	-	0.2	0.3
10. Peak C sound level	✓	-	0.2	0.35
11. Overload indication	✓	-	0.2	0.25
12. High level stability	✓	-	0.1	0.1

เอกสารแนบ

Continuation of Calibration Certificate

Cert. No. : ACL22082  
Job No. : VC65AC0044  
Pages : 4 of 8

Result of calibration:

1. Absolute sensitivity

Reference Acoustic Signal (dB)	Measured Value (dB)	Deviation (dB)	Acceptance Limit (dB)
93.9 (93.96)	94.0	0.1	±0.3

2. Self-generated noise

2.1 Normal test

Measured Value (dB)
29.6

2.2 The microphone of the sound level meter was replaced by electrical signal input device

Frequency Weighting	Measured value (dB)
A-weight	29.1
C-weight	29.1
Flat	34.8

3. Acoustical signal tests of frequency weightings

Meter free field acoustic response at a level of 84 dB

Frequency (Hz)	Deviation from various frequency weighting response curve (dB)		
	Flat	C-weight	A-weight
125	-0.1	0.2	0.2
1000	-0.2	-0.2	-0.2
8000	2.6	2.6	2.6
			Acceptance limits
			±1.5
			±1.0
			±5.0

เอกสารแนบ

Continuation of Calibration Certificate

Cert. No. : ACL22082  
Job No. : VC65AC0044  
Pages : 5 of 8

4. Electrical signal tests of frequency weightings

Weighting network response with relative to 1 kHz.

Frequency ( Hz )	Deviation from various frequency weighting response curve (dB)		
	Flat	C-weight	A-weight
63	0.0	0.0	± 2.0
125	0.0	0.1	± 1.5
250	0.0	0.0	± 1.5
500	0.0	0.0	± 1.5
1000	0.0	0.0	± 1.0
2000	0.0	0.1	± 2.0
4000	0.0	-0.1	± 3.0
8000	0.0	0.1	± 5.0
16000	-0.1	0.1	± 5.0 (-∞)

5. Frequency and time weightings at 1 kHz

5.1 Frequency weightings at 1 kHz

Frequency Weighting	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	0.0	± 1.1
C - weight	94.0	0.0	± 0.2
Flat	94.0	0.0	± 0.2

5.2 Time weighting at 1 kHz

Frequency Weighting	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
Fast	94.0	0.0	± 0.1
Slow	94.0	0.0	± 0.1
Lsq	94.0	0.0	± 0.1

6. Long - term stability

Frequency Weighting	SIM Display at initial ( dB )	SIM Display at final ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
A - weight	94.0	94.0	0.0	± 0.3

Continuation of Calibration Certificate

Cert. No. : ACL22082  
Job No. : VC65AC0044  
Pages : 6 of 8

7. Level linearity on the reference level range

Anticipated Value ( dB )	Measured Value ( dB )	Deviated Value ( dB )	Acceptance Limits ( dB )
135.0	135.0	0.0	± 1.1
134.0	134.0	0.0	± 1.1
133.0	133.0	0.0	± 1.1
132.0	132.0	0.0	± 1.1
131.0	131.0	0.0	± 1.1
129.0	129.0	0.0	± 1.1
124.0	124.0	0.0	± 1.1
119.0	119.0	0.0	± 1.1
114.0	114.0	0.0	± 1.1
109.0	109.0	0.0	± 1.1
104.0	104.0	0.0	± 1.1
99.0	99.0	0.0	± 1.1
94.0	94.0	0.0	± 1.1
89.0	89.0	0.0	± 1.1
84.0	84.0	0.0	± 1.1
79.0	79.0	0.0	± 1.1
74.0	74.0	0.0	± 1.1
69.0	69.0	0.0	± 1.1
64.0	64.0	0.0	± 1.1
59.0	59.0	0.0	± 1.1
54.0	54.0	0.0	± 1.1
49.0	49.0	0.0	± 1.1
44.0	44.0	0.0	± 1.1
39.0	39.0	0.0	± 1.1

Continuation of Calibration Certificate

Cert. No. : ACL22082  
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Pages : 7 of 8

8. Level linearity including the level range control

Range	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
140	94.0	94.0	0.0	±0.5

9. Tone burst response

Time Weighting	Tone burst duration, (ms)	Cycle	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Fast	0.25	1	108.0	107.8	-0.2	1.5 ; -5.0
	2	8	117.0	116.7	-0.3	1.0 ; -2.5
	200	800	134.0	133.9	-0.1	±1.0
Slow	2	8	108.0	107.8	-0.2	1.5 ; -5.0
	200	800	127.6	127.6	0.0	±1.0
	0.25	1	N/A	N/A	N/A	1.5 ; -5.0
SEL	2	8	N/A	N/A	N/A	1.0 ; -2.5
	200	800	N/A	N/A	N/A	±1.0

10. Peak C sound level

Number of cycle in test signal	Anticipated Value (dB)	Measured Value, L peak (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
One	136.4	135.8	-0.6	±3.0

Number of cycle in test signal	Anticipated Value (dB)	Measured Value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Continuous	133.0	133.0	0.0	-
Positive half cycle	135.4	135.4	0.0	±1.0
Negative half cycle	135.4	135.4	0.0	±1.0

Continuation of Calibration Certificate

Cert. No. : ACL23082  
Job No. : VC65AC0044  
Pages : 8 of 8

11. Overload indication

Measured value (dB)	Deviated Value (dB)	Acceptance Limits (dB)
Positive one-half cycle	89.4	±1.5
Negative one-half cycle	89.4	±1.5

12. High level stability

Frequency Weighting	SLM Display at initial (dB)	SLM Display at final (dB)	Deviated Value (dB)	Acceptance Limits (dB)
A - weight	137.0	137.0	0.0	±0.3

The reported uncertainty is based on a standard uncertainty multiplied by coverage factor  $k = 2$  or any value following calculation providing a level of confidence of approximately 95 %

End of Calibration Certificate



## Certificate of Calibration

**Customer:** UNITED ANALYST AND ENGINEERING CONSULTANTS CO., LTD  
**Sense:** Certificate No: 22-ALP-309  
**Address:** 11, S. L. Desai Road, Madhavaram, Bangalore - 560037  
Request No: Reg 2022/01/1

**Unit Under Calibration Details:**  
**Measurement:** Sound Level Meter  
**Manufacturer:** Larson Davis  
**Model:** L52  
**Serial Number:** 000704  
**ID:** L52/FM/10562  
**Resolution:** 0.1 dB  
**Calibration Status:** Used

**Calibration Environment and Details:**  
**Temperature:** 23°C ± 2°C  
**Humidity:** 50% RH ± 5% RH  
**Barometric Pressure:** 1013 hPa ± 10 hPa  
**Received Date:** 28 March 2022  
**Calibrated Date:** 1 April 2022  
**Calibration Procedure:** In-house method (IEC 61672-1, 2011) Electroacoustic Sound Level meters - Part 1: Performance  
**Location of Calibration:** Lab Acoustic

Item	Brand	Model	SN	Use Calibration	Traceable
Standard Microphone	GRAS	40AN	10823	15 September 2022	GRAS
Reference Frequency Calibrator	Quest	Questal	EF7000234	14 June 2022	TSI
Audio Generator	Samick	Samick	131	15 October 2022	WA Liteme

**Note:** The reported uncertainty is based on standard uncertainties multiplied by the coverage factor k = 2, giving a level of confidence approximately 95%.

**Calibrated By:** Pratik  
**Approved By:** Pratik  
Mr. Pratik Mahapatra  
Certification Engineer - Signal  
Issue Date: 1 April 2022

There is no additional calibration service provided. The certificate shall be valid only for the equipment and the conditions specified on the certificate.  
**เอกสารไม่ควบคุม**



**Certificate No:** 22-ALP-349  
**Request No:** Reg 2022/06/2

## 1. Indication at the calibration check frequency

UUC Setting	Nominal Level (dB)	Before Adjust		Adjust		Acceptance Limit (+/- dB)
		UUC (dB)	ERR (dB)	UUC (dB)	ERR (dB)	
FAST (125 Hz)	112.5	113.8	-0.03	113.9	0.03	0.3

**Note:** Microphone sensitivity was substituted by the use of Sound Calibration Board SYNTEK Model 99/25/50/9

## 2. Self-generated noise, Microphone Installed

UUC Setting	Measured (dB)	UNCERTAINTY (+/- dB)
FAST (125 Hz)	24.7	0.10
UUC Weighting		
A		

## 3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured (dB)	UNCERTAINTY (+/- dB)
FAST (125 Hz)	24.1	0.10
UUC Weighting		
A	23.5	0.10
Z	22.8	0.10

## 4. Acoustic signal test of frequency weightings (Without Windscreen)

UUC Setting	Deviation from various Frequency Weighting Response curve (dB)	UNCERTAINTY (+/- dB)		Acceptance Limit (+/- dB)
		A	Z	
FAST (125 Hz)	0.1	0.1	0.1	2.0
125 Hz	0.0	0.0	0.0	1.0
1000 Hz	0.1	0.1	0.1	3.0
8000 Hz	-0.2	-0.2	-0.1	5.0

There is no additional calibration service provided. The certificate shall be valid only for the equipment and the conditions specified on the certificate.  
**เอกสารไม่ควบคุม**

Calibration No. : 22-ACT-019  
 Request No. : RA-2022-009

5. Electrical signal test of frequency weighting, Weighting network response with relative to 1 kHz

U/C Setting	STD	RP	ERR	Acceptance Limit
FAST 27-119	1.00	0.0	0.0	0.0
U/C Weighting	1.00	0.0	0.0	0.0
A	1.00	0.0	0.0	0.0
C	1.00	0.0	0.0	0.0
Z	1.00	0.0	0.0	0.0

6. Frequency and time weighting at 1 kHz

U/C Setting	STD	RP	ERR	Acceptance Limit
FAST 27-119	1.00	0.0	0.0	0.0
U/C Weighting	1.00	0.0	0.0	0.0
A	1.00	0.0	0.0	0.0
C	1.00	0.0	0.0	0.0
Z	1.00	0.0	0.0	0.0

U/C Setting	STD	RP	ERR	Acceptance Limit
FAST 27-119	1.00	0.0	0.0	0.0
U/C Weighting	1.00	0.0	0.0	0.0
A	1.00	0.0	0.0	0.0
C	1.00	0.0	0.0	0.0
Z	1.00	0.0	0.0	0.0

Calibration No. : 22-ACT-019  
 Request No. : RA-2022-009

7. Long Term Stability

U/C Setting	Measured	Uncertainty	Acceptance Limit
FAST 27-119	1.00	0.0	0.0
U/C Weighting	1.00	0.0	0.0
A	1.00	0.0	0.0
C	1.00	0.0	0.0
Z	1.00	0.0	0.0

8. Level Linearity on the reference level range

U/C Setting	Anticipated	Deviation	Uncertainty	Acceptance Limit
FAST 27-119	1.00	0.0	0.0	0.0
U/C Weighting	1.00	0.0	0.0	0.0
A	1.00	0.0	0.0	0.0
C	1.00	0.0	0.0	0.0
Z	1.00	0.0	0.0	0.0

Category	Frequency
Category 1	10
Category 2	20
Category 3	30
Category 4	40
Category 5	50
Category 6	60
Category 7	70
Category 8	80
Category 9	90
Category 10	100

9. Level linearit, including the level range control

STANDARD	FASST Setting	STD REF	Measured		INVERTIVITY (± dB)	Acceptance Limit (± dB)
			F1 C (dB)	ERR (dB)		
FASST A	FASST A	REF	11 C	ERR	0	1.1
	F1 C Range	11 C	11 C	ERR		
3 <sup>rd</sup> I-19	3 <sup>rd</sup> I-19	314	11 C	ERR	0	1.1

## 10. Tone burst response

F111 Netting		STU Yonkeford (ms)	Anticipated Age <sup>a</sup> (dB)	Measured		UNCERTAINTY (+/- dB)	Acceptance Limit (+/- dB)
UIC Time Response				UIC <sup>c</sup> (dB)	ERR (dB)		
A 374.36	Fast	200	135.0	135.0	0.0	1.0	-1.0, +2.5, 5.0
		2	118.0	117.8	-0.2		
Slow	Slow	200	109.0	108.8	-0.2	1.0	-1.0, +5.0
		2	128.0	128.5	+0.1		
SLI	SLI	200	109.0	108.9	-0.1	1.0	-1.0, +2.5
		2	129.0	129.0	0.0		
		90.5	140.0	99.3	0.1	1.0	-1.0, +5.0

### 11. Peak C Sound level

LL Peak & Sound Level	Anticipated		Measured		UNCERTAINTY { ± dB}	Acceptance Limit $t \pm \text{dB}$
	REF (dB)	UIC (dB)	ERR (dB)	ERR (dB)		
UIC Setting						
FAN C / 36-42	137.4	136.9	-0.5	-0.5	0.2	2.0
STD Setting						
Complete cycle	136.4	136.2	-0.2	-0.2	0.2	2.0
Positive half cycle						
Negative half cycle	136.4	136.2	-0.2	-0.2	0.2	2.0

End of Certificate

**เอกสารแนบฉบับที่ ๑**

# เอกสารแนบคุณ

30-1-1981

2011年11月11日  
 2011年11月11日

[illegible]

2. Self-generated noise. Microphone installed

Figure	Figure	Figure
Figure 1	Figure 2	Figure 3

UIC Noting		Measured	UNCERTAINTY
FA1	73.49	(dB)	( $\pm 0.6$ )
UIC Welding			
A		78.8	0.10
C		78.4	0.19

$\lambda$	$\mu$	$\alpha_{\lambda,\mu}$

4. Acoustic signal test of frequency weighting		(Without Wind screen)		4-reference	
Decision from various frequency		Weighting Response curve		UNCERTAINTY	
1/3 Oct. Setting	FASTER 1/3-1/9	A	C <sub>1</sub>	C <sub>2</sub>	(1std)
STD Setting	12.5 Hz	0.0	0.0	0.0	± 0.05
1000 Hz	12.5 Hz	0.0	0.0	0.0	± 0.05
4000 Hz	12.5 Hz	0.0	0.2	0.2	± 0.05
8000 Hz	12.5 Hz	0.0	0.0	0.0	± 0.05

The respective quantities are given by

3. 1994-1995

[REDACTED]

100

644, line 1

644, line 1

เอกสารไม่ว่าแบบ

The results are only to be used as a guide. The publisher disclaims any liability for any loss or damage caused by the use of the information contained herein.



Certificate No. : 22-ACT-74  
 Request No. : Ref:2022-0028

5. Electrical signal test of frequency weighting with relative to 1 kHz

U/C Setting FAST A 1/3-1/9	Deviation from various frequency Weighting Response curve				UNCERTAINTY (± 0.0)	Acceptance Limit (± 0.0)
	A (dB)	C (dB)	Z (dB)			
STD Setting	0.2	0.1	0.1			± 0.9
125 Hz	0.1	0.0	0.0			± 5
250 Hz	0.1	0.0	0.0			± 5
500 Hz	0.1	0.0	0.0			± 5
1000 Hz	0.0	0.0	0.0		0.2	± 0
2000 Hz	0.0	0.0	0.0			± 0
4000 Hz	0.0	0.0	0.0			± 0
16000 Hz	0.1	-0.1	0.0			± 0.5
160000 Hz	0.1	0.1	-0.1			± 1.0

6. Frequency and time weighting at 1kHz

U/C Setting	STD		Measured		Acceptance Limit (± dB)
	REF (dB)		U/C (dB)	ERR (dB)	
FAST 1/3-1/9					
U/C Weighting					
A	114.00		114.0	0.0	0.2
C	114.00		114.0	0.0	0.2
Z	114.00		114.0	0.0	0.2

U/C Setting	STD		Measured		Acceptance Limit (± dB)
	REF (dB)		U/C (dB)	ERR (dB)	
1/3-1/9 A					
U/C Time Response					
Fast	114.00		114.0	0.0	0.1
Slow	114.00		114.0	0.0	0.1
Flat	114.00		114.0	0.0	0.1

Certificate No. : 22-ACT-74  
 Request No. : Ref:2022-0028

7. Long Term Stability

U/C Setting	Measured		Acceptance Limit (± dB)
	U/C (dB)	ERR (dB)	
FAST A 1/3-1/9			
STD Setting			
Initial	114.0		
Final	114.0		
Deviation	0.0	0.1	0.1

8. Level linearity on the reference level range

U/C Setting	Anticipated		Deviation		Acceptance Limit (± dB)
	REF (dB)		U/C (dB)	ERR (dB)	
FAST A 1/3-1/9					
STD dB					
119.00	119.0	0.0	119.0	0.0	1.1
131.00	131.0	0.0	131.0	0.0	1.1
143.00	143.0	0.0	143.0	0.0	1.1
155.00	155.0	0.0	155.0	0.0	1.1
167.00	167.0	0.0	167.0	0.0	1.1
179.00	179.0	0.0	179.0	0.0	1.1
191.00	191.0	0.0	191.0	0.0	1.1
203.00	203.0	0.0	203.0	0.0	1.1
215.00	215.0	0.0	215.0	0.0	1.1
227.00	227.0	0.0	227.0	0.0	1.1
239.00	239.0	0.0	239.0	0.0	1.1
251.00	251.0	0.0	251.0	0.0	1.1
263.00	263.0	0.0	263.0	0.0	1.1
275.00	275.0	0.0	275.0	0.0	1.1
287.00	287.0	0.0	287.0	0.0	1.1
299.00	299.0	0.0	299.0	0.0	1.1
311.00	311.0	0.0	311.0	0.0	1.1
323.00	323.0	0.0	323.0	0.0	1.1
335.00	335.0	0.0	335.0	0.0	1.1
347.00	347.0	0.0	347.0	0.0	1.1
359.00	359.0	0.0	359.0	0.0	1.1
371.00	371.0	0.0	371.0	0.0	1.1
383.00	383.0	0.0	383.0	0.0	1.1
395.00	395.0	0.0	395.0	0.0	1.1
407.00	407.0	0.0	407.0	0.0	1.1
419.00	419.0	0.0	419.0	0.0	1.1
431.00	431.0	0.0	431.0	0.0	1.1
443.00	443.0	0.0	443.0	0.0	1.1
455.00	455.0	0.0	455.0	0.0	1.1
467.00	467.0	0.0	467.0	0.0	1.1
479.00	479.0	0.0	479.0	0.0	1.1
491.00	491.0	0.0	491.0	0.0	1.1
503.00	503.0	0.0	503.0	0.0	1.1
515.00	515.0	0.0	515.0	0.0	1.1
527.00	527.0	0.0	527.0	0.0	1.1
539.00	539.0	0.0	539.0	0.0	1.1
551.00	551.0	0.0	551.0	0.0	1.1
563.00	563.0	0.0	563.0	0.0	1.1
575.00	575.0	0.0	575.0	0.0	1.1
587.00	587.0	0.0	587.0	0.0	1.1
599.00	599.0	0.0	599.0	0.0	1.1
611.00	611.0	0.0	611.0	0.0	1.1
623.00	623.0	0.0	623.0	0.0	1.1
635.00	635.0	0.0	635.0	0.0	1.1
647.00	647.0	0.0	647.0	0.0	1.1
659.00	659.0	0.0	659.0	0.0	1.1
671.00	671.0	0.0	671.0	0.0	1.1
683.00	683.0	0.0	683.0	0.0	1.1
695.00	695.0	0.0	695.0	0.0	1.1
707.00	707.0	0.0	707.0	0.0	1.1
719.00	719.0	0.0	719.0	0.0	1.1
731.00	731.0	0.0	731.0	0.0	1.1
743.00	743.0	0.0	743.0	0.0	1.1
755.00	755.0	0.0	755.0	0.0	1.1
767.00	767.0	0.0	767.0	0.0	1.1
779.00	779.0	0.0	779.0	0.0	1.1
791.00	791.0	0.0	791.0	0.0	1.1
803.00	803.0	0.0	803.0	0.0	1.1
815.00	815.0	0.0	815.0	0.0	1.1
827.00	827.0	0.0	827.0	0.0	1.1
839.00	839.0	0.0	839.0	0.0	1.1
851.00	851.0	0.0	851.0	0.0	1.1
863.00	863.0	0.0	863.0	0.0	1.1
875.00	875.0	0.0	875.0	0.0	1.1
887.00	887.0	0.0	887.0	0.0	1.1
899.00	899.0	0.0	899.0	0.0	1.1
911.00	911.0	0.0	911.0	0.0	1.1
923.00	923.0	0.0	923.0	0.0	1.1
935.00	935.0	0.0	935.0	0.0	1.1
947.00	947.0	0.0	947.0	0.0	1.1
959.00	959.0	0.0	959.0	0.0	1.1
971.00	971.0	0.0	971.0	0.0	1.1
983.00	983.0	0.0	983.0	0.0	1.1
995.00	995.0	0.0	995.0	0.0	1.1
1007.00	1007.0	0.0	1007.0	0.0	1.1
1019.00	1019.0	0.0	1019.0	0.0	1.1
1031.00	1031.0	0.0	1031.0	0.0	1.1
1043.00	1043.0	0.0	1043.0	0.0	1.1
1055.00	1055.0	0.0	1055.0	0.0	1.1
1067.00	1067.0	0.0	1067.0	0.0	1.1
1079.00	1079.0	0.0	1079.0	0.0	1.1
1091.00	1091.0	0.0	1091.0	0.0	1.1
1103.00	1103.0	0.0	1103.0	0.0	1.1
1115.00	1115.0	0.0	1115.0	0.0	1.1
1127.00	1127.0	0.0	1127.0	0.0	1.1
1139.00	1139.0	0.0	1139.0	0.0	1.1
1151.00	1151.0	0.0	1151.0	0.0	1.1
1163.00	1163.0	0.0	1163.0	0.0	1.1
1175.00	1175.0	0.0	1175.0	0.0	1.1
1187.00	1187.0	0.0	1187.0	0.0	1.1
1199.00	1199.0	0.0	1199.0	0.0	1.1
1211.00	1211.0	0.0	1211.0	0.0	1.1
1223.00	1223.0	0.0	1223.0	0.0	1.1
1235.00	1235.0	0.0	1235.0	0.0	1.1
1247.00	1247.0	0.0	1247.0	0.0	1.1
1259.00	1259.0	0.0	1259.0	0.0	1.1
1271.00	1271.0	0.0	1271.0	0.0	1.1
1283.00	1283.0	0.0	1283.0	0.0	1.1
1295.00	1295.0	0.0	1295.0	0.0	1.1
1307.00	1307.0	0.0	1307.0	0.0	1.1
1319.00	1319.0	0.0	1319.0	0.0	1.1
1331.00	1331.0	0.0	1331.0	0.0	1.1
1343.00	1343.0	0.0	1343.0	0.0	1.1
1355.00	1355.0	0.0	1355.0	0.0	1.1
1367.00	1367.0	0.0	1367.0	0.0	1.1
1379.00	1379.0	0.0	1379.0	0.0	1.1
1391.00	1391.0	0.0	1391.0	0.0	1.1
1403.00	1403.0	0.0	1403.0	0.0	1.1
1415.00	1415.0	0.0	1415.0	0.0	1.1
1427.00	1427.0	0.0	1427.0	0.0	1.1
1439.00	1439.0	0.0	1439.0	0.0	1.1
1451.00	1451.0	0.0	1451.0	0.0	1.1
1463.00	1463.0	0.0	1463.0	0.0	1.1
1475.00	1475.0	0.0	1475.0	0.0	1.1
1487.00	1487.0	0.0	1487.0	0.0	1.1
1499.00	1499.0	0.0	1499.0	0.0	1.1
1511.00	1511.0	0.0	1511.0	0.0	1.1
1523.00	1523.0	0.0	1523.0	0.0	1.1
1535.00	1535.0	0.0	1535.0	0.0	1.1
1547.00	1547.0	0.0	1547.0	0.0	1.1
1559.00	1559.0	0.0	1559.0	0.0	1.1
1571.00	1571.0	0.0	1571.0	0.0	1.1
1583.00	1583.0	0.0	1583.0	0.0	1.1
1595.00	1595.0	0.0	1595.0	0.0	1.1
1607.00	1607.0	0.0	1607.0	0.0	1.1
1619.00	1619.0	0.0	1619.0	0.0	1.1
1631.00	1631.0	0.0	1631.0	0.0	1.1
1643.00	1643.0	0.0	1643.0	0.0	1.1
1655.00	1655.0	0.0	1655.0	0.0	1.1
1667.00	1667.0	0.0	1667.0	0.0	1.1
1679.00	1679.0	0.0	1679.0	0.0	1.1
1691.00	1691.0	0.0	1691.0	0.0	1.1
1703.00	1703.0	0.0	1703.0	0.0	1.1
1715.00	1715.0	0.0	1715.0	0.0	1.1
1727.00	1727.0	0.0	1727.0	0.0	1.1
1739.00	1739.0	0.0	1739.0	0.0	1.1
1751.00	1751.0	0.0	1751.0	0.0	1.1
1763.00	1763.0	0.0	1763.0	0.0	1.1
1775.00	1775.0	0.0	1775.0	0.0	1.1
1787.00	1787.0	0.0	1787.0	0.0	1.1
1799.00	1799.0	0.0	1799.0	0.0	1.1
1811.00	1811.0	0.0	1811.0	0.0	1.1
1823.00	1823.0	0.0	1823.0	0.0	1.1
1835.00	1835.0	0.0	1835.0	0.0	1.1
1847.00	1847.0	0.0	1847.0	0.0	1.1
1859.00	1859.0	0.0	1859.0	0.0	1.1
1871.00	1871.0	0.0	1871.0	0.0	1.1
1883.00	1883.0	0.0	1883.0	0.0	1.1
1895.00	1895.0	0.0			

9. Level linearity / including the level range control

UUC Setting FAN 1 A	STD REF (dB)	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)		
UUC Range	44.2	44.1	0.2	0.3	1.1
37-119	114	114.0	0.0	0.3	1.1

10. Tone burst response

UUC Setting A, 37-119	STD Transducer (ms)	Anticipated Ref (dB)	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
			UUC (dB)	ERR (dB)		
F tone	200	134.0	133.3	0.0	0.3	1.0
	2	41.0	41.7	-0.3		1.0, 2.5
	0.25	109.0	108.8	-0.2		1.5, 5.0
Sine	200	128.6	128.5	-0.1	0.3	1.0
	2	40.0	40.9	-0.3		1.0, 5.0
	200	125.3	129.1	0.1		1.0
B/L	2	100.0	100.1	-0.1	0.3	1.0, 2.5
	0.25	100.0	100.0	0.0		1.5, 5.0

11. Peak C Sound level

UUC Setting FAN 1 105-112	Anticipated REF (dB)	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UUC (dB)	ERR (dB)		
STD Setting	137.1	136.7	-0.70	0.2	3.0
Complex cycle	136.3	136.1	-0.70		2.0
Positive half cycle	137.4	136.2	-0.20		2.0

12. Overload indication

UUC Setting FAN 1 A, 37-119	Measured UUC (dB)	UNCERTAINTY (± dB)	Acceptance Limit (± dB)
STD Setting	143.2	0.3	1.2
Complex cycle	143.1		
Positive half cycle	143.1		
Overload	0.1	0.3	1.2

13. High Level Stability

UUC Setting FAN 1 A, 37-119	Measured UUC (dB)	UNCERTAINTY (± dB)	Acceptance Limit (± dB)
STD Setting	138.0	0.3	0.7
Complex cycle	138.0		
Positive half cycle	138.0		
Overload	0.0	0.3	0.7

End of Certificate



Certificate of Calibration

Customer: UNITED ANALYST AND FURNISHING CONSULTANTS LTD.  
Name: 41 Se. Chuan Rd, Se. Chuan Rd, Pak Wai, Hong Kong, China  
Address: 112/01  
Certificate No.: 22-ACT-013  
Request No.: Ref: 2022-0092

Unit Under Calibration Details  
Measurement Item: Sound Level Meter  
Manufacturer: PARSONDAVIS  
Model: LK12  
Serial Number: 1605344  
Hy: 1A1EFM112164  
Resolution: 0.1 dB  
Calibration Environment and Details  
Temperature: 23.1°C ± 0.1  
Humidity: 50-80% ± 20% RH  
Barometric Pressure: 1013 hPa ± 10 hPa  
Received Date: 14 January 2022  
Calibrated Date: 21 January 2022  
Calibration Procedure: JIS B 8752-2:2018 (Electromagnetic Sound level meter - Part 3: Periodic tests)  
Location of Calibration: Lab Acoustic

Reference Standard	Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	GRAS	40AN	19723	14 September 2022	GRAS
Multi-frequency Calibrator	Qeeer	Qeeer	Qeeer	17560734	14 June 2022	TSI
Audio Generator	Sennheiser	Sennheiser	6401	11	18 October 2022	WIS (Germany)

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

Calibrated By: [Signature]  
Mr. Seapaden Lianan  
Calibration Engineer  
Issue Date: 21 January 2022  
Approved By: [Signature]  
Mr. Peter Mahfouz  
Calibration Engineer  
Issue Date: 21 January 2022



Certificate No.: 22-ACT-013  
Request No.: Ref: 2022-0092

1. Indication at the calibration check frequency						
UUT Setting	Nominal Level	Before Adjust		Adjust		Acceptance Limit (+/- dB)
		UUT (dB)	ERR (dB)	UUT (dB)	ERR (dB)	
Calibrator Setting 1000 Hz 114.00 dB	114.00	113.9	-0.05	113.9	0.05	0.5
Note: Absolute repeatability was established by the use of sound Calibrator Brüel & Kjær 8010, Model S1A, IN-5907.						

2. Self-generated noise, Microphone installed	
UUT Setting	Measured
FAST 23.1 Hz	27.4
UUT Weighting	UUT (dB)
A	27.4

3. Self-generated noise, Microphone replaced by the electrical input signal device	
UUT Setting	Measured
FAST 23.1 Hz	27.4
UUT Weighting	UUT (dB)
A	27.4
C	27.6
F	31.5

4. Acoustic signal test of frequency weightings (Without Windscreen)					
UUT Setting	Deviation from various frequency Weighting Response curve			Acceptance Limit (+/- dB)	
	A (dB)	C (dB)	Z (dB)	UUT (dB)	ERR (dB)
FAST 23.1 Hz	0.0	0.1	0.0	0.50	2.0
STD Setting	0.0	0.0	0.0	0.60	1.0
125 Hz	0.0	0.0	0.0	0.60	3.0
1000 Hz	0.2	0.3	0.7	0.70	5.0
5000 Hz	-0.3	-0.3	-0.3	0.70	5.0

Certificate No. 22-AC1004  
Request No. 1 Req-2022-0022

### 5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

UUC Setting	Deviation from variant Frequency				Acceptance Limit (± dB)
	FAST / 31.5 Hz	STD Setting	UUC	UUC	
FAST / 31.5 Hz	0.1	0.1	0.1	0.1	2.0
STD Setting	0.1	0.1	0.1	0.1	1.5
125 Hz	0.1	0.1	0.1	0.1	1.5
250 Hz	0.1	0.1	0.1	0.1	1.5
500 Hz	0.1	0.1	0.1	0.1	1.5
1000 Hz	0.1	0.1	0.1	0.1	1.5
2000 Hz	0.1	0.1	0.1	0.1	2.0
4000 Hz	0.1	0.1	0.1	0.1	3.0
8000 Hz	0.1	0.1	0.1	0.1	5
16000 Hz	0.1	0.1	0.1	0.1	5.0

### 6. Frequency and time weighting at 1 kHz

UUC Setting	STD		Measured		Acceptance Limit (± dB)
	FAST / 31.5 Hz	STD	UUC	ERR	
FAST / 31.5 Hz	0.1	0.1	0.1	0.1	0.2
UUC Weighting	0.1	0.1	0.1	0.1	0.2
A	114.00	114.00	114.00	0.0	0.2
C	114.00	114.00	114.00	0.0	0.2
Z	114.00	114.00	114.00	0.0	0.2

UUC Setting	STD		Measured		Acceptance Limit (± dB)
	FAST / 31.5 Hz	STD	UUC	ERR	
FAST / 31.5 Hz	0.1	0.1	0.1	0.1	0.2
UUC Time Response	0.1	0.1	0.1	0.1	0.2
F-A	114.00	114.00	114.00	0.0	0.1
Slope	114.00	114.00	114.00	0.0	0.1
Time	114.00	114.00	114.00	0.0	0.1





## Certificate of Calibration

<b>Customer</b>	
Name	UNITED ASIA YAK AND LUNG/SHRIMP/CRAB/CLAM/TOOTH
Address	100, South Street, Clifton, Bristol, Avon, GL1 1JH Tel: 0117 924 4444 Fax: 0117 924 4445
<b>Unit Under Calibration Details</b>	
Manufacturer	SHRIMP/CLAM/TOOTH
Model	SHRIMP/CLAM/TOOTH
Serial Number	0005555
ID	UNITAS/0005555
Resolution	0.1 dB
<b>Calibration Environment and Details</b>	
Temperature	23.1 ± 0.2 °C
Humidity	50 ± 5% RH ± 2% RH
Barometric Pressure	1013 hPa ± 0.1 hPa
Received Date	23 March 2022
Calibrated Date	1 April 2022
Calibration Frequency	In-house method (P/N 1000) based on IEC 60375, 2013 Electromagnetic Noise level measurement Part 1: Periodic tests
Location of Calibration	Lab: Acoustic
Reference Standard	

Instrument	Brand	Model	S/N	Date of Calibration	Location of Calibration
Standard Microphone	GRAS	40AN	15227	15 September 2022	GRAS
Multi-frequency Calibrator	QMC	QMC	11460214	14 June 2022	TSI
Acoustic Reference	Source	Source	131	18 October 2022	W. K. P. Electronics

Note

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

Calibrated By:	Mr. Paul Matheson
Approved By:	Mr. Paul Matheson
Calibration Engineer's Signature:	
Issue Date:	1 April 2022

5. Electrical signal test of frequency weightings, Weighting network response one with relative to 1 kHz

ITU Setting	Deviation from various frequencies				UNCERTAINTY (-dB)	Acceptance Limit f (-dB)
	Weighting Brochure curve					
FAN1, 4, 11, 19	A (dB)	C (dB)	Z (dB)			
STD Setting						
63 Hz	-0.2	-0.1	-0.1			-0.0
125 Hz	-0.1	0.0	-0.0			1.5
250 Hz	-0.1	0.0	-0.0			1.5
500 Hz	0.1	0.0	0.0			4.5
1000 Hz	0.0	0.0	0.0		0.2	1.0
2000 Hz	0.0	0.0	0.0			0.0
4000 Hz	0.0	-0.1	0.0			0.0
8000 Hz	-0.1	-0.1	0.0			0.0
16000 Hz	-0.1	-0.1	-0.1			4.5, -INF

### 5. Frequency and time weightings at 1 kHz

U1 C setting	6TD		Measured	UNCERTAINTY	Acceptance
	REF	(dB)	U1C (dB)	FRR (dB)	$f \pm \Delta f$
11C Weighting					
A	114.90	(dB)	114.0	0.0	0.7
C	114.90	(dB)	114.0	0.0	0.2
Z	114.90	(dB)	114.0	0.0	0.7

ITU-T Suggestion	SSTD	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
		RFF (dB)	FUR (dB)		
37-139: A					
1 L.C. Band Repeater					
	T <sub>30</sub>	112.0	112.0	0.0	0.1
		112.0	112.0	0.0	0.1
Simple		112.0	112.0	0.0	0.1
LCF		112.0	112.0	0.0	0.1

## 7. Long Term Stability

Flowchart with Assembly	Measured	UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
1.1C Setting L357-A, 37-199	UBC (dB)		
5.1D Setting		$\pm 14.0$	
Initial			
Final	$\pm 14.0$		
Deviated	0.0	$\pm 1$	0.3

### 8. Level linearity on the reference level range.

[illegible]

Request No. 2007-0001-1007

City of Chicago

2007-0001-1007

[illegible]

### 9. Level linearity including the level range control

FUC Setting	MID	Measured		ACCEPTANCE
		UFC	ERR.	
FAN A	REF		ERR.	1 ind
FUC Range	(DB)		ERR.	(+dB)
	FS	FS	0.1	0.1
37.4 V	11.0	11.0	0.0	2.1

## 10. Tone burst response

FUT Setting	NTD Traction-1 (mm)	Anticipated Ref (dB)	Measured		UNCERTAINTY $\pm \Delta \text{dB}$	Acceptance Limit $\pm \Delta \text{dB}$
			ULC (dB)	ERR (dB)		
Fast	100	13.0	13.0	-0.1		1.0
	2	11.0	11.8	-0.2		$\pm 0.25$
	0.5	10.0	10.7	-0.1		$\pm 0.50$
Slow	200	12.6	12.4	-0.2	0.3	1.0
	2	10.0	10.8	-0.2		$\pm 0.50$
	200	13.0	12.0	-0.8		1.0
SFF	2	10.0	10.4	-0.4		$\pm 0.25$
	0.5	10.0	9.9	-0.1		$\pm 0.50$

## 11. Peak C Sound level

TFC Setting		Anticipated REF	Measured		ACCEPTANCE %	Acceptance Limit ( ± 0.03)
INST. 951.2			11 C (dB)	ERR (dB)		
STD Setting		137.4	137.4	-0.69	0.2	0.3
Temperature cycle		136.4	136.2	-0.70		
Frequency shift cycle		136.4	136.2	-0.70		

End of Certificate

# เอกสารไม่ควมคน

# เอกสารไม่ควบบอม





## Certificate of Calibration

### Customer

Name : UNITED ANALYST AND ENGINEERING CONSULTANTS CO., LTD.  
Address : 81 Soi Eka-sak 41, Sakumvit Road, Bangchak, Prakanong, Bangkok 10260  
Certificate No : 22-AC-1105  
Request No : Req-2022-0720

### Unit Under Calibration Details

Measurement item : Sound level Meter  
Manufacturer : LARSON DAVIS  
Model : I8T2  
Serial Number : 0605306  
ID : CAL-HMU112564  
Resolution : 0.1 dB  
Calibration Environment and Details  
Temperature : 23 °C ± 2 °C  
Humidity : 50 % RH ± 5 % RH  
Barometric Pressure : 1013 hPa ± 10 hPa  
Received Date : 31 January 2022  
Calibrated Date : 11 February 2022  
Calibration Procedure : In-house method (P/N:M01) based on IEC 61672-1:2013 Electroacoustics - Part 1: Periodic test  
Location of Calibration : Lab Acoustic

Microphone Class : 2  
Microphone Model : 375A04  
Microphone S/N : 292350  
Preamplifier Model : PPM1x12C  
Preamplifier S/N : 073612  
Instrument Signal : Used

### Reference Standard

Instrument	Brand	Model	S/N	Due calibration	Traceability
Standard Microphone	GRAS	40AN	188271	15 September 2022	GRAS
Mid-frequency Calibrator	Quest	Questal	LEA400214	14 June 2022	TSI
Audio Generator	Singtek	Stan401	131	18 October 2022	WRU, JICA

### Note

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

### Calibrated By :

Mr. Nopadol Lamsart  
Calibration Officer

### Approved By :

Mr. Paet Vithakarn  
Calibration Engineer Supervisor

Issue Date : 11 February 2022

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Certificate No : 22-AC-1105

Request No : Req-2022-0720

### 1. Indication at the calibration check frequency

UUC Setting	Nominal Level	Before Adjust	Adjust	Uncertainty	Acceptance Limit
FAST / 37.139		UUC (dB)	FRR (dB)	UUC (dB)	(± dB)
Calibrator Setting		UUC (dB)	FRR (dB)	UUC (dB)	(± dB)
1000 Hz 114.00 dB	113.85	113.9	-0.05	113.9	±0.3

Note : Absolute uncertainty was established by the use of Sound Calibrator Briel-Syntek, Model SY-TSA, SN: 50079.

### 2. Self-generated noise, Microphone installed

UUC Setting	Measured	Uncertainty
FAST / 37.139		UUC (dB)
UUC Weighting		(± dB)
A	27.8	±0.10

### 3. Self-generated noise, Microphone replaced by the electrical input signal device

UUC Setting	Measured	Uncertainty
FAST / 37.139		UUC (dB)
UUC Weighting		(± dB)
A	27.8	±0.10
C	27.3	±0.10
Z	33.1	±0.10

### 4. Acoustic signal test of frequency weightings (Without Windscreens)

UUC Setting	Deviation from various Frequency Weighting Response curve	Uncertainty (1 $\sigma$ )	Acceptance Limit
FAST / 37.139	A C Z	(dB)	(± dB)
STD Setting	(dB)	(dB)	(± dB)
125 Hz	0.1	0.1	0.50
1000 Hz	0.0	0.0	0.60
4000 Hz	0.6	0.5	0.60
8000 Hz	0.1	0.0	0.70

The results obtained are the property of the customer and must not be reproduced or used in full or in part without written approval of the Innovative Instrument Co., Ltd.  
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Contract No. 22-ACF-108  
Required by Reg. 201.5 0222

Certificate No.	21-ACT-105
Request No.	HOI 2072-022

### 5. Electrical signal test of frequency weightings, Weighting network response with relative to 1 kHz

LFC Setting		Deviation from various frequency		UNCERTAINTY		Acceptance Limit ( $\pm$ dB)
EAS / 77.139	Weighting	A (dB)	C (dB)	Z (dB)	( $\pm$ dB)	
STD Setting						
63 Hz		-0.3	0.0	0.0		0.0
125 Hz		-0.1	0.0	0.0		1.5
250 Hz		0.1	0.0	0.0		1.5
500 Hz		-0.1	0.0	0.0		1.5
1000 Hz		0.0	0.0	0.0	0.2	1.0
2000 Hz		0.0	0.1	0.0		2.0
4000 Hz		0.0	0.0	0.0		3.0
8000 Hz		0.0	0.0	0.0		5.0
16000 Hz		0.1	0.1	0.1		> 5. INF.

## 6. Frequency and time weightings at 1kHz

UIC Setting	STD REF (dB)	Measured		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
		UIC (dB)	ERR (dB)		
FAST [7-139]					
UIC Weighting					
A	14.00	14.0	0.0		0.2
C	14.00	14.0	0.0	0.2	0.2
Z	14.00	14.0	0.0		0.2

EUC Setting		STD REF (dB)	Measured		ENCRYPTION $\epsilon \pm \text{dB}$	Acceptance Limit ( $\pm \text{dB}$ )
$\gamma_{\text{EUC}}/\text{A}$			EUC (dB)	FRR (dB)		
EUC Fine Response						
Fast		134.00	134.0	0.6		0.1
Slow		134.00	134.9	0.9	0.2	0.1
Eq		134.00	134.0	0.0		0.3

The results related to the three categories of the specific staff can be interpreted as follows. First, as we can see in Table 1, the results related to the three categories of the specific staff are all significant at the 1% level.

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## 7. Long Term Stability

Test Setting	Measured $U(\alpha')$ (dB)	UNCERTAINTY $(\pm \text{dB})$	Acceptance Limit ( $\pm \text{dB}$ )
FAST / A / 1:1:9			
STP Setting			
Instal	114.0		
Prod	114.9		
Deviated	0.9	0.1	0.1

### 3. Level linearity on the reference level range

UUC Setting		Anticipated		Deviation		UNCERTAINTY (± dB)	Acceptance Limit (± dB)
FACT A / T-110		REF (dB)	UUC (dB)	ERR (dB)			
STD DB							
13.00		119	119.0	0.0	1.1		1.1
13.05		111	114.0	0.0	1.1		1.1
12.50		119	119.0	0.0	1.1		1.1
12.00		114	114.0	0.0	1.1		1.1
119.03		119	119.0	0.0	1.1		1.1
114.00		111	114.0	0.0	1.1		1.1
109.00		109	109.0	0.0	1.1		1.1
104.00		104	104.0	0.0	1.1		1.1
99.00		99	99.0	0.0	1.1		1.1
94.00		94	93.8	-0.1	1.1		1.1
89.00		89	88.9	-0.1	1.1		1.1
84.00		84	83.9	-0.1	1.1		1.1
79.00		79	78.9	-0.1	1.1		1.1
74.00		74	73.9	-0.1	1.1		1.1
69.00		69	68.9	-0.1	1.1		1.1
64.00		64	63.9	-0.1	1.1		1.1
59.00		59	58.9	-0.1	1.1		1.1
54.00		54	53.9	-0.1	1.1		1.1
49.00		49	48.9	-0.1	1.1		1.1
44.00		44	44.0	0.0	1.1		1.1
39.00		39	39.0	0.0	1.1		1.1
34.00		34	34.1	0.1	1.1		1.1

The results of the fitting are shown in Fig. 10. The solid line shows the fit to the data, and the dashed line shows the fit to the data with the background subtracted. The fit is very good, and the background is well represented by a single exponential decay.

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### 9. Level linearity including the level range control

ULC Setting	STD Ref	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
		F <sub>1</sub> A	ERR (dB)		
ULC Range					
37-139	11.4	43.3	-0.4	1.1	1.1

## 10. Tone burst response

FVC Setting		STB Tuneburst (ms)	Anticipated Ref (dB)	Measured		UNCERTAINTY ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
A	37-119			UU <sub>1</sub> (dB)	ERR (dB)		
FVC Time Response		200	115.0	114.9	-0.1		1.0
Fast		2	118.0	117.6	-0.4		+1.0, -2.5
		0.25	109.0	108.7	-0.3		+1.5, -5.0
Slow		200	128.6	128.5	-0.1	0.3	1.0
		2	109.0	108.9	-0.1		+1.0, -5.0
		200	129.0	129.0	0.0		1.0
SEL		2	109.0	108.9	-0.1		+1.0, -2.5
		0.25	100.0	100.0	0.0		+1.5, -5.0

### 11. Peak C Sound level

UCC Setting	Anticipated	Measured		Uncertainty	Acceptance
	RFF	U/C	ERR	( $\pm$ dB)	Limit
	(dB)	(dB)	(dB)		( $\pm$ dB)
FAS-T: C-95-142	137.1	136.7	-0.70		3.0
$\Delta$ FD Setting					
Complete cycle	136.4	136.2	-0.70	6.2	$\geq 6$
Positive half cycle					
Negative half cycle	136.1	136.2	-0.70		2.0

## 12. Overload indication

Test Conditions	Measured LTC (dB)	Uncertainty ( $\pm$ dB)	Acceptance Limit ( $\pm$ dB)
<b>LTC Setting</b> 1A, 1F, 1A, 1F, 1B, 1B	141.7		
<b>STD Setting</b> Positive one-half cycle Negative one-half cycle	141.8		
Dryland	-0.1	0.2	1.5

### 13. High Level Stability

2.5. High Level Summary	Measured	UNCERTAINTY	Acceptance Limit
<b>UUA Setting</b> <b>FAST_A 17.139</b>	UUC		(+ dB)
<b>STD Setting</b>	(dB)		
Initial Final Divided	13.5.0 136.0 0.0		

### End of Certificate

The result relative to the item also is of theoretical interest. The results indicate that the item is not a good indicator of the frequency of instrument use.

1000

It is the related only, the very common. The coffee will not be separated in full, with its own upper, and the

2014年12月15日

## เอกสารไม่ควบคุม

เอกสารเบญจกุล



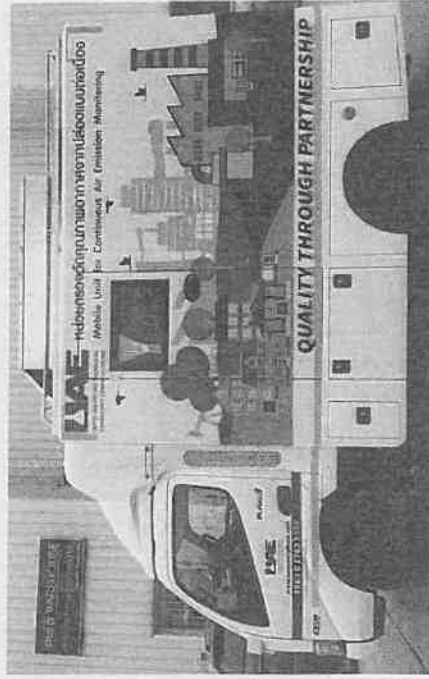
Petro-Instruments Corp., Ltd.  
To be Leader of Engineering Company.

## SERVICE REPORT

### Preventive Maintenance

For

### Mobile Continuous Emission Monitoring System (Mobile CEMS)



March, 2022 (1<sup>st</sup>)

JID2200206

BY..

PETRO-INSTRUMENTS CORP.,LTD

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PETRO-INSTRUMENTS CORP., LTD.

### Mobile Continuous Emission Monitoring System-PM Report

#### PART#1 – INTRODUCTION

This document is the Preventive Maintenance Report for Mobile Continuous Emission Monitoring System. The system included the Sampling probe, Sampling line, Zero Air, CO analyzer, CO<sub>2</sub> / O<sub>2</sub> analyzer, NO<sub>x</sub> analyzer, SO<sub>2</sub> analyzer, Standard gases and Data acquisition system.

#### PART#2 – GENERAL

Station Name: Mobile Continuous Emission Monitoring System  
Station Address: CEMS  
Application: CEMS

#### PART#3 - SAMPLING SYSTEM

##### 3.1 Sampling Probe

Type: Probe Brand: ABB  
Model: FE2 Serial Number:

- Cleaning probe. ☒ Yes ☐ No
- Inspection critical orifice. ☒ Good ☐ No
- Filter Stone replacement ☒ Yes ☐ No
- Heater Operation. ☒ Yes ☐ No
- Replaced sealing gasket ☒ Yes ☐ No

##### 3.2 Sampling Line

Type: Umbilical cord-3 tubes inside

- Check leak on tubing, Are they good? ☒ Yes ☐ No
- Check leak on lifting, Are they good? ☒ Yes ☐ No
- Check status on heated line, Are they good? ☒ Yes ☐ No

Type: Gas Cooler On Stack

- Cooler Operate status ☒ On ☐ Off
- Ventilation Fan ☒ Normal ☐ Fail
- Leak check ☒ Not Leak ☐ Leak
- Peristaltic pump operation ☒ Normal ☐ Fail
- Temperature LED status ☒ Green ☐ Red

Type: Gas Cooler On Mobile car

- Cooler Operate status ☒ On ☐ Off
- Leak check ☒ Not Leak ☐ Leak
- Peristaltic pump operation ☒ Normal ☐ Fail
- Temperature reading. 4 °C

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# Mobile Continuous Emission Monitoring System-PM Report

## PART#4 -- CALIBRATION SYSTEM

#### 4.1 Zero Air Supply Unit

Type: Free CO<sub>2</sub>, CO<sub>2</sub>, SO<sub>2</sub> & NO  
Model: 1160-BHR2C

Brand: Thermo Scientific  
Serial Number: 1180540076

- |   | 100                                 | %   |
|---|-------------------------------------|-----|
| - Check charcoal efficiency, [≥50%]       | <input checked="" type="checkbox"/> | Yes |
| - Check purafil efficiency, [≥60%]        | <input type="checkbox"/>            | No  |
| - Replace charcoal                        | <input checked="" type="checkbox"/> | Yes |
| - Replace purafil                         | <input type="checkbox"/>            | No  |
| - Check pressure reading, [30-60 psi]     |                                     |     |
| - Check temperature reading, [300-400 °C] |                                     |     |
|   | 50                                  | psi |
|   | 360                                 | °C  |

## Mobile Continuous Emission Monitoring System-PM Report

#### 4.2 Calibration Gas Unit

Type:	EPA Protocol (Mixed Gas)	Brand:	Air gas
Expiration Date:	16 Nov 2028	Cylinder Number:	EB0125076

- |                                      | 1,000                               | Psig     |
|--------------------------------------|-------------------------------------|----------|
| Check cylinder pressure. (>200 Psig) | <input checked="" type="checkbox"/> | Not leak |
| Check leak in system. Found leak?    | <input type="checkbox"/>            | Yes      |

### Composition gas in cylinder

Composition gas	Concentration	Uncertainty (%)
Oxide of Nitrogen (NO <sub>x</sub> )	197.8 ppm	± 0.7%
Nitric Oxide (NO)	197.6 ppm	± 0.8%
Carbon Monoxide (CO)	393.0 ppm	± 0.6%
Sulfur Dioxide (SO <sub>2</sub> )	204.2 ppm	± 1.1%
Carbon Dioxide (CO <sub>2</sub> )	15.94 %	± 1.0%
Balance Nitrogen	N <sub>2</sub>	

<sup>13</sup> For further information please see certification of standard gas in the attachment.

Type:	EPA Protocol (O <sub>2</sub> Gas)	Brand:	Air Gas
Expiration Date:	21 Dec 2028	Cylinder Number:	CC155952

- | Check cylinder pressure. (>200 Psig) | 1,100 Psig                              | Not leak                                     |
|--------------------------------------|---|--|
| Check leak in system. Found leak?    | <input checked="" type="checkbox"/> Yes | <input checked="" type="checkbox"/> Not leak |

### Composition gas in cylinder

Composition gas	Concentration	Uncertainty (%)
Oxygen	15.07%	± 0.4%
Balance Nitrogen	N <sub>2</sub>	

For further information please see certification of standard gas in this attachment.



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Mobile Continuous Emission Monitoring System-PM Report

PART#5 - ANALYZER SYSTEM

5.1 NO-NO<sub>x</sub>-NO<sub>2</sub> Analyzer

Type: Chemiluminescence Brand: Thermo Scientific  
Model: 42HL-BN5SDAA Serial Number: 1180540072  
Program Ver. 02.02.05.432+, Firmware 11.35.158

Parameters	Diagnostic Record Value		Unit	Acceptable Value
	Before	After		
NO Sample Reading	0.024	0.015	ppm	0-10 to 5000 ppm
NO <sub>x</sub> Sample Reading	0.045	0.047	ppm	0-10 to 5000 ppm
NO <sub>2</sub> Sample Reading	0.069	0.062	ppm	0-10 to 5000 ppm
Measuring Range	200	200	ppm	0-10 to 5070 ppm
Averaging Time	60	30	sec	10-300 sec.
NO Background	0.044	55	ppm	0-10 ppm
NO <sub>2</sub> Background	0.058	72	ppm	0-10 ppm
NO Coefficient	0.934	0.971	--	1.0 ± 0.3
NO <sub>2</sub> Coefficient	1.021	1.018	--	1.0 ± 0.3
NO <sub>2</sub> Coefficient	1.00	1.00	--	1.0 ± 0.3
Motherboard Voltage:				
+3.3 Supply	3.3	3.3	vdc	(+)3.3 ± 0.3 vdc
+5.0 Supply	5.0	5.0	vdc	(+)5.0 ± 0.5 vdc
+15.0 Supply	14.7	14.7	vdc	(+)15.0 ± 1.0 vdc
+24.0 Supply	24.1	24.1	vdc	(+)24.0 ± 1.0 vdc
-3.3 Supply	-3.2	-3.2	vdc	(-)3.3 ± 0.3 vdc
Interface Board Voltage:				
PMT Supply	-989.8	-984.6	volt	(-)700 to (-) 1,200 volt
+3.3 Supply	3.3	3.3	volt	(+)3.3 ± 0.3 vdc
+5.0 Supply	5.0	5.0	vdc	(+)5.0 ± 0.5 vdc
+15.0 Supply	14.6	14.7	vdc	(+)15.0 ± 1.0 vdc
P15.0 Supply	13.2	13.2	vdc	(+)15.0 ± 1.0 vdc
+24.0 Supply	N/A	N/A	vdc	(+)24.0 ± 1.0 vdc
-15.0 Supply	-15.1	-15.1	vdc	(-)15.0 ± 1.0 vdc
Internal Temperature	35	36	°C	> 45 °C
Chamber Temperature	49.7	50	°C	50 ± 2 °C
Coder Temperature	-2.7	-2.9	°C	(-)3 ± 2 °C
Converter Temperature	625.1	625.8	°C	325 ± 5 °C
Sample Pressure	625.0	625.0	mmHg	250 ± 50 mmHg
Chamber Pressure	47.3	43	mmHg	20-100 mmHg

Diagnostics checking

☒ Passed ☐ Not Passed

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PETRO-INSTRUMENTS CORP., LTD.  
Mobile Continuous Emission Monitoring System-PM Report

5.3 SO<sub>2</sub> Analyzer

Type: UV Fluorescent Brand: Thermo Scientific  
Model: 43HL-BNAA Serial Number: 1180540073  
Program Ver. 01.05.06.165 Firmware: 10.13.77

Parameter	Diagnostic Record Value		Unit	Acceptable Value
	Before	After Adjust		
SO <sub>2</sub> Sample Reading	0.43	0.03	ppm	0 to 1000 ppm
Measuring Range	200	200	ppm	0 to 1000 ppm
Averaging Time	60	30	sec	10-300 sec.
SO <sub>2</sub> Background	3.47	3.72	ppm	0-10 ppm
SO <sub>2</sub> Coefficient	0.928	1.025	--	1.000 ± 0.300
Motherboard Voltage:				
+3.3 Supply	3.3	3.3	vdc	(+)3.3 ± 0.3 vdc
+5.0 Supply	5.0	5.0	vdc	(+)5.0 ± 0.5 vdc
+15.0 Supply	15.0	15.0	vdc	(+)15.0 ± 1.0 vdc
+24.0 Supply	24.2	24.1	vdc	(+)24.0 ± 1.0 vdc
-3.3 Supply	-3.2	-3.2	vdc	(-)3.3 ± 0.3 vdc
Interface Board Voltage:				
PMT Supply	-579.1	-594.7	volt	(-)700 to (-) 1,200 volt
Flash Lamp Supply	623	606	volt	600 - 1,000 volt
+3.3 Supply	3.3	3.3	vdc	(+)3.3 ± 0.3 vdc
+5.0 Supply	5.0	5.0	vdc	(+)5.0 ± 0.5 vdc
+15.0 Supply	14.7	14.7	vdc	(+)15.0 ± 1.0 vdc
-15.0 Supply	-15.1	-15.1	vdc	(-)15.0 ± 1.0 vdc
+24.0 Supply	N/A	N/A	vdc	(+)24.0 ± 1.0 vdc
Internal Temperature	33.8	35	°C	> 45 °C
Chamber Temperature	44.8	45	°C	50 ± 2 °C
Sample Pressure	744.1	748	mmHg	700 ± 100 mmHg
Sample Flow	0.784	0.811	--	0.500 ± 0.100 lpm
Lamp Intensity	88	91	%	50 - 100 %

Diagnostics checking

☒ Passed ☐ Not Passed

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Mobile Continuous Emission Monitoring System-PM Report

5.5 CO Analyzer

Type: NDIR (QFC Wheel) Brand: Thermo Scientific  
Model: 48i-BNSAA Serial Number: 1140540070  
Program Ver. 02.02.04.305+ Firmware 11.62.161

Parameter	Diagnostic Record Value		Unit	Acceptable Value
	Before	After Adjust		
CO Sample Reading	0.736	0.074	ppm	0 to 10,000 ppm
Measuring Range	1000	500	ppm	0 to 10,000 ppm
Averaging Time	60	30	sec	10-300 sec.
CO Back ground	3.121	0.00	ppm	0-10 ppm
CO Coefficient	0.976	0.992	--	1.0 ± 0.3
Motherboard Voltage:				
+3.3 Supply	3.3	3.3	vdc	(+/-)3.3 ± 0.3 vdc
+5.0 Supply	5.0	5.0	vdc	(+/-)5.0 ± 0.5 vdc
+15.0 Supply	15.0	15.0	vdc	(+/-)15.0 ± 1.0 vdc
+24.0 Supply	24.2	24.2	vdc	(+/-)24.0 ± 1.0 vdc
-3.3 Supply	-3.2	-3.2	vdc	(+/-)3.3 ± 0.3 vdc
Interface Board Voltage:				
+3.3 Supply	3.3	3.3	vdc	(+/-)3.3 ± 0.3 vdc
+5.0 Supply	4.9	4.9	vdc	(+/-)5.0 ± 0.5 vdc
+15.0 Supply	14.9	14.9	vdc	(+/-)15.0 ± 1.0 vdc
+24.0 Supply	24.2	24.2	vdc	(+/-)24.0 ± 1.0 vdc
-15.0 Supply	-15.3	-15.3	vdc	(+/-)15.0 ± 1.0 vdc
+18.0 IR Supply	18.3	18.3	vdc	(+/-)18.0 ± 1.0 vdc
+18.0 MOT Supply	17.6	17.6	vdc	(+/-)18.0 ± 5.0 vdc
Bias Supply	-104.4	-104.7	vdc	(-) 110 ± 10 vdc
Internal Temperature	34.9	35	°C	> 45 °C
Chamber Temperature	48.4	48	°C	50 ± 2 °C
Sample Pressure	740.4	745	mmHg	700 ± 100 mmHg
Sample Flow	0.880	883	--	1.00 ± 0.10 lpm
S/R Ratio	1.16	1.16	--	1.140 ~ 1.180 (Zero gas)
AGC Intensity	198882	198964	Hz	250,000 ± 50,000 Hz
Motor Speed	100.01	100.3	%	80-100%
Dilution Ratio Selector	1:1	1:1	--	Refer probe dilution ratio

Diagnostics checking

☒ Passed

☐ Not Passed

Note:



Mobile Continuous Emission Monitoring System-PM Report

PART#8 – DATA ACQUISITION SYSTEM

6.1 Data Logger

Type: PC Base Brand: ADVANTECH  
Model: Envidas Ultimate Serial Number: KMA2992318

- ☒ Check hardware properly operating. ☐ Normal ☐ Abnormal
- ☒ Check software properly operating. ☒ Normal ☐ Abnormal
- ☒ Check communication system. ☒ Normal ☐ Abnormal
- ☒ Check logger configuration. ☒ Normal ☐ Abnormal
- ☒ Check logging system ☒ Normal ☐ Abnormal
- ☒ Check Windows OS operating. ☒ Normal ☐ Abnormal
- ☒ Check software auto run. ☒ Normal ☐ Abnormal
- ☒ Check reporter software operating. ☒ Normal ☐ Abnormal
- ☒ Check real time graph operating. ☒ Normal ☐ Abnormal
- ☒ Perform Disk Clean-up ☒ Action
- ☒ Perform Defragment and Optimize Drives ☒ Action
- ☒ Disk use and Free space

C: 45.2 GB Free of 97 GB  
D: 120 GB Free of 125 GB

\*\*\*\*\* Completed Checking \*\*\*\*\*



Mobile Continuous Emission Monitoring System-PM Report

PART#7 – SERVICE REPORT

Service Date: 8-16 March 2022

Work Description:

1. Diagnostics checking and record to all gas analyzers.
2. Performed disk clean-up for the data logger.
3. Replaced annual consumable parts for all gas analyzer and sampling condition system.
4. Checked leak for the sampling condition system was found leak point and already fixed.
5. Cleaned all equipment for the sampling condition system.
6. Flushing sampling line.
7. Make a new heated line for length 4 meter.
8. Performed adjusted the electronic gain of all the gas analyzer.
9. Performed single point and multi-point calibration.
10. Performed calibration drift test at 24 Hr.
11. Performed LDL (Lower Detection Limit).
12. Performed system bias.
13. Performed gas response time direct and full system
14. Checked the power system.
15. Checked and backup configuration and disk cleanup for the data logger.
16. Checked operating for both air conditioners.

Recommendation:

During Time of Preventive Maintenance  
9 Days

Preventive Maintenance and Issued By:

(Mr. Peeraphon Puangpoonoi)  
Date: 15 March 2022

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Mobile Continuous Emission Monitoring System-PM Report

PART#8 – CALIBRATION REPORT

8.1 Single Point Calibration Report

Calibration Date: 11 March 2022 Calibration No. UAE CEMS-2022/1

Analyzer System Information

Item	Gas Analyzer	Brand	Model	Serial Number
1	NO-NO <sub>2</sub> -NO <sub>x</sub> Analyzer	Thermo Scientific	43i-HL	1180540072
2	SO <sub>2</sub> Analyzer	Thermo Scientific	43i-HL	1180540073
3	CO Analyzer	Thermo Scientific	48i	1180546070
4	CO <sub>2</sub> Analyzer	Thermo Scientific	410i HL	1180546075

Calibration Result

Parameter	Measuring Range(MFR)	Gas Phase	Standard Value	Analyzer Value	%Drift	Verify Result
NO	0-200 ppm	Zero	0.00	0.00	0.00	Passed
NO <sub>x</sub>	0-200 ppm	Span	197.60	197.90	0.16	Passed
SO <sub>2</sub>	0-200 ppm	Span	197.90	197.00	0.05	Passed
CO	0-200 ppm	Zero	0.00	0.00	0.00	Passed
CO	0-500 ppm	Span	204.20	204.00	-0.10	Passed
CO <sub>2</sub>	0-500 ppm	Zero	0.00	0.00	0.00	Passed
CO <sub>2</sub>	0-20 %	Span	393.00	393.00	0.00	Passed
O <sub>2</sub>	0-25 %	Span	15.94	15.94	0.00	Passed
O <sub>2</sub>	0-25 %	Zero	0.00	0.00	0.00	Passed
O <sub>2</sub>	0-25 %	Span	15.07	15.07	0.00	Passed

Note: % Drift should not over  $\pm 2\%$  of reading.

Remark:

Calibrated and Issued By:

(Mr. Peeraphon Puangpoonoi)  
Date: 11 March 2022

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Mobile Continuous Emission Monitoring System-PM Report

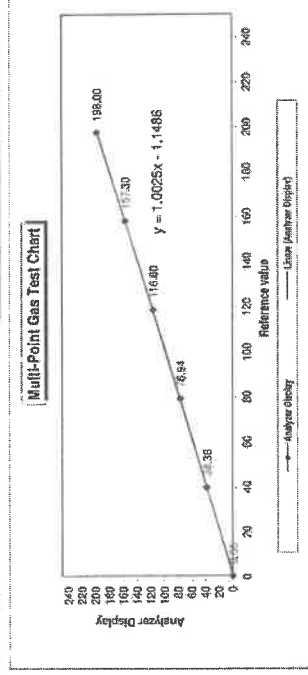
8.2 Multi Point Calibration Report

Calibration Date: 11 March 2022 Calibration No. UAE-CEMS-2022/1

Analyzer System Information			
Item	Gas Analyzer	Brand	Model
1	NO-NO <sub>2</sub> -NO <sub>x</sub> Analyzer	Thermo	42i-HL
2	SO <sub>2</sub> Analyzer	Thermo	43i-HL
3	CO Analyzer	Thermo	48i
4	CO <sub>2</sub> Analyzer	Thermo	410i

8.2.1 NO<sub>x</sub> Multi-Point Calibration Report

Reference Value (ppm)	Analyzer Display (ppm)	Difference Error (ppm)	Percent Error	Percent Error (abs)
Level 1 Zero	0.00	0.00	0.00	0.00
Level 2 20.00%	39.52	-1.16	-0.58	0.58
Level 3 40.00%	76.94	-2.10	-1.05	1.05
Level 4 60.00%	118.56	-1.76	-0.88	0.88
Level 5 80.00%	158.08	-0.78	-0.39	0.39
Level 6 100.00%	197.60	0.40	0.20	0.20
Measuring Range		200.0 ppm	Average Difference (%)	0.52



Remark :

Calibrated and Issued By:

(Mr. Praphon Puangpooon)  
Date: 11 March 2022

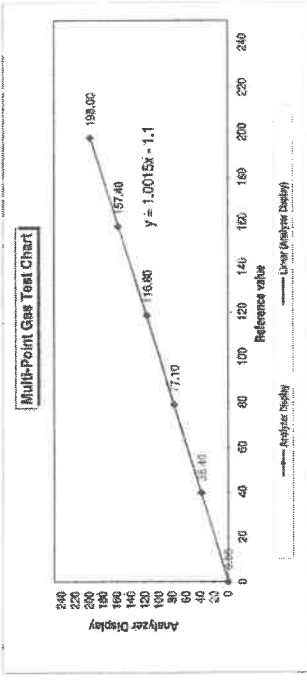
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Mobile Continuous Emission Monitoring System-PM Report

8.2.2 NO<sub>x</sub> Multi-Point Calibration Report

Reference Value (ppm)	Analyzer Display (ppm)	Difference Error (ppm)	Percent Error	Percent Error (abs)
Level 1 Zero	0.00	0.00	0.00	0.00
Level 2 20.00%	39.56	-1.16	-0.58	0.58
Level 3 40.00%	79.12	-2.02	-1.01	1.01
Level 4 60.00%	118.68	-1.58	-0.94	0.94
Level 5 80.00%	158.24	-0.84	-0.42	0.42
Level 6 100.00%	197.80	0.20	0.10	0.10
Measuring Range		200.0 ppm	Average Difference (%)	0.51



Remark :

Calibrated and Issued By:

(Mr. Praphon Puangpooon)  
Date: 11 March 2022

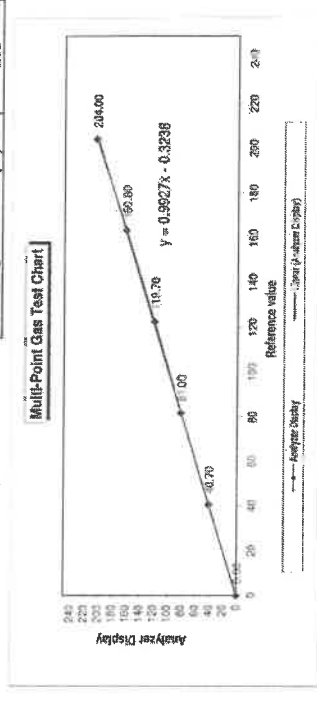
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Mobile Continuous Emission Monitoring System-PM Report

8.2.3 SO<sub>2</sub> - Multi-point Calibration Report

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error (ppm)	Percent Error (%)	Percent Error (abs)
Level 1	Zero	0.00	0.00	0.00	0.00
Level 2	20.00%	46.70	-0.14	-0.07	0.07
Level 3	40.00%	81.68	-0.08	-0.34	0.34
Level 4	60.00%	119.70	-2.82	-1.41	1.41
Level 5	80.00%	160.80	-2.56	-1.28	1.28
Level 6	100.00%	204.00	-0.20	-0.10	0.10
Measuring Range	200.0 ppm				
			Average Difference (%)	0.53	



Remark :

Calibrated and Issued By:

(M. Pongaporn Puangponnol)

Date: 11 March 2022

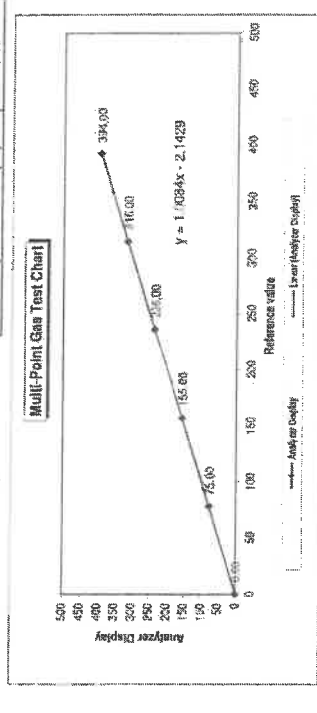
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Mobile Continuous Emission Monitoring System-PM Report

8.2.4 CO - Multi-point Calibration Report

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error (ppm)	Percent Error (%)	Percent Error (abs)
Level 1	Zero	0.00	0.00	0.00	0.00
Level 2	20.00%	75.00	-3.60	-0.72	0.72
Level 3	40.00%	155.00	-2.20	-0.44	0.44
Level 4	60.00%	235.00	0.20	0.07	0.07
Level 5	80.00%	315.00	1.60	0.32	0.32
Level 6	100.00%	394.00	1.00	0.20	0.20
Measuring Range	500.0 ppm				
			Average Difference (%)	0.29	



Remark :

Calibrated and Issued By:

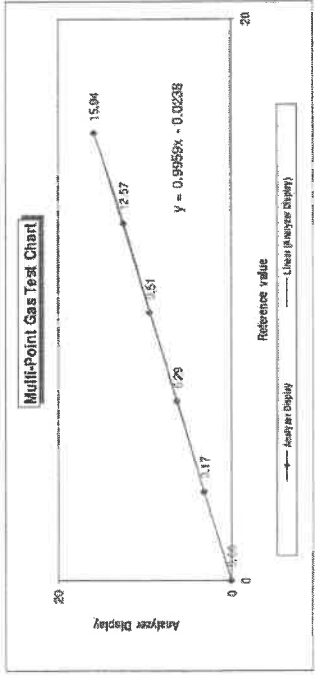
(M. Pongaporn Puangponnol)

Date: 11 March 2022

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8.2.5 CO<sub>2</sub> -- Multi-point Calibration Report

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error (ppm)	Percent Error (abs)
Level 1	Zero	0.00	0.00	0.00
Level 2	20.00%	3.19	-0.02	-0.09
Level 3	40.00%	6.38	-0.09	-0.43
Level 4	60.00%	9.56	-0.05	-0.27
Level 5	80.00%	12.75	-0.18	-0.51
Level 6	100.00%	15.94	0.00	0.00
Measuring Range	20.0 %		Average Difference (%)	0.28



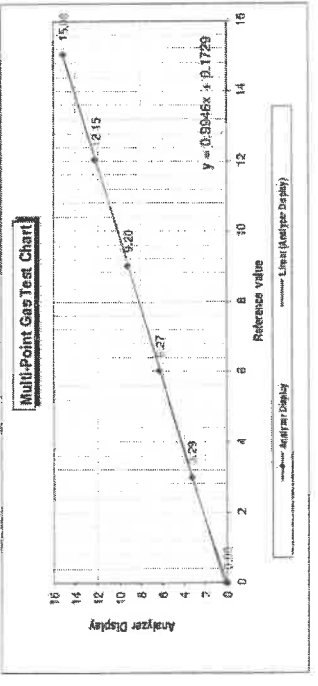
Intercept: -0.0238      Slope: 0.9959      Correlation Coefficient: 0.9959

Remark :

Calibrated and issued By: \_\_\_\_\_  
(Mr. Peeraphon Puangpoontai)  
Date: 11 March 2022

8.2.6 O<sub>2</sub> -- Multi-point Calibration Report

	Reference Value (ppm)	Analyzer Display (ppm)	Difference Error (ppm)	Percent Error (abs)
Level 1	Zero	0.00	0.00	0.00
Level 2	20.00%	3.01	0.28	0.28
Level 3	40.00%	6.27	0.24	0.24
Level 4	60.00%	9.20	0.15	0.16
Level 5	80.00%	12.05	0.10	0.10
Level 6	100.00%	15.06	0.01	0.01
Measuring Range	100.0 %		Average Difference (%)	0.13



Intercept: 0.1729      Slope: 0.9946      Correlation Coefficient: 0.9946

Remark :

Calibrated and issued By: \_\_\_\_\_  
(Mr. Peeraphon Puangpoontai)  
Date: 11 March 2022



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PETRO-INSTRUMENTS CORP., LTD.  
Mobile Continuous Emission Monitoring System-PM Report

8.3 Lower Detection Limit (LDL) and Zero/Span Drift Test Report

Record zero gas reading after calibrated zero gas every 2 minutes of each composition

Values Record After supply Zero gas 10 record,	Analyzer Type				
	NO	NO <sub>x</sub>	SO <sub>2</sub>	CO	CO <sub>2</sub>
Record#1	0.0050	0.0750	0.0200	0.020	0.041
Record#2	0.0030	0.0770	0.0500	0.027	0.042
Record#3	0.0030	0.0330	0.0100	0.030	0.040
Record#4	0.0040	0.0090	0.0700	0.035	0.041
Record#5	0.0030	0.0330	0.0200	0.040	0.038
Record#6	0.0740	0.0070	0.0500	0.040	0.038
Record#7	0.0000	0.0020	0.0700	0.027	0.041
Record#8	0.0040	0.0230	0.0900	0.027	0.030
Record#9	0.0020	0.0010	0.0200	0.034	0.038
Record#10	0.0020	0.0010	0.0200	0.037	0.038
STD. Deviation	0.0020	0.0022	0.0250	0.0776	0.0019
LDL is 2:1 of STD Dev.	0.0039	0.0044	0.0499	0.0153	0.0039

Note:

Conclusion of test

- The lower detection limit of NO composition  
The lower detection limit of NO<sub>x</sub> composition  
The lower detection limit of SO<sub>2</sub> composition  
The lower detection limit of CO composition  
The lower detection limit of CO<sub>2</sub> composition

Remark:

Lower Detectable Limit is twice the Zero Noise value. This is chosen to make the minimum Signal-to-Noise level 2:1

Calibrated and Issued By:

(Mr. Peeraphon Puangpradol)  
Date: 11 March 2022

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บริษัท เพทโร-อินสตรูเมนต์ จำกัด  
PETRO-INSTRUMENTS CORP., LTD.  
Mobile Continuous Emission Monitoring System-PM Report

8.4 Zero/Span Drift Test Report per 24 Hours

Composition Gas	Zero gas reading		%Drift	Span gas reading		%Drift
	Day#1	Day#2		Day#1	Day#2	
NO (ppm)	0.000	0.019	0.02	198.0	201.0	0.50
NO <sub>x</sub> (ppm)	0.000	0.017	0.02	198.0	202.0	0.80
SO <sub>2</sub> (ppm)	0.00	0.06	0.06	204.0	200.0	2.00
CO (ppm)	0.000	0.005	0.01	393.0	392.0	1.00
CO <sub>2</sub> (%)	0.000	-0.011	0.01	15.95	16.04	0.45
O <sub>2</sub> (%)	0.00	0.00	0.00	15.07	15.07	0.00

Remark:

Zero and Span drift test result are in normal condition.

The highlight is the analyzer problem and cannot to perform testing.

8.4 Gas Response time testing report

NO Response time	<10	Sec (Direct)
NO <sub>x</sub> Response time	<10	Sec (Direct)
SO <sub>2</sub> Response time	<10	Sec (Direct)
CO Response time	<10	Sec (Direct)
CO <sub>2</sub> Response time	<10	Sec (Direct)
O <sub>2</sub> Response time	<10	Sec (Direct)
With Sampling Line 30 meters	<40	Sec (Feed to End point)
With Sampling Line 70 meters	<50	Sec (Feed to End point)
With Sampling Line 100 meters	<90	Sec (Feed to End point)

At averaging time 30 sec.

Calibrated and Issued By:

(Mr. Peeraphon Puangpradol)  
Date: 15 March 2022

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9.5 Reference Method System Calibration Bias

Parameter	Range	Unit	Standard	Analyzer Calibration Response	System Calibration Response	Initial Values System Cal. Bias (% percent of span)
NO	200	ppm	Gas	0.00	0.11	0.11
Low level (zero)			0.00	0.00		
High level (Span)			197.60	198.00	194.00	-2.02
Remark : Percent error not over +/- 5 %						

Parameter	Range	Unit	Standard	Analyzer Calibration Response	System Calibration Response	Initial Values System Cal. Bias (% percent of span)
NO <sub>x</sub>	200	ppm	Gas	0.00	0.12	0.12
Low level (zero)			0.00	0.00		
High level (Span)			197.80	198.00	194.70	-1.67
Remark : Percent error not over +/- 5 %						

Parameter	Range	Unit	Standard	Analyzer Calibration Response	System Calibration Response	Initial Values System Cal. Bias (% percent of span)
SO <sub>2</sub>	200	ppm	Gas	0.00	0.08	0.08
Low level (zero)			0.00	0.00		
High level (Span)			204.20	204.00	198.50	-2.69
Remark : Percent error not over +/- 5 %						

Parameter	Range	Unit	Standard	Analyzer Calibration Response	System Calibration Response	Initial Values System Cal. Bias (% percent of span)
CO	500	ppm	Gas	0.00	0.18	0.18
Low level (zero)			0.00	0.00		
High level (Span)			393.00	393.00	392.00	-0.25
Remark : Percent error not over +/- 5 %						

Parameter	Range	Unit	Standard	Analyzer Calibration Response	System Calibration Response	Initial Values System Cal. Bias (% percent of span)
CO <sub>2</sub>	20	%	Gas	0.00	0.05	0.05
Low level (zero)			0.00	0.00		
High level (Span)			15.94	15.95	15.78	-1.07
Remark : Percent error not over +/- 5 %						

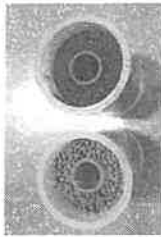


Parameter	Range	Unit	Standard	Analyzer Calibration Response	System Calibration Response	Initial Values System Cal. Bias (% percent of span)
O <sub>2</sub>	100	%	Gas	0.00	0.07	0.07
Low level (zero)			0.00	0.00		
High level (Span)			15.07	15.07	15.08	0.07
Remark : Percent error not over +/- 5 %						

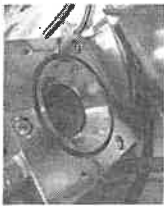

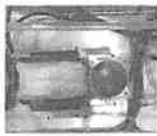
Calibrated and Issued By:  
  
(Mr. Praphan Pungboonoi)  
Date: 15 March 2022



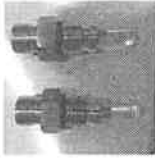

Zero Air M.1160

Item	Action	Picture
1	Replace Charcoal and Purafil	

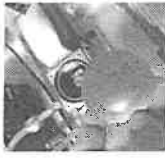
NOx Analyzer M.42i-HL

Item	Action	Picture
1	Cleaned the Reaction cell.	
2	Replaced pump repair kit for the Sample pump.	
3	Replaced pump repair kit for the bypass pump.	




4	Replaced O-ring, Capillary.	
5	Replace silica gel for dry air.	

SO<sub>2</sub> Analyzer M.43i-HL


Item	Action	Picture
1	Replaced pump repair kit.	

CO Analyzer M.48i




Item	Action	Picture
1	Replaced pump repair kit.	



Mobile Continuous Emission Monitoring System-PM Report




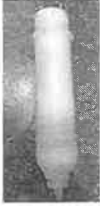

2	Cleaned the gas correlation wheel	
3	Adjusted new multi-point curve.	

CO<sub>2</sub> Analyzer M.410i

Item	Action	Picture
1	Replaced pump repair kit.	
2	Replaced O-ring, Capillary.	
3	Adjusted new multi-point curve.	



Mobile Continuous Emission Monitoring System-PM Report  
Gas Cooler on mobile car



Item	Action	Picture
1	Replace flexible tube for the peristaltic pump.	
2	Replaced conveying belt.	
3	Replaced drive complete	
4	Cleaned the heat exchanger.	
5	Re-tight the fitting.	

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Mobile Continuous Emission Monitoring System-PM Report  
Gas Cooler on Stack

Item	Action	Picture
1	Cleaned the heat exchanger.	
2	Replaced O-ring.	
3	Replace flexible tube for the peristaltic pump.	

Filter Probe M.FE2

Item	Action	Picture
1	Replace sealing kit.	

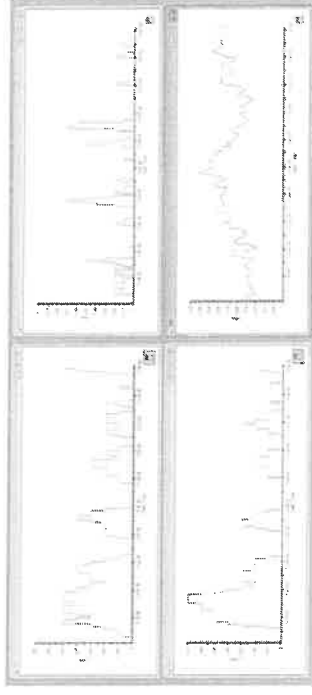
เอกสารไม่ควบคุม



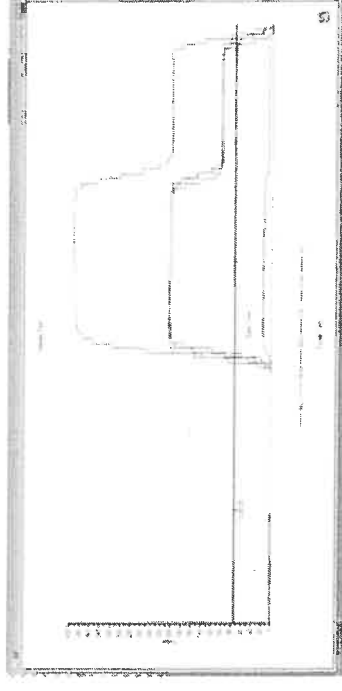
Mobile Continuous Emission Monitoring System-PM Report

2	Replaced new filter stone.	
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- Performed LDL (Lower Detection Limit) for NO<sub>x</sub>, SO<sub>2</sub>, CO and CO<sub>2</sub> analyzer.



- Performed Multi-point calibration for NO<sub>x</sub>, SO<sub>2</sub>, CO and CO<sub>2</sub> analyzer.



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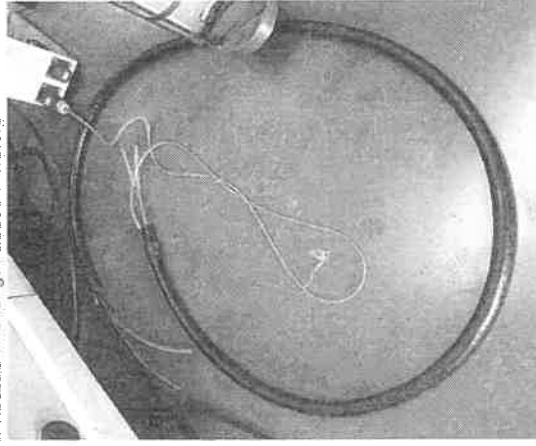




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Mobile Continuous Emission Monitoring System-PM Report

- Make a new heated line length about 4 meters



\*\*\*\*\* END SERVICE REPORT \*\*\*\*\*

Certification  
of  
Standard gas

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CERTIFICATE OF ANALYSIS  
Grade of Product: EPA Protocol

Part Number: E02N093E15AC003C  
Cylinder Number: C2232371  
Laboratory: 124 - Plumsteadville - PA  
PGVP Number: A12021  
Gas Code: CO2.CO.NO.NOX.SO2.BALN  
Reference Number: 180-401927175-1  
Cylinder Volume: 145.0 CF  
Cylinder Pressure: 2015 PSIG  
Valve Outlet: 590  
Certification Date: Jan 12, 2021  
Expiration Date: Jan 12, 2029

Certification performed in accordance with EPA Testability Protocol for Analysis and Certification of Gaseous Calibration Standards (May 2012) document EPA-600/4-12-031, using the assay procedures listed. Analytical Methodology does not require correction for analytical bias. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. These are no significant biases which affect the use of the calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

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

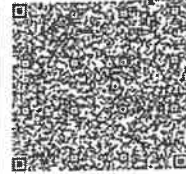
ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
NOX	100.0 PPM	100.3 PPM	G1	+/- 0.3% NIST Traceable
HYDROGEN	100.0 PPM	100.3 PPM	G1	+/- 0.3% NIST Traceable
SULFUR DIOXIDE	100.0 PPM	100.3 PPM	G1	+/- 0.3% NIST Traceable
CARBON MONOXIDE	200.0 PPM	200.3 PPM	G1	+/- 0.3% NIST Traceable
CARBON DIOXIDE	8.000 %	8.025 %	G1	+/- 0.3% NIST Traceable
NITROGEN	Balance	Balance	G1	+/- 0.3% NIST Traceable

CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Uncertainty
NTRM	1800111	KALCO0100	248.9 PPM HYDROGEN	+/- 0.4%
NTRM	1800111	KALCO0100	250.1 PPM NITROGEN	+/- 0.4%
NTRM	1800111	CC440700	248.1 PPM SULFUR DIOXIDE	+/- 0.4%
NTRM	1800111	CC440700	248.1 PPM SULFUR DIOXIDE	+/- 0.4%
NTRM	1800111	KALCO0100	248.9 PPM CARBON MONOXIDE	+/- 0.4%
NTRM	1800111	CC411178	18.308 % CARBON DIOXIDE	+/- 0.5%

ANALYTICAL EQUIPMENT				
Instrument/Make/Model	Analytical Principle			
IRIS FTIR - CO2 - 00028781	FTIR			
IRIS FTIR - NO - 00028781	FTIR			
IRIS FTIR - NOx - 00028781	FTIR			
IRIS FTIR - SO2 - 00028781	FTIR			

Triad Data Available Upon Request

NOTES: Gross Weight: 27.1 Kg, Net Weight: 4.8 Kg, PO# 522003926.



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สแกจอยบ่คองบดMer

CERTIFICATE OF ANALYSIS  
Grade of Product: EPA Protocol

Part Number: E02N093E15AC003C  
Cylinder Number: C2232371  
Laboratory: 124 - Plumsteadville - PA  
PGVP Number: A12021  
Gas Code: CO2.BALN  
Reference Number: 180-401927175-1  
Cylinder Volume: 145.0 CF  
Cylinder Pressure: 2015 PSIG  
Valve Outlet: 590  
Certification Date: Jan 12, 2021  
Expiration Date: Jan 12, 2029

Certification performed in accordance with EPA Testability Protocol for Analysis and Certification of Gaseous Calibration Standards (May 2012) document EPA-600/4-12-031, using the assay procedures listed. Analytical Methodology does not require correction for analytical bias. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. These are no significant biases which affect the use of the calibration mixture. All concentrations are on a mole/mole basis unless otherwise noted.

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

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
OXYGEN	20.00 %	20.00 %	G1	+/- 0.4% NIST Traceable
NITROGEN	Balance	Balance	G1	+/- 0.4% NIST Traceable

CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Uncertainty
NTRM	10010602	1D30055	9.867 % OXYGEN/NITROGEN	+/- 0.3%

ANALYTICAL EQUIPMENT				
Instrument/Make/Model	Analytical Principle			
SIEMENS OXYMAT 6 + H1-VS-001 - O2	PARAMAGNETIC			

Triad Data Available Upon Request

NOTES:

Gross Weight: 27.8 Kg  
Net Weight: 4.7 Kg  
PO# 522005732  
150 Aluminum Cylinder  
CGA 590



Approved for Release

Page 1 of 180-401927175-1

สแกจอยบ่คองบดMer

## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA Protocol

Part Number: E02N185E15AC0GC  
Cylinder Number: CC755952  
Laboratory: 124 - Plumsteadville - PA  
PGVP Number: A12020  
Gas Code: O2,BALN  
Reference Number: 160-401972174-1  
Cylinder Volume: 145.7 CF  
Cylinder Pressure: 2015 PSIG  
Valve Outlet: 550  
Certification Date: Dec 21, 2020  
Expiration Date: Dec 21, 2028

Certification performed in accordance with EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012) document EPA 600/R-12/021, 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 interferences which affect the use of this calibration medium. All concentrations are on a mole/mole basis unless otherwise noted.

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

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
OXYGEN	15.00 %	15.07 %	G1	+/- 0.3% NIST Traceable
NITROGEN	Balance			
CALIBRATION STANDARDS				
Type	Lot ID	Cylinder No	Concentration	Expiration Date
NITRA	08610230	K065228	23.40 % OXYGEN/NITROGEN	Jun 01, 2024
ANALYTICAL EQUIPMENT				
Instrument/Make/Model			Analytical Principle	
SIEMENS O2 VMAT 8 - N1-WP-361 - O2			PARAMAGNETIC	
Last Multipoint Calibration			Dec 17, 2020	

Triad Data Available Upon Request

NOTES:

Gross Weight: 27.3 Kg  
Net Weight: 4.9 Kg  
PC# 522005732



Approved for Release

Page 1 of 160-401972174-1

สแก๊สดอกขี้เฒ่า

## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA Protocol

Part Number: E05N185E15A001C  
Cylinder Number: EB0125076  
Laboratory: 124 - Plumsteadville - PA  
PGVP Number: A12020  
Gas Code: CO,CO2,NO,NOX,S02,BALN  
Reference Number: 160-401972174-1A  
Cylinder Volume: 133.9 CF  
Cylinder Pressure: 2015 PSIG  
Valve Outlet: 680  
Certification Date: Nov 16, 2020  
Expiration Date: Nov 16, 2028

Certification performed in accordance with EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012) document EPA 600/R-12/021, 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 interferences which affect the use of this calibration medium. All concentrations are on a mole/mole basis unless otherwise noted.

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

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty
NOX	200.0 PPM	197.8 PPM	G1	+/- 0.7% NIST Traceable
NITRIC OXIDE	200.0 PPM	197.8 PPM	G1	+/- 0.8% NIST Traceable
SULFUR DIOXIDE	200.0 PPM	204.2 PPM	G1	+/- 1.1% NIST Traceable
CARBON MONOXIDE	400.0 PPM	383.0 PPM	G1	+/- 0.9% NIST Traceable
CARBON DIOXIDE	16.00 %	15.94 %	G1	+/- 1.0% NIST Traceable
NITROGEN	Balance			

### CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NITRA	13010202	KAL030922	243.4 PPM NITRIC OXIDE/NITROGEN	+/- 0.8%	May 04, 2026
PRM	12386	D866023	9.91 PPM AMMONIUM NITROGEN DIOXIDE	2.0%	Feb 20, 2026
GNIS	124205889	CC623707	4.022 PPM NITROGEN DIOXIDE/NITROGEN	2.1%	Aug 15, 2021
NITRA	10010212	AL070473	265.3 PPM SULFUR DIOXIDE/NITROGEN	+/- 0.8%	Apr 25, 2022
NITRA	042012	N048548	483.4 PPM CARBON MONOXIDE/NITROGEN	+/- 0.8%	Jun 03, 2024
NITRA	03010621	K013730	13.94 % CARBON DIOXIDE/NITROGEN	+/- 0.8%	Jun 03, 2024

The 3500 PPM or 3500 mg/L value shown is only for reference to the GMS used in the assay, and not part of the analysis.

### ANALYTICAL EQUIPMENT

Instrument/Make/Model		Analytical Principle		Last Multipoint Calibration	
Nickel 6700	APM1100391 CO2	FTIR	NDIR	Oct 23, 2020	
SIEMENS ULTRAMATEE N1-C8-180		FTIR	FTIR	Oct 27, 2020	
Nickel 6700	APM1100391 NO	FTIR	FTIR	Nov 12, 2020	
Nickel 6700	APM1100391 NO2	FTIR	FTIR	Nov 12, 2020	
Nickel 6700	APM1100391 S02	FTIR	FTIR	Oct 22, 2020	

Triad Data Available Upon Request

NOTES:

PC# 522004417  
Gross Weight: 28.7 Kg  
Net Weight: 5.5 Kg



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สแก๊สดอกขี้เฒ่า

## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA Protocol

Part Number: E05N183E15A0004  
Cylinder Number: CCY15540  
Laboratory: 124 - Riverton (SAP) - NJ  
PGVP Number: B52019  
Gas Code: CO2 CO NO NOX SO2 BALN  
Reference Number: 82-40142750-1  
Cylinder Volume: 154.0 CF  
Cylinder Pressure: 2015 PSIG  
Valve Outlet: 560  
Certification Date: Feb 27, 2019  
Expiration Date: Feb 27, 2020

Certification performed in accordance with EPA Method 100/101 for Analysis and Certification of Gaseous Calibration Standards (May 2012), document EPA 600/R-12/021, using the gravimetric method for gas and the gravimetric method for liquid calibration standards. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. The analytical uncertainty is based on the use of the calibration gas, the analytical method, and the instrument used for the analysis.

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Total Relative Uncertainty	Assay Dates
NOX	400.0 PPM	400.0 PPM	+/- 0.7% NIST Traceable	02/19/2019, 02/27/2019
NITRIC OXIDE	400.0 PPM	400.0 PPM	+/- 0.7% NIST Traceable	02/19/2019, 02/27/2019
CARBON MONOXIDE	400.0 PPM	400.0 PPM	+/- 0.7% NIST Traceable	02/19/2019, 02/27/2019
SULFUR DIOXIDE	400.0 PPM	400.0 PPM	+/- 0.7% NIST Traceable	02/19/2019, 02/27/2019
CARBON DIOXIDE	16.00 %	16.00 %	+/- 0.8% NIST Traceable	02/19/2019, 02/27/2019
NITROGEN	Balance	Balance	+/- 0.8% NIST Traceable	02/19/2019, 02/27/2019

CALIBRATION STANDARDS			
Type	Lot ID	Cylinder No	Expiration Date
NTRM	15016127	KAL004357	Jan 01, 2021
PRM	12386	DA50025	Jan 01, 2021
GMS	114201631	CS500710	Nov 14, 2019
NTRM	14301468	CL408840	Nov 14, 2019
NTRM	11101954	KAL004012	Nov 14, 2019
NTRM	12001554	CS354883	Nov 14, 2019

ANALYTICAL EQUIPMENT			
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration	
Nicodet 6700 AIR2001933 CO2	FIR	Feb 07, 2019	
Siemens Ultramat 8 D-505 CO2	NDIR	Feb 11, 2019	
Nicodet 6700 AIR2001933 NO	FIR	Feb 01, 2019	
Nicodet 6700 AIR2001933 NO2	FIR	Feb 01, 2019	
Nicodet 6700 AIR2001933 SO2	FIR	Feb 14, 2019	

Triad Data Available Upon Request

NOTES:  
Gross Weight: 26231.4 grams  
Net Weight: 5516.5 gram  
FOUO 521900067

This calibration was performed in accordance with the May 2012 EPA Traceability Protocol, document EPA 600/R-12/021. All testing processes and measurements conform to the requirements of the EPA 600/R-12/021 and to Airgas ISO 9001:2008 and relate only to items identified on this certificate. Measurements are certified to be NIST Traceable with total uncertainty as detailed under Analytical Uncertainty. This document shall only be reproduced in full without written approval of the issuer.

TESTING CERT No. 3082.05

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## CERTIFICATE OF ANALYSIS

### Grade of Product: EPA Protocol

Part Number: E05N183E15A0010  
Cylinder Number: CCY19340  
Laboratory: 124 - Plumsteadville - PA  
PGVP Number: A12020  
Gas Code: CO CO2 NO NOX SO2 BALN  
Reference Number: 160-401882912-1A  
Cylinder Volume: 153.9 CF  
Cylinder Pressure: 2015 PSIG  
Valve Outlet: 660  
Certification Date: Oct 14, 2020  
Expiration Date: Oct 14, 2021

Certification performed in accordance with EPA Method 100/101 for Analysis and Certification of Gaseous Calibration Standards (May 2012), document EPA 600/R-12/021, using the gravimetric method for gas and the gravimetric method for liquid calibration standards. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. The analytical uncertainty is based on the use of the calibration gas, the analytical method, and the instrument used for the analysis.

ANALYTICAL RESULTS				
Component	Requested Concentration	Actual Concentration	Total Relative Uncertainty	Assay Dates
NOX	200.0 PPM	200.0 PPM	+/- 0.8% NIST Traceable	10/09/2020, 10/13/2020
NITRIC OXIDE	200.0 PPM	200.0 PPM	+/- 0.8% NIST Traceable	10/09/2020, 10/13/2020
SULFUR DIOXIDE	200.0 PPM	200.0 PPM	+/- 0.8% NIST Traceable	10/09/2020, 10/13/2020
CARBON MONOXIDE	400.0 PPM	400.0 PPM	+/- 0.8% NIST Traceable	10/09/2020, 10/13/2020
CARBON DIOXIDE	16.00 %	16.00 %	+/- 1.0% NIST Traceable	10/09/2020, 10/13/2020
NITROGEN	Balance	Balance	+/- 1.0% NIST Traceable	10/09/2020, 10/13/2020

CALIBRATION STANDARDS			
Type	Lot ID	Cylinder No	Expiration Date
NTRM	03161217	KAL004009	May 25, 2026
PRM	12386	DA50025	Feb 20, 2023
GMS	124204889	CS323707	Aug 15, 2021
NTRM	1600660	CC405077	Dec 17, 2023
NTRM	042012	N0485648	Jul 02, 2024
NTRM	080118	K009725	Jul 27, 2027

ANALYTICAL EQUIPMENT			
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration	
HORIBA VAS011 JVSXVUP NDIR CO2	NDIR	Oct 02, 2020	
SIEMENS ULTRAMAT8 N1-C6-18V	NDIR	Oct 06, 2020	
Nicodet 650 FTIR AUP2010245 NO	FTIR	Sep 14, 2020	
Nicodet 650 FTIR AUP2010245 NO2	FTIR	Sep 22, 2020	
Nicodet 650 FTIR AUP2010245 SO2	FTIR	Sep 16, 2020	

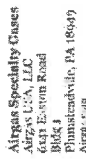
Triad Data Available Upon Request

NOTES: Gross Weight: 28.1 Kg, Net Weight: 5.1 Kg, PO#521900067



เอกสารไม่ควบคุม

Page 1 of 160-401882912-1A



## Certificate of Calibration

Reference Number: 160-401892911-1  
Cylinder Volume: 148.7 CF  
Cylinder Pressure: 2015 PSIG  
Valve Outlet: 550  
Certification Date: Sep 18, 2020

Expiration Date	Exp. 18, 2028
<p>Certification performed in accordance with TPA Testability Procedure 1. A study and Certification of Gasphase Calibration Standards (May 2012) occurred EPA 600/9-12353. This study was performed using the same procedures listed in the testability procedure. A physical flow rate was not required for this study. This study has a total analytical uncertainty as stated below with a confidence level of 95%. These are <math>\pm 5.5\%</math> for impurities which reflect the use of this calibration matrix. All concentrations are on a mass/mass basis. These are <math>\pm 5.5\%</math> for impurities which reflect the use of this calibration matrix. All concentrations are on a mass/mass basis.</p>	

Triad Data Available Upon Request

NOTES: Gross Weight: 27.1 Kg, Net Weight: 4.8 Kg, PO# 530005916.



Triad Data Available Upon Request



Page 1 of 160-401822911-1



# เอกสารประกอบ

Approved By: \_\_\_\_\_

Issue Date: \_\_\_\_\_

Mr. Pacific Maritime

2007 EQUUS 364 7-8

# เอกสารประกอบ

4. nitrating Sol	Not Applicable	Certificate No.: 22-1991-94
5. CAC Adjustment		Request No.: Req-2022-203

## Point of Application

Category	Item	Unit	Quantity	Unit Price	Total Price
Material	1. Cement	m³	100	120	12000
	2. Sand	m³	200	80	16000
	3. Gravel	m³	150	100	15000
	4. Bricks	1000s	50	200	10000
	5. Tiles	m²	100	150	15000
	6. Paint	kg	50	300	15000
	7. Steel	kg	100	100	10000
	8. Wood	m³	50	200	10000
	9. Glass	m²	100	100	10000
	10. Labor	hr	1000	10	10000
Equipment	1. Excavator	hr	100	100	10000
	2. Bulldozer	hr	50	100	5000
	3. Loader	hr	100	50	5000
	4. Pallet Jack	hr	100	20	2000
	5. Forklift	hr	50	50	2500
	6. Crane	hr	100	100	10000
	7. Drilling Machine	hr	100	50	5000
	8. Scaffolding	hr	100	50	5000
	9. Safety Gear	hr	100	20	2000
	10. Transportation	hr	100	100	10000
Other	1. Permits	hr	100	100	10000
	2. Insurance	hr	100	100	10000
	3. Security	hr	100	100	10000
	4. Maintenance	hr	100	100	10000
	5. Cleaning	hr	100	100	10000
	6. Lighting	hr	100	100	10000
	7. Heating	hr	100	100	10000
	8. Cooling	hr	100	100	10000
	9. Water	hr	100	100	10000
	10. Electricity	hr	100	100	10000

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# เอกสารแนบ

## Certificate of Calibration

<b>Customer</b>	Certificate No.: 22-RUN-011
<b>Name</b>	Request No.: Pol 202-1069 DANIEL ALEXANDER NGILU INCHANG LAMOLITTE

Time & order of application noted

Material of Form	Relative Humidity Meter	Resolution (11 $\mu$ g/gH <sub>2</sub> O)
Manometer	MI	Resolution =
Model	: Q1-23	Sensitivity Model =
Serial Number	1F5010601	Accuracy N.N. =
IP	1A111M500504	Temperature Status Used

[illegible]

Temperature	5 ° ± 5 °C
Humidity	50 % RH to 90 % RH
Received Date	17 November 2022
Calibration Date	24 November 2022
Calibration By	Mr. Suresh Singhdesikan
Location of Calibration	Lab 2 Temperature
Calibration Method	Ice-bath method (PT-TIM-91) by Comparison With Standard Reference Humidity Meter and Standard Thermometer with RH Probe in Humidity Temperature Chamber

### Reference Standard

[illegible]

**Figure 1**

This coefficient is available in  $\{ \text{CointStrength} \}$  within `CSA` and `CSA2` functions.

**Note**

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

Calibrated By: [REDACTED] Approved by: [REDACTED]  
 Station: Station Engineer: [REDACTED] Mr. T. C. Mathison

Print Date: 24 November 2022

# เอกสารแนบฉบับ



INNOVATIVE INSTRUMENT CALIBRATION LAB  
INNOVATIVE INSTRUMENT CO. LTD. HEAD OFFICE  
130 Moo 12, Soi Srinakharinwirot, Bang Kapi,  
Amphur Bang Kapi, Prachin Buri, 10140 THAILAND  
TEL : (66) 02116-5866-4 FAX: (66) 02116-7140

Page 1 of 1

Certificate No : 22-RH-130

Request No : Req-2022-2009

Calibration Results :  
Relative Humidity Calibration

Humidity Range (% RH)	Without Adjustment (% RH)			1 uncertainty (%RH)
	STD Reading (%RH)	UUC Reading (%RH)	Correction (%RH)	
35	35.95	36	-0.05	0.9
80	79.80	80	0.1	1.0

End of Certificate

This certificate is valid only for the instrument calibrated. The certificate shall not be reproduced or copied in full or in part without written approval of the Innovate Instrument Co., Ltd.

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INNOVATIVE INSTRUMENT CALIBRATION LAB  
INNOVATIVE INSTRUMENT CO. LTD. HEAD OFFICE  
130 Moo 12, Soi Srinakharinwirot, Bang Kapi,  
Amphur Bang Kapi, Prachin Buri, 10140 THAILAND  
TEL : (66) 02116-5866-4 FAX: (66) 02116-7140

## Certificate of Calibration

Customer : UNITED ANALYST AND ENGINEERING  
Name : CONSULTANT CO., LTD.  
Address : 81 Soi Edomsuk 41, Sukhumvit Road, Bangchak, Prachinong,  
Bangkok 10260

Certificate No : 22-TPM-005  
Request No : Req-2022-0289  
Page : 1/2

### Unit Under Calibration Details

Calibration Parameter : Temperature  
Instrument Name : Thermal Environment Monitor  
Manufacturer : 3M  
Model : QT-32  
Serial Number : TFS030008  
Resolution : 0.1 °C  
ID Number : UAE-TPM 0337561  
Range Calibration : 20 °C to 60 °C  
Type of Sensor : RTD  
Sensor Diameter (mm) : 4.5  
Calibration Position (mm) : 67.5  
Immersion Status : Used

### Calibration Environment and Details

Temperature : 23 °C ± 3 °C  
Humidity : 55 %RH ± 1 %RH  
Received Date : 4 February 2022  
Calibrated Date : 22 February 2022  
Calibration Procedure : In house method (P-TPM-01) by Comparison with Standard Thermometer.

### Reference Standard

Digital Thermometer with Sensor, Manufacturer: GINGGO GINGGO, Model: G111/RTD100, SN:  
12000077, ID: AR-TPM Which was calibrated on 30 March 2021. Calibration Certificate No.: QC21-0719

Traceability : This Certificate is traceable to SI Unit through Quality Reference Co., Ltd. NIST-CNSC Accreditation No.:  
Calibration 0292

### Note

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

Approved By :

Mr. Pait Mahayoon  
Calibration Engineer Supervisor

Issue Date :

22 February 2022

This certificate is valid only for the instrument calibrated. The certificate shall not be reproduced or copied in full or in part without written approval of the Innovate Instrument Co., Ltd.  
P-TPM-0289-01 Rev-01 Issue date: 11/02/25

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Calibration Note

1177 Adjutant : New York

Certificate No: 2278496

Request No. : RA-2112-0249

1998

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Temperature °C	Conductivity μS/cm	Current mA	TVR Reading °C	Standard temperature °C	100°C Salinity
20.001	0.14	0.01	19.9	20.001	W11
25.004	0.14	0.01	24.9	25.004	
30.005	0.14	0.01	30.0	30.005	
35.004	0.14	0.01	34.9	35.004	
40.008	0.14	0.01	39.9	40.008	
45.006	0.14	0.01	45.0	45.006	W11
50.006	0.14	0.01	50.0	50.006	
55.008	0.14	0.01	55.0	55.008	
60.008	0.14	0.01	60.0	60.008	
65.008	0.14	0.01	65.0	65.008	
20.001	0.14	0.01	20.0	20.001	DRY
25.002	0.14	0.01	25.0	25.002	
30.005	0.14	0.01	30.0	30.005	
35.007	0.14	0.01	35.1	35.007	
40.007	0.14	0.01	40.0	40.007	
45.005	0.14	0.01	45.2	45.005	DRY
50.004	0.14	0.01	50.2	50.004	
55.007	0.14	0.01	55.2	55.007	
60.008	0.14	0.01	60.0	60.008	
65.008	0.14	0.01	65.0	65.008	
20.004	0.14	0.01	19.9	20.004	G108C
25.004	0.14	0.01	25.0	25.004	
30.004	0.14	0.01	30.0	30.004	
35.005	0.14	0.01	35.0	35.005	
40.006	0.14	0.01	40.0	40.006	
45.006	0.14	0.01	45.0	45.006	G108C
50.007	0.14	0.01	50.0	50.007	
55.006	0.14	0.01	55.0	55.006	
60.008	0.14	0.01	60.0	60.008	
65.006	0.14	0.01	65.0	65.006	

kind of certificate

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U.S. DEPT. OF JUSTICE

The results indicate only a few items with small differences in the two conditions. The verification half of the experiment failed for the high-stimulus intensity condition. The verification half of the experiment failed for the high-stimulus intensity condition.

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