

ภาคผนวก จ

ใบแสดงการตรวจเทียบเครื่องมือ

Sheet No. : CAL-M5008/01/22



CONTROL UNIT CALIBRATION

(Metric units, mm)

Date 13 Jan 22

Barometric press, Pb

Initial	Final	Average
759	759	759

 mmHg

Dry Gas Meter Data

Console No. M50-08

Metering System ID

DGM Number 971415

DGM Model ES-110

Calibrated by : Montri P.

Reference Dry Gas Meter Data

Serial No. 358794

Model S110

Correction factor (Yr) 0.9966

Last Calibration Date 8 Jan 22

Orifice manometer setting, ΔH mm H2O	Ref.	DGM	Temperature (°C)				Time Θ min	DGM Correction factor (Y)	ΔH@ mm
	DGM	Volume V _m Liters	Ref DGM T _r	Dry Gas Meter					
	Volume V _r Liters			Inlet T _i	Outlet T _o	Avg T _m			
12.5	100.0	101.7	23	23	22	22.5	9.23	0.9771	49.1298
25.0	100.1	100.9	23	23	22	22.5	6.73	0.9847	52.1391
50.0	100.0	100.0	23	23	22	22.5	4.88	0.9902	55.0134
76.0	100.0	98.8	23	23	22	22.5	3.93	0.9997	54.2067
100.0	100.0	99.1	23	23	22	22.5	3.93	0.9945	52.8042
150.0	100.2	97.3	23	23	22	22.5	2.82	1.0099	54.6989

Average 0.9927 52.9987

Approved by : 
(Miss Katesarin Vorradetwittaya)

Sheet No. : CAL-PI-PS10-01/2022



PITOT TUBE CALIBRATION

Calibration Location: SECOT

Calibration Date : 14/01/2022

Calibrated duct No. : 1

Calibration Standard Pitot tube data

Pitot No. : Sid-01

Coefficient (Cp) : 1

Type S Pitot No. : PS10-01

Calibrated by : Mr. Montri P.

A Side Calibration

Run No.	ΔPstd (mm H ₂ O)	ΔPs (mm H ₂ O)	Cp(s)	Deviation, δ Cp(s) - Cp(A)
1	7.55	10.75	0.8380	0.0032
2	7.55	10.75	0.8380	0.0032
3	7.55	11.00	0.8285	-0.0064

C_{P(A),avg} 0.8349

B Side Calibration

Run No.	ΔPstd (mm H ₂ O)	ΔPs (mm H ₂ O)	Cp(s)	Deviation, δ Cp(s) - Cp(B)
1	7.55	11.00	0.8285	-0.0097
2	7.55	10.75	0.8380	-0.0001
3	7.55	10.50	0.8480	0.0098

C_{P(B),avg} 0.8382

|CP(A)-CP(B)| = 0.0033

C_{P(Avg)} = 0.8365

Approved by : 
(Miss Katesarin Vorradetwittaya)

*** δ must be ≤ 0.01 for the test to be acceptable ***
*** |Cp(A)-Cp(B)| must also be < 0.01 if average of Cp(A) and Cp(B) is to be used ***

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E04NI99E15AC084 Reference Number: 82-401409170-1
Cylinder Number: EB0108319 Cylinder Volume: 144.4 CF
Laboratory: 124 - Riverton (SAP) - NJ Cylinder Pressure: 2015 PSIG
PGVP Number: B52019 Valve Outlet: 660
Gas Code: CO,NO,NOX,SO2,BALN Certification Date: Feb 05, 2019

Expiration Date: Feb 05, 2023

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 800R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

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

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	50.00 PPM	50.93 PPM	G1	+/- 1.4% NIST Traceable	01/28/2019, 02/05/2019
NITRIC OXIDE	50.00 PPM	50.82 PPM	G1	+/- 1.4% NIST Traceable	01/28/2019, 02/05/2019
SULFUR DIOXIDE	50.00 PPM	48.82 PPM	G1	+/- 1.0% NIST Traceable	01/28/2019, 02/05/2019
CARBON MONOXIDE	0.5000 %	0.5040 %	G1	+/- 1.1% NIST Traceable	01/31/2019
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13060206	CC401947	4950 PPM CARBON MONOXIDE/NITROGEN	+/- 0.4%	Feb 15, 2019
PRM	12367	APEX1089237	9.82 PPM NITROGEN DIOXIDE/AIR	+/- 2.0%	Jun 02, 2017
NTRM	12010724	KAL004497	50.03 PPM NITRIC OXIDE/NITROGEN	+/- 0.8%	Mar 12, 2024
GMIS	1114201601	CC508710	4.971 PPM NITROGEN DIOXIDE/NITROGEN	+/- 2.0%	Nov 14, 2019
NTRM	14010327	KAL004376	49.08 PPM SULFUR DIOXIDE/NITROGEN	+/- 1.0%	Apr 17, 2024

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

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Siemens Ultramat 6 J3-S99 CO/HIGH	NDIR	Jan 18, 2019
Nicolet 6700 APW1100391 NO	FTIR	Jan 10, 2019
Nicolet 6700 APW1100391 NO2	FTIR	Jan 10, 2019
Nicolet 6700 APW1100391 SO2	FTIR	Jan 10, 2019

Triad Data Available Upon Request

PERMANENT NOTES: PRODUCED IN ACCORDANCE WITH ISO17025 REQUIREMENTS

NOTES:

Gross Weight: 27806.3 grams

Net Weight: 4733.2 grams

This calibration std. has been certified in accordance with the May 2012 EPA Traceability Protocol document EPA-600/R-12/531. All testing processes and measurements conform to the requirements of ISO/IEC 17025 and to Airgas ISO 9001:2008 and relate only to items identified on this certificate. This document shall not be reproduced in full without written approval of the issuer.



TESTING CERT No. 3082.05

D. Moore
Approved for Release

Page 1 of 82-401409170-1



High Volume TSP & PM-10 Calibration Data Sheet

Calibration Location : SECOT Co., Ltd. Calibration Date : Jan 13, 2022
Hi-Vol Pump No. : BH-002 Indicator No. : CM-01
Amb. Temp (°C) : 25 Press (mmHg) : 760
Calibration by : Mr. Punkawin K.

Plate	Indicate (X) (cm)	True H ₂ O (in.)	Actual Flow (Y) (cfm)	XY	X ²	Remark
18	16.20	11.90	57.45	930.69	262.44	
13	13.40	9.30	51.10	684.74	179.56	
10	11.00	7.40	45.72	502.92	121.00	
7	7.00	4.90	37.44	262.08	49.00	
5	4.20	3.00	29.58	124.24	17.64	
Sum	51.80	36.50	221.29	2,504.67	629.64	

Calibrated by : *Punkawin* Approved by : *W. Haya K.*



High Volume TSP & PM-10 Calibration Data Sheet

Calibration Location : SECOT Co.,Ltd. Calibration Date : Jan 14, 2022
 Hi-Vol Pump No. : BH-001 Indicator No. : CM-01
 Amb. Temp (°C) : 25 Press (mmHg) : 760
 Calibration by : Mr.Punkawin K.

Plate	Indicate (X) (cm.)	True H ₂ O (in.)	Actual Flow (Y) (cfm)	XY	X ²	Remark
18	17.40	12.60	59.07	1,027.82	302.76	
13	14.40	10.10	53.20	766.08	207.36	
10	11.40	7.80	46.90	534.66	129.96	
7	7.20	5.00	37.81	272.23	51.84	
5	4.40	3.00	226.60	997.04	19.36	
Sum	54.80	38.50	423.58	3,597.83	711.28	

Calibrated by : Ratana Approved by : Willaya K

Sheet No. : NC-74-2022-079



SOUND LEVEL METER CALIBRATION

Calibration Location: SECOT Calibration Date: Sep 3, 22

SOUND LEVEL CALIBRATOR

Brand	Model	Serial No.	Calibrated (dB)	Frequency (Hz)
RION	NC-74	34283648	94.00	1000

No.	Brand	Model	Serial No.	Microphone Serial No.	SLM Reading (dB)	dB Adjust
26	RION	NL-21	00187481	117664	93.9	0.1
34	RION	NL-21	00187489	117711	94.1	-0.1
42	RION	NL-21	00187497	117801	93.8	0.2
50	RION	NL-21	00187505	117809	93.8	0.2
92	RION	NL-21	00198274	123477	93.7	0.3
95	RION	NL-21	00198277	123480	94.0	0.0

Calibrated by : [Signature] Approved by : Preda S.

Sheet No. : CEL120/2-2022-092



SOUND LEVEL METER CALIBRATION

Calibration Location: SECOT

Calibration Date: Sep 13, 22

SOUND LEVEL CALIBRATOR

Brand	Model	Serial No.	Calibrated (dB)	Frequency (Hz)		
CASELLA	CEL120/2	2839225	114.0	1000		
No.	Brand	Model	Serial No.	Microphone Serial No.	SLM Reading (dB)	dB Adjust
21	CASELLA	CEL-246	3173337	3173337	114.0	0.0
23	CASELLA	CEL-246	3173339	3173339	114.0	0.0

Calibrated by :

Approved by :

CEL120/2-2022-092/Ca/72/09/2022

SECOT CO., LTD.
239 Rungkongpuri Rd. Bangsue, Bangkok 10800, THAILAND
Tel: (66)959-1600 Fax: (66)959-5535
E-Mail: ca@secot.com.th

CERTIFICATE OF CALIBRATION

ISSUED BY Noisemeters

DATE OF ISSUE 06/04/22

CERTIFICATE NUMBER 172633

NoiseMeters

NoiseMeters
Acoustic House
Bridlington Road
Hunmanby
YO14 0PH
United Kingdom
www.noisemeters.com

Page 1 of 1

Approved signatory

N.Smith

Electronically signed:

Dosimeter

Instrument information

Manufacturer: Pulsar Instruments Plc Notes:
Model: Model 22
Serial number: PB632
Firmware version: 501

Test summary

Date of calibration: 06/04/22

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.

The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.

The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Multimeter	Fluke	8845A	1520023
Multimeter	Fluke	8845A	2702002
Signal Generator	TTi	TG4001	327881

Notes

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%.

CERTIFICATE OF CALIBRATION

ISSUED BY **Noisemeters**

DATE OF ISSUE **06/04/22**

CERTIFICATE NUMBER **172642**

Noisemeters

Noisemeters
Acoustic House
Bridlington Road
Hunmanby
YO14 0PH
United Kingdom
www.noisemeters.com

Page 1 of 1

Approved signatory
N. Smith
Electronically signed:

N. Smith

Dosimeter

Instrument information

Manufacturer: Pulsar Instruments Plc
Model: Model 22
Serial number: PB644
Firmware version: 501

Notes:

Test summary

Date of calibration: 06/04/22

The calibration was performed respecting the requirements of ISO/IEC 17025:2017.

The dosimeter submitted for testing successfully completed the periodic tests of IEC 61252-1993+A1:2000.

The dosimeter submitted for testing conforms to the specifications in IEC 61252-1993+A1:2000.

Test equipment

Equipment	Manufacturer	Model	Serial number
Multimeter	Fluke	8845A	1520023
Signal Generator	TTi	TG4001	327881
Multimeter	Fluke	8845A	2702002

Notes

This certificate provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory. The results within this certificate relate only to the items calibrated. The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a coverage probability of approximately 95%.



THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Mechanical Engineering Standards Laboratory Sol 1, Bangpoo Industrial Estate, Muang, Samutprakan 10280, Thailand.

Request No.23-65/0223

MTC.No.23-65/0223-02

Number of page(s) 2

CALIBRATION CERTIFICATE

Nomenclature : DRYCAL

Manufacturer : Mesa Labs

Serial No.: 160100

Model : Defender 520-L

Scale range : 5 ml/min to 500 ml/min

Subdivision : (0.001, 0.01) ml/min

Submitted by : SECOT CO.,LTD.

239, Rimklongprapa Road, Bangsue,
Bangkok 10800, Thailand.

Received date : 26 January 2022

Condition of measured item : Normal

Calibration date : 3 February 2022

Standard	Certificate No.	Date due	Traceability
RTD Thermometer	PSL-T 336/63	6-Apr-22	TISTR
Molbox/Pressure Transducer/Upstream	MP-0013-21	25-Jan-23	NIMT
Primary Flow Calibrator S/N 117982	MW-0011-21	8-Apr-23	NIMT

Calibrated by :

Terasak Panna

(Mr.Terasak Panna)

Approved by :

(Mr. Kiatana Juntachai)

Mechanical Engineering Standards Laboratory

Ref. 2013265012600367002

Issued Date 3 February 2022

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

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THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Mechanical Engineering Standards Laboratory Soi 1, Bangpoo Industrial Estate, Muang, Samutprakan 10280, Thailand.

Request No.23-65/0223

2/2

MTC.No.23-65/0223-02

Calibration point : (20, 50, 100, 200, 400) ml/min

Ambient condition : Temperature (23 ± 3) °C , Relative humidity (55 ± 15) %

Atmospheric pressure (1010 ± 13) hPa

Calibration method : The flowmeter (UUC) was calibrated by comparison method with standard flowmeter according to CP-370.01.

The reported value is the value that converted to value at reference condition within pressure and temperature of the actual gas entering the UUC

Measurement data :

UUC Value (ml/min)	Standard Value (ml/min)	Temperature (°C)	Pressure (hPa)	Deviation (%)	Uncertainty (%)
*22.473	22.553	25.071	1009.97	-0.35	1.08
53.343	53.559	25.077	1009.93	-0.40	1.01
102.11	103.17	25.075	1010.08	-1.02	1.04
199.33	202.02	25.035	1010.16	-1.33	1.06
404.44	411.64	24.950	1010.43	-1.75	1.00

The reported expanded uncertainties are based on standard uncertainties multiplied by a coverage factor $k=2$, which provides a level of confidence of approximately 95%.

* : The calibration point is not the scope of accreditation.

The end of calibration certificate.

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FMBL MTC.002 Rev

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