

ภาคผนวก ง

เอกสารการสอบเทียบ
เครื่องมือตรวจวัดและวิเคราะห์

High Volume Sampler Calibration

CONDITIONS

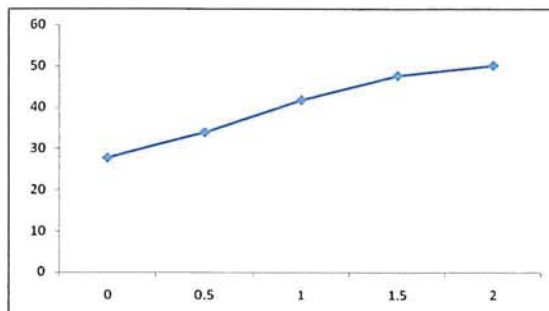
Barometric Pressure (mm Hg)	:	752.80	Corrected Pressure (mm Hg)	:	753
Temperature rapture (deg C)	:	32	Temperature	:	305
Average Press. (mm Hg)	:	752.80	Corrected Average (mm Hg)	:	753
Average Temp. (deg C)	:	31	Average Temp. (deg K)	:	304

CALIBRATION ORIFICE

Make	:	General Metal Works	Qstd Slope	:	1.89677
Model	:	GMW	Qstd Intercept	:	-0.02329
Serial #	:	F36	Date Certified	:	January 18, 2022

CALIBRATIONS

Plate or	H2O	Qstd	I	IC	LINEAR	
Test #	(in)	(m3/min)	(Chart)	(Corrected)	REGRESSION	
15	9.20	1.587	52.5	51.69	Slope	= 30.0359
13	7.60	1.443	48.5	47.75	Intercept	= 4.4591
10	5.22	1.198	42.5	41.84	Corr. Coeff.	= 0.9976
7	3.42	0.972	34.0	33.48		
5	2.20	0.782	28.5	28.06	# of Observations	: 5
Range of Chart						37
at 1.1-1.7 m3/min						56



Calibrated By :



Mr. PASAGORN SAMOL



บริษัท เอ็นไวร์ เซอร์วิส จำกัด

บริษัท เอ็นไวร์ เซอร์วิส จำกัด
ENVIR SERVICE CO., LTD.

42 รามอินทรา 14 แยก 9 แขวงท่าแร้ง เขตบางเขน กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201
42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

Analyzer Performance Test

Calibrated Date: 18 January 2022

Instruments Information

Analyzer Type: CO Analyzer Model: 300	Manufacturer API S/N: 1306
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Calibration System

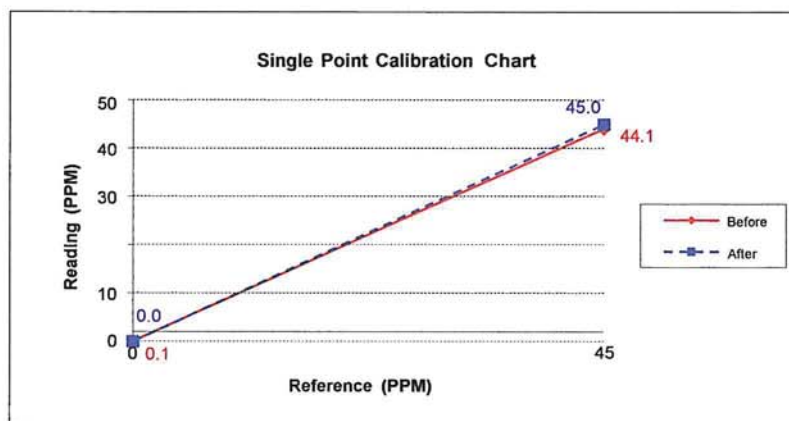
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 45.2 PPM SO2 Conc 44.9 PPM CO Conc 4,490 PPM Expire Date: 6 October 2022

Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	0.1	0.1	45.0	44.1	-2.0
After	0.0	0.0	0.0	45.0	45.0	0.0



Calibrate By :

Analyzer Performance Test

Calibrated Date: 18 January 2022

Instruments Information

Analyzer Type: CO Analyzer Model: 300	Manufacturer API S/N: 1371
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Calibration System

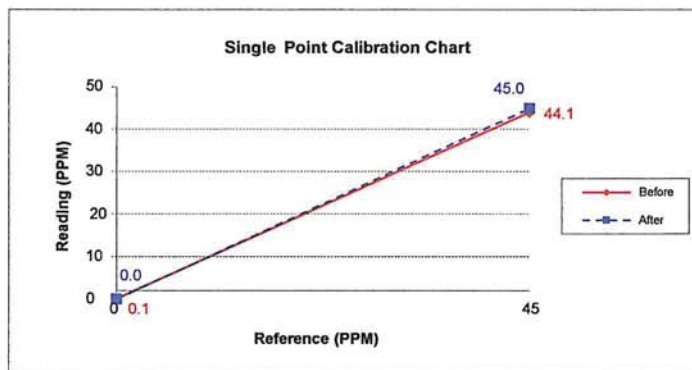
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 45.2 PPM SO2 Conc 44.9 PPM CO Conc 4,490 PPM Expire Date: 6 October 2022

Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	0.1	0.1	45.0	44.1	-2.0
After	0.0	0.0	0.0	45.0	45.0	0.0



Calibrate By:



Mr. PASAGORN SAMOL



บริษัท เอ็นไวร์ เซอร์วิส จำกัด

บริษัท เอ็นไวร์ เซอร์วิส จำกัด
ENVIR SERVICE CO., LTD.

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42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

Analyzer Performance Test

Calibrated Date: 18 January 2022

Instruments Information

Analyzer Type: CO Analyzer Model: 48C	Manufacturer Thermo Environmental S/N: 48C-65775-350
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Calibration System

Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 45.2 PPM SO2 Conc 44.9 PPM CO Conc 4,490 PPM Expire Date: 6 October 2022

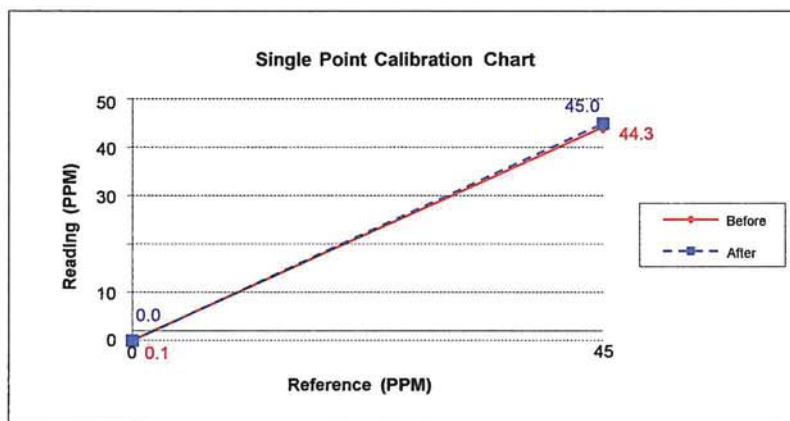
Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	0.1	0.1	45.0	44.3	-1.6
After	0.0	0.0	0.0	45.0	45.0	0.0

20



Calibrate By :

Mr. PASAGORN SAMOL



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บริษัท เอ็นไวร์ เซอร์วิส จำกัด
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42 Raminthra 14 yeak 9, Tha Rang, Bangkhen, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

Analyzer Performance Test

Calibrated Date: 18 January 2022

Instruments Information

Analyzer Type: CO Analyzer Model: 300	Manufacturer API S/N: 1307
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Calibration System

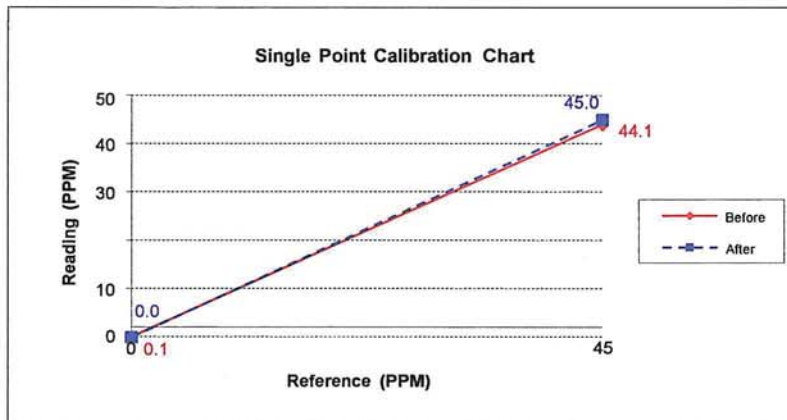
Calibrator Unit	Standard Gas
Dilutor Model Dasibi Model 5008 S/N: 705 ZERO AIR Generator API MODEL 701 S/N: 1924	NO Conc 45.2 PPM SO2 Conc 44.9 PPM CO Conc 4,490 PPM Expire Date: 6 October 2022

Environment: Temperature 25.5 °C

Humidity: 51 %RH

Calibration Report

Status	Zero			Span		
	Reference (PPM)	Reading (PPM)	Drift (PPM)	Reference (PPM)	Reading (PPM)	Drift%
Before	0.0	0.1	0.1	45.0	44.1	-2.0
After	0.0	0.0	0.0	45.0	45.0	0.0



Calibrate By :

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0279

MTC No. EEL. BP. 120/0165

CALIBRATION CERTIFICATE

Submitted by : SAFETY PLAN CO., LTD.

Address : 1034 Moo 3 Rangsit-pathumthani Rd., Tambol Bangpoo, Amphur Maung Pathumthani 12000.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Level Calibrator

Manufacturer : Rion

Model : NC-73

Serial No. : 10848247

Ambient Environment

Temperature : $(23 \pm 3) ^\circ\text{C}$

Relative Humidity : $(50 \pm 15) \%$

Ambient Pressure : $(101.325 \pm 1.500) \text{ kPa}$

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.

2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.

3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.

4. Digital Multimeter Agilent 34401A S/N MY44005560.

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

6. Audio Analyzer Keithley 2015-P S/N 4106495.

7. Condenser Microphone Bruel&Kjaer 4180 S/N 2889871.

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

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

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

Date of Receipt : 28 Jan. 2022

Date of Calibration : 8 Feb. 2022

1 / 2

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

FM.BL.MTC.002 Rev.4

Head Office
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E-mail : sumalee@tistr.or.th

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0279

MTC No. EEL. BP. 120/0165

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

Nominal Output of Unit Under Test = 94 dB re 20 μ Pa at 1000 Hz

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

1. Sound Pressure Level

Standard Microphone Type	Measured Sound Pressure Level (dB)	Deviated value (dB)	Uncertainty (dB)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	94.26	0.26	± 0.10	± 0.75 dB

2. Frequency


Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	998.7	-1.3	± 1.5	$\pm 2.0\%$

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	1.95	± 0.50	$\pm 4.0\%$

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

Calibrated by :


.....
(Mr.Tawikiat Iamsamran)

Approved by :


.....
(Mr.Prawate Klaiyapa)
Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 8 Feb. 2022

Date of Issue : 9 Feb. 2022

Ref : 2011265012800389002

2 / 2

End of Certificate

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Head Office

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Thailand

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Fax. (66) 0 2579 8592

E-mail : sumalee@tistr.or.th



Safety Plan Co., Ltd.

บริษัท เซฟตี้ แพลน จำกัด

1034 หมู่ 3 ถนนรังสิต-ปทุมธานี ตำบลบางพลี อำเภอมัญจาคีรี จังหวัดปทุมธานี 12000 โทรศัพท์ 0-2567-3549 โทรสาร 0-2567-3485
1034 Moo 3 Rangsit-Pathum Thani Rd., Tambol Bangpooon, Amphur Muang, Pathum Thani 12000 Tel. 0-2567-3549 Fax 0-2567-3485

Calibration Sound Level Meter Certificate

Date of Calibration : February 9, 2022

Condition of Calibration

Temperature : (° c) 25 ± 2 Humidity : (%RH) 50 ± 10

Ambient Pressure : 758.8 mmHg

Signal Level Adjustment

Level Range : 60-120 dB Time Weighting : Slow

Frequency Weighting : C Acoustic Calibrator : 114.0 dB

Reference Equipment

Sound Level Calibrator Quest Technologies

Model : NC-73 Serial No. : 10848247

Reference No. : MTC No. EEL.BP. 38/0264 (TISTR)

Calibration Date : February 8, 2022

Integrating Sound Level Meter : ACO TYPE 6226

Intergrating Sound Level Meter	Reading (dB)	Error (dB)	Adjustment
SLM (S1) ACO S/N 140075	113.9	-0.1	Adjusted +0.1 to 114.0
SLM (S2) ACO S/N 120077	113.9	-0.1	Adjusted +0.1 to 114.0
SLM (S3) ACO S/N 140072	113.9	0.1	Adjusted +0.1 to 114.0
SLM (S4) ACO S/N 120078	113.9	-0.1	Adjusted +0.1 to 114.0
SLM (S5) ACO S/N 140073	113.9	-0.2	Adjusted +0.1 to 114.0
SLM (S6) ACO S/N 120080	113.9	-0.1	Adjusted +0.1 to 114.0
SLM (S7) ACO S/N 140074	113.9	-0.1	Adjusted +0.1 to 114.0
SLM (S8) ACO S/N 120079	113.9	-0.1	Adjusted +0.1 to 114.0
SLM (S9) ACO S/N 060176	113.9	0.1	Adjusted +0.1 to 114.0
SLM (S10) ACO S/N 060177	113.9	-0.1	Adjusted +0.1 to 114.0
SLM (S11) ACO S/N 090053	113.9	-0.1	Adjusted +0.1 to 114.0
SLM (S12) ACO S/N 75938	113.9	0.1	Adjusted +0.1 to 114.0
SLM (S13) ACO S/N 75936	113.9	-0.1	Adjusted +0.1 to 114.0
SLM (S14) ACO S/N 75937	113.9	-0.2	Adjusted +0.1 to 114.0

Calibrated By :

ชวาลิต ่อนไสว

(Mr. Chawwalit Onswai)

Approve By :



(Mr. Narongsak Serpanitkarn)

THAILAND INSTITUTE OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH (TISTR)

Request No. 21-65/0279

MTC No. EEL. BP. 120/0165

CALIBRATION CERTIFICATE

Submitted by : SAFETY PLAN CO., LTD.

Address : 1034 Moo 3 Rangsit-pathumthani Rd., Tambol Bangpoon, Amphur Maung Pathumthani 12000.

Calibrated at : Electrical and Electronic Standards Laboratory, Industrial Metrology and Testing Service Centre.
: Soi 1C, Bangpoo Industrial Estate, Sukhumvit Rd., Muang, Samutprakan 10280.

Instrument Calibrated :

Description : Sound Level Calibrator

Manufacturer : Rion

Model : NC-73

Serial No. : 10848247

Ambient Environment

Temperature : $(23 \pm 3) ^\circ\text{C}$

Relative Humidity : $(50 \pm 15) \%$

Ambient Pressure : $(101.325 \pm 1.500) \text{ kPa}$

Standards used : 1. Digital Function Synthesizer NF Electronic DF-193A S/N 122037.

2. Measuring Amplifier Bruel&Kjaer 2636 S/N 1537484.

3. Programmable Attenuator Tamagawa TPA-303A S/N OF 2214.

4. Digital Multimeter Agilent 34401A S/N MY44005560.

5. Pressure Transmitter Vaisala PTB202AD S/N T0650001.

6. Audio Analyzer Keithley 2015-P S/N 4106495.

7. Condenser Microphone Bruel&Kjaer 4180 S/N 2889871.

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

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

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

Date of Receipt : 28 Jan. 2022

Date of Calibration : 8 Feb. 2022

1 / 2 1

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Request No. 21-65/0279

MTC No. EEL. BP. 120/0165

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

Nominal Output of Unit Under Test = 94 dB re 20 μ Pa at 1000 Hz

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

1. Sound Pressure Level

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Standard Microphone Type	Measured Frequency (Hz)	Deviated value (Hz)	Uncertainty (Hz)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	998.7	-1.3	± 1.5	$\pm 2.0\%$

3. Total Distortion

Standard Microphone Type	Measured Total Distortion (%)	Uncertainty (%)	Tolerance limit IEC60942:2003 Class 2
1/2 inch Bruel&Kjaer 4180	1.95	± 0.50	$\pm 4.0\%$

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

Calibrated by :



(Mr.Tawikiat Iamsamran)

Approved by :


(Mr.Prawate Khlaypa)
Director

Electrical and Electronic Standards Laboratory

Industrial Metrology and Testing Service Centre

Date of Calibration : 8 Feb. 2022

Date of Issue : 9 Feb. 2022

Ref : 2011265012800389002

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Safety Plan Co., Ltd.

บริษัท เซฟตี้ แพลน จำกัด

1034 หมู่ 3 ถนนพหลโยธิน-ปทุมธานี ตำบลบางคูเวียง อำเภอเมือง จังหวัดปทุมธานี 12000 โทรศัพท์ 0-2567-3549 โทรสาร 0-2567-3485
1034 Moo 3 Rangsit-Pathum Thani Rd., Tambol Bangkueon, Amphur Muang, Pathum Thani 12000 Tel. 0-2567-3549 Fax 0-2567-3485

Calibration Sound Level Meter Certificate

Date of Calibration : February 9, 2022

Condition of Calibration

Temperature : ($^{\circ}\text{C}$) 25 ± 2 Humidity : (%RH) 50 ± 10
Ambient Pressure : 758.8 mmHg

Signal Level Adjustment

Level Range : 60-120 dB Time Weighting : Slow
Frequency Weighting : C Acoustic Calibrator : 114.0 dB

Reference Equipment

Sound Level Calibrator Quest Technologies

Model : NC-73 Serial No. : 10848247
Reference No. : MTC No. EEL.BP. 38/0264 (TISTR)
Calibration Date : February 8, 2022
Integrating Sound Level Meter : PICCOLO

Integrating Sound Level Meter	Reading (dB)	Error (dB)	Adjustment
SLM (No.1) PICCOLO S/N P0220012705	113.9	0.1	Adjusted +0.1 to 114.0
SLM (No.2) PICCOLO S/N P0220012801	113.9	-0.1	Adjusted +0.1 to 114.0
SLM (No.3) PICCOLO S/N P0220031802	113.9	0.1	Adjusted +0.1 to 114.0
SLM (No.4) PICCOLO S/N P0220031804	113.9	-0.2	Adjusted +0.1 to 114.0
SLM (No.5) PICCOLO S/N P0220031803	113.9	0.1	Adjusted +0.1 to 114.0
SLM (No.6) PICCOLO S/N P0220012704	113.9	-0.2	Adjusted +0.1 to 114.0
SLM (No.7) PICCOLO S/N P0220012703	113.9	-0.1	Adjusted +0.1 to 114.0
SLM (No.8) PICCOLO S/N P0220031801	113.9	0.1	Adjusted +0.1 to 114.0
SLM (No.9) PICCOLO S/N P0220012802	113.9	-0.1	Adjusted +0.1 to 114.0
SLM (No.10) PICCOLO S/N P0220031901	113.9	-0.1	Adjusted +0.1 to 114.0

Calibrated By : ชาวลิต ่อนสว
(Mr. Chawwalit Onswai)

Approve By : หรรษา
(Mr. Narongsak Seripantkarn)



Calibration Certificate

Part Number: 714A9701
Description: Triaxial Geophone (ISEE)
Serial Number: BG20548
Calibration Date: **Dec 01 2021**
Calibration Equipment: 714J7402

Instantel certifies that the above product was calibrated in accordance with the applicable Instantel procedures. These procedures are part of a quality system that is designed to assure that the product listed above meets or exceeds Instantel specifications.

Instantel further certifies that the measurement instruments used during the calibration of this product are traceable to the National Institute of Standards and Technology; or National Research Council of Canada. Evidence of traceability is on file at Instantel and is available upon request.

The environment in which this product was calibrated is maintained within the operating specifications of the instrument.

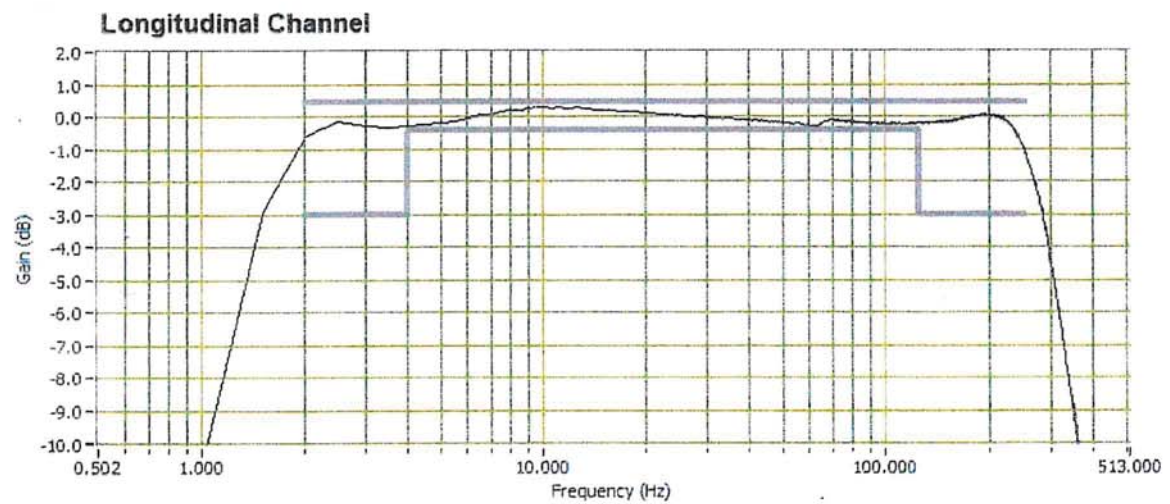
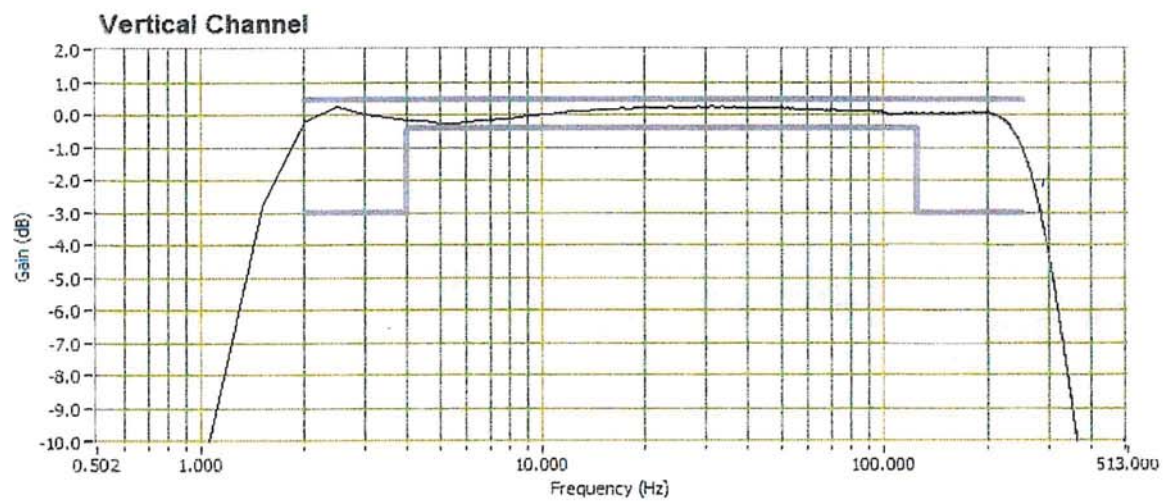
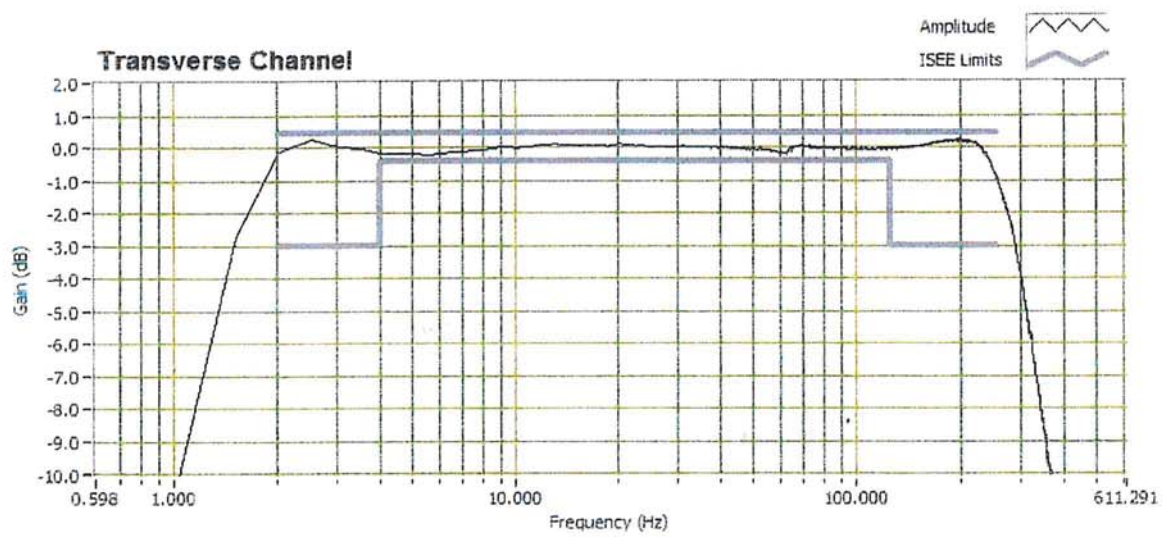
Please note that the sensor check function is intended to check that the sensors are connected to the unit, installed in the proper orientation and sufficiently level to operate properly. This function should not be confused with a formal calibration, which requires the sensors be checked against a reference that is traceable to a known standard. Instantel recommends that products be returned to Instantel or an authorized service and calibration facility for annual calibration.

Calibrated By: _____


Ninh Nguyen



Amplitude Frequency Response of BG20548





TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3: EQUIPMENT CALIBRATION AND TESTING SERVICES
534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250
TEL. 0-2717-3000-27 FAX. 0-2719-9484



Cert. No.: 21TM1547

Page.: 1 of 2

Certificate of Calibration

Equipment : pH Meter with Sensor
Manufacturer : Eutech
Model : pH 700
Serial No. : 2858459
ID No. : LB-Eq-027
Submitted by : Special Lab Envi And Consultant Co.,Ltd.
47/91-93 Moo 3 Thambon Tha-it,
Pakkret,
Nonthaburi 11120
Location : TPA Chemistry Calibration Laboratory
Received Order : 23 August 2021
Calibrated Date : 27 August 2021
Ambient Temperature : (26 ± 10) °C
Relative Humidity : (50 ± 30) %
AC Line Voltage : (220 ± 22) V
Calibrated by : Kunchit Promprat

Approved by :

Malee

Approved Signatory

(/) Pornthippa Tameyakul

(✓) Malee Butkruea

() Suwit Imjai

Issue Date : 31 August 2021

The Uncertainties are for a confidence probability of approximately 95%

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Approval of the head of Corporate Services 3 : Equipment Calibration and Testing Services.

A 0031535



Equipment : pH Meter with Sensor
Condition As-Received : Used Item
Reference : 2108-0663WN-2

Cert. No.: 21TM1547
Page.: 2 of 2

Procedure Used :-

Calibration were conducted using in-house calibration procedure CP-OT01 according to comparison with Industrial Platinum Resistance Thermometer (IPRT) into Temperature Bath.

The temperature scale used was based on ITS-90.

Condition of this result of calibration

1. Reference standard instrument:-

<u>Instrument</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert. No.</u>	<u>Due Date</u>
1) Digital Thermometer	1523	2188080	2011389	20 Nov 2021

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

3. This certification is traceable to the International System of Unit.

Result of Calibration :- (*) Without Adjustment

Function : Temperature measurement.

This instrument was connected with temperature sensor, ID No.: SL-33/1

<u>Calibration Point</u> (°C)	<u>Immersion Depth</u> (mm)	<u>Standard Temperature</u> (°C)	<u>UUC* Reading</u> (°C)	<u>Error</u> (°C)	<u>Uncertainty</u> (±°C)	<u>Coverage Factor</u> <i>k</i>
25.0	100	25.0	25.000	0.000	0.16	2.00

UUC* : Unit Under Calibration

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

-o0o-

Maku.

a 1069519



BECTHAI BANGKOK EQUIPMENT & CHEMICAL CO., LTD.
CALIBRATION LABORATORY

300 Phaholyothin Road, Phayathai, Bangkok 10400, Thailand Tel: +66 2615-2929 Fax: +66 2615-2350-1
E-mail: bkk@becthai.com Website: www.becthai.com



Certificate No. : CAL-21-517

Page : 1 of 3

CERTIFICATE OF CALIBRATION

Equipment	:	Spectrophotometer
Manufacturer	:	Merk
Model	:	Prove 100
Serial No.	:	1809112938
ID No.	:	N/A
Customer	:	Special Lab Envi And Consultant Co., Ltd.
	:	47/91 Moo 3, Tambol Tait ,
	:	Amphur Pakrad, Nonthaburi, 11120.
Location	:	Becthai Laboratory
Date of Receipt	:	21 August 2021
Date of Calibration	:	21 August 2021
Date of Issue	:	21 August 2021
Ambient Temperature	:	(25±10) °C
Relative Humidity	:	(60±20) %
Condition As-Received	:	Used Item

Calibrated by

.....*Kittikorn Boonprapai*.....

(Mr. Kittikorn Boonprapai)

Calibration Engineer

Approved by

.....*Jintana Sangthaijaroenlap*.....

(Ms. Jintana Sangthaijaroenlap)

Calibration Manager

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

This certificate may not be reproduced other than in full, except with the prior written approval of the head of Calibration Laboratory.

Indicated values are valid for the state of the Spectrophotometer at the time of calibration only.



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CALIBRATION LABORATORY

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E-mail: bkk@becthai.com Website: www.becthai.com



Certificate No. : CAL-21-517

Page : 2 of 3

CALIBRATION REPORT

Conditions of this result of calibration

1. Reference Standard Material :

<u>Material</u>	<u>Model</u>	<u>Serial No.</u>	<u>Cert.No.</u>	<u>Due date</u>
Holmium Glass Filter	RM-HG	24563	90313	2 Mar 23
Neutral Density Filter	RM-1N2N3N	24568	90324	3 Mar 23

2. Traceability : This certification is traceable to the International System of Unit maintained at;
The Starna Scientific Ltd. Accredited Calibration Laboratory No. 0659.

3. Method of calibration :

The calibration procedure was carried out according to the Guide to CPM-CAL-02 based on ASTM E275-08 (2013) and-
ASTM E925-09 (2014).

4. Result of calibration :

(☒) without adjustment

(☐) after adjustment

5. Equipment Specifications:

Spectral Bandwidth :	4	nm
Data Interval :	0.1	nm
Scan Speed :	N/A	nm/min



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E-mail: bkk@becthai.com Website: www.becthai.com



Certificate No. : CAL-21-517

Page : 3 of 3

CALIBRATION REPORT

Wavelength Calibration

Certified Values of Reference Material (nm)	Nominal Value (nm)	UUC*Reading (nm)	Error (nm)	Uncertainty of Measurement (\pm nm)
418.48	418.48	418.4	-0.08	0.13
536.90	536.90	534.3	-2.60	0.27
637.94	637.94	636.1	-1.84	0.17

Photometric Calibration for Visible

Wavelength (nm)	Certified Values of Reference Material (A)	UUC* Reading (A)	Error (A)	Uncertainty of Measurement (\pm A)
420.0	Zero	0.000	0.0000	0.0028
	0.5824	0.580	-0.0024	0.0044
	0.7266	0.721	-0.0056	0.0041
	1.0377	1.029	-0.0087	0.0040
440.0	Zero	0.000	0.0000	0.0028
	0.5659	0.559	-0.0069	0.0043
	0.7126	0.710	-0.0026	0.0038
	1.0172	1.013	-0.0042	0.0038
465.0	Zero	0.000	0.0000	0.0028
	0.5256	0.522	-0.0036	0.0044
	0.6705	0.673	0.0025	0.0036
	0.9562	0.958	0.0018	0.0035
546.1 (546.0)	Zero	0.000	0.0000	0.0028
	0.5236	0.520	-0.0036	0.0036
	0.6962	0.695	-0.0012	0.0031
	0.9933	0.991	-0.0023	0.0033
590.0	Zero	0.000	0.0000	0.0028
	0.5578	0.557	-0.0008	0.0036
	0.7523	0.752	-0.0003	0.0032
	1.0747	1.072	-0.0027	0.0033
635.0	Zero	0.000	0.0000	0.0028
	0.5655	0.565	-0.0005	0.0036
	0.7321	0.731	-0.0011	0.0032
	1.0454	1.043	-0.0024	0.0031

Remark : Each individual filter is measured against the empty filter holder (blank) used to zero the Spectrophotometer.

Note:

UUC* : Unit Under Calibration

- End of Report -



TECHNOLOGY PROMOTION ASSOCIATION (THAILAND-JAPAN)
CORPORATE SERVICES 3 : EQUIPMENT CALIBRATION AND TESTING SERVICES


534/4 PATTANAKARN ROAD SOI 18, SUANLUANG, SUANLUANG BANGKOK 10250

TEL. 0-2717-3000 FAX. 0-2719-9484

Cert.No.: 20TW258

Page.: 1 of 2

Certificate of Testing

Equipment :	Dissolved Oxygen Meter
Manufacturer :	AMTAST
Model :	DO900
Serial No. :	DO900X19081008
ID No. :	-
Received Date :	18 December 2020
Test Date :	22 December 2020
Reference :	2012-0586DN-1
Submitted by :	Safety Plan Co.,Ltd. 1034 Moo 3, Rangsit-Pathumthani Road, T.Bangpoon, A.Muang, Pathumthani 12000
Laboratory Condition :	Temperature (25 ± 5) °C Humidity (50 ± 20) %
Test Procedure :	In - house method : CP-CH9 by Comparison Technique with Azide Modification Method
Calibrated by :	Walalak Sirithean
Approved by :	 Approved Signatory
<input checked="" type="checkbox"/> Malee Butkruea <input type="checkbox"/> Saithip Meangmai <input type="checkbox"/> Warakorn Lerngagtrakul	
Issue Date :	28 December 2020



Cert.No.: 20TW258

Page.: 2 of 2

Result : Dissolved Oxygen Meter Adjustment With Air 100 %

Dissolved Oxygen Probe No.: PONPE5805769

Titration Method (Azide Modification Method) (mg/L)	Dissolved Oxygen Meter Reading (mg/L)	Standard Deviation (mg/L)
8.10	8.01	0.017

This report was certified only for the instrument we tested. It is allowable to use for study the system efficiency, The environmental impact control and present to organization it may concerned. Intend to use for advertising and referral purpose is prohibited. This report may not be reproduced other in full, without written approval of the laboratory.

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Maka



PinAAcle 900F Preventive Maintenance Report

Company Name: SPECIAL LAB ENVI & CONSULTANT


Instrument Location: PAKKRET NONTHABURI 11120

Instrument Serial No.: PFBS17082303

Date: 03-Sep-2021

PinAAcle 900F Preventive Maintenance (PM)

Company Name:	SPECIAL LAB ENVI & CONSULTANT		
Address (Instrument Location):	PAKKRET NONTABURI 11120		
Serial Number:	PFBS17082303	PM Number:	1 of 1
Customer Name (if applicable):	K. Fhatiha	Telephone Number:	(092) 283-9054
Customer Support Engineer Name:	K. Weerayoot keadpon	Service Order Number:	WO-00925451
Date PM Performed: (DD-MMM-YYYY)	03-Sep-2021	Next PM Due Date: (DD-MMM-YYYY)	03-Sep-2022
Standard Labor Hours to Complete PM :		5 hours	

Part Number	Release	Publication Date	
09370145 Rev.9	A	January 2018	

Scope

The purpose of this PM is to ensure the continued functionality of the PinAAcle 900F by inspecting and replacing any worn or damaged parts. This service should only be performed by a trained representative of PerkinElmer.

The customer should save their method before the PM begins.

General Instructions:

The customer must provide the engineer operational data to demonstrate recent instrument performance prior to starting the PM.

Always check with the customer before making any changes that may affect the customer's analysis or calibration, including a current back-up of system software and/or data files.

The completed document should be signed by an authorized PerkinElmer and customer representative and left with the customer.

Update the PM sticker and instrument logbook as required.

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Component List

Component / Specific Model	Serial #	Configuration Notes

Parts Lists

Parts Included with the PM		
Part Number (if applicable)	Description	Quantity
B0501696	Fan Filters	1
N3160156	O-Ring Kits for Sampling Introduction (Stainless Steels Nebulizer)	N/A
N3160157	O-Ring Kits for Sampling Introduction (Plastic Nebulizer)	2
N9301714	Replacement Acetylene Filter Cartridge	1
TH001022	Replacement Air Filter Cartridge	2

Additional Reagents and Standards Required for PM				
Part Number (if applicable)	Description	Quality	Batch/Lot #	Expired Date (MM/YY)
N9300183	1000 mg/L Copper Standard	AR	25-20CUY1	30-Jan-2022

Additional Reagents and Standards Required for PM (Customer Support Solution)				
Part Number (if applicable)	Description	Quantity	Batch/Lot #	Expiration Date (MM/YY)
N/A	DI Water	250 ml.	AR	AR
N/A	0.5% HNO ₃	250 ml.	AR	AR

Additional Tools Required for PM			
Part Number (if applicable)	Description	Quantity	Serial #
N1013000	0.2A Neutral density filter	1	5503530856
N1013002	1.0A Neutral density filter	1	5503555491
03030997	System 2 EDL Driver	1	03030997
N3050605	As System 2 EDL	1	16148
N3050121	Cu Lumina HCL	1	021913-020070
N3050109	Ba Lumina HCL	1	102416-040160
N3050139	K Lumina HCL	1	110716-010060
N3050152	Ni Lumina HCL	1	100516-030190

Procedure Checklist

Use (✓) to check off those steps in the checklist that have been completed.

1. General:

- ☒ Review the instrument performance with the customer and document any recent problems.
- ☒ Inspect the customer log book and make any appropriate PM entries.
- ☒ Perform general inspection of system for cleanliness.

2. PC Instrument Software:

- ☒ Instrument Software user files/databases archived, packed, and/or deleted as needed.

3. Mechanical:

- ☒ Inspect and clean all fans and filters. Replace filters if necessary
- ☒ Inspect all gas lines for leaks and/or wear. Replace if needed.
- ☒ Clean exterior of the instrument.
- ☒ Inspect the burner head, burner chamber, and nebulizer. Clean if needed as stated in the Hardware Guide.
- ☒ Check burner head dimensions with the feeler gauge as stated in the Hardware Guide in the Maintenance chapter section on cleaning the burner head and checking sloth width. Replace if out of specification
- ☒ Check the condition of the end cap, burner head, and nebulizer O-rings. Replace if necessary.
- ☒ Check the drain system for signs of wear. Replace worn or damaged parts.
- ☒ Visually check for proper flame conditions when igniting the Air-C₂H₂ and N₂O-C₂H₂ flames (if applicable).

4. Electrical:

- ☒ Inspect PC boards. Clean if necessary.
- ☒ Carefully check all internal and external cable connections.
- ☒ Check instrument firmware revisions upgrade to current levels (if necessary)
- ☒ Run Diagnostics Test within the Advanced function of the Spectrometer page. Check the results in the service log folder in the Spectrometer BM Log Viewer.

5. Optics:

- ☒ Inspect and clean the sample compartment windows, if needed.
- ☒ Inspect optics. Clean or replace if necessary,

6. Gasses:

- ☒ Verify that the Gasses supplied to the instrument are within the pressure and purity specifications found in the PinAAcle 900 Series Pre-installation Checklist SDB.
- ☒ Verify that the acetylene filter and air filter element is dry. Replace if necessary.

7. Flame Interlock Check:

Description: Check to ensure that all safety interlocks are closed.

Parameter	Specification	Test Results	Pass/Fail
Flame Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Drain Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Nebulizer Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
C ₂ H ₂ Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Air Pressure Sensor	Air/C ₂ H ₂ Flame correctly shuts down	Active	Passed
Burner Head Sensor	Choosing Nitrous Oxide as the oxidant should trigger an interlock shuts down	Active	Passed

8. After PM Performance tests:

8.1 Detector Linearity with Barium

Description: Ensures that the detector is linear in the Visible Range.

Parameter	Specification	Certificate Value at 553.6 nm (Abs.)	Test Results	Pass/Fail
1.0 A ND Filter	± 5% from Cert.	0.9798	0.9766	Passed
0.2 A ND Filter	± 5% from Cert.	0.2042	0.1989	Passed

8.2 Baseline Noise at 1.0 Absorbance with Barium

Description: Ensures that a high absorbance will not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0015	Passed

8.3 AA Baseline Noise with Copper

Description: Check baseline noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.001	0.0002	Passed

8.4 D₂ Background Compensation with Copper

Description: Verifies the instruments ability to compensate for Background absorption.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.010	0.0079	Passed

8.5 AA-BG Baseline Noise with Copper

Description: Ensures that background correction does not produce excessive noise.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0004	Passed

8.6 AA-BG Baseline Noise with Arsenic

Description: Ensures that background correction does not produce excessive noise at a low wavelength.

Parameter	Specification	Results	Pass/Fail
Standard Deviation	≤ 0.005	0.0011	Passed

8.7 Flame Sensitivity

Description: Instrument Sensitivity checked against Copper standard.

Standard Copper Sensitivity	Specification	Results (Abs.)	Pass/Fail
5 mg/L Sensitivity SS Neb (if applicable)	> 0.250 Abs.	NA	Not Applicable
2 mg/L Sensitivity HS Neb (if applicable)	> 0.250 Abs.	0.3221	Passed

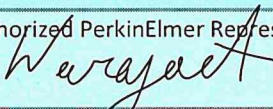
10. Review:

- ☒ Review with the customer PM work performed.
- ☒ Review with the customer routine maintenance procedures.
- ☒ Discuss recommended customer supplied materials to have on hand.
- ☒ Attach PM sticker.

Additional Comments

Additional Comments Regarding the PM	

Review

<i>The preventive maintenance checks and if applicable performance tests for PinAAcle 900F have been completed.</i>	
<i>This PinAAcle 900F Passes <input checked="" type="checkbox"/> Fails <input type="checkbox"/> the preventive maintenance.</i>	
Review of Preventive Maintenance:	
Authorized PerkinElmer Representative: 	Date: 03-Sep-2021 (DD-MMM-YYYY)
Authorized Customer Representative:	Date: (DD-MMM-YYYY)