



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC 20460

OFFICE OF
ENFORCEMENT AND COMPLIANCE
ASSURANCE

April 25, 2020

Mr. Robert Beck
President
Thelin Hearth Products
63 Laxalt Drive
Carson City, Nevada 89706

Re: Echo-Comstock II Pellet Heater Model Certification Letter Number 254-20

Dear Mr. Beck:

I am pleased to inform Thelin Hearth Products (Thelin) that the above-referenced model has been approved for certification pursuant to the 2015 New Source Performance Standard (NSPS) for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced-Air Furnaces at 40 CFR Part 60, Subpart AAA (2015 NSPS) by the United States Environmental Protection Agency (EPA). Certification under the 2015 NSPS is valid through April 23, 2025. This letter serves as your pellet heater certification and no separate certification is required. Please refer to the certification number above in all future correspondence.

Based on a March 6, 2020, test report prepared by PFS TECO and the information provided in your March 4, 2020, application, the above-referenced model is certified as meeting the 2015 NSPS. Under the 2015 NSPS and based on PFS TECO's March 6, 2020, certification of conformity, the model's emission rate of 0.88 g/hr meets the 2020 NSPS particulate matter emissions limit of 2.0 g/hr. The heat output range and overall heating efficiency for the above-referenced model are 16,754 – 26,783 BTU/hr and 75%, respectively. The carbon monoxide emission rate for this model line is 0.15 g/min.

This certification is valid for the above-referenced model and cannot be transferred to another model line without applying for certification. This certification allows Thelin to manufacture and sell the above-referenced model through April 23, 2025. Thereafter, Thelin may not manufacture, advertise for sale, offer for sale, or sell pellet heaters under this certification without applying for and obtaining another compliance certification.

All pellet heaters manufactured or sold under this certification must comply with EPA labeling requirements found at §60.536. These provisions require each pellet heater to have a permanent label affixed to it that includes the month and year of manufacture, model name or number, serial number, certification test emission value, test method, standard met, and compliance certification statement.

In addition, Thelin must comply with all applicable requirements of the regulation, including:

1. Conducting a third-party certifier-approved quality assurance program which ensures that all units within a model line are similar to the pellet heater submitted for certification testing in all respects that would affect emissions and are in compliance with the applicable emission limit, pursuant to §60.533(m);
2. Applying for recertification whenever any change is made to the above-referenced model that affects or is presumed to affect the particulate matter emission rate for the model line, pursuant to §60.533(k)(1);
3. Providing an owner's manual that includes the information listed in §60.536(g)(1) with each affected pellet heater model offered for sale;
4. Placing a copy of the certification test report and summary on the manufacturer's website. The test report and summary shall be available to the public within 30 days after the EPA issues a certificate of compliance, pursuant to §60.533(b)(12);
5. Submitting a report to the EPA every two years following issuance of a certificate of compliance for each model line. This report must include the sales for each model by state and certify that no changes in the design or manufacture of this model line have been made that require recertification under §60.533(k);
6. Retaining records and submitting reports as required at §60.537; and
7. Submitting pellet heaters for audit testing if selected by the EPA under §60.533(n)(1)(i) and (2)(i).

Failure to comply with these requirements may result in a revocation of this certification and enforcement action, including penalties as specified under the Clean Air Act. To promote transparency in the implementation of the Wood Heater Program, we suggest that manufacturers submit the Uniform Resource Locator (URL) or web address where the test report is posted to PelletHeaterReports@epa.gov within ten (10) days of posting the test report.

Once EPA has verified that the full non-CBI certification test report has been posted on the manufacturer's website, the Agency will add the above-referenced model to the EPA-Certified Wood Heater Database. If you have any questions concerning this letter, please contact Rafael Sanchez of my staff at (202) 564-7028 or via email at sanchez.rafael@epa.gov.

Sincerely,



Martha Segall
Acting Director
Monitoring, Assistance, and Media Programs Division
Office of Compliance

Thelin Hearth Products

Project # 20-568

Model: Echo-Comstock II

Type: Pellet-Fired Room Heater

March 6, 2020

**ASTM E2779 Standard Test Method for
Determining Particulate Matter Emissions
from Pellet Heaters**

Contact: Mr. Robert Beck
Thelin Hearth Products
63 Laxalt Dr.
Carson City, NV 89706
775-241-2586 x105

Prepared by: Sebastian Button



**11785 SE Highway 212 – Suite 305
Clackamas, OR 97015-9050
(503) 650-0088
WWW.PFSTECO.COM**

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Contents

Affidavit	3
Introduction.....	4
Notes	4
Pellet Heater Identification and Testing.....	5
Test Procedures and Equipment	6
Results	7
Summary Table.....	7
Test Run Narrative.....	8
Run 1	8
Test Conditions Summary.....	8
Appliance Operation and Test Settings	8
Settings & Run Notes	8
Appliance Description.....	9
Appliance Dimensions	9
Test Fuel Properties.....	12
Pellet Fuel Analysis.....	13
Sampling Locations and Descriptions	14
Sample Points.....	14
Sampling Methods.....	15
Analytical Methods Description	15
Calibration, Quality Control and Assurances	15
Appliance Sealing and Storage	15
Sealing Label.....	15
Sealed Unit	16
List of Appendices.....	17

Affidavit

PFS-TECO was contracted by Thelin Hearth Products to provide testing services for the Echo-Comstock II Pellet-Fired Room Heater per ASTM E2779, *Determining PM Emissions from Pellet Heaters*. All testing and associated procedures were conducted at PFS-TECO's Portland Laboratory on 2/10/2020. PFS-TECO's Portland Laboratory is located at 11785 SE Highway 212 – Suite 305, Clackamas, Oregon 97015. Testing procedures followed ASTM E2779. Particulate sampling was performed per ASTM E2515, *Standard Test Method for Determination of Particulate Matter Emissions Collected by a Dilution Tunnel*.

PFS-TECO is accredited by the U.S. Environmental Protection Agency for the certification and auditing of wood heaters pursuant to subpart AAA of 40 CFR Part 60, New Source Performance Standards for Residential Wood Heaters and subpart QQQQ of 40 CFR Part 60, Standards of Performance for New Hydronic Heaters and Forced Air Furnaces, Methods 28R, 28WHH, 28 WHH-PTS, and all methods listed in Sections 60.534 and 60.5476. PFS-TECO holds EPA Accreditation Certificate Numbers 4 and 4M (mobile). PFS-TECO is accredited by IAS to ISO 17020:2012 "Criteria for Bodies Performing Inspections", and ISO 17025:2005 "Requirements for Testing Laboratories." PFS-TECO is also accredited by Standards Council of Canada to ISO 17065:2012 "Requirements for Bodies Operating Product Certification Systems."

The following people were associated with the testing, analysis and report writing associated with this project.



Sebastian Button, Laboratory Supervisor

Introduction

Thelin Hearth Products of Carson City, NV, contracted with PFS-TECO to perform EPA certification testing on the Echo-Comstock II Pellet-Fired Room Heater. All testing was performed at PFS-TECO's Portland Laboratory. Testing was performed by Mr. Sebastian Button.

Notes

- Prior to start of testing, 50 hours of conditioning was performed per ASTM E2779
- Prior to start of testing, the dilution tunnel was cleaned with a steel brush.
- Front filters were changed on sample train A at one hour after the test began.
- A single, integrated test run, in accordance with ASTM E2779 was performed:
 - 1 Hour at Maximum Burn Setting
 - 2 Hours at Medium Burn Setting
 - 3 Hours at Minimum Burn Setting

Pellet Heater Identification and Testing

- Appliance Tested: ***Echo-Comstock II***
- Serial Number: ***SN 16049; PFS Tracking Number 0062***
- Manufacturer: ***Thelin Hearth Products***
- Catalyst: ***No***
- Heat exchange blower: ***Integral***
- Type: ***Pellet Stove***
- Style: ***Free Standing***
- Date Received: ***Thursday, February 06, 2020***
- Testing Period – Start: ***Monday, February 10, 2020*** Finish: ***Monday, February 10, 2020***
- Test Location: ***PFS-TECO Portland Laboratory, 11785 SE HWY 212 - Suite 305, Clackamas, OR 97015***
- Elevation: ***≈131 Feet above sea level***
- Test Technician(s): ***Sebastian Button***
- Observers: ***None***

Test Procedures and Equipment

All Sampling and analytical procedures were performed by Sebastian Button. All procedures used are directly from ASTM E2779 and ASTM E2515. See the list below for equipment used. See Appendix C submitted with this report for calibration data.

Equipment List:

Equipment ID#	Equipment Description
041	Rice Lake 3'x3' floor scale w/digital weight indicator
053	APEX XC-60 Digital Emissions Sampling Box A
054	APEX XC-60 Digital Emissions Sampling Box B
057	California Analytical ZRE CO2/CO/O2 IR ANALYZER
064	Digital Barometer
107	Sartorius Analytical Balance
109A/B	Troemner 100mg/200mg Audit Weights
051	10 lb audit weight
095	Anemometer
111	Microtector
SA17187	Gas Analyzer Calibration Span Gas
CC170624	Gas Analyzer Calibration Mid Gas

Results

The integrated test run emission rate for test Run 1 was measured to be **0.88 g/hr** with a Higher Heating Values efficiency of **75.0%** and a CO emission rate of **0.15 g/min.** The calculated first hour particulate emission rate was **0.61 g/hr.** The Thelin Hearth Products Model Echo-Comstock II Pellet-Fired Room Heater meets the 2020 PM emission standard of ≤ 2.0 g/hr per CFR 40 part 60, §60.532 (b).

Detailed individual run data can be found in Appendix A submitted with this report.

Summary Table

Summary Table

EPA Application Table											
Run Number	Date	Segments		Run Time (min)	Heat Output (BTU/hr)	1st Hr Emissions (g/hr)	Integrated Total (g/hr)	CO Emissions (g/min)	Overall CO Emissions (g/min)	Heating Efficiency (%HHV)	Overall Heating Efficiency (%HHV)
		Setting	BR								
1	2/10/2020	H	1.86	60	26783	0.61	0.88	0.03	0.15	74.6%	75.0%
		M	1.57	120	22845			0.13		75.3%	
		L	1.16	180	16754			0.20		74.5%	
		OA	1.42	360	20505			0.15		75.0%	

Test Run Narrative

Run 1

Run 1 was performed on 2/10/2020 as an attempted integrated test run per ASTM E2779. The overall test duration was 360 minutes. The particulate emissions rate for the integrated test run was 0.88 g/hr. The run had an overall HHV efficiency of 75.0%. The train A front filter was changed at 1 hr. All test results were appropriate and valid and the burn rate requirement for the integrated test run were achieved. There were no anomalies and all criteria were met.

Test Conditions Summary

Testing conditions for all runs fell within allowable specifications of ASTM E2779 and ASTM E2515. A summary of facility conditions, fuel burned, and run times is listed below.

Runs	Ambient (°F)		Relative Humidity (%)		Average Barometric Pressure (In. Hg.)	Preburn Fuel Weight (lbs)	Test Fuel Weight (lbs)	Test Fuel Moisture (%DB)	Test Run Time (Min)
	Pre	Post	Pre	Post					
1	64	67	39.7	32.2	30.30	4.2	19.2	2.54	360

Appliance Operation and Test Settings

The appliance was operated according to procedures as described in the Operations Manual, found in Appendix B submitted with this report. Detailed run information can be found in Appendix A submitted with this report.

Settings & Run Notes

	Pre-Burn	Test Run
Run 1	"Hi," Feed trim Max	High Segment: "Hi," Feed trim Max Medium Segment: "Med," Feed trim Max Low Segment: "Lo," Feed trim Max

Appliance Description

Model(s): Echo-Comstock II

Additional Models Discussion: None

Appliance Type: Pellet-Fired Room Heater

Air Introduction System: Air enters the burn chamber by being pulled through the firepot, via the exhaust blower, see air flow diagram in Appendix D.

Combustion Control: Feed rate is electronically controlled via user-selectable controls.

Baffles: N/A

Flue Outlet: 3-inch exhaust outlet located on the bottom/rear of the appliance.

Appliance Dimensions

Echo-Comstock II Dimensions				
Height	Width	Depth	Firebox Volume	Weight
29.5"	27"	25.5"	N/A – Pellet Stove	250 lbs

Appliance design drawings can be found in Appendix D submitted with the CBI copy of this report.

Appliance Front



Appliance Left



Appliance Right



Appliance Rear



Test Fuel Properties



Test fuel used was Bear Mountain Wood Pellet Fuel, a PFI Certified Premium Pellet Brand. A sample of pellets was sent to Twin Ports Testing for analysis, see report below.

Pellet Fuel Analysis



Twin Ports Testing, Inc.
1301 North 3rd Street
Superior, WI 54880
p: 715-392-7114
p: 800-373-2562
f: 715-392-7183
www.twinportstesting.com

Analytical Test Report

Report No: USR:W219-0755-01
Issue No: 1

Client: PFS-TECO

Signed:

Attention: Sebastian Button

Stephen Sundeen
Chemistry Laboratory Manager

PO No: A-Kravitz

Date of Issue: 9/20/2019

THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

Sample Details

Sample Log No: W219-0755-01
Sample Designation: Bear Mountain
Sample Recognized As: Wood Pellets

Sample Date: 8/30/2019
Sample Time: 10:30 AM
Arrival Date: 9/12/2019

Test Results

	METHOD	UNITS	MOISTURE FREE	AS RECEIVED
Moisture Total	ASTM E871	wt. %		2.48
Ash	ASTM D1102	wt. %	0.24	0.24
Volatile Matter	ASTM D3175	wt. %	80.80	78.79
Fixed Carbon by Difference	ASTM D3172	wt. %	18.96	18.49
Sulfur	ASTM D4239	wt. %	0.034	0.034
SO ₂	Calculated	lb/mmbtu		0.079
Net Cal. Value at Const. Pressure	ISO 1928	GJ/tonne	19.02	18.49
Gross Cal. Value at Const. Vol.	ASTM E711	Btu/lb	8752	8535
Carbon	ASTM D5373	wt. %	49.35	48.12
Hydrogen*	ASTM D5373	wt. %	6.14	5.99
Nitrogen	ASTM D5373	wt. %	< 0.20	< 0.20
Oxygen*	ASTM D3176	wt. %	> 44.03	> 42.94

*Note: As received values do not include hydrogen and oxygen in the total moisture.

Chlorine	ASTM D6721	mg/kg		
Fluorine	ASTM D3761	mg/kg		
Mercury	ASTM D6722	mg/kg		
Bulk Density	ASTM E873	lbs/ft ³		
Fines (Less than 1/8")	TPT CH-P-06	wt. %		
Durability Index	Kansas State	PDI		
Sample Above 1.50"	TPT CH-P-06	wt. %		
Maximum Length (Single Pellet)	TPT CH-P-06	inch		
Diameter, Range	TPT CH-P-05	inch		to
Diameter, Average	TPT CH-P-05	inch		
Stated Bag Weight	TPT CH-P-01	lbs		
Actual Bag Weight	TPT CH-P-01	lbs		

Comments:

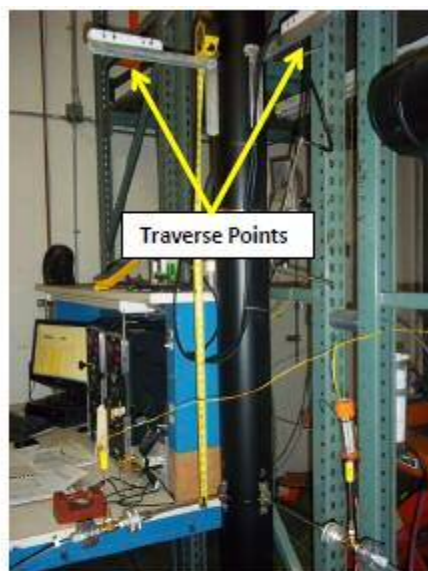
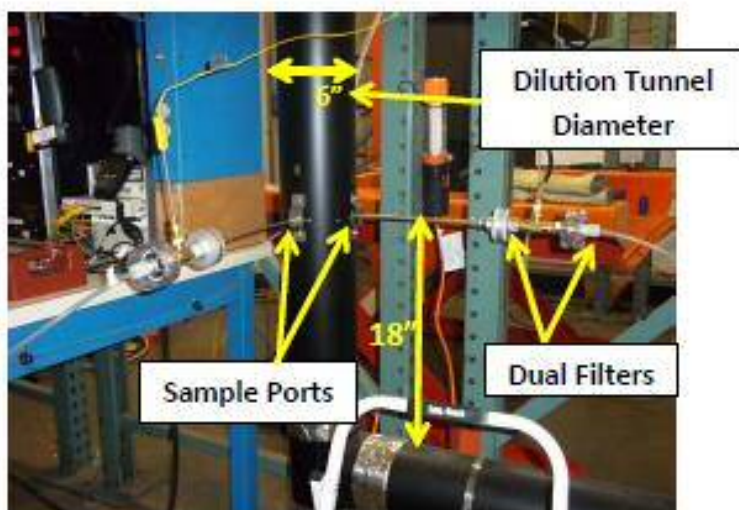


Results issued on this report only reflect the analysis of the sample submitted. Our reports and letters are for the exclusive and confidential use of our clients and may not be reproduced, except in their entirety, without the written approval of Twin Ports Testing. Twin Ports Testing Laboratory is accredited to the ISO/IEC 17025:2017 standard by PJLA.

Sampling Locations and Descriptions

Sample ports are located 16.5 feet downstream from any disturbances and 1 foot upstream from any disturbances. Flow rate traverse data was collected 12 feet downstream from any disturbances and 5.5 feet upstream from any disturbances. (See below).

Sample Points



Sampling Methods

ASTM E2515 was used in collecting particulate samples. The dilution tunnel is 6 inches in diameter. All sampling conditions per ASTM E2515 were followed. No alternate procedures were used.

Analytical Methods Description

All sample recovery and analysis procedures followed ASTM E2515 procedures. At the end of each test run, filters, O-Rings and probes were removed from their housings, dessicated for a minimum of 24 hours, and then weighed at 6 hour intervals to a constant weight per ASTM E2515-11 Section 10.

Calibration, Quality Control and Assurances

Calibration procedures and results were conducted per EPA Method 28R, ASTM E2515-11 and ASTM E2780-10. Test method quality control procedures (leak checks, volume meter checks, stratification checks, proportionality results) followed the procedures outlined.

Appliance Sealing and Storage

Upon completion of testing, the appliance was secured with metal strapping and the seal below was applied, the appliance was then returned to the manufacturer's location at: 63 Lexalt Drive, Carson City, NV 89706 for archival.

Sealing Label

ATTENTION:

THIS SEAL IS NOT TO BE BROKEN WITHOUT PRIOR AUTHORIZATION FROM THE
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY.

THIS APPLIANCE HAS BEEN SEALED IN ACCORDANCE WITH REQUIREMENTS OF 40CFR
PART 60 SUBPART AAA §60.535 (a)(2)(vii)

REPORT # _____

DATE SEALED _____

MANUFACTURER _____

MODEL # _____

Sealed Unit



List of Appendices

The following appendices have been submitted electronically in conjunction with this report:

Appendix A – Test Run Data, Technician Notes, and Sample Analysis

Appendix B – Labels and Manuals

Appendix C – Equipment Calibration Records

Appendix D – Design Drawings (CBI Report Only)

Appendix E – Manufacturer QAP (CBI Report Only)



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(503) 236-2712 • FAX (503) 235-2535 • www.qc-services.com



PFS Teco
11785 SE Hwy 212 STE#305
Clackamas, OR 97015

Report Number: DIRI01A05026190611

A2LA ACCREDITED **CERTIFICATE OF CALIBRATION WITH DATA**

INSTRUMENT INFORMATION

Item	Make	Model	Serial Number	Customer ID	Location
Scale	Rice Lake	IQ+355E-2A x 1000	A05026	#041	Lab
Units	Readability	SOP	Cal Date	Last Cal Date	Cal Due Date
lbs	0.1	QC033	6/11/19	12/18/18	6/2020

FUNCTIONAL CHECKS

SHIFT TEST	LINEARITY	REPEATABILITY	ENVIRONMENTAL CONDITIONS
Test Wt: 250 Tol: 1	Test Wt: HB44 Tol: HB44	Test Wt: 250 Tol: 1	
As-Found: Pass: <input checked="" type="checkbox"/> Fail: <input type="checkbox"/>	As-Found: Pass: <input checked="" type="checkbox"/> Fail: <input type="checkbox"/>	As-Found: Pass: <input checked="" type="checkbox"/> Fail: <input type="checkbox"/>	<input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> Good Fair Poor
As-Left: Pass: <input checked="" type="checkbox"/> Fail: <input type="checkbox"/>	As-Left: Pass: <input checked="" type="checkbox"/> Fail: <input type="checkbox"/>	As-Left: Pass: <input checked="" type="checkbox"/> Fail: <input type="checkbox"/>	Temperature: 20.6°C

CALIBRATION DATA

Standard	As-Found	As-Left	Expanded Uncertainty
1000	1000.1	1000.1	0.12
700	700.1	700.1	0.12
500	500.0	500.0	0.08
300	299.9	299.9	0.08
100	100.0	100.0	0.05
50	50.0	50.0	0.05

CALIBRATION STANDARDS

Item	Make	Model	Serial Number	Cal Date	Cal Due Date	NIST ID
Avoirdupois Cast W	Rice Lake	25 and 50lb	PWO990-CA	11/24/17	11/2019	20172265

Permanent Information Concerning this Equipment:

12 month calibration cycle. 2000lb platform.

Comments/Information Concerning this Calibration

6/19 RH = 47%.

Report prepared/reviewed by: ServiceTech DC Date: 6/11/19

Technician: JJ Colacchio
Signature: [Signature]

THIS CERTIFICATE SHALL NOT BE REPRODUCED, EXCEPT IN FULL, WITHOUT THE APPROVAL OF QUALITY CONTROL SERVICES, INC.

The uncertainty is calculated according to the ISO Guide to the Expression of Uncertainty in Measurement and includes the uncertainty of standards used combined with the observed standard deviation of the unit under test. The uncertainty is expanded with a k factor of 2 for an approximate 95% level of confidence. Instruments listed above were calibrated using standards traceable to the National Institute of Standards and Technology (NIST). Calibration data reflect results at the time and location of calibration. Calibration data should be reviewed to insure that the instrument is performing to its required accuracy.

Dry Gas Meter Calibration

Meter Manufacturer: Apex
 Model: XC-60-ED
 Lab ID #: 53
 Serial #: 1902130
 Calibration Date: 1/23/2020
 Calibration Expiration: 7/23/2020
 Barometric Pressure: 29.93 in. Hg



Reference Standard DGM	
Manufacturer:	Apex
Model:	SK25DA
Lab ID#:	47
Serial #:	1101001
Calibration Expiration Date:	3/13/2020
Calibration γ Factor:	0.998

Unit Under Test Previous Calibration	
Date	6/14/2019
γ Factor:	0.999
Allowable Deviation ($\pm 5\%$):	0.04995
Actual Deviation:	0.01
Result:	PASS

Calibration Data	Run 1	Run 2	Run 3
Standard DGM Initial Volume (L)	0.000	0.000	0.000
Standard DGM Final Volume (L)	162.364	142.013	148.622
Standard DGM Temperature ($^{\circ}\text{F}$)	69.0	70.0	70.0
Standard DGM Pressure (in H_2O)	0.00	0.00	0.0
DGM Initial Volume (ft^3)	0.000	0.000	0.000
DGM Final Volume (ft^3)	5.814	5.147	5.409
DGM Temperature ($^{\circ}\text{F}$)	88.0	94.0	96.0
DGM Pressure (in H_2O)	3.42	2.04	1.0
Time (min)	32.0	36.0	52.0
Net Volume for Standard DGM (ft^3)	5.734	5.015	5.249
Net Volume for DGM (ft^3)	5.814	5.147	5.409
Dry Gas Meter γ Factor	1.011	1.011	1.013
γ Factor Deviation From Average	1.011	1.011	1.013

Average Gas Meter γ Factor

1.012

Calculations:

- Deviation = |Average value for all runs - current run value|
- $\gamma = [V_{\text{std}} \times (\gamma_{\text{std}}) \times (P_{\text{bar}} + P_{\text{std}}/13.6) \times (T_{\text{DGM}} + 460)] / [V_{\text{DGM}} \times (T_{\text{std}} + 460) \times (P_{\text{bar}} + P_{\text{DGM}}/13.6)]$

Standard Reference Meter is calibrated to NIST traceable standards. Uncertainty of measurement is $\pm 0.5\%$.

Dry Gas Meter Calibration

Meter Manufacturer: Apex
 Model: XC-60-ED
 Lab ID #: 54
 Serial #: 1902133
 Calibration Date: 1/23/2020
 Calibration Expiration: 7/23/2020
 Barometric Pressure: 23.93 in. Hg



Reference Standard DGM	
Manufacturer:	Apex
Model:	SK25DA
Lab ID#:	47
Serial #:	1101001
Calibration Expiration Date:	3/13/2020
Calibration γ Factor:	0.998

Unit Under Test Previous Calibration	
Date	6/14/2019
γ Factor:	0.996
Allowable Deviation ($\pm 5\%$):	0.0498
Actual Deviation:	0.01
Result:	PASS

Calibration Data	Run 1	Run 2	Run 3
Standard DGM Initial Volume (L)	0.000	0.000	0.000
Standard DGM Final Volume (L)	153.663	172.691	287.542
Standard DGM Temperature ($^{\circ}\text{F}$)	69.0	69.0	69.0
Standard DGM Pressure (in H_2O)	0.00	0.00	0.0
DGM Initial Volume (ft^3)	0.000	0.000	0.000
DGM Final Volume (ft^3)	5.576	6.296	10.530
DGM Temperature ($^{\circ}\text{F}$)	95.0	95.0	96.0
DGM Pressure (in H_2O)	3.60	2.00	1.0
Time (min)	30.0	45.0	99.0
Net Volume for Standard DGM (ft^3)	5.427	6.099	10.154
Net Volume for DGM (ft^3)	5.576	6.296	10.530
Dry Gas Meter γ Factor	1.008	1.008	1.008
γ Factor Deviation From Average	1.008	1.008	1.008

Average Gas Meter γ Factor

1.008

Calculations:

- Deviation = |Average value for all runs - current run value|
- $\gamma = [V_{\text{std}} \times (\gamma_{\text{std}}) \times (P_{\text{bar}} + P_{\text{std}}/13.6) \times (T_{\text{DGM}} + 460)] / [V_{\text{DGM}} \times (T_{\text{std}} + 460) \times (P_{\text{bar}} + P_{\text{DGM}}/13.6)]$

Standard Reference Meter is calibrated to NIST traceable standards. Uncertainty of measurement is $\pm 0.5\%$.

Certificate of Calibration

Certificate Number: 712600



JJ Calibrations, Inc.

7724 SE Aspen Summit Drive

Portland, OR 97266-9217

Phone 503.786.3005

FAX 503.786.2994

PFS TECO

11785 SE Hwy 212

Suite 305

Clackamas, OR 97015

PO: **john.steinst.PFSTECO.co**

Order Date: **11/06/2019**

Authorized By: **N/A**

Calibrated on: **11/15/2019**

*Recommended Due: **11/15/2020**

Environment: **21 °C 48 % RH**

* As Received: **Within Tolerance**

* As Returned: **Within Tolerance**

Action Taken: **Calibrated**

Technician: **146**



0723.01

Calibration

Property #: **064**

User: **N/A**

Department: **N/A**

Make: **Control Company**

Model: **4198**

Serial #: **80531676**

Description: **Digital Temp. / Barometer**

Procedure: **404323**

Accuracy: **±1°C ±0.2362Hg(±8mb)**

Remarks: * Many factors may cause the unit to drift out of calibration before the recommended due date. Any reported error is the absolute value between the reference and the unit. Uncertainties include the effects of the unit.

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
644A	Thunder Scientific	1200	Two Pressure Humidity Generator	10/14/2020	710583
847A	Fluke	RPM4	Reference Pressure Monitor	11/21/2019	688957

Parameter

Measurement Data

Measurement Description	Range	Unit	Reference	Min	Max	*Error	UUT	Uncertainty
Before/After Temperature								Accredited = ✓
		°C	20.00	19.0	21.0	0.1	20.1 °C	8.1E-02 ✓
		°C	30.00	29.0	31.0	0.8	29.2 °C	8.1E-02 ✓
		°C	40.00	39.0	41.0	0.2	39.8 °C	8.1E-02 ✓
Barometer		mbar	1010.70	1002.7	1018.7	0.7	1010.0 mbar	

This instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual and is traceable to either the SI or to National Institute of Standards and Technology (NIST). The quality system and this certificate are in compliance with ANSI/NCSL Z540-1-1994, ISO/IEC 17025-2017, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainties of measurements for this calibration are based upon 95% (2 sigma) confidence limits. Unless stated in the comments, certificates reflect the "Simple Acceptance Rule" as specified by JCGM 106:2012. Unless otherwise stated, a test accuracy ration (TAR) of 4:1, if achievable, is maintained.

The results reported herein apply only to the calibration of the item described above. This report may not be reproduced, except in full, without written approval of JJ Calibrations.

Reviewer

3 Issued 11/16/2019

Rev # 15

Inspector



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PFS Teco
11785 SE Hwy 212 STE#305
Clackamas, OR 97015

Report Number: DIR10134307497200110

A2LA ACCREDITED **CERTIFICATE OF CALIBRATION WITH DATA**

INSTRUMENT INFORMATION

Item	Make	Model	Serial Number	Customer ID	Location
Balance	Sartorius	ENTRIS224-1S	34307497	#107	Lab
Units	Readability	SOP	Cal Date	Last Cal Date	Cal Due Date
g	0.0001	QC012	1/10/20	6/10/19	6/2020

FUNCTIONAL CHECKS

ECCENTRICITY		LINEARITY		STANDARD DEVIATION			ENVIRONMENTAL CONDITIONS		
Test Wt:	Tol:	Test Wt:	Tol:	Test Wt:	Tol:		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
100	0.0003	50 x 4	0.0002	100	0.0001		Good	Fair	Poor
As-Found:		As-Found:		1. 100.0001	5. 99.9999	9. 100.0000	Temperature: 19.3°C		
Pass: <input checked="" type="checkbox"/>	Fail: <input type="checkbox"/>	Pass: <input checked="" type="checkbox"/>	Fail: <input type="checkbox"/>	2. 100.0000	6. 100.0000	10. 99.9999			
As-Left:		As-Left:		3. 100.0000	7. 100.0001	Result			
Pass: <input checked="" type="checkbox"/>	Fail: <input type="checkbox"/>	Pass: <input checked="" type="checkbox"/>	Fail: <input type="checkbox"/>	4. 100.0000	8. 100.0000	0.00006			

A2LA ACCREDITED SECTION OF REPORT

Standard	As-Found	As-Left	Expanded Uncertainty
200	199.9997	200.0000	0.00019
100	100.0000	100.0001	0.00018
50	49.9999	50.0001	0.00018
20	20.0001	20.0000	0.00017
1	0.9998	0.9999	0.00017
0.1	0.0999	0.1000	0.00017

CALIBRATION STANDARDS

Item	Make	Model	Serial Number	Cal Date	Cal Due Date	NIST ID
Weight Set	Rice Lake	20kg to 1mg	7133	4/19/19	4/2020	20190811

Permanent Information Concerning this Equipment:

Comments/Info Concerning this Calibration:

01/20 RH= 49% Adjusted span.

Report prepared/reviewed by: R.B. Date: 1-10-20

Technician: R. Butcher

Signature: R. Butcher

THIS CERTIFICATE SHALL NOT BE REPRODUCED WITHOUT THE APPROVAL OF QUALITY CONTROL SERVICES, INC.

The uncertainty is calculated according to the ISO Guide to the Expression of Uncertainty in Measurement and includes the uncertainty of standards used combined with the observed standard deviation and readability of the unit under test. The uncertainty is expanded with a k factor of 2 for an approximate 95% level of confidence. Instruments listed above were calibrated using standards traceable to the National Institute of Standards and Technology (NIST). Calibration data reflect results at the time and location of calibration. Calibration data should be reviewed to insure that the instrument is performing to its required accuracy. Calibrations comply with ISO/IEC 17025 and ANSI/Z540-1-1994 quality standards.

Member: National Conference of Standards Laboratories and Weights & Measures

PT ID: DIR101



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Report of Calibration

Firm: Dirigo Laboratories
Address: 11785 SE Hwy 212, Ste 305
City/State/Zip: Clackamas, OR 97015

Test Completed: 03/21/17
Submitted By: John Steiner
Traceable Number: 20170468

Test Item: 200mg and 100mg Individual Weights
Serial No.: Listed in Table

Manufacturer: Troemner

<u>Material</u>	<u>Assumed Density</u>	<u>Range</u>	<u>Tolerance Class</u>
Stainless Steel	7.95 g/cm ³	200mg & 100mg	ASTM Class 1

Method and Traceability

The procedure used for this calibration is NIST IR 6969 SOP 4 Double Substitution Weighing Design. Standards used for comparison are traceable to the National Institute of Standards and Technology (reports on file) and are part of a comprehensive measurement assurance program for ensuring continued accuracy and traceability within the level of uncertainty reported. The Traceable Number listed above is Traceable to National Standards through an unbroken chain of comparison each having stated uncertainties.

Standards Used:

100g to 1mg Working Standards Were Calibrated: 03/03/17 Due: 03/31/18 Standards ID: 723318

Mass Comparators Used: MET-05

Tested by: D. Thompson

Conventional Mass: "The conventional value of the result of weighing a body in air is equal to the mass of a standard, of conventionally chosen density, at a conventionally chosen temperature, which balances this body at this reference temperature in air of conventionally chosen density. International Recommendation 33 (OIML IR 33 1973, 1979). "Conventional Value of the Result of Weighing in Air" (Previously known as "Apparent Mass vs. 8.0g/cm³).

Uncertainty Statement: The uncertainty conforms to the ISO Guide to the Expressions of Uncertainty in Measurement. Uncertainty as reported is based on a coverage factor k=2 for an approximate 95 percent level of uncertainty. Uncertainty components include the standard deviation of the process, the uncertainty of the standard used, an uncertainty component associated with the potential drift of the standard used, and the estimated uncertainty related to measuring and determining the air buoyancy effect.

Conventional Mass Values are listed on page 2 of this report.

page 1 of 2

Quality Control Services, Inc.
Metrology Laboratory Manager
E-mail dthompson@qc-services.com

Date: 03/21/17

Signature David S. Thompson

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Report of Calibration

Firm: Dirigo Laboratories
Address: 11785 SE Hwy 212, Ste 305
City/State/Zip: Clackamas, OR 97015

Test Completed: 03/21/17
Submitted By: John Steiner
Traceable Number: 20170468

Test Item: 200mg and 100mg Individual Weights
Serial No.: Listed in Table

Manufacturer: Troemner

Laboratory Environment at time of test

Temperature °C	Pressure mmHg	Humidity %RH
21.967	753.44	49.44

Conventional Mass Value

Nominal Value	As Found grams	As Found Correction* (mg)	Uncertainty (mg)	Tolerance (mg)
200mg SN 1000101395	0.2000061	0.0061	0.0026	0.01
100mg SN 1000126267	0.1000046	0.0046	0.0028	0.01

*Correction is the difference between the conventional mass value of a weight and its nominal value.

Comments: These weights were new from the manufacturer and were within ASTM Class 1 tolerances As Found. No adjustments or changes were made so As Found values should be considered to be As Left values.

Accredited by the American Association for Laboratory Accreditation (A2LA) under Calibration Laboratory Code 115953 and Certificate Number 1550.01. This laboratory meets the requirements of ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This laboratory also meets the requirements of ANSI/NCSL Z540-1-1994 and any additional program requirements in the field of calibration.

page 2 of 2

Quality Control Services, Inc.
Metrology Laboratory Manager
E-mail dthompson@qc-services.com

Date: 03/21/17

Signature David S. Thompson

CERTIFICATE OF CALIBRATION

CUSTOMER: PFS-TECO : CLACKAMAS, OR
PO NUMBER: N/A
INST. MANUFACTURER: DWYER
INST. DESCRIPTION: VELOMETER
MODEL NUMBER: 471
SERIAL NUMBER: CP288559 (ID# 095)
RATED UNCERTAINTY: SEE NOTES BELOW.
UNCERTAINTY GIVEN: $\pm .20\%$ RD ; $k=2$
NOTES: $\pm 3\%$ FS (0-500 / 0-1500) *** $\pm 4\%$ F.S. (0-5000) *** $\pm 5\%$ F.S. (0-15000) *** $\pm 2^\circ$ F
NOTES CONT. : Q.MANUAL IM 1.5 REV 2017.1 DATED 7-18-2017

CALIBRATION DATE: 03/14/2019
CALIBRATION DUE: 03/14/2020
PROCEDURE: T.O.33K6-4-1769-1
CALIBRATION FLUID: AIR @ 14.7 PSIA 70°F
RECEIVED CONDITION: WITHIN MFG. SPECS.
LEFT CONDITION: WITHIN MFG. SPECS.
AMBIENT CONDITIONS: 762 mm HGA 43% RH 69°F
CERTIFICATE FILE #: 490265.2019

UUT INDICATED FT/MIN	DM.STD. ACTUAL FT/MIN	UUT INDICATED DEG. F	DM STD. ACTUAL DEG. F
64	65	0 TO 200°F	0 TO 200°F
110	112	43.4	43.5
206	210	69.0	68.9
498	509	99.4	99.2
503	505		
1049	1058		
1497	1514		
509	513		
3419	3460		
4992	5068		
5136	5235		
13928	14232		

STANDARDS USED:

A220: 12" WIND TUNNEL 0 - 8000 FPM CMC $\pm .203\%$ RD TRACE# 1520423238	DUE	05/23/2019
A24: HART SCIENTIFIC TEMP. STANDARD $\pm .024$ F TRACE# 1520423238	DUE	03/07/2020

All instruments used in the performance of the shown calibration have traceability to the National Institute of Standards and Technology (NIST). The uncertainty ratio between the calibration standards (DM.STD.) used and the unit under test (UUT) is a minimum of 4:1, unless otherwise noted. Calibration has been performed per the shown procedure number, in accordance with ISO 10012:2003, ISO 17025:2005, ANSI/NCSSL-Z-540.3, and/or MIL-STD-45662A. Test methods: API2530-92 & ASME MFC-3M-1989.

Dick Munns Company • 11133 Winners Circle • Los Alamitos, CA 90720
 Phone (714) 827-1215 • Fax (714) 827-0823

This Calibration Certificate shall not be reproduced, except in full, without approval by DICK MUNNS COMPANY. The data shown applies only to the instrument being calibrated and under the stated conditions of calibration.

Date:

Calibration Technician:

3/14/2019



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Report of Calibration

Firm: Dirigo Laboratories
Address: 11785 SE Hwy 212, Ste 305
City/State/Zip: Clackamas, OR 97015

Test Completed: 01/15/16
Purchase Order: 1001
Traceable Number: 20152489

Test Item: 20lb and 10lb Individual Grip Handle Weights
Serial No.: Listed in Table

Manufacturer: Unknown

<u>Material</u>	<u>Assumed Density</u>	<u>Range</u>	<u>Tolerance Class</u>
Cast Iron	7.2 g/cm ³	20lb to 10lb	NIST HB 105-1 (F)

Method and Traceability

The procedure used for this calibration is NIST IR 6969 SOP 7 Single Substitution Weighing Design. Standards used for comparison are traceable to the National Institute of Standards and Technology (reports on file) and are part of a comprehensive measurement assurance program for ensuring continued accuracy and traceability within the level of uncertainty reported. The Traceable Number listed above is Traceable to National Standards through an unbroken chain of comparison each having stated uncertainties.

Standards Used:

Avoirdupois Working Standards were calibrated: 06/18/2014 Due: 06/18/2016 Standards ID: 34AA
Mass Comparators Used: MET-09, 20 Tested by: D. Thompson

Conventional Mass: "The conventional value of the result of weighing a body in air is equal to the mass of a standard, of conventionally chosen density, at a conventionally chosen temperature, which balances this body at this reference temperature in air of conventionally chosen density. International Recommendation 33 (OIML IR 33 1973, 1979). "Conventional Value of the Result of Weighing in Air" (Previously known as "Apparent Mass vs. 8.0g/cm³).

Uncertainty Statement: The uncertainty conforms to the ISO Guide to the Expressions of Uncertainty in Measurement. Uncertainty as reported is based on a coverage factor K=2 for an approximate 95 percent level of uncertainty. Uncertainty components include the standard deviation of the process, the uncertainty of the standard used, an uncertainty component associated with the potential drift of the standard used, and the estimated uncertainty related to measuring and determining the air buoyancy effect.

Conventional Mass Values are listed on page 2 of this report.

page 1 of 2

Quality Control Services, Inc.
Metrology Laboratory Manager
E-mail dthompson@qc-services.com

Date: 01/15/16

Signature  David S. Thompson

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Report of Calibration

Firm: Dirigo Laboratories
Address: 11785 SE Hwy 212, Ste 305
City/State/Zip: Clackamas, OR 97015

Test Completed: 01/15/16
Purchase Order: 1001
Traceable Number: 20152489

Test Item: 20lb and 10lb Individual Grip Handle Weights
Serial No.: Listed in Table

Manufacturer: Unknown

Laboratory Environment at time of test

Temperature °C	Pressure mmHg	Humidity %RH
21.448	760.64	44.58

Conventional Mass Value

Nominal Value	As Found pounds	As Found Correction* (mg)	Uncertainty (mg)	Tolerance (mg)
20lb #098	19.9995450	-206.4	6.4	910
10lb #097	10.0006510	295.3	5.1	450
10lb #051	10.0003421	155.2	5.1	450

*Correction is the difference between the conventional mass value of a weight and its nominal value.


Comments: These weights were received in good condition and were within NIST Handbook 105-1 Class F tolerances As Found. No adjustments or changes were made so As Found values should be considered to be As Left values.

Accredited by the American Association for Laboratory Accreditation (A2LA) under Calibration Laboratory Code 115953 and Certificate Number 1550.01. This laboratory meets the requirements of ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This laboratory also meets the requirements of ANSI/NCSL Z540-1-1994 and any additional program requirements in the field of calibration.

page 2 of 2

Quality Control Services, Inc.
Metrology Laboratory Manager
E-mail dthompson@qc-services.com

Date: 01/15/16


Signature David S. Thompson



Model 1430 Microtector® Electronic Point Gage

Installation and Operating Instructions



Model 1430 Microtector® Portable Electronic Point Gage combines modern, solid-state integrated circuit electronics with a time-proven point gage manometer to provide fast, accurate pressure measurements.

SPECIFICATIONS AND FEATURES

- Accurate and repeatable to $\pm .00025$ inches water column
- Pressure range: 0 - 2" w.c., positive, negative, or differential pressures
- Non-toxic and inexpensive gage fluid consists of distilled water mixed with a small amount of fluorescein green color concentrate
- Convenient, portable, lightweight and self-contained, the unit requires no external power connections and is operated by a 1.5 volt penlight cell
- A.C. detector current eliminates point plating, fouling and erosion
- Micrometers are manufactured in accordance with ASME B89.1.13-2001, and are traceable to a standard at the National Institute of Standards and Technology

- Three-point mounting, dual leveling adjustment, and circular level vial assure rapid setup
- Durablock® precision-machined acrylic plastic gage body
- Sensitive 0 - 50 microamp D.C. meter acts as a detector and also indicates battery and probe condition
- Heavy 2" thick steel base plate provides steady mounting
- Top-quality glass epoxy circuit board and solid-state, integrated circuit electronics
- Electronic enclosure of tough, molded styrene acrylonitrile provides maximum protection to components yet allows easy access to battery compartment
- Rugged sheet steel cover and carrying case protects the entire unit when not in use
- Accessories included are (2) 3-foot lengths Tygon® tubing, (2) 1/8" pipe thread adapters and 3/4 oz. bottle of fluorescein green color concentrate with wetting agent

Maximum pressure: 100 psig with optional pipe thread connections.

Tygon® is a registered trademark of Saint-Gobain Corporation

DWYER INSTRUMENTS, INC.

P.O. BOX 373

MICHIGAN CITY, INDIANA 46361, U.S.A

Phone: 219/879-8000

Fax: 219/872-9057

www.dwyer-inst.com

e-mail: info@dwyer-inst.com



CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information

PXPKG TUALATIN OR H
10450 SW TUALATIN SHERWOOD ROAD
TUALATIN OR 97062

Certificate Modification Date: 10/01/2018

Praxair Order Number: 70743165

Part Number: NI CD17CO8E-AS

Fill Date: 09/26/2018

Lot Number: 70086826911

Cylinder Style & Outlet: AS

CGA 590

Cylinder Pressure and Volume: 1290 psig 140 ft3

Certified Concentration

Expiration Date:	10/01/2026	NIST Traceable
Cylinder Number:	SA17187	Expanded Uncertainty
17.00 %	Carbon dioxide	± 0.3 %
4.31 %	Carbon monoxide	± 0.6 %
16.99 %	Oxygen	± 0.2 %
Balance	Nitrogen	

ProSpec EZ Cert



Certification Information:

Certification Date: 10/01/2018

Term: 96 Months

Expiration Date: 10/01/2026

This cylinder was certified according to the 2012 EPA Traceability Protocol, Document #EPA-600/R-12/531, using Procedure G1.

Do Not Use this Standard if Pressure is less than 100 PSIG.

CO2 responses have been corrected for Oxygen IR Broadening effect. O2 responses have been corrected for CO2 interference.

Analytical Data:

(R=Reference Standard, Z=Zero Gas, C=Gas Candi:late)

1. Component:

Carbon dioxide

Requested Concentration: 17 %
Certified Concentration: 17.00 %
Instrument Used: Horiba VIA-510 S/N 20C194WK
Analytical Method: NDIR
Last Multipoint Calibration: 09/21/2018

First Analysis Data:				Date
Z:	0	R:	20.1	10/01/2018
R:	20.1	Z:	0	
Z:	0	C:	17.01	
C:	17	R:	20.11	
Conc:	17	Conc:	17	
UOM:	%	Mean Test Assay:	17	%

Reference Standard:

Type / Cylinder #: GMIS / CC187238

Concentration / Uncertainty: 20.10 % ±0.24%

Expiration Date: 06/07/2026

Traceable to: SRM # / Sample # / Cylinder #: RGM#CC193512 / N/A / RGM#CC193512

SRM Concentration / Uncertainty: 26.99% / ±0.05%

SRM Expiration Date: 05/15/2023

Second Analysis Data:				Date
Z:	0	R:	0	
R:	0	Z:	0	
Z:	0	C:	0	
C:	0	R:	0	
Conc:	0	Conc:	0	
UOM:	%	Mean Test Assay:		%

2. Component:

Carbon monoxide

Requested Concentration: 4.25 %
Certified Concentration: 4.31 %
Instrument Used: Horiba VIA-510 S/N UB9UCSYX
Analytical Method: NDIR
Last Multipoint Calibration: 09/21/2018

First Analysis Data:				Date
Z:	0	R:	5	10/01/2018
R:	5	Z:	0	
Z:	0	C:	4.32	
C:	4.31	R:	5.01	
Conc:	4.31	Conc:	4.3	
UOM:	%	Mean Test Assay:	4.31	%

Reference Standard:

Type / Cylinder #: GMIS / CC242633

Concentration / Uncertainty: 5.00 % ±0.543%

Expiration Date: 04/03/2025

Traceable to: SRM # / Sample # / Cylinder #: SRM 2642a / 51-D-23 / FF23106

SRM Concentration / Uncertainty: 7.859% / ±0.039%

SRM Expiration Date: 07/15/2019

Second Analysis Data:				Date
Z:	0	R:	0	
R:	0	Z:	0	
Z:	0	C:	0	
C:	0	R:	0	
Conc:	0	Conc:	0	
UOM:	%	Mean Test Assay:		%

3. Component:

Oxygen

Requested Concentration: 17 %
Certified Concentration: 16.99 %
Instrument Used: OXYMAT 5E
Analytical Method: Paramagnetic
Last Multipoint Calibration: 09/04/2018

First Analysis Data:				Date
Z:	0	R:	20.86	10/01/2018
R:	20.86	Z:	0	
Z:	0	C:	16.99	
C:	16.99	R:	20.86	
Conc:	16.99	Conc:	16.99	
UOM:	%	Mean Test Assay:	16.99	%

Reference Standard:

Type / Cylinder #: GMIS / CC75874

Concentration / Uncertainty: 20.86 % ±0.111%

Expiration Date: 11/07/2025

Traceable to: SRM # / Sample # / Cylinder #: SRM 2659a / 71-E-19 / FF22331

SRM Concentration / Uncertainty: 20.863% / ±0.021%

SRM Expiration Date: 08/23/2021

Second Analysis Data:				Date
Z:	0	R:	0	
R:	0	Z:	0	
Z:	0	C:	0	
C:	0	R:	0	
Conc:	0	Conc:	0	
UOM:	%	Mean Test Assay:		%

Analyzed By

Jose Vasquez

Certified By

Danielle Burns



CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information

PXPKG TUALATIN OR H
10450 SW TUALATIN SHERWOOD ROAD
TUALATIN OR 97062

Certificate Modification Date: 09/05/2018

Praxair Order Number: 70716136

Part Number: NI CD10C033E-AS

Fill Date: 08/31/2018

Lot Number: 70086824308

Cylinder Style & Outlet: AS

CGA 590

Cylinder Pressure and Volume: 2000 psig 140 ft3

Certified Concentration

Expiration Date:	09/05/2026	NIST Traceable
Cylinder Number:	CC170624	Expanded Uncertainty
10.00 %	Carbon dioxide	± 0.3 %
2.51 %	Carbon monoxide	± 0.7 %
10.50 %	Oxygen	± 0.6 %
Balance	Nitrogen	

ProSpec EZ Cert



Certification Information:

Certification Date: 09/05/2018

Term: 96 Months

Expiration Date: 09/05/2026

This cylinder was certified according to the 2012 EPA Traceability Protocol, Document #EPA-600/R-12/531, using Procedure G1.

Do Not Use this Standard if Pressure is less than 100 PSIG.

CO responses have been corrected for CO2 interference. CO2 responses have been corrected for Oxygen IR Broadening effect. O2 responses have been corrected for CO2 interference.

Analytical Data:

(R=Reference Standard, Z=Zero Gas, C=Gas Candidate)

1. Component: Carbon dioxide

Requested Concentration: 10 %
Certified Concentration: 10.00 %
Instrument Used: Horiba VIA-510 S/N 20C194WK
Analytical Method: NDIR
Last Multipoint Calibration: 08/20/2018

First Analysis Data:		Date	
Z:	0	R:	14.02
R:	14.02	Z:	0
Z:	0	C:	10
C:	10	R:	14.02
UOM:	%	Mean Test Assay:	10 %

Reference Standard: Type / Cylinder #: GMIS / CC141375

Concentration / Uncertainty: 14.02 % ± 0.3%

Expiration Date: 06/11/2026

Traceable to: SRM # / Sample # / Cylinder #: SRM 1675b / 6-F-51 / CAL014538

SRM Concentration / Uncertainty: 13.963% / ± 0.034%

SRM Expiration Date: 05/16/2022

Second Analysis Data:		Date	
Z:	0	R:	0
R:	0	Z:	0
Z:	0	C:	0
C:	0	R:	0
UOM:	%	Mean Test Assay:	%

2. Component: Carbon monoxide

Requested Concentration: 2.5 %
Certified Concentration: 2.51 %
Instrument Used: Horiba VIA-510 S/N UB9UCSYX
Analytical Method: NDIR
Last Multipoint Calibration: 08/20/2018

First Analysis Data:		Date	
Z:	0	R:	2.48
R:	2.48	Z:	0
Z:	0	C:	2.51
C:	2.51	R:	2.48
UOM:	%	Mean Test Assay:	2.51 %

Reference Standard: Type / Cylinder #: GMIS / CC102045

Concentration / Uncertainty: 2.48 % ± 0.448%

Expiration Date: 04/03/2025

Traceable to: SRM # / Sample # / Cylinder #: SRM 2641a / 52-D-30 / CAL017193

SRM Concentration / Uncertainty: 4.009% / ± 0.017%

SRM Expiration Date: 07/15/2019

Second Analysis Data:		Date	
Z:	0	R:	0
R:	0	Z:	0
Z:	0	C:	0
C:	0	R:	0
UOM:	%	Mean Test Assay:	%

3. Component: Oxygen

Requested Concentration: 10.5 %
Certified Concentration: 10.50 %
Instrument Used: OXYMAT 5E
Analytical Method: Paramagnetic
Last Multipoint Calibration: 09/04/2018

First Analysis Data:		Date	
Z:	0	R:	9.88
R:	9.88	Z:	0
Z:	0	C:	10.5
C:	10.5	R:	9.88
UOM:	%	Mean Test Assay:	10.5 %

Reference Standard: Type / Cylinder #: NTRM / DT0010402

Concentration / Uncertainty: 9.88 % ± 0.4%

Expiration Date: 11/18/2022

Traceable to: SRM # / Sample # / Cylinder #: NTRM #170701 / N/A / NTRM #DT0010402

SRM Concentration / Uncertainty: 9.875% / ± 0.040%

SRM Expiration Date: 11/18/2022

Second Analysis Data:		Date	
Z:	0	R:	0
R:	0	Z:	0
Z:	0	C:	0
C:	0	R:	0
UOM:	%	Mean Test Assay:	%

Analyzed By

Danielle Burns

Certified By

Jose Vasquez