

# **Non-Confidential Business Information (Non - CBI)**

## **Certification Test Report**

**Maine Energy Systems, Inc.  
Pellet-Fired Warm Air Furnace  
Model: AutoPellet Air 28kW**

**Prepared for:** Maine Energy Systems, Inc.  
8 Airport Road  
Bethel, ME 04217

**Prepared by:** OMNI-Test Laboratories, Inc.  
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**Report Date:** November 13, 2015  
**Report Revision Date:** March 20, 2025

**Report Number:** 0444PB008E  
**Project Number:** 0444PB008E.REV001

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-Document Edition # 002 (03/20/25)-

*Model: AutoPellet Air  
Maine Energy Systems, Inc.  
8 Airport Road  
Bethel, ME 04217*

## **AUTHORIZED SIGNATORIES**

This report has been reviewed and approved by the following authorized signatories:

### **Evaluator:**



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Ken Morgan, Technical Services Director  
OMNI-Test Laboratories, Inc.

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# **Section 1**

## **Sampling Procedures and Test Results**

## **INTRODUCTION**

Maine Energy Systems, Inc. retained OMNI-Test Laboratories to certify tests results to CSA B415.1 on the AutoPellet Air 28kW warm air furnace. Certification testing on the furnace was performed by Polytests Services of St-Jean-sur-Richelieu, QC. The AutoPellet Air furnace is, per the definitions of 40 CFR 60 subpart QQQQ, a “Large” non-catalytic, thermostatically controlled indoor warm air furnace.

The conditioning and testing was performed at Polytests Services’ testing facility in St-Jean-sur-Richelieu. The unit was received in good condition and assigned and labeled with Polytests Services ID # QI\_20137. Polytests Services representative Danick Power and Maxime Martin conducted the certification testing and completed all testing by 2015-09-03.

The AutoPellet Air furnace was tested in accordance with CSA B415.1-10 as a central indoor heating appliance. Particulate emissions were measured using an ASTM E2515 sampling train consisting of two filters (front and back). The average emissions of the four test runs included in the results indicate a particulate emission rate of 0.06 lbs/mmBTU output. Test runs were conducted in each of four burn rate categories (below 35% of maximum, 35%-53% of maximum, 53%-76% of maximum and maximum). Emissions for each of their individual test runs did not exceed the cap. Results shown in the following tables reflect results calculated using CSA B415.1-10.

The full test report submitted by Polytests is appended to this report for reference.

Report addendum was added to Appendix B of this report, due to additional confirmation testing (under CSAB415.1-10) requirements for low burn rates. This was performed under the auspices of EPA ALT-134 and submitted to the EPA separately from the original report and is now being added to the updated completed report. Refer to Appendix B for specifics of this addendum and Appendix H for a copy of ALT-134.

Operating Instructions were gathered from the Operating Manual (see Operating the Furnace section).

This report is organized in accordance with the EPA-recommended outline and is summarized in the Table of Contents immediately preceding this report. The results in this report are limited to the item submitted.

**Table 1.1 – Particulate Emissions**

<b>Run</b>	<b>Target Delivered Heat Output Range (BTU/hr)</b>	<b>Actual Delivered Heat Output Rate (BTU/hr)</b>	<b>Percent of Maximum Output (%)</b>	<b>First Hour Emissions Rate (lbs/mmbtu output)</b>	<b>Total Emissions Rate (lbs/mmbtu output)</b>
1	N/A - Maximum	92,178	100	0.0416	0.0424
2	48,854 - 70,055	61,716	67	0.0382	0.035
3	32,262 - 48,854	45,529	49	0.0436	0.0416
4	<32,262	29,509	32	0.1300	0.122

**Table 1.2 – Heat Output & Efficiency**

<b>Run</b>	<b>Delivered Heat Output Rate (BTU/hr)</b>	<b>HHV Heat Input Rate (BTU/hr)</b>	<b>Delivered HHV Efficiency (%)</b>	<b>Overall HHV Efficiency (%)</b>	<b>Overall Heat Output (BTU/hr)</b>
1	92178	109390	86.2	87.7	95920
2	61716	69589	89.5	89.4	62239
3	45529	51711	88.8	90.0	46529
4	29509	33497	88.9	90.6	30330

**Table 1.3 – Supplementary Emissions Data**

<b>Run</b>	<b>CO Emissions Rate (g/hr)</b>	<b>ASTM E2515 Emissions – First Hour (g/hr)</b>
1	4.35	1.74
2	0	1.07
3	0	0.90
4	2.6	1.74

**Table 1.4 – Train Precision**

<b>Run</b>	<b>Train Precision g/kg</b>	<b>Train Precision (%)</b>
1	0.022	3.89
2	0.019	3.50
3	0.003	0.56
4	0.023	1.25

## **TEST RESULTS AND DISCUSSION**

A total of four test runs were performed on the AutoPellet air furnace. The four runs test runs were conducted in the following categories and included in the average emission level results: one below 35%, one in the 35% to 53% category; one in the 53% to 76% category; and one at maximum.

The average particulate emission rate was measured to be **0.06 Lb/MMbtu output** as calculated using CSA B415.1-10.

The proportionality results for all four test runs were acceptable. All four tests were valid and appropriate for inclusion in a strait average.

The overall thermal efficiency was measured to be 89.42 % (HHV) and the delivered heat efficiency was measured to be 88.35%.

### **Run Anomalies**

**Run 1** – No sampling anomalies occurred, this test run was determined to be valid and appropriate for inclusion in the strait average.

**Run 2** – Negative filter weight was found on Train B, this is caused by filter material transferring to the O-ring gasket. Transfer weight can be seen as a positive weight on the O-rings, negative filter is added back into the calculation to prevent transfer weight as being counted as emissions. No additional sampling anomalies occurred, this test run was determined to be valid and appropriate for inclusion in the strait average.

**Run 3** - No sampling anomalies occurred, this test run was determined to be valid and appropriate for inclusion in the strait average.

**Run 4** - Negative filter weight was found on Train A (first hour), this is caused by filter material transferring to the O-ring gasket. Transfer weight can be seen as a positive weight on the O-rings, negative filter is added back into the calculation to prevent transfer weight as being counted as emissions. No additional sampling anomalies occurred, this test run was determined to be valid and appropriate for inclusion in the strait average.

*Model: AutoPellet Air  
Maine Energy Systems, Inc.  
8 Airport Road  
Bethel, ME 04217*

## **Section 2**

### **Appliance Photographs and Description**



Model: AutoPellet Air  
Maine Energy Systems, Inc.  
8 Airport Road  
Bethel, ME 04217

**Maine Energy Systems, Inc.**  
**AutoPellet Air**  
**Test Dates: August 8-15, 2014**



## PELLET FURNACE DESCRIPTION

**Appliance Manufacturer:** Maine Energy System

Pellet Furnace **Model:** AutoPellet Air

**Type:** Pellet burning hot-air furnace

## PELLET FURNACE INFORMATION

**Materials of Construction:** The firebox and heat exchanger are constructed primarily of mild steel. The burner plate and secondary combustion tube (flame tube) are made of stainless steel. The unit's enclosure is painted steel.

**Air Introduction System:** Primary combustion air enters through the combustion air blower on the burner. Secondary air enters through the same blower but is diverted to secondary combustion within the burner plenum.

**Combustion Control Mechanisms:** Combustion air is modulated by varying the combustion fan speed. The fuel delivery auger is run at varying speeds as well, to achieve the different modulation steps of the boiler as well as to control fuel / air mixture. The combustion fan varies in speed as required, again to meet the different modulation steps of the furnace.

**Combustor:** Ignition at start up is by electric heating element contained within a steel tube. Air is passed through / over the heating element and the resultant hot air is applied directly to the pellets laying on the burner plate..

**Internal Baffles:** Each fire-tube has a spiral turbulator to disrupt laminar air flow and to serve as a cleaning mechanism.

**Other Features:** A ducting plenum is located at the rear of the unit, behind the heat exchanger. A convection blower is operated at variable speeds by the temperature in this plenum and by room / load requirements.

**Flue Outlet:** The 6-inch diameter flue outlet is located in the lower rear of the unit.

## PELLET FURNACE OPERATING INSTRUCTIONS

**Specific Written Instructions:** See Section 3 of this report. All markings and instruction materials were reviewed for content prior to printing.

*Model: AutoPellet Air  
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8 Airport Road  
Bethel, ME 04217*

## **Section 3**

### **Quality Assurance/Quality Control**

## QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

As a testing laboratory, *OMNI* follows the guidelines of ISO/IEC 17025, “General Requirements for the Competence of Testing and Calibration Laboratories,” and the quality assurance/quality control (QA/QC) procedures found in *OMNI*’s Quality Assurance Manual. As a certification organization, *OMNI* follows ISO/IEC Guide 65, “General Requirements for Bodies Operating Product Certification Systems.”

*OMNI*’s scope of accreditation includes, but is not limited to, the following:

- American National Standards Institute (ANSI) for certification of products to safety standards (Certification ID #0654).
- International Accreditation Service, Inc. (formerly ICBO ES) as a testing laboratory (TL-130).
- Standards Council of Canada (SCC) for certification of products to safety standards.
- Serving as a testing laboratory for the certification of wood heaters by the U.S. Environmental Protection Agency.

This report is issued within the scope of *OMNI*’s accreditation. Accreditation certificates are available upon request.

The manufacturing facilities and quality control system for the production of the AutoPellet Air at Maine Energy Systems, Inc. were evaluated to determine if sufficient to maintain conformance with *OMNI*’s requirements for product certification. *OMNI* has concluded that the manufacturing facilities, processes, and quality control system are adequate to produce the appliance congruous with the standards and model codes to which it was evaluated. To ensure continuing conformance, follow-up quality control inspections of finished products and manufacturing quality control will be conducted by *OMNI* as a condition of listing.

Following each quality assurance inspection, an audit form will be submitted to the manufacturer for signature indicating that the production furnaces meet the requirements, as tested by *OMNI*, of the appropriate standards or that resolutions must be made to continue listing. Failure to produce data needed for quarterly audits or unapproved changes in production that may jeopardize the safety and emissions of the appliance may result in the revocation of listing.

This report shall not be reproduced, except in full, without the written approval of *OMNI-Test Laboratories, Inc.*

*Model: AutoPellet Air  
Maine Energy Systems, Inc.  
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## **Section 4**

### **Labeling and Owner's Manual**

(In Polytests report – See Appendix A)

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# **Appendix A**

## **POLYTEST TEST REPORT**

# Certification Test Report

Maine Energy Systems, Inc.

**Pellet-Fired Warm Air Furnace**

**Model:** AutoPellet Air

**Prepared for:** Maine Energy Systems  
8 Airport Road  
Bethel, ME 04217

**Prepared by:** Polytests Services  
695-B Rue Gaudette  
Saint-Jean-sur-Richelieu, QC J3B 7S7  
Canada

**Test Period:** September 1 – 3, 2015

**Report Date:** October 2015

**Report Number:** PI-20112

*Model: AutoPelletAir  
Maine Energy System  
8 Airport Road, Bethel, Maine 04217, USA*

# **Section 1**

## **Fuel Photographs/Appliance Description/Drawings**



Model: AutoPelletAir  
Maine Energy System  
8 Airport Road, Bethel, Maine 04217, USA

**Maine Energy System**  
**AutoPellet Air**  
**Test Dates: sept 1<sup>st</sup> 2015 to Sept 3<sup>rd</sup> 2015**



## Maine Energy System Model: AutoPellet Air

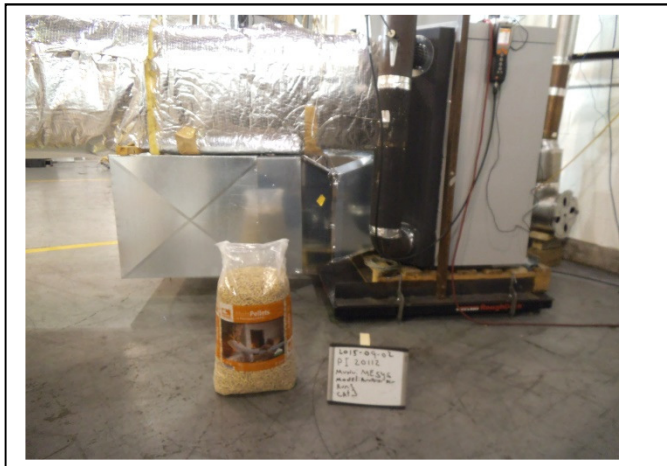
**Run 1 – Fuel**



**Run 1 – Newly Loaded Stove**



**Run 2 – Fuel**



**Run 2 – Newly Loaded Stove**



## Maine Energy System Model: AutoPellet Air

**Run 3 – Fuel**



**Run 3 – Newly Loaded Stove**



**Run 4 – Fuel**



**Run 4 – Newly Loaded Stove**



## PELLET FURNACE DESCRIPTION

**Appliance Manufacturer:** Maine Energy System

Pellet Furnace **Model:** AutoPellet Air

**Type:** Pellet burning hot-air furnace

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**Other Features:** A ducting plenum is located at the rear of the unit, behind the heat exchanger. A convection blower is operated at variable speeds by the temperature in this plenum and by room / load requirements.

**Flue Outlet:** The 6-inch diameter flue outlet is located in the lower rear of the unit.

## PELLET FURNACE OPERATING INSTRUCTIONS

**Specific Written Instructions:** See Section 3 of this report. All markings and instruction materials were reviewed for content prior to printing.

*Model: AutoPelletAir  
Maine Energy System  
8 Airport Road, Bethel, Maine 04217, USA*

# **Engineering Drawings/Blueprints**

Provided Directly to Omni By MESY  
(Safety project)

## **Section 2**

### **Quality Assurance/Quality Control**

## QUALITY ASSURANCE/QUALITY CONTROL

*Polytests Services* follows the guidelines of ISO/IEC 17025, “General Requirements for the Competence of Testing and Calibration Laboratories,” and the quality assurance/quality control (QA/QC) procedures found in *Polytests Services* Quality Assurance Manual.

*Polytests Services* scope of accreditation includes, but is not limited to, the following:

- ANSI (American National Standards Institute) for certification of product to safety standards.
- To perform product safety testing by the International Accreditation Service, Inc. (formerly ICBO ES) under accreditation as a testing laboratory designated TL-642.
- To perform product safety testing as a “Certification Organization” by the Standards Council of Canada (SCC).
- Serving as a testing laboratory for the certification of wood heaters by the U.S. Environmental Protection Agency.

This report is issued within the scope of *Polytests Services* accreditation. Accreditation certificates are available upon request.

The following has been verified during the evaluation process to the manufacturer’s engineering drawings that are included in this report:

- Na Firebox dimensions: the dimensions of the firebox must be detailed enough to determine firebox volume.
- Na Air introduction systems: Cross-sectional area from inlet and outlet of all air introduction systems. Airflow diagram using arrows showing airflow introduction to exit. Example: Start-up air, Primary air, secondary air, air wash for the glass.
- X Baffle dimensions and locations.
- X Refractory insulation dimensions and locations: Example: firebrick and baffle material. Material specifications on these items. (Data sheet from manufacturer is preferred.)
- X Flue gas exit. Dimensions and exit location. This would include dimensions above the baffle to and including the flue collar.  
All gasket material. This would include dimensions, length and material specifications of all gasket material and a clear indication of its location on the appliance. (Material specs from manufacturer would be helpful) The specifications, size and thickness of door glass.
- X Outer shielding and locations. Drawings should include shielding and locations and overall dimensions.
- X (Pellet Stoves) Auger motor rating, design and power rating. Show a drawing the angle of the auger to the firebox.
- X (Pellet Stoves) Forced air combustions system. Motor specs of the combustions system and blade size.
- X Fan Option appliances: CFM of optional fan (send manufacturer data sheet)

# Sample Analysis

## Analysis Worksheets

### Tared Filter and Beaker Data

## Run1

### Filter set weight

	System 1 (g) 1st hour				System 1 (g)			
	probe	front	back	gasket	probe	front	back	gasket
Before (1)								
Before (2)								
Before (3)	108,963	0,1225	0,1242	10,1303	108,844	0,1239	0,1218	10,3216
Before (4)	108,963	0,1224	0,1243	10,1303	108,844	0,1238	0,122	10,3217
After (1)	108,9631	0,1235	0,1243	10,1326	108,844	0,1249	0,1221	10,3272
After (2)	108,963	0,1234	0,1243	10,1303	108,844	0,1248	0,122	10,3226
After (3)	108,963	0,1234	0,1243	10,1303	108,844	0,1248	0,122	10,3227
After (4)								
After (5)								
After (6)	108,963	0,1234	0,1243	10,1303	108,844	0,1248	0,122	10,3217

Difference	0,0000	0,0010	0,0000	0,0000	0,0000	0,0010	0,0000	0,0000
Total (mg)	1				2			
Total ajusté (mg)	<b>1,00</b>				<b>2,00</b>			

System 2 (g)				Ambient blank (g)	Date	Heure
probe	front	back	gasket	Filter		
108,7481	0,1219	0,1229	10,1259	0,1219	2015-08-31	17:00
108,7482	0,1219	0,123	10,1258	0,1218	2015-09-01	14:30
108,7484	0,1231	0,123	10,13	0,1218	2015-09-01	19:30
108,7482	0,1234	0,123	10,1264	0,1218	2015-09-15	16:00
108,7482	0,1234	0,123	10,1264	0,1218	2015-09-21	16:00
108,7482	0,1234	0,123	10,1264	0,1218	2015-09-21	16:00

0,0000	0,0015	0,0000	0,0006	0,0000
	2,1			0
	<b>2,10</b>			

<b>Project nu.</b>	PI-20112
<b>Date</b>	01-09-2015
<b>Technicien</b>	M.M



## Run2

### Filter set weight

	System 1 (g) 1st hour				System 1 (g)			
	probe	front	back	gasket	probe	front	back	gasket
Before (1)								
Before (2)								
Before (3)	108,7839	0,1261	0,1263	10,3686	108,756	0,1252	0,1294	10,4308
Before (4)	108,784	0,126	0,1264	10,3688	108,756	0,1253	0,1295	10,431
After (1)	108,7841	0,1261	0,1267	10,3722	108,756	0,1255	0,1296	10,4351
After (2)	108,784	0,1262	0,1264	10,3694	108,756	0,1256	0,1295	10,4314
After (3)	108,784	0,1262	0,1264	10,3692	108,756	0,1256	0,1295	10,4313
After (4)								
After (5)								
After (6)	108,784	0,1262	0,1264	10,3692	108,756	0,1256	0,1295	10,4313

Difference	0,0000	0,0002	0,0000	0,0004	0,0000	0,0003	0,0000	0,0003
Total (mg)		0,6				1,2		
Total ajusté (mg)		<b>0,60</b>				<b>1,20</b>		

System 2 (g)				Ambient blank (g)	Date	Heure
probe	front	back	gasket	Filter		
109,0984	0,129	0,1215	10,2243	0,1254	2015-09-01	17:00
109,0984	0,1292	0,1214	10,2245	0,1255	2015-09-06	09:00
109,0986	0,1301	0,1214	10,2275	0,1255	2015-09-02	15:00
109,0984	0,13	0,1214	10,2248	0,1256	2015-09-15	16:15
109,0984	0,13	0,1214	10,2248	0,1255	2015-09-21	16:00
109,0984	0,13	0,1214	10,2248	0,1255	2015-09-21	16:00

0,0000	0,0008	0,0000	0,0003	0,0000
	1,1			0
	<b>1,10</b>			<b>0,00</b>

<b>Project nu.</b>	PI-20112
<b>Date</b>	02-09-2015
<b>Technicien</b>	M.M

## Run3

### Filter set weight

	System 1 (g) 1st hour				System 1 (g)			
	probe	front	back	gasket	probe	front	back	gasket
Before (1)								
Before (2)								
Before (3)	61,4591	0,1261	0,1263	10,241	61,3837	0,1249	0,1233	10,2168
Before (4)	61,4593	0,1261	0,1265	10,2412	61,3837	0,125	0,1233	10,2169
After (1)	61,4594	0,1262	0,1266	10,2446	61,384	0,1251	0,1236	10,2206
After (2)	61,4593	0,1262	0,1265	10,2418	61,3837	0,1251	0,1234	10,2173
After (3)	61,4593	0,1262	0,1265	10,2417	61,3837	0,1251	0,1233	10,2173
After (4)								
After (5)								
After (6)	61,4593	0,1262	0,1265	10,2417	61,3837	0,1251	0,1233	10,2173

Difference	0,0000	0,0001	0,0000	0,0005	0,0000	0,0001	0,0000	0,0004
Total (mg)		0,6				1,1		
Total ajusté (mg)		<b>0,50</b>				<b>1,00</b>		

System 2 (g)				Ambient blank (g)	Date	Heure
probe	front	back	gasket	Filter		
61,3786	0,1251	0,1222	10,9955	0,127	2015-09-02	17:00
61,3787	0,1252	0,1222	10,9956	0,1272	2015-09-03	07:15
61,3788	0,1253	0,1223	10,9995	0,1273	2015-09-03	16:00
61,3787	0,1256	0,1222	10,9963	0,1273	2015-09-15	16:30
61,3787	0,1256	0,1222	10,9963	0,1273	2015-09-21	16:30
61,3787	0,1256	0,1222	10,9963	0,1273	2015-09-21	16:30

0,0000	0,0004	0,0000	0,0007	0,0001
	1,1			0,1
	<b>1,00</b>			

<b>Project nu.</b>	PI-20112
<b>Date</b>	03-09-2015
<b>Technicien</b>	M.M

## Run4

### Filter set weight

	System 1 (g) 1st hour				System 1 (g)			
	probe	front	back	gasket	probe	front	back	gasket
Before (1)								
Before (2)								
Before (3)	94,644	0,1231	0,1279	10,457	93,7296	0,1281	0,1224	10,3261
Before (4)	94,6442	0,123	0,1278	10,457	93,7297	0,1281	0,1224	10,3263
After (1)	94,6443	0,124	0,1281	10,4581	93,7298	0,1291	0,1224	10,3278
After (2)	94,6442	0,1239	0,1278	10,4571	93,7297	0,129	0,1224	10,3264
After (3)	94,6442	0,1239	0,1278	10,4571	93,7297	0,1289	0,1224	10,3264
After (4)								
After (5)								
After (6)	94,6442	0,1239	0,1278	10,4571	93,7297	0,1289	0,1224	10,3264

Difference	0,0000	0,0009	0,0000	0,0001	0,0000	0,0008	0,0000	0,0001
Total (mg)	1				1,9			
Total ajusté (mg)	<b>1,00</b>				<b>1,90</b>			

System 2 (g)				Ambient blank (g)	Date	Heure
probe	front	back	gasket	Filter		
108,9538	0,1289	0,1288	10,3017	0,1278	2015-09-02	19:30
108,9538	0,1288	0,1288	10,3017	0,1278	2015-09-03	15:00
108,9538	0,1298	0,1288	10,3029	0,1278	2015-09-03	20:00
108,9538	0,1298	0,1288	10,3026	0,1278	2015-09-15	17:00
108,9538	0,1298	0,1288	10,3026	0,1278	2015-09-21	17:00
108,9538	0,1298	0,1288	10,3026	0,1278	2015-09-21	17:00

0,0000	0,0010	0,0000	0,0009	0,0000
	1,9			0
	<b>1,90</b>			

<b>Project nu.</b>	PI-20112
<b>Date</b>	03-09-2015
<b>Technicien</b>	M.M

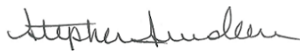


Twin Ports Testing, Inc.  
 1301 North 3rd Street  
 Superior, WI 54880  
 p: 715-392-7114  
 p: 800-373-2562  
 f: 715-392-7163  
 www.twinportstesting.com

**Report No:** USR:W215-0978-01  
**Issue No:** 2  
*Revised Report. Previous report is USR:W215-0978-01 issue number 1*

## Analytical Test Report

**Client:** POLYTESTS  
 695-B Gaudette  
 St-jean-sur-richelieu, QB J3B 7S7  
**Attention:** Danick Power  
**PO No:** 100371

**Signed:**   
 Stephen Sundeen  
 Chemistry Laboratory Manager  
**Date of Issue:** 9/17/2015  
*THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL*

**Sample Details**  
**Sample Log No:** W215-0978-01      **Sample Date:**  
**Sample Designation:** Pellet Sample      **Sample Time:**  
**Sample Recognized As:** Pellets      **Arrival Date:** 9/8/2015

### Test Results

	METHOD	UNITS	MOISTURE FREE	AS RECEIVED
Moisture Total	ASTM E871	wt. %		5.90
Ash	ASTM D1102	wt. %	0.38	0.36
Volatile Matter	ASTM D3175	wt. %		
Fixed Carbon by Difference	ASTM D3172	wt. %		
Sulfur	ASTM D4239	wt. %	0.007	0.006
SO <sub>2</sub>	Calculated	lb/mmbtu		0.015
Net Cal. Value at Const. Pressure	ISO 1928	GJ/tonne	18.89	16.58
Net Cal. Value at Const. Pressure	ISO 1928	J/g	18890	16582
Gross Cal. Value at Const. Vol.	ASTM E711	J/g	20214	19021
Gross Cal. Value at Const. Vol.	ASTM E711	Btu/lb	8691	8178

Carbon	ASTM D5373	wt. %	50.43	47.45
Hydrogen*	ASTM D5373	wt. %	6.08	5.73
Nitrogen	ASTM D5373	wt. %	< 0.20	< 0.19
Oxygen*	ASTM D3176	wt. %	> 42.90	> 40.36

\*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 <sup>3</sup>		
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**

## Calibrations

ITEM	EQUIPMENT TYPE	MANUFACTURER	EQUIPMENT #	CALIBRATION DUE DATE	COMPLIES WITH STANDARD REQUIREMENTS
1	Dessicator cabinet	Shop built	EG-014	Na	Y
2	dilution tunnel blower 6in.	Shop built	EG-027	Na	Y
3	Wood humidity chamber	Shop built	EG-034	Na	Y
4	Filter holder 47 mm in line(4)	Pall	EG-052	Na	Y
5	Filter holder 47 mm in line(4)	Pall	EG-053	Na	Y
6	Impiger train	Shop built	EG-054	Na	Y
7	Diaphragm Vacuum pump avec gauge	GAST	EG-055 / EG-056	Na	Y
8	Laboratory gas drying unit	Drierite	EG-061/ EG-062	Na	Y
9	Moisture meter	Delmhosrt	EM-003/	Verification before use	Y
10	Moisture meter Hammer	Delmhorst	EM-112	Verification before use	Y
11	Calibration block	Delmhorst	EM-191	2015-12-22	Y
12	Digital Manometer	Dwyer	EM-006	2016-02-06	Y
13	Digital Manometer	Dwyer	EM-007	2016-02-06	Y
14	Data aquisition System	Keithley	EM-047	2016-02-06	Y
15	analytical scale 200gr.	Ohaus	EM-051	2016-09-14	Y
16	Weight 2kg	na	EM-090	2015-11-03	Y
17	Pitot tube	Dwyer	EM-111	Verification before use	Y
18	Scale 0-1000lbs Rough Deck	Rice lake	EM-114	2016-09-14	Y

19	Gas analyzer	Siemen's	EM-118	Verification before use	Y
20	Digital Manometer	Dwyer	EM-124	2016-02-06	Y
21	Vacuum gauge	Dwyer	EM-126	2016-02-06	Y
22	Vacuum gauge	Dwyer	EM-127	2016-02-06	Y
23	Calibration weight 100mg	Troemer	EM-128	2015-11-03	Y
24	Calibration weight 200g	Troemer	EM-129	2015-11-03	Y
25	Reference Dry gas meter	American meter	EM-130	2015-10-31	Y
26	Temperature humidity meter	Fluke	EM-136	2016-02-10	Y
27	Digital weight indicator	Rice lake	EM-137	2016-09-14	Y
28	Vane anemometer	Omega	EM-153	2016-08-04	Y
29	caliper	Mitutoyo	EM-176	2016-05-19	Y
30	Dry gas meter	Shinagwa corporation	EM-178	2015-10-15	Y
31	Dry gas meter	Shinagwa corporation	EM-179	2015-10-15	Y
32	Calibrabration gas	Praxair	EM-183	2016-08-16	Y
33	Calibrabration gas	Praxair	EM-201	2017-10-16	Y
34	Thermometer	Fluke	EM-001	2016-02-06	Y
35	Data Acquisition system	Keithley	EM-012	2016-02-05	Y
36	20 channel card	Keithley	EM-015	2016-02-05	Y
37	20 channel card	Keithley	EM-154	2016-02-05	Y

	Post test dry gas meter calibration data		Date :	2015-09-08	Barometric pressure:	101.6	Tech/Eng. M.M.
	Manufacturer. : Maine Energy system Model : Autopellet AIR	Calibration factor 1.007 DGM 1 : EM-178	Calibration factor EM-179 DGM 2 : 1.015	Calibration factor 1.00272 Standardized DGM : EM-130			

Standard meter							Dry gas meter #1					
Trail #	Press drop	Final ft3	Initial ft3	Change ft3	Temp F	STD ft3	Final Liter	Initial Liter	Change ft3	Temp F	STD ft3	Cal Factor
1	0	8693,1	8692,1	1,000	78,4	0,983	292724,830	292696,130	1,014	79,52	0,9919	1,0087
2	0	8694,1	8693,1	1,000	78,5	0,983	292753,540	292724,830	1,014	79,52	0,9922	1,0092
3	0	8695,1	8694,1	1,000	78,5	0,983	292782,270	292753,540	1,015	79,52	0,9929	1,0099
Average calibration factor : 1.0093												

Previous cal factor	minus	Average cal factor	Divided by	Previous cal. factor	Multiplied * 100	Equals	Deviation percent Max5%
1.007	-	1.0093	/	1.007	*100	=	0.22 %

Standard meter							Dry gas meter #2					
Trail #	Press drop	Final ft3	Initial ft3	Change ft3	Temp F	STD ft3	Final Liter	Initial Liter	Change ft3	Temp F	STD ft3	Cal Factor
1	0	8693,1	8692,1	1,000	78,4	0,983	250926,41	250897,51	1,021	80,06	0,998	1,0147
2	0	8694,1	8693,1	1,000	78,5	0,983	250955,24	250926,41	1,018	80,06	0,995	1,0124
3	0	8695,1	8694,1	1,000	78,5	0,983	250984,09	250955,24	1,019	80,06	0,996	1,0131
Average calibration factor : 1.0134												

Previous cal factor	minus	Average cal factor	Divided by	Previous cal. factor	Multiplied * 100	Equals	Deviation percent Max5%
1.015	-	1.0134	/	1.015	*100	=	0.16 %



Airgas USA, LLC  
325 McCausland Court  
Cheshire, CT 06410  
(203) 250-6820  
(203) 272-1584 (FAX)

## CERTIFICATE OF ANALYSIS

### Grade of Product: CERTIFIED STANDARD-SPEC

Part Number:	X04NI77C15A0004	Reference Number:	37-400429255-1
Cylinder Number:	CC46789	Cylinder Volume:	144.0 CF
Laboratory:	ANE - Cheshire (SAP) - CT	Cylinder Pressure:	1862 PSIG
Analysis Date:	Sep 29, 2014	Valve Outlet:	350
Lot Number:	37-400429255-1		

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/or N.I.S.T. Gas Mixture reference materials.

### ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration (Mole %)	Analytical Uncertainty
OXYGEN	2.000 %	1.989 %	+/- 2%
CARBON MONOXIDE	3.000 %	2.971 %	+/- 2%
CARBON DIOXIDE	18.00 %	17.87 %	+/- 2%
NITROGEN	Balance		

  
\_\_\_\_\_  
Approved for Release





EM-183

Airgas USA, LLC  
325 McCausland Court  
Cheshire, CT 06410  
(203) 250-6820  
(203) 272-1584 (FAX)

### CERTIFICATE OF ANALYSIS

Grade of Product: **CERTIFIED STANDARD-SPEC**

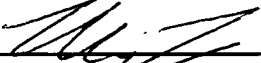
Part Number:	X04NI79C15A2VF3	Reference Number:	37-400238139-1
Cylinder Number:	SG9140147	Cylinder Volume:	151.0 CF
Laboratory:	ANE - Cheshire (SAP) - CT	Cylinder Pressure:	2015 PSIG
Analysis Date:	Aug 16, 2013	Valve Outlet:	590
Lot Number:	37-400238139-1		

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/or N.I.S.T. Gas Mixture reference materials.

### ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration (Mole %)	Analytical Uncertainty
CARBON MONOXIDE	1.000 %	1.031 %	+/- 2%
CARBON DIOXIDE	10.00 %	9.968 %	+/- 2%
OXYGEN	10.00 %	9.995 %	+/- 2%
NITROGEN	Balance		

Notes:

  
 \_\_\_\_\_  
 Approved for Release

## CERTIFICAT D'ÉTALONNAGE # 5145

Date d'étalonnage : 2015/09/21

Date d'émission du certificat : 2015/09/22

Services Polytests  
695 B Gaudette street  
St-Jean-sur-Richelieu, Québec, Canada  
J3B 7S7

Étalonnage d'un  
Shinigawa DCDA-2c S/N : 23543

### CONFORMITÉ AU PROGRAMME DE QUALITÉ

Tous les étalonnages sont effectués conformément au manuel d'assurance qualité de Polycontrols et sont conformes à la norme ISO/IEC 17025 – 2005, à la norme ISO 9001 – 2008 ainsi qu'à tout autre exigences de qualité définies dans la description d'achat des clients.

### TRAÇABILITÉ

La traçabilité des étalons de débit au National Institute of Standards and Technology, NIST, est maintenue par les laboratoires de Fluke Corporation de Phoenix, Arizona et est conforme aux normes ISO/IEC 17025, AINSI/NCSL Z540-1-1994, ISO-10012-1, MIL-STD 45662A.

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

### APTITUDE EN MATIÈRE DE MESURE ET D'ÉTALONNAGE - CMC

Les références utilisées pour l'étalonnage de débit ont une incertitude de  $\pm 0.2\%$  de la lecture pour les mesures entre 5 SCCM à 10 SLPM,  $\pm 0.3\%$  de la lecture pour les mesures entre 10 SLPM à 30 SLPM,  $\pm 0.2\%$  de la lecture pour les mesures entre 30 SLPM à 3000 SLPM,  $\pm 0.3\%$  de la lecture pour les mesures supérieures à 3000 SLPM jusqu'à 6000 SLPM et  $\pm 0.5\%$  pour les mesures inférieures à 5 SCCM jusqu'à concurrence de 1 SCCM, équivalent air ou azote. Les incertitudes exprimées sont élargies avec un facteur d'élargissement  $k = 2$ , et ce, pour un niveau de confiance d'environ 95 %, dans l'hypothèse d'une distribution normale. Le rapport d'incertitude des essais (RIE) de cet étalonnage respecte un ratio de 4:1 à moins d'indication contraire.

### SOMMAIRE DES CONDITIONS DE L'INSTRUMENT EN TEST

Conditions initiales	En bon état
Travail Effectué	Étalonnage de l'instrument
Résultats	Lectures finales dans les tolérances
Remarques	Tolérance placée à 2% OR à la demande du client

  
Métrologiste

  
Responsable du laboratoire

## Certificat d'étalonnage # 5145

Numéro de série:	23543	Station de mesure:	3
Date d'étalonnage:	2015/09/21	Procédure:	POS-CAL-005
Identification de l'instrument:	EM-179		

### Instrument de mesure de référence utilisé pour l'étalonnage final

Description	Modèle	# Série	Traçabilité	Date dû
DHI molbloc (30 slpm)	3E4-VCR-V-Q	2359	1500173210	2015/11/12
DHI molbloc (5 slpm)	5E3-VCR-V-Q	2473	1500177779	2016/03/03
DHI molbloc (10 slpm)	1E4-VCR-V-Q	2969	1500180895	2016/05/08
DHI molbox1	Molbox1	881	1500181338	2016/05/13
RTD Mist	M22	1478002	AC15041413-1478002	2016/04/24
Module 44.5 PSI avec Baro 163671	Module 30	160659	AC15041466-160659	2016/05/06

### Spécifications finales de l'appareil


### Condition d'étalonnage

Spécifications finales de l'appareil		Condition d'étalonnage	
Gaz	Air	Gaz	Air
Température d'opération	70 °F	Température ambiante	22 °C
Pression à l'entrée		Pression ambiante	1022 mbar
Pression à la sortie	14.7 PSIA	Orientation	Horizontale
Température de référence		Élastomère	Viton
Pression de référence		Valve	
Étendue d'échelle	10-2000 ALH		
Signaux Entrée/Sortie	-		
Alimentation			
Tolérance	±2 %O.R.		

### Lectures finales

Débit du test ALH	Instrument en test L	Valeurs mesurées			Référence calculée L	Erreur calculée L	Tolérance acceptable L	TUR
		Pression PSIA	Température °C	Référence L				
240.2115	40.5300	14.8534	23.08	40.2907	40.1306	0.3994	0.8026	>4
357.9294	60.2300	14.8526	23.10	59.8336	59.6039	0.6261	1.1921	>4
482.1559	81.1350	14.8519	23.09	80.5968	80.2884	0.8466	1.6058	>4
597.9776	100.5650	14.8533	23.10	99.9645	99.5776	0.9874	1.9916	>4
1201.7844	202.2300	14.8569	23.10	200.8896	200.0572	2.1728	4.0011	>4

correction factor 0,99005 2015-09-25



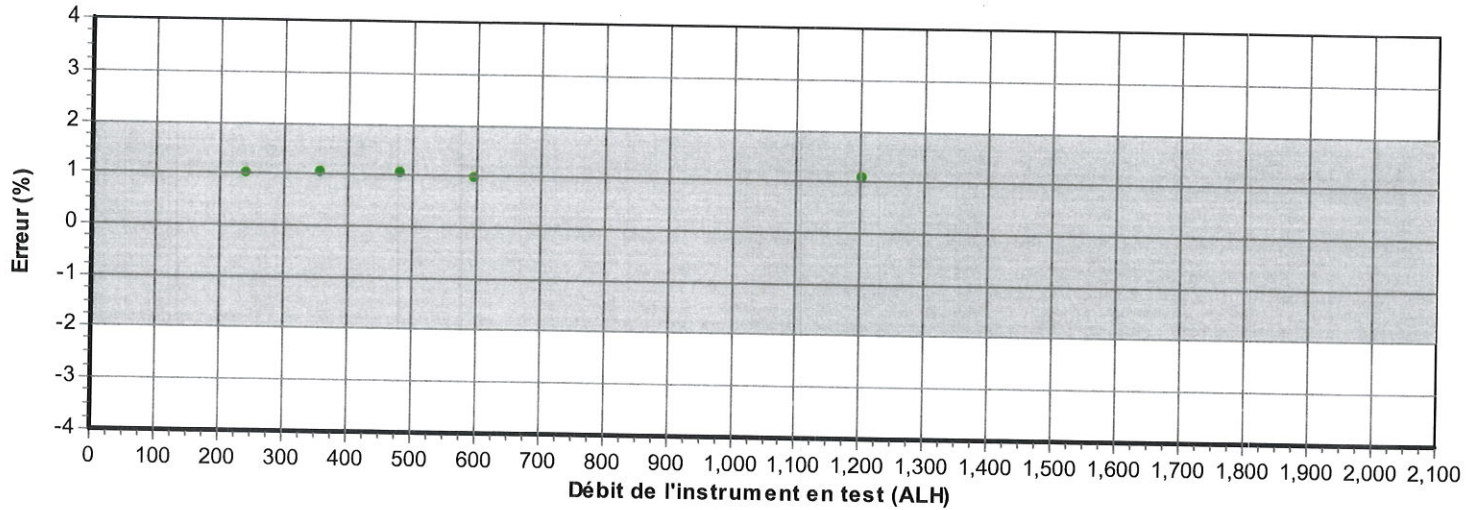
Signature

Bernard Poirier  
Métrologue

## Certificat d'étalonnage # 5145

Numéro de série:	23543	Station de mesure:	3
Date d'étalonnage:	2015/09/21	Procédure:	POS-CAL-005
Identification de l'instrument:	EM-179		

### Résultats finaux



- La mesure (et son incertitude) se situe dans les tolérances
- La mesure (et son incertitude) se situe hors tolérance
- La mesure (et son incertitude) ne rencontre pas la marge de sécurité tel que spécifié dans le document G-8 de l'ILAC

 2015-09-25

Bernard Poirier  
Métrologue

  
Signature

## CERTIFICAT D'ÉTALONNAGE # 5144

Date d'étalonnage : 2015/09/21

Date d'émission du certificat : 2015/09/22

Services Polytests  
695 B Gaudette street  
St-Jean-sur-Richelieu, Québec, Canada  
J3B 7S7

Étalonnage d'un  
Shinigawa DCDA-2c S/N : 23544

### CONFORMITÉ AU PROGRAMME DE QUALITÉ

Tous les étalonnages sont effectués conformément au manuel d'assurance qualité de Polycontrols et sont conformes à la norme ISO/IEC 17025 – 2005, à la norme ISO 9001 – 2008 ainsi qu'à tout autre exigences de qualité définies dans la description d'achat des clients.

### TRAÇABILITÉ

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### APTITUDE EN MATIÈRE DE MESURE ET D'ÉTALONNAGE - CMC

Les références utilisées pour l'étalonnage de débit ont une incertitude de  $\pm 0.2\%$  de la lecture pour les mesures entre 5 SCCM à 10 SLPM,  $\pm 0.3\%$  de la lecture pour les mesures entre 10 SLPM à 30 SLPM,  $\pm 0.2\%$  de la lecture pour les mesures entre 30 SLPM à 3000 SLPM,  $\pm 0.3\%$  de la lecture pour les mesures supérieures à 3000 SLPM jusqu'à 6000 SLPM et  $\pm 0.5\%$  pour les mesures inférieures à 5 SCCM jusqu'à concurrence de 1 SCCM, équivalent air ou azote. Les incertitudes exprimées sont élargies avec un facteur d'élargissement  $k = 2$ , et ce, pour un niveau de confiance d'environ 95 %, dans l'hypothèse d'une distribution normale. Le rapport d'incertitude des essais (RIE) de cet étalonnage respecte un ratio de 4:1 à moins d'indication contraire.

### SOMMAIRE DES CONDITIONS DE L'INSTRUMENT EN TEST

Conditions initiales	En bon état
Travail Effectué	Étalonnage de l'instrument
Résultats	Lectures finales dans les tolérances
Remarques	Tolérance placée à 2% OR à la demande du client

  
Métrologue

  
Responsable du laboratoire

## Certificat d'étalonnage # 5144

Numéro de série:	23544	Station de mesure:	3
Date d'étalonnage:	2015/09/21	Procédure:	POS-CAL-005
Identification de l'instrument:	EM-178		

### Instrument de mesure de référence utilisé pour l'étalonnage final

Description	Modèle	# Série	Traçabilité	Date dû
DHI molbloc (30 slpm)	3E4-VCR-V-Q	2359	1500173210	2015/11/12
DHI molbloc (5 slpm)	5E3-VCR-V-Q	2473	1500177779	2016/03/03
DHI molbloc (10 slpm)	1E4-VCR-V-Q	2969	1500180895	2016/05/08
DHI molbox1	Molbox1	881	1500181338	2016/05/13
RTD Mist	M22	1478002	AC15041413-1478002	2016/04/24
Module 44.5 PSI avec Baro 163671	Module 30	160659	AC15041466-160659	2016/05/06

### Spécifications finales de l'appareil

### Condition d'étalonnage

Spécifications finales de l'appareil		Condition d'étalonnage	
Gaz	Air	Gaz	Air
Température d'opération	70 °F	Température ambiante	22 °C
Pression à l'entrée		Pression ambiante	1022 mbar
Pression à la sortie	14.7 PSIA	Orientation	Horizontale
Température de référence		Élastomère	Viton
Pression de référence		Valve	
Étendue d'échelle	10-2000 ALH		
Signaux Entrée/Sortie	-		
Alimentation			
Tolérance	±2 %O.R.		

### Lectures finales

Débit du test ALH	Instrument en test L	Valeurs mesurées			Référence calculée L	Erreur calculée L	Tolérance acceptable L	TUR
		Pression PSIA	Température °C	Référence L				
238.92417	39.9800	14.8361	23.21	39.8618	39.7672	0.2128	0.7953	>4
358.99658	59.9500	14.8388	23.15	60.0432	59.8780	0.0720	1.1976	>4
478.19782	79.9100	14.8426	23.12	79.8495	79.6030	0.3070	1.5921	>4
598.14179	99.9900	14.8459	23.13	99.6913	99.3646	0.6254	1.9873	>4
1194.42507	200.6300	14.8537	23.14	199.5841	198.8317	1.7983	3.9766	>4

Bernard Poirier  
Métrologue

*Correction factor 0.99614*

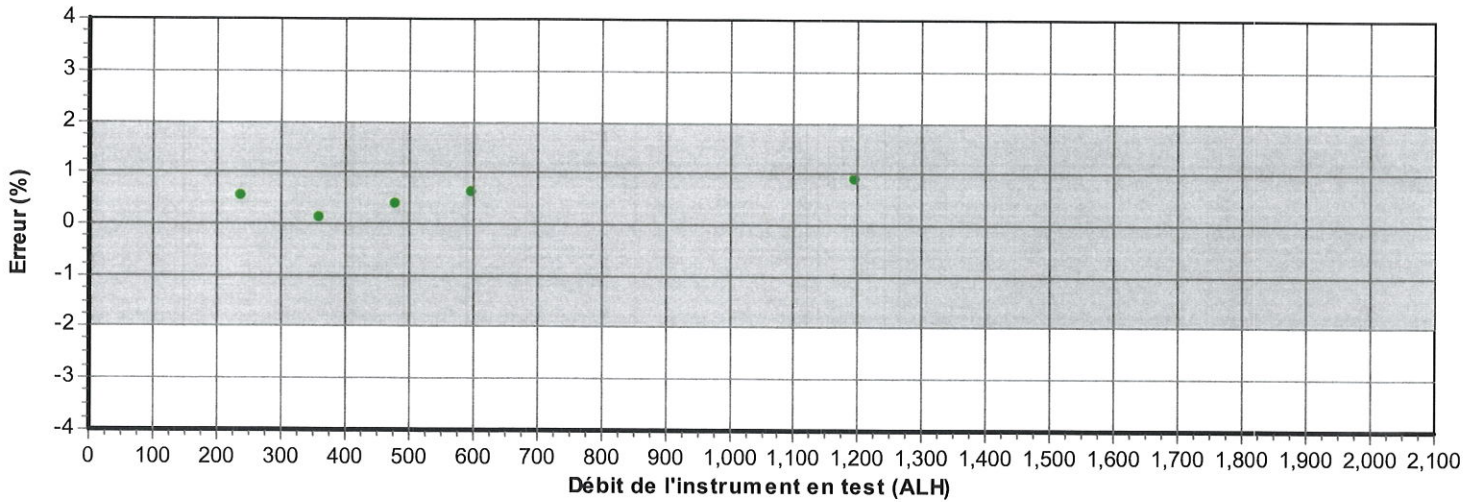
*B. Poirier*  
Signature

2015.09.25


## Certificat d'étalonnage # 5144

Numéro de série:	23544	Station de mesure:	3
Date d'étalonnage:	2015/09/21	Procédure:	POS-CAL-005
Identification de l'instrument:	EM-178		

### Résultats finaux



- La mesure (et son incertitude) se situe dans les tolérances
- La mesure (et son incertitude) se situe hors tolérance
- La mesure (et son incertitude) ne rencontre pas la marge de sécurité tel que spécifié dans le document G-8 de l'ILAC

  
2015-09-25

Bernard Poirier  
Métrologue

  
Signature



**Ulrich Métrologie inc.**  
**Ulrich Metrology Inc.**  
 9912, Côte-de-Liesse  
 Montréal (Québec) H8T 1A1

Tél. (514) 631-6653  
 Fax (514) 631-6122  
[info@ulrich.ca](mailto:info@ulrich.ca)  
[www.ulrich.ca](http://www.ulrich.ca)



**ACCREDITATION**  
**ISO 17025**  
 IN  
 SCC Scope Number 220

## CALIBRATION CERTIFICATE

<b>Certificate no.:</b>	472805	<b>Calibration date:</b>	May 19, 2015
<b>Identification:</b>	EM-176	<b>Certificate issued:</b>	May 21, 2015
<b>Description:</b>	CALIPER, DIGITAL, 6 IN	<b>Interval:</b>	12 months
<b>Size:</b>	6 IN	<b>Due date:</b>	May 19, 2016
<b>Manufacturer:</b>	MITUTOYO	<b>Procedure no.:</b>	CP-28 rev. 2
<b>Model no.:</b>	500-171-20	<b>Procedure date:</b>	2010-07-08
<b>Serial no.:</b>	12610701	<b>Environment:</b>	CLAS Type 1 Laboratory
		<b>Temperature:</b>	20 ± 1°C
		<b>Humidity:</b>	35 - 55% RH
		<b>Metrologist:</b>	MOH

**Property of:** SERVICES POLYTESTS INC  
 695-B GAUDETTE  
 ST-JEAN-SUR-RICHELIEU, QC J3B 7S7

**Approved by:**   
 David Llorens, Quality Manager

*This calibration certificate is issued in accordance with the applicable requirements of ISO/IEC 17025 and Ulrich Metrology's quality manual QM-09 Revision 9. Measurement results provided are traceable to either the National Research Council Canada (NRC), the National Institute of Standards and Technology (NIST), a national laboratory of another country signatory to the CIPM Mutual Recognition Arrangement (MRA), or a calibration laboratory accredited by an accrediting body with which Canada has an equivalence agreement.*

### CALIBRATION STANDARDS

Identification	Description	Cal. date	Due date
27071932	Gauge Blocks, In, 81 Pcs	2015-01-09	2017-01-31
76072	Caliper Checker, Mitutoyo 515-560-um	2015-01-07	2016-01-31
SP-3	Granite Surface Plate	2013-10-28	2015-10-31





### MEASUREMENT UNCERTAINTY

Outside: ± 0.00030 in. Inside: ± 0.00030 in. Depth: ± 0.00030 in.  
 The uncertainties are expanded using a coverage factor K=2 for a level of confidence of approximately 95%, assuming a normal distribution.

### INSTRUMENT CONDITION

**Received (As Found):** Out of Specifications      **Returned (As Left):** Within Specifications

### CALIBRATION DATA

Attribute	Minimum	Maximum	As Found	As Left	Units
Outside 1 in	-1	1	-2	0	.001 in 
Outside 2 in	-1	1	-2	0	.001 in 
Outside 4 in	-1	1	-2	0	.001 in 
Outside 6 in	-1	1	-2	0	.001 in 
Inside 1 in	-1	1	2	0	.001 in 
Inside 6 in	-1	1	2	0	.001 in 
Depth 1 in	-1	1	0	0	.001 in
Depth 6 in	-1	1	0	0	.001 in

The Calibration Laboratory Assessment Service (CLAS) of the National Research Council of Canada (NRC) has assessed and certified specific calibration capabilities of this laboratory and traceability to the International System of Units (SI) or to standards acceptable to the CLAS program. This certificate of calibration is issued in accordance with the conditions of certification granted by CLAS and the conditions of accreditation granted by the Standards Council of Canada (SCC). Neither CLAS nor SCC guarantee the accuracy of individual calibrations by accredited laboratories.



  
 30 MAR 2015





**Ulrich Métrologie inc.**  
**Ulrich Metrology Inc.**  
 9912, Côte-de-Liesse  
 Montréal (Québec) H8T 1A1

Tél. (514) 631-6653  
 Fax (514) 631-6122  
[info@ulrich.ca](mailto:info@ulrich.ca)  
[www.ulrich.ca](http://www.ulrich.ca)



**ACCREDITATION**  
**ISO 17025**  
1<sup>st</sup>  
 SCC Scope Number 220

<b>Certificate no.:</b> 472805	<b>Calibration date:</b> May 19, 2015
<b>Identification:</b> EM-176	<b>Certificate issued:</b> May 21, 2015

**CALIBRATION DATA**

Attribute	Minimum	Maximum	As Found	As Left	Units
-----------	---------	---------	----------	---------	-------

■ : Adjusted

**Notes:**

*Gauge was received out of tolerance.  
 Gauge was adjusted.*

The Calibration Laboratory Assessment Service (CLAS) of the National Research Council of Canada (NRC) has assessed and certified specific calibration capabilities of this laboratory and traceability to the International System of Units (SI) or to standards acceptable to the CLAS program. This certificate of calibration is issued in accordance with the conditions of certification granted by CLAS and the conditions of accreditation granted by the Standards Council of Canada (SCC). Neither CLAS nor SCC guarantee the accuracy of individual calibrations by accredited laboratories.





## CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-154 05/02/15

CLIENT		SPÉCIFICATION DE CALIBRATION	
Compagnie:	Services Polytests Inc	Procédure de service:	4IN9101
Adresse:	695 B rue Gaudette	Précision requise:	+/- 2°C
	St-Jean-sur-Richelieu, Québec, J3B 7S7	Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Enregistreur	Type d'entrée:	Temp
Manufacturier:	Keithley	Type de sortie:	Digitale
No. Model:	7700	Type de mesure:	Température
No. Série:	1306774	Gamme:	Divers
Emplacement:	EM-047	Conditions Enviro:	Normale

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Fluke 744	No. du certificat d'étalonnage:	AC14061448-7798010
No. Série:	7798010	Dernière date d'étalonnage:	26-Jun-14
Certificat fait par:	Alpha Controls	Prochaine date d'étalonnage:	26-Jun-15

Commentaire:

### RÉSULTAT D'ÉTALONNAGE

Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Incertitude Élargie	Commentaire
-17.000 mV	-17.000 mV	-17.001 mV	-0.001 mV	-17.001 mV	0.1 mV	Input#1
0.000 mV	0.000 mV	-0.005 mV	-0.005 mV	-0.005 mV	0.1 mV	Input#1
20.000 mV	20.000 mV	19.993 mV	-0.007 mV	19.993 mV	0.1 mV	Input#1
30.000 mV	30.000 mV	30.001 mV	0.001 mV	30.001 mV	0.1 mV	Input#2
Input#3 Non-Conforme						
100.0 °C	100.0 °C	99.8 °C	-0.2 °C	99.8 °C	1.0 °C	Input#4 TypeJ
100.0 °C	100.0 °C	100.2 °C	0.2 °C	100.2 °C	1.0 °C	Input#5 TypeJ
100.0 °C	100.0 °C	100.2 °C	0.2 °C	100.2 °C	1.0 °C	Input#6 TypeJ
100.0 Ohms	100.0 Ohms	100.0 Ohms	0.0 Ohms	100.0 Ohms	1.0 Ohms	Input#7
100.0 Ohms	100.0 Ohms	100.0 Ohms	0.0 Ohms	100.0 Ohms	1.0 Ohms	Input#8
100.0 Ohms	100.0 Ohms	99.9 Ohms	-0.1 Ohms	99.9 Ohms	1.0 Ohms	Input#9
100.0 Ohms	100.0 Ohms	99.8 Ohms	-0.2 Ohms	99.8 Ohms	1.0 Ohms	Input#10
100.0 °C	100.0 °C	100.0 °C	0.0 °C	100.0 °C	1.0 °C	Input#11 TypeT
100.0 °C	100.0 °C	100.1 °C	0.1 °C	100.1 °C	1.0 °C	Input#12 TypeT
100.0 °C	100.0 °C	100.0 °C	0.0 °C	100.0 °C	1.0 °C	Input#13 TypeJ
100.0 °C	100.0 °C	100.2 °C	0.2 °C	100.2 °C	1.0 °C	Input#14 TypeJ
100.0 °C	100.0 °C	99.8 °C	-0.2 °C	99.8 °C	1.0 °C	Input#15 TypeJ
100.0 °C	100.0 °C	100.0 °C	0.0 °C	100.0 °C	1.0 °C	Input#16 TypeJ
100.0 Ohms	100.0 Ohms	100.1 Ohms	0.1 Ohms	100.1 Ohms	1.0 Ohms	Input#17
100.0 Ohms	100.0 Ohms	100.1 Ohms	0.1 Ohms	100.1 Ohms	1.0 Ohms	Input#18
100.0 Ohms	100.0 Ohms	100.2 Ohms	0.2 Ohms	100.2 Ohms	1.0 Ohms	Input#19
100.0 Ohms	100.0 Ohms	99.9 Ohms	-0.1 Ohms	99.9 Ohms	1.0 Ohms	Input#20
12.000 mA	12.000 mA	12.003 mA	0.003 mA	12.003 mA	1.00 mA	Input#21
12.000 mA	12.000 mA	12.003 mA	0.003 mA	12.003 mA	1.00 mA	Input#22

Conditions Environnementales: Température: 20 °C Humidité: 24 %RH

5F09101

2015-02-16

## CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-154 05/02/15

CLIENT	
Compagnie:	Services Polytests Inc
Adresse:	695 B rue Gaudette
	St-Jean-sur-Richelieu, Québec, J3B 7S7

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	4IN9101
Précision requise:	+/- 2°C
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Enregistreur	Type d'entrée:	Temp
Manufacturier:	Keithley	Type de sortie:	Digitale
No. Model:	7700	Type de mesure:	Température
No. Série:	1306774	Gamme:	Divers
Emplacement:	EM-047	Conditions Enviro:	Normale

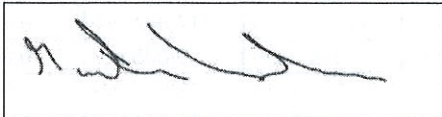
Type d'Étalonnage:

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabricant. Le système qualité de l'entreprise est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour effectuer l'étalonnage est retraçable au CNRC et/ou au NIST. Le degré d'incertitude est basé sur un niveau de confiance=95%, K=2.

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	5 Février 2015
Date du prochain Étalonnage:	5 Février 2016
Date d'émission du certificat:	5 Février 2015

CONFORMITÉ D'ÉTALONNAGE		
	Avant	Après
Conforme:	X	X
Non Conforme:		

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Numéro d'accréditation du CCN: # 669. Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.



Martin Langlais - Technicien

# CERTIFICATE OF NIST TRACEABLE CALIBRATION

Calibration Certificate No: 50431

## Customer Information

Customer: Services Polytests, Inc.

Address : 695-B Gaudette

St-Jean-sur-richelieu

J3B 7S7

Customer PO #: 100365



**LABORATORY  
ACCREDITATION  
BUREAU** a division of A-S-B

**ACCREDITED** ISO/IEC 17025  
Certificate # L2115-1 Calibration

## Calibration Procedure Information

Procedure ID: GTP AIRVEL

Revision #: 6

Revision Date: 1/6/2013

## Calibration Standards Information

<u>Graffel ID</u>	<u>Manufacturer</u>	<u>Model #</u>	<u>Description</u>	<u>CAL Due</u>
10171	Furness	FC0332-2W	0 - .4" H2O	11/13/2015
10100	Graffel	n/a	Temperature	10/29/2016
60030	Paroscientific	760-100A	Pressure, 100 psia	5/7/2016
10155	HOBO	UX100-011	RH/Temp logger	11/18/2015
10187	Vaisala	PTB210	Barometric Pressure Gauge	6/16/2016

## Sensor Information

Manufacturer: Omega

Description: Anemometer

Method Used: Pitot Tube

Model #: HHF143

Rated Accuracy:  $\pm$  See Attachment

Accuracy Specified By: Omega

Instrument ID#: EM153

Range: 40 to 7800 fpm

Condition: Functional

Serial #: 1015949

Comments: Calibration Date: 08-04-2015

*The instruments(s) listed on this certificate have been calibrated against standards traceable to the National Institute of Standards & Technology (NIST) or compared to nationally or internationally recognized consensus standards. The reported calibration uncertainty has a confidence level of 95% (k=2). A calibration uncertainty ratio of 4:1 was maintained unless required uncertainty is supported by analysis. Graffel, LLC. Quality Assurance System complies with applicable requirements of ISO/IEC-17025-2005, ANSI/NCSL Z540-1-1994 and ISO 9001: 2008. All results contained within this certificate relate only to item(s) calibrated. This certificate shall not be reproduced except in full and with the written consent of Graffel, LLC. Acceptance Criteria per Simple Acceptance Rule: Measurement Uncertainty is not applied to the measured value when in/out of tolerance statement is made.*

Performed By:

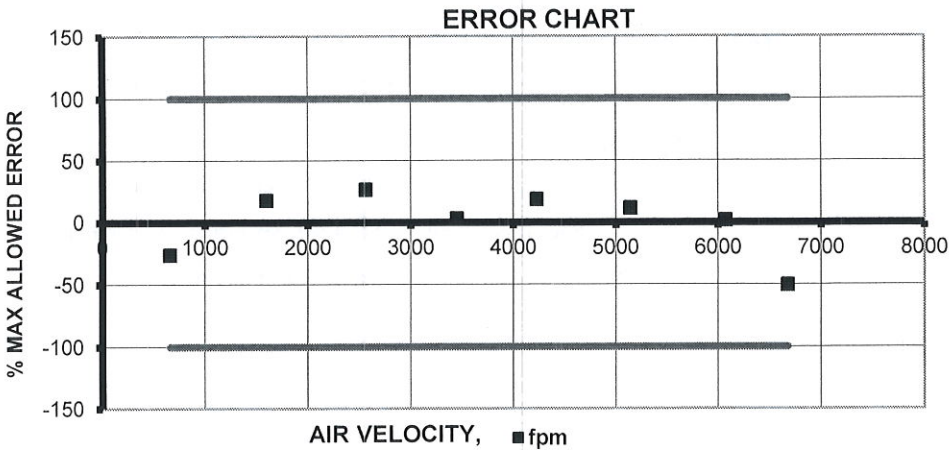
D. Stocks  
Calibration Technician

Date: 8/4/2015

17 Aug  
2015

**ATTACHMENT TO CALIBRATION CERTIFICATE 50431  
AS FOUND/AS LEFT DATA  
Page 2 of 2**

Reading From Standard,	Lower Limit of Meter Reading,	Measured Reading From Meter,	Upper Limit of Meter Reading,	Error,	Measurement Uncertainty,	STATUS
<b>Actual Air Velocity</b>						
fpm	fpm	fpm	fpm	fpm	fpm	
662	654	660	670	-2	3.31	Pass
1600	1583	1603	1617	3	8.00	Pass
2562	2535	2569	2589	7	12.81	Pass
3449	3414	3450	3484	1	17.25	Pass
4231	4188	4239	4274	8	21.16	Pass
5144	5092	5150	5196	6	25.72	Pass
6074	6012	6075	6136	1	30.37	Pass
6678	6610	6644	6746	-34	33.39	Pass



**INSTRUMENT SPECIFICATIONS**

Test Fluid	Air	
Lower Range	40	fpm
Upper Range	7800	fpm
Rated Accuracy	1% Rding +1 fpm	

**LABORATORY AMBIENT CONDITIONS**

Pressure	14.31	psia
Humidity	50.90	% RH
Temperature	74.56	F



Flow - Humidity - Temperature - Pressure - Design - Consulting - Engineering

**NIST Traceable Calibration Data Sheet**

Graftel, LLC, 870 Cambridge Drive, Elk Grove Village, IL 60007  
P. 847-364-2600 F. 847-364-2899

www.graftel.com

*[Signature]*  
17 Oct 2015



## CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-136 10/02/15

CLIENT		SPÉCIFICATION DE CALIBRATION	
Compagnie:	Services Polytests Inc	Procédure de service:	ISL-004
Adresse:	695 B rue Gaudette	Précision requise:	+/-2°C +/-3%RH
	St-Jean-sur-Richelieu, Québec, J3B 7S7	Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Hygromètre	Type d'entrée:	Temp/%RH
Manufacturier:	Fluke	Type de sortie:	Digitale
No. Model:	971	Type de mesure:	Temp/humidité
No. Série:	10610850	Gamme:	5-95%RH -20a60°C
Emplacement:	N.A.	Conditions Enviro:	Normale

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Vaisala Portable 1	No. du certificat d'étalonnage:	AC14061448-U4840010
No. Série:	U4840010/U4920031	Dernière date d'étalonnage:	2-Jul-14
Certificat fait par:	Alpha Controls	Prochaine date d'étalonnage:	2-Jul-15

Commentaire:

RÉSULTAT D'ÉTALONNAGE						
Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Incertitude Élargie	Commentaire
25.0 °C	25.0 °C	25.0 °C	0.0 °C	25.0 °C	1.0 °C	
40.0 °C	40.0 °C	40.2 °C	0.2 °C	40.2 °C	1.0 °C	
33.0 %RH	33.0 %RH	33.8 %RH	+0.8 %RH	33.8 %RH	3.0 %RH	
50.0 %RH	50.0 %RH	50.8 %RH	+0.8 %RH	50.8 %RH	3.0 %RH	
80.0 %RH	80.0 %RH	81.4 %RH	+1.4 %RH	81.4 %RH	3.0 %RH	

Conditions Environnementales:      Température: 23 °C      Humidité: 42 %RH

Type d'Étalonnage:

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabricant. Le système qualité de l'entreprise est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour effectuer l'étalonnage est retraçable au CNRC et/ou au NIST. Le degré d'incertitude est basé sur un niveau de confiance=95%, K=2.

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	10 Février 2015
Date du prochain Étalonnage:	10 Février 2016
Date d'émission du certificat:	10 Février 2015

CONFORMITÉ D'ÉTALONNAGE		
	Avant	Après
Conforme:	X	X
Non Conforme:		

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Numéro d'accréditation du CCN: # 669. Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

Martin Langlais - Technicien

## CERTIFICAT D'ÉTALONNAGE # 5138

Date d'étalonnage : 2015/09/18

Date d'émission du certificat : 2015/09/18

Services Polytests  
695 B Gaudette street  
St-Jean-sur-Richelieu, Québec, Canada  
J3B 7S7

Étalonnage d'un  
Débitmètre volumétrique American Meter Company DTM-200A S/N : 99A274209

### CONFORMITÉ AU PROGRAMME DE QUALITÉ

Tous les étalonnages sont effectués conformément au manuel d'assurance qualité de Polycontrols et sont conformes à la norme ISO/IEC 17025 – 2005, à la norme ISO 9001 – 2008 ainsi qu'à tout autre exigences de qualité définies dans la description d'achat des clients.

### TRAÇABILITÉ

La traçabilité des étalons de débit au National Institute of Standards and Technology, NIST, est maintenue par les laboratoires de Fluke Corporation de Phoenix, Arizona et est conforme aux normes ISO/IEC 17025, AINSI/NCSL Z540-1-1994, ISO-10012-1, MIL-STD 45662A.

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

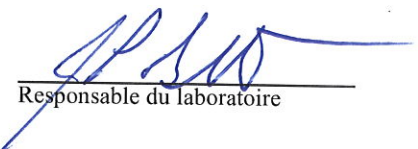
### APTITUDE EN MATIÈRE DE MESURE ET D'ÉTALONNAGE - CMC

Les références utilisées pour l'étalonnage de débit ont une incertitude de  $\pm 0.2\%$  de la lecture pour les mesures entre 5 SCCM à 10 SLPM,  $\pm 0.3\%$  de la lecture pour les mesures entre 10 SLPM à 30 SLPM,  $\pm 0.2\%$  de la lecture pour les mesures entre 30 SLPM à 3000 SLPM,  $\pm 0.3\%$  de la lecture pour les mesures supérieures à 3000 SLPM jusqu'à 6000 SLPM et  $\pm 0.5\%$  pour les mesures inférieures à 5 SCCM jusqu'à concurrence de 1 SCCM, équivalent air ou azote. Les incertitudes exprimées sont élargies avec un facteur d'élargissement  $k = 2$ , et ce, pour un niveau de confiance d'environ 95 %, dans l'hypothèse d'une distribution normale. Le rapport d'incertitude des essais (RIE) de cet étalonnage respecte un ratio de 4:1 à moins d'indication contraire.

### SOMMAIRE DES CONDITIONS DE L'INSTRUMENT EN TEST

Conditions initiales	En bon état
Travail Effectué	Étalonnage de l'instrument
Résultats	Lectures finales dans les tolérances
Remarques	Fréquence d'étalonnage aux 12 mois

  
Métrologiste

  
Responsable du laboratoire

## Certificat d'étalonnage # 5138

Numéro de série:	99A274209	Station de mesure:	3
Date d'étalonnage:	2015/09/18	Procédure:	POS-CAL-005
Identification de l'instrument:	EM-130		

### Instrument de mesure de référence utilisé pour l'étalonnage final

Description	Modèle	# Série	Traçabilité	Date dû
DHI molbloc (30 slpm)	3E4-VCR-V-Q	2359	1500173210	2015/11/12
DHI molbloc (120 slpm)	2E2-S	237	1500173211	2015/11/12
DHI molbox1	Molbox1	881	1500181338	2016/05/13
RTD Mist	M22	1871501	AC15021633-1871501	2016/03/27
Module 44.5 PSI avec Baro 163671	Module 30	160659	AC15041466-160659	2016/05/06

### Spécifications finales de l'appareil

### Condition d'étalonnage

Gaz	Air	Gaz	Air
Température d'opération		Température ambiante	23 °C
Pression à l'entrée		Pression ambiante	1010 mbar
Pression à la sortie		Orientation	Verticale
Température de référence		Élastomère	Viton
Pression de référence		Valve	Viton
Étendue d'échelle	0-200 ACFH		
Signaux Entrée/Sortie	-		
Alimentation			
Tolérance	±1 %O.R.		

### Lectures finales

Débit du test ACFH	Instrument en test ft3	Valeurs mesurées			Référence calculée ft3	Erreur calculée ft3	Tolérance acceptable ft3	TUR
		Pression PSIA	Température °C	Référence ft3				
40.5223	13.535	14.687	23.73	13.367	13.494	0.041	0.135	2.98
70.6538	11.800	14.712	23.67	11.674	11.763	0.037	0.118	3.98
161.3162	26.875	14.818	23.61	26.851	26.856	0.019	0.269	>4

Correction factor  
0,9968

Bernard Poirier  
Métrologue

2015-09-25

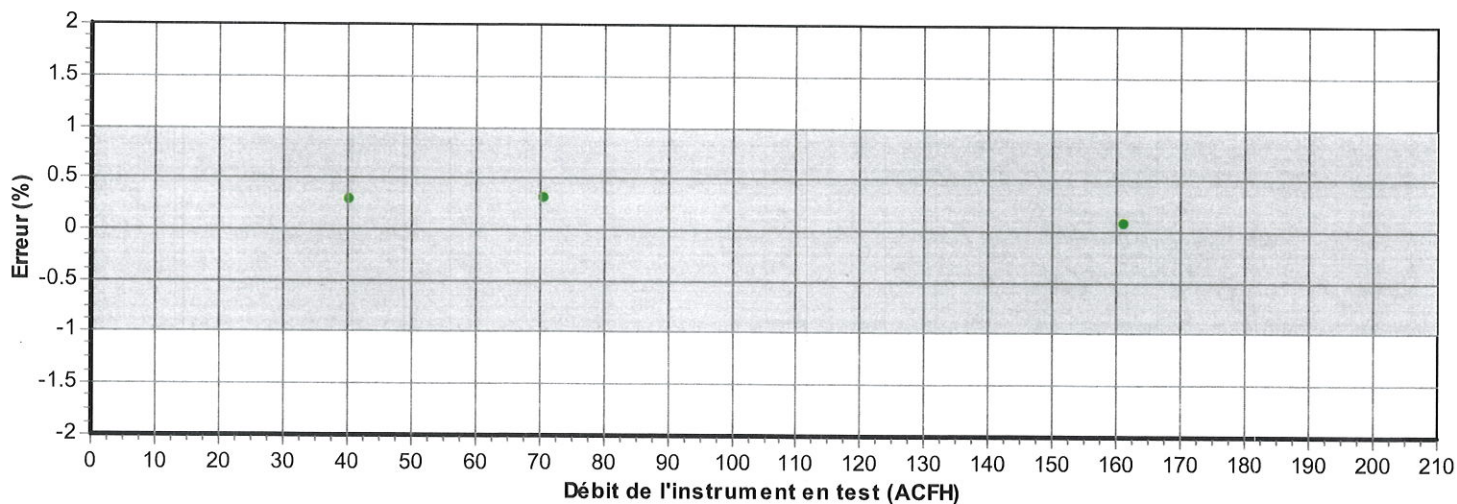
Signature



## Certificat d'étalonnage # 5138

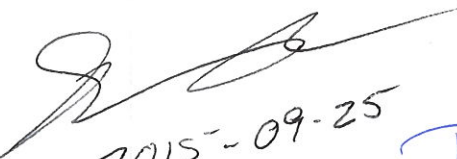
Numéro de série:	99A274209	Station de mesure:	3
Date d'étalonnage:	2015/09/18	Procédure:	POS-CAL-005
Identification de l'instrument:	EM-130		

### Résultats finaux



- La mesure (et son incertitude) se situe dans les tolérances
- La mesure (et son incertitude) se situe hors tolérance
- La mesure (et son incertitude) ne rencontre pas la marge de sécurité tel que spécifié dans le document G-8 de l'ILAC

Bernard Poirier  
Métrologue

  
2015-09-25


  
Signature

## CERTIFICAT D'ÉTALONNAGE

<b>Client :</b>	Polytests	<b>No. du Certificat :</b>	900-259410-141
<b>Adresse :</b>	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	<b>Date d'étalonnage :</b>	03-11-2014

**Technicien :**  
CB001,

Station d'étalonnage automatisée



Pierre Trépanier, Directeur laboratoire

### DESCRIPTION DU SERVICE:

<b>Description des masses :</b>	ASTM E617	<b>Date d'approbation :</b>	03-11-2014
<b>Classe de précision :</b>	ASTM 1	<b>Date prochain étalonnage :</b>	03-11-2015
<b>Densité :</b>	7.95g/cm <sup>3</sup>	<b>Accréditation CCN n. :</b>	668
<b>Identification (si unique) :</b>	(items multiples)	<b>Certification CLAS n. :</b>	2010-01

<b>Condition d'essai :</b>	Temp °C:	20.51	Pression kPa:	101.195	Humidité:	48.615
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### NOTES:

Pour l'étalonnage des masses, nous utilisons la procédure "Comparaison individuelle" PDL-09-MG-001 et la procédure "Détermination des incertitudes" PDL-09-MG-002. Le droit d'auteur du présent certificat appartient au laboratoire délivreur et doit être reproduit intégralement, à moins d'une autorisation écrite du laboratoire délivreur.

### REMARQUES:

## CERTIFICAT D'ÉTALONNAGE

108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3  
www.dispersion.ca 1.866.390.5066

<b>Client :</b>	Polytests	<b>No. du Certificat :</b>	<b>900-259410-141</b>
<b>Adresse :</b>	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	<b>Accréditation CCN n. :</b>	668
		<b>Certification CLAS n. :</b>	2010-01
		<b>Classe d'exactitude :</b>	ASTM 1
<b>Masse :</b>	100 mg - 200 g	<b>Date d'étalonnage :</b>	03-11-2014
		<b>Date du prochain étalonnage :</b>	03-11-2015

### RÉSULTAT DE L'ÉTALONNAGE, MASSE CONVENTIONNELLE:

Valeur Nominale	No de série	No d'inventaire	Masse conventionnelle	Masse conventionnelle après ajustement	Tolérance ± (mg)	Incertitudes ± (mg)
100 mg	1000014200	EM-128	99.9996 mg		0.010 mg	0.002 mg
200 g	1000026013	EM-129	200.00023 g		0.50 mg	0.11 mg

\*S'applique seulement pour les masses qui ont été ajustées\*

\*\*Hors-tolérance pour la classe spécifiée\*\*

2014-11-05

## CERTIFICAT D'ÉTALONNAGE

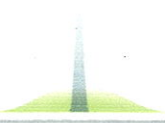
108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3  
www.dispersion.ca 1.866.390.5066

<b>Client :</b>	Polytests	<b>No. du Certificat :</b>	<b>900-259410-141</b>
<b>Adresse :</b>	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	<b>Accréditation CCN n. :</b>	668
<b>Masse :</b>	100 mg - 200 g	<b>Certification CLAS n. :</b>	2010-01
		<b>Classe d'exactitude :</b>	ASTM 1
		<b>Date d'étalonnage :</b>	03-11-2014
		<b>Date du prochain étalonnage :</b>	03-11-2015

## RÉSULTAT DE L'ÉTALONNAGE DES POIDS, CORRECTIONS:

Valeur Nominale	No de série	No d'inventaire	Masse conventionnelle Correction	Masse conventionnelle Correction après ajustement	Tolérance ± (mg)	Incertitudes ± (mg)
100 mg	1000014200	EM-128	-0.0004 mg		0.010 mg	0.002 mg
200 g	1000026013	EM-129	0.23 mg		0.50 mg	0.11 mg

\*S'applique seulement pour les masses qui ont été ajustées\*    \*\*Hors-tolérance pour la classe spécifiée\*\*



### BALANCES UTILISÉES

Pour l'étalonnage manuel :

> 5 kg à 25 kg :	Mettler Toledo XP32003L, SNR 1123271214, max. 32100 g, d = 0.005 g
> 1 kg à 5 kg	Mettler Toledo PR5003, SNR 1115311634, max. 5100 g, d = 0.001 g
> 300 g à 2 kg :	Mettler Toledo XP2004S, SNR B131185222, max. 2100 g, d = 0.1 mg
> 100 g à 200 g :	Mettler Toledo AT201 SNR BA1115230146, max. 205 g, d = 0.01 mg
> 5 g à 100 g :	Mettler Toledo AX106 SNR 1127063924, max. 111 g, d = 1 µg
1 mg à 5 g :	Mettler UMX5, SNR 1121103055, max. 5.1 g, d = 0.1 µg

Pour l'étalonnage automatisé :

> 200 g à 1 kg :	Mettler Toledo AX1005 SNR 1127063210, max. 1109 g, d = 0.01 mg
> 5 g à 100 g :	Mettler Toledo AX106 SNR 1120143015, max. 111 g, d = 1 µg
1 mg à 5 g :	Mettler UMX5, SNR 1125140561, max. 5.1 g, d = 0.1 µg

Les balances sont vérifiées selon notre procédure de contrôle périodique PDL-11-MG-001.

### INCERTITUDES:

Les incertitudes que nous retrouvons comprennent :

1. *L'incertitude associée à l'opération de pesage.*
2. *L'incertitude associée à la densité de l'air.*
3. *L'incertitude associée à l'étalon utilisé.*
4. *L'incertitude associée à la densité de la masse à être étalonnée.*

L'incertitude de l'opération de pesage comprend la reproductibilité à long terme.

Les incertitudes précisées dans ce rapport sont des incertitudes élargies représentant un niveau de confiance d'approximativement 95 %, obtenu en multipliant ensemble l'incertitude-type composée par un facteur de couverture de  $k = 2$ . Pour de plus amples renseignements, veuillez consulter la publication GUM (Guide pour l'expression de l'incertitude de mesure, édition de 1995).

### TRAÇABILITÉ

Le Service d'évaluation de laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et a certifié des capacités d'étalonnage spécifiques de ce laboratoire et leur traçabilité à des étalons nationaux de mesure reconnus et au Système international d'unités (SI). Ce certificat d'étalonnage est émis conformément aux conditions de certification accordées par CLAS et aux conditions d'accréditation accordées par le Conseil canadien des normes (CCN). Le CLAS pas plus que le CCN ne peut garantir l'exactitude des étalonnages individuels effectués par des laboratoires accrédités.



## CERTIFICAT D'ÉTALONNAGE

108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3  
www.dispersion.ca 1.866.390.5066

### RÉFÉRENCES UTILISÉES

Poids	No de série	Fabricant	Date d'étalonnage
20kg	69976	Troemner	18-03-2014
1kg - 1mg	MT-01	Mettler Toledo	04-09-2014
300g	96-0888-50-2	Denver Instrument Company	04-09-2014
2kg	96-0888-50-3	Denver Instrument Company	04-09-2014
2kg	129098	Mettler Toledo	04-09-2014
5kg	96-0888-50-3	Denver Instrument Company	04-09-2014
5kg	129099	Mettler Toledo	04-09-2014
10kg	129100	Mettler Toledo	14-08-2014

### ÉTALONS CERTIFIÉS PAR LE CNRC:

Poids	No de série	Fabricant	Date d'étalonnage
100g	95170	Mettler Toledo	19-08-2014
1kg	95171	Mettler Toledo	02-05-2014

### RÉFÉRENCES DE LA STATION ROBOTISÉE:

Poids	No de série	Fabricant	Date d'étalonnage
1kg - 1mg	DK000A133	Laboratoire Dispersion	04-09-2014
1kg - 1mg	DK000A132	Laboratoire Dispersion	01-02-2013



Instrumentation  
**Saint-Laurent** inc.  
Accrédité ISO 17025



80 rue de la montagne  
St-Joseph du lac  
(Québec), J0N 1M0  
Tél: (450) 473-6169  
Fax: (450) 473-5207  
Email: inst.st-laurent@videotron.ca

## CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-127 05/02/15

CLIENT	
Compagnie:	Services Polytests Inc
Adresse:	695 B rue Gaudette St-Jean-sur-Richelieu, Québec, J3B 7S7

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	4IN9106
Précision requise:	+/- 1"Hg
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Manomètre	Type d'entrée:	Pression
Manufacturier:	Dwyer	Type de sortie:	Digitale
No. Model:	DPG200	Type de mesure:	Pression
No. Série:	N.A.	Gamme:	0-28"Hg
Emplacement:	N.A.	Conditions Enviro:	Normale

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Crystal XP2i 300	No. du certificat d'étalonnage:	AC14061448-864490
No. Série:	864490	Dernière date d'étalonnage:	27-Jun-14
Certificat fait par:	Alpha Controls	Prochaine date d'étalonnage:	27-Jun-15
Commentaire:			

RÉSULTAT D'ÉTALONNAGE						
Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Incertitude Élargie	Commentaire
0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	1 "Hg	
-7.50 "Hg	-7.50 "Hg	-7.50 "Hg	0.00 "Hg	-7.50 "Hg	1 "Hg	
-15.00 "Hg	-15.00 "Hg	-15.01 "Hg	-0.01 "Hg	-15.01 "Hg	1 "Hg	
-22.50 "Hg	-22.50 "Hg	-22.51 "Hg	-0.01 "Hg	-22.51 "Hg	1 "Hg	
-28.00 "Hg	-28.00 "Hg	-28.04 "Hg	-0.04 "Hg	-28.04 "Hg	1 "Hg	

Conditions Environnementales: Température: 20 °C Humidité: 24 %RH

Type d'Étalonnage:

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabricant. Le système qualité de l'entreprise est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour effectuer l'étalonnage est retraçable au CNRC et/ou au NIST. Le degré d'incertitude est basé sur un niveau de confiance=95%, K=2.

### DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT

Date d'Étalonnage:	5 Février 2015
Date du prochain Étalonnage:	5 Février 2016
Date d'émission du certificat:	5 Février 2015

### CONFORMITÉ D'ÉTALONNAGE

	Avant	Après
Conforme:	X	X
Non Conforme:		

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Numéro d'accréditation du CCN: # 669. Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

Martin Langlais - Technicien

2015-02-16

5F09106



**Instrumentation  
Saint-Laurent** inc.  
Accrédité ISO 17025



80 rue de la montagne  
St-Joseph du lac  
(Québec), J0N 1M0  
Tél: (450) 473-6169  
Fax: (450) 473-5207  
Email: inst.st-laurent@videotron.ca

## CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-126 05/02/15

CLIENT	
Compagnie:	Services Polytests Inc
Adresse:	695 B rue Gaudette St-Jean-sur-Richelieu, Québec, J3B 7S7

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	4IN9106
Précision requise:	+/- 1"Hg
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Manomètre	Type d'entrée:	Pression
Manufacturier:	Dwyer	Type de sortie:	Digitale
No. Model:	DPG200	Type de mesure:	Pression
No. Série:	N.A.	Gamme:	0-28"Hg
Emplacement:	N.A.	Conditions Enviro:	Normale

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Crystal XP2i 300	No. du certificat d'étalonnage:	AC14061448-864490
No. Série:	864490	Dernière date d'étalonnage:	27-Jun-14
Certificat fait par:	Alpha Controls	Prochaine date d'étalonnage:	27-Jun-15
Commentaire:			

RÉSULTAT D'ÉTALONNAGE						
Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Incertitude Élargie	Commentaire
0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	1 "Hg	
-7.50 "Hg	-7.50 "Hg	-7.50 "Hg	0.00 "Hg	-7.50 "Hg	1 "Hg	
-15.00 "Hg	-15.00 "Hg	-15.10 "Hg	-0.10 "Hg	-15.10 "Hg	1 "Hg	
-22.50 "Hg	-22.50 "Hg	-22.74 "Hg	-0.24 "Hg	-22.74 "Hg	1 "Hg	
-28.00 "Hg	-28.00 "Hg	-28.34 "Hg	-0.34 "Hg	-28.34 "Hg	1 "Hg	

Conditions Environnementales: Température: 20 °C Humidité: 24 %RH

Type d'Étalonnage:

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabricant. Le système qualité de l'entreprise est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour effectuer l'étalonnage est retraçable au CNRC et/ou au NIST. Le degré d'incertitude est basé sur un niveau de confiance=95%, K=2.

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	5 Février 2015
Date du prochain Étalonnage:	5 Février 2016
Date d'émission du certificat:	5 Février 2015

CONFORMITÉ D'ÉTALONNAGE		
	Avant	Après
Conforme:	X	X
Non Conforme:		

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Numéro d'accréditation du CCN: # 669. Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

Martin Langlais - Technicien

5F09106  
Page 1 de 1





**Instrumentation  
Saint-Laurent** inc.  
Accrédité ISO 17025



80 rue de la montagne  
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(Québec), J0N 1M0  
Tél: (450) 473-6169  
Fax: (450) 473-5207  
Email: inst.st-laurent@videotron.ca

## CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-124 06/02/15

CLIENT	
Compagnie:	Services Polytests Inc
Adresse:	695 B rue Gaudette St-Jean-sur-Richelieu, Québec, J3B 7S7

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	4IN9106
Précision requise:	+/- 0.25"H2O
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Indicateur	Type d'entrée:	Pression
Manufacturier:	Dwyer	Type de sortie:	Digitale
No. Model:	MS-321-LCD	Type de mesure:	Pression
No. Série:	E39V060010/1	Gamme:	0-0.5"H2O
Emplacement:	N.A.	Conditions Enviro:	Normale

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Setra	No. du certificat d'étalonnage:	AC15011147-2784759
No. Série:	2784759	Dernière date d'étalonnage:	15-Jan-15
Certificat fait par:	Alpha Controls	Prochaine date d'étalonnage:	15-Jan-16
Commentaire:			


RÉSULTAT D'ÉTALONNAGE						
Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Incertitude Élargie	Commentaire
0.0000 "H2O	0.0000 "H2O	0.0009 "H2O	0.0009 "H2O	0.0009 "H2O	0.25 "H2O	
0.1500 "H2O	0.1500 "H2O	0.1470 "H2O	-0.0030 "H2O	0.1470 "H2O	0.25 "H2O	
0.2500 "H2O	0.2500 "H2O	0.2480 "H2O	-0.0020 "H2O	0.2480 "H2O	0.25 "H2O	
0.3500 "H2O	0.3500 "H2O	0.3485 "H2O	-0.0015 "H2O	0.3485 "H2O	0.25 "H2O	
0.5000 "H2O	0.5000 "H2O	0.4990 "H2O	-0.0010 "H2O	0.4990 "H2O	0.25 "H2O	
Conditions Environnementales:			Température: 20 °C	Humidité: 28 %RH		
Type d'Étalonnage:						

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabricant. Le système qualité de l'entreprise est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour effectuer l'étalonnage est retraçable au CNRC et/ou au NIST. Le degré d'incertitude est basé sur un niveau de confiance=95%, K=2.


DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	6 Février 2015
Date du prochain Étalonnage:	6 Février 2016
Date d'émission du certificat:	6 Février 2015

CONFORMITÉ D'ÉTALONNAGE		
	Avant	Après
Conforme:	X	X
Non Conforme:		

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Numéro d'accréditation du CCN: # 669. Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.



Martin Langlais - Technicien



2015-02-16

## CERTIFICAT D'ÉTALONNAGE

108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3  
www.dispersion.ca 1.866.390.5066

<b>Client :</b>	Polytests	<b>No. du Certificat :</b>	<b>122-2E3F09-151-1648</b>
<b>Adresse :</b>	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	<b>Date d'étalonnage :</b>	14-09-2015

**Technicien :**

Auclair, François

Directeur de Service

Auclair, François

### DESCRIPTION DU SERVICE:

<b>Modèle de la Base :</b>	4X4HP-10K	<b>Capacité :</b>	400kg
<b>Numéro de Série Base:</b>	C18395	<b>Méthode:</b>	ISO 17025 / Class III
<b>Modèle de Terminal:</b>	IQ355	<b>Résolution:</b>	0.05kg
<b>Numéro de Série Terminal:</b>	164851	<b>Date d'approbation :</b>	14-09-2015
<b>Numéro d'identification :</b>	EM-137 + EM. 114 DP	<b>Date prochain étalonnage :</b>	14-09-2016

<b>Condition d'essai :</b>	Temp °C:	20.1	Pression kPa:	100.5	Humidité %:	79.2
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Note: Les conditions environnementales ne sont pas utilisées dans le calcul de l'incertitude.

### CETTE BALANCE RENCONTRE LES SPÉCIFICATIONS SUIVANTES:

Type de test :	Manufacturier
Excentricité:	<input checked="" type="checkbox"/> Oui <input type="checkbox"/> Non
Linéarité:	<input checked="" type="checkbox"/> Oui <input type="checkbox"/> Non
Sensibilité:	<input checked="" type="checkbox"/> Oui <input type="checkbox"/> Non
Répétabilité:	<input checked="" type="checkbox"/> Oui <input type="checkbox"/> Non

### NOTES:

Cette balance a été certifiée selon la procédure de travail PDL-09-MG-010 (certification de balance analytique et à plateau) et la et la procédure PDL-09-MG-012 (détermination des incertitudes de pesées). Nos étalons sont certifiés à chaque année. Le droit d'auteur du présent certificat appartient au laboratoire délivreur et doit être reproduit intégralement, à moins d'une autorisation écrite du laboratoire délivreur.



2015-09-15

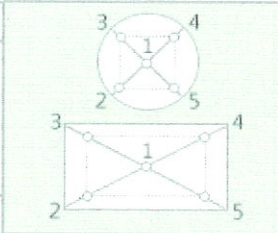
## CERTIFICAT D'ÉTALONNAGE

108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3  
www.dispersion.ca 1.866.390.5066

<b>Client :</b>	Polytests	<b>No. du Certificat :</b>	<b>122-2E3F09-151-1648</b>
<b>Adresse :</b>	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	<b>Accréditation CCN n. :</b>	668
<b>Méthode :</b>	ISO 17025	<b>Certification CLAS n. :</b>	2010-01
		<b>Modèle de la Base :</b>	4X4HP-10K
		<b>Date d'étalonnage :</b>	14-09-2015
		<b>Date du prochain étalonnage :</b>	14-09-2016

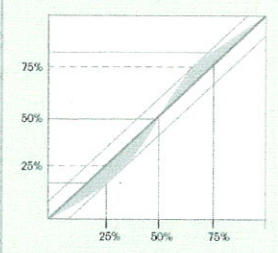
### TEST D'EXCENTRICITÉ:

Poids Test: 200 kg Tolérance 0.15 kg  
(Note: Le Poids Test est taré au centre du plateau de pesée)

Position	Avant Ajustement	Après Ajustement	
1: Centre:	0.00 kg	---	
2: Avant Gauche:	0.05 kg	---	
3: Arrière Gauche:	0.10 kg	---	
4: Arrière Droit:	0.10 kg	---	
5: Avant Droit:	0.05 kg	---	
<b>Résultats</b>	<b>0.10 kg</b>	---	
<b>STATUT</b>	<b>CONFORME</b>	<b>N/A</b>	

### TEST DE LINÉARITÉ:

Méthode: Accumulation Plage: 400 kg Poids Test: 100 kg Tolérance: 0.10 kg

Pré-Charge	Avant Ajustement	Après Ajustement	
0.00 kg	99.95 kg	---	
0.00 kg	199.95 kg	---	
0.00 kg	299.95 kg	---	
0.00 kg	400.00 kg	---	
---	---	---	
---	---	---	
<b>Résultats</b>	<b>0.050 kg</b>	---	
<b>STATUT</b>	<b>CONFORME</b>	<b>N/A</b>	

### TEST DE SENSIBILITÉ:

Valeur de masse conventionnelle: 400.00 kg Tolérance: 0.25 kg

	Avant Ajustement	Après Ajustement	
Lecture:	400.00 kg	---	$S = \frac{\Delta W}{\Delta m}$
<b>Résultats:</b>	<b>0.00 kg</b>	---	
<b>STATUT</b>	<b>CONFORME</b>	<b>N/A</b>	

## CERTIFICAT D'ÉTALONNAGE

108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3  
www.dispersion.ca 1.866.390.5066

<b>Client :</b>	Polytests	<b>No. du Certificat :</b>	<b>122-2E3F09-151-1648</b>
<b>Adresse :</b>	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	<b>Accréditation CCN n. :</b>	668
<b>Méthode :</b>	ISO 17025	<b>Certification CLAS n. :</b>	2010-01
		<b>Modèle de la Base :</b>	4X4HP-10K
		<b>Date d'étalonnage :</b>	14-09-2015
		<b>Date du prochain étalonnage :</b>	14-09-2016

### TEST DE RÉPÉTABILITÉ:

#### AVANT AJUSTEMENT:

Charge Utilisée:  
100.00 kg

Tolérance:  
0.100 kg

Résolution d'affichage:  
0.05 kg

Moyenne:  
99.950 kg

Écart-type:  
**0.000 kg**

#	Vide	Chargé	Différence
1	0.00 kg	99.95 kg	99.95 kg
2	0.00 kg	99.95 kg	99.95 kg
3	0.00 kg	99.95 kg	99.95 kg
4	0.00 kg	99.95 kg	99.95 kg
5	0.00 kg	99.95 kg	99.95 kg
6	0.00 kg	99.95 kg	99.95 kg
7	0.00 kg	99.95 kg	99.95 kg
8	0.00 kg	99.95 kg	99.95 kg
9	0.00 kg	99.95 kg	99.95 kg
10	0.00 kg	99.95 kg	99.95 kg

Statut : **CONFORME**

#### APRÈS AJUSTEMENT:

Charge Utilisée:  
---

Tolérance:  
0.100 kg

Résolution d'affichage:  
0.05 kg

Moyenne:  
---

Écart-type:  
---

#	Vide	Chargé	Différence
1	---	---	---
2	---	---	---
3	---	---	---
4	---	---	---
5	---	---	---
6	---	---	---
7	---	---	---
8	---	---	---
9	---	---	---
10	---	---	---

Statut : **N/A**



## CERTIFICAT D'ÉTALONNAGE

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### INCERTITUDE AVANT AJUSTEMENT :

$$Uc = \sqrt{(u_{(cr)})^2 + s_p^2 + u_{(l)}^2 + u_{(dr)}^2 + u_{(s)}^2}$$

- u(cr)** = Incertitude reliée à l'étalon utilisé
- Sp** = Incertitude de l'écart-type
- u(l)** = Incertitude associée à la linéarité
- u(dr)** = Incertitude associée à résolution si Sp = 0
- u(s)** = Incertitude liée à la sensibilité (span)

Valeur	Incertitude	Incertitude (%)
25.00 kg	0.0627975 kg	0.251190 %
50.00 kg	0.0627975 kg	0.125595 %
100.00 kg	0.0627975 kg	0.062797 %
200.00 kg	0.0627975 kg	0.031399 %
400.00 kg	0.119 kg	0.029760 %

### INCERTITUDE APRÈS AJUSTEMENT :

Valeur	Incertitude	Incertitude (%)
---	---	---
---	---	---
---	---	---
---	---	---

### NOTES :

De ces valeurs d'incertitudes, seule la valeur surlignée est calculée selon ISO17025:2005, les autres étant estimées jusqu'au résultat de l'incertitude minimale. Dans le calcul de cette l'incertitude, l'écart-type utilisé est de 0,577d (où d est la précision d'affichage de la balance) lorsque cet écart-type est plus inférieur à 0,577d.



## CERTIFICAT D'ÉTALONNAGE

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### RÉFÉRENCE

#### ENSEMBLE DE RÉFÉRENCE:

Référence	No de série	Fabricant	Date d'étalonnage
1mg - 5kg	DK000A161	Dispersion Laboratoire	21-08-2015

### INCERTITUDES:

Les incertitudes que nous retrouvons comprennent :

3. *L'incertitude associée à l'étalon utilisé.*
2. *L'incertitude associée à l'écart-type.*
1. *L'incertitude associée à l'opération de pesage.*
4. *L'incertitude associée à la résolution de l'appareil.*

L'incertitude de l'opération de pesage comprend la reproductibilité à long terme.

Les incertitudes précisées dans ce rapport sont des incertitudes élargies représentant un niveau de confiance d'approximativement 95 %, obtenu en multipliant ensemble l'incertitude-type composée par un facteur de couverture de  $k = 2$ . Pour de plus amples renseignements, veuillez consulter la publication GUM (Guide pour l'expression de l'incertitude de mesure, édition de 1995).

### TRAÇABILITÉ

Le Service d'évaluation de laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et a certifié des capacités d'étalonnage spécifiques de ce laboratoire et leur traçabilité à des étalons nationaux de mesure reconnus et au Système international d'unités (SI). Ce certificat d'étalonnage est émis conformément aux conditions de certification accordées par CLAS et aux conditions d'accréditation accordées par le Conseil canadien des normes (CCN). Le CLAS pas plus que le CCN ne peut garantir l'exactitude des étalonnages individuels effectués par des laboratoires accrédités.

### REMARQUES:

## CERTIFICAT D'ÉTALONNAGE

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<b>Client :</b>	Polytests	<b>No. du Certificat :</b>	123-259410-142
<b>Adresse :</b>	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	<b>Date d'étalonnage :</b>	30-10-2014

**Technicien :**  
Simard, Catherine

Technicienne Métrologie



Pierre Trépanier, Directeur laboratoire

### DESCRIPTION DU SERVICE:

<b>Description des masses :</b>	ASTM E617	<b>Date d'approbation :</b>	03-11-2014
<b>Classe de précision :</b>	ASTM 6	<b>Date prochain étalonnage :</b>	03-11-2015
<b>Densité :</b>	7.95g/cm <sup>3</sup>	<b>Accréditation CCN n. :</b>	668
<b>Identification (si unique) :</b>	EM-090	<b>Certification CLAS n. :</b>	2010-01

<b>Condition d'essai :</b>	Temp °C: 20.605	Pression kPa: 101.2	Humidité: 46.785
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### NOTES:

Pour l'étalonnage des masses, nous utilisons la procédure "Comparaison individuelle" PDL-09-MG-001 et la procédure "Détermination des incertitudes" PDL-09-MG-002. Le droit d'auteur du présent certificat appartient au laboratoire délivreur et doit être reproduit intégralement, à moins d'une autorisation écrite du laboratoire délivreur.

### REMARQUES:



## CERTIFICAT D'ÉTALONNAGE

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<b>Client :</b>	Polytests	<b>No. du Certificat :</b>	123-259410-142
<b>Adresse :</b>	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	<b>Accréditation CCN n. :</b>	668
<b>Masse :</b>	2 kg	<b>Certification CLAS n. :</b>	2010-01
		<b>Classe d'exactitude :</b>	ASTM 6
		<b>Date d'étalonnage :</b>	30-10-2014
		<b>Date du prochain étalonnage :</b>	03-11-2015

### RÉSULTAT DE L'ÉTALONNAGE, MASSE CONVENTIONNELLE:

Valeur Nominale	No de série	No d'inventaire	Masse conventionnelle	Masse conventionnelle après ajustement	Tolérance ± (mg)	Incertitudes ± (mg)
2 kg		EM-090	2.0001350 kg		200 mg	2.0 mg

\*S'applique seulement pour les masses qui ont été ajustées\*

\*\*Hors-tolérance pour la classe spécifiée\*\*



2014-11-05





## CERTIFICAT D'ÉTALONNAGE

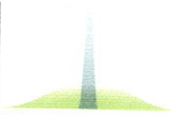
108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3  
www.dispersion.ca 1.866.390.5066

<b>Client :</b>	Polytests	<b>No. du Certificat :</b>	123-259410-142
<b>Adresse :</b>	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	<b>Accréditation CCN n. :</b>	668
		<b>Certification CLAS n. :</b>	2010-01
		<b>Classe d'exactitude :</b>	ASTM 6
<b>Masse :</b>	2 kg	<b>Date d'étalonnage :</b>	30-10-2014
		<b>Date du prochain étalonnage :</b>	03-11-2015

### RÉSULTAT DE L'ÉTALONNAGE DES POIDS, CORRECTIONS:

Valeur Nominale	No de série	No d'inventaire	Masse conventionnelle Correction	Masse conventionnelle Correction après ajustement	Tolérance ± (mg)	Incertitudes ± (mg)
2 kg		EM-090	135.0 mg		200 mg	2.0 mg

\*S'applique seulement pour les masses qui ont été ajustées\*      \*\*Hors-tolérance pour la classe spécifiée\*\*



## CERTIFICAT D'ÉTALONNAGE

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### BALANCES UTILISÉES

Pour l'étalonnage manuel :

> 5 kg à 25 kg :	Mettler Toledo XP32003L, SNR 1123271214, max. 32100 g, d = 0.005 g
> 1 kg à 5 kg :	Mettler Toledo PR5003, SNR 1115311634, max. 5100 g, d = 0.001 g
> 300 g à 2 kg :	Mettler Toledo XP2004S, SNR B131185222, max. 2100 g, d = 0.1 mg
> 100 g à 200 g :	Mettler Toledo AT201 SNR BA1115230146, max. 205 g, d = 0.01 mg
> 5 g à 100 g :	Mettler Toledo AX106 SNR 1127063924, max. 111 g, d = 1 µg
1 mg à 5 g :	Mettler UMX5, SNR 1121103055, max. 5.1 g, d = 0.1 µg

Pour l'étalonnage automatisé :

> 200 g à 1 kg :	Mettler Toledo AX1005 SNR 1127063210, max. 1109 g, d = 0.01 mg
> 5 g à 100 g :	Mettler Toledo AX106 SNR 1120143015, max. 111 g, d = 1 µg
1 mg à 5 g :	Mettler UMX5, SNR 1125140561, max. 5.1 g, d = 0.1 µg

*Les balances sont vérifiées selon notre procédure de contrôle périodique PDL-11-MG-001.*

### INCERTITUDES:

Les incertitudes que nous retrouvons comprennent :

1. *L'incertitude associée à l'opération de pesage.*
2. *L'incertitude associée à la densité de l'air.*
3. *L'incertitude associée à l'étalon utilisé.*
4. *L'incertitude associée à la densité de la masse à être étalonnée.*

L'incertitude de l'opération de pesage comprend la reproductibilité à long terme.

Les incertitudes précisées dans ce rapport sont des incertitudes élargies représentant un niveau de confiance d'approximativement 95 %, obtenu en multipliant ensemble l'incertitude-type composée par un facteur de couverture de  $k = 2$ . Pour de plus amples renseignements, veuillez consulter la publication GUM (Guide pour l'expression de l'incertitude de mesure, édition de 1995).

### TRAÇABILITÉ

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## CERTIFICAT D'ÉTALONNAGE

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### RÉFÉRENCES UTILISÉES

Poids	No de série	Fabricant	Date d'étalonnage
20kg	69976	Troemner	18-03-2014
1kg - 1mg	MT-01	Mettler Toledo	04-09-2014
300g	96-0888-50-2	Denver Instrument Company	04-09-2014
2kg	96-0888-50-3	Denver Instrument Company	04-09-2014
2kg	129098	Mettler Toledo	04-09-2014
5kg	96-0888-50-3	Denver Instrument Company	04-09-2014
5kg	129099	Mettler Toledo	04-09-2014
10kg	129100	Mettler Toledo	14-08-2014

### ÉTALONS CERTIFIÉS PAR LE CNRC:

Poids	No de série	Fabricant	Date d'étalonnage
100g	95170	Mettler Toledo	19-08-2014
1kg	95171	Mettler Toledo	02-05-2014

### RÉFÉRENCES DE LA STATION ROBOTISÉE:

Poids	No de série	Fabricant	Date d'étalonnage
1kg - 1mg	DK000A133	Laboratoire Dispersion	04-09-2014
1kg - 1mg	DK000A132	Laboratoire Dispersion	01-02-2013

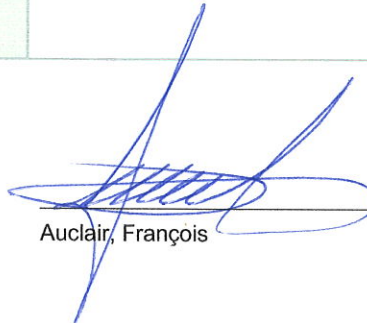
*[Signature]*  
2014-11-05

## CERTIFICAT D'ÉTALONNAGE

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<b>Client :</b>	Polytests	<b>No. du Certificat :</b>	<b>122-2E3F09-151-1649</b>
<b>Adresse :</b>	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	<b>Date d'étalonnage :</b>	14-09-2015

**Technicien :**  
Auclair, François  
  
Directeur de Service



Auclair, François

### DESCRIPTION DU SERVICE:

<b>Modèle de Balance :</b>	AR2140	<b>Méthode :</b>	ISO 17025
<b>Manufacturier :</b>	Ohaus	<b>Date d'approbation :</b>	14-09-2015
<b>Numéro de Série :</b>	M3658329010091	<b>Date prochain étalonnage :</b>	14-09-2016
<b>Numéro d'identification :</b>	EM-051	<b>Accréditation CCN n. :</b>	668
<b>Capacité :</b>	210g	<b>Certification CLAS n. :</b>	2010-01
<b>Résolution:</b>	0.0001g		

<b>Condition d'essai :</b>	Temp °C:	21.3	Pression kPa:	100.5	Humidité %:	69.2
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Note: Les conditions environnementales ne sont pas utilisées dans le calcul de l'incertitude.

### CETTE BALANCE RENCONTRE LES SPÉCIFICATIONS SUIVANTES:

Type de test :	Manufacturier
Excentricité:	<input checked="" type="checkbox"/> Oui <input type="checkbox"/> Non
Linéarité:	<input checked="" type="checkbox"/> Oui <input type="checkbox"/> Non
Sensibilité:	<input checked="" type="checkbox"/> Oui <input type="checkbox"/> Non
Répétabilité:	<input checked="" type="checkbox"/> Oui <input type="checkbox"/> Non

### NOTES:

Cette balance a été certifiée selon la procédure de travail PDL-09-MG-010 (certification de balance analytique et à plateau) et la et la procédure PDL-09-MG-012 (détermination des incertitudes de pesées). Nos étalons sont certifiés à chaque année. Le droit d'auteur du présent certificat appartient au laboratoire délivreur et doit être reproduit intégralement, à moins d'une autorisation écrite du laboratoire délivreur.



2015-09-15

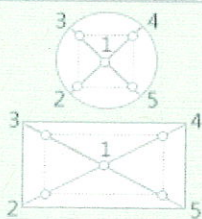
## CERTIFICAT D'ÉTALONNAGE

108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3  
www.dispersion.ca 1.866.390.5066

<b>Client :</b>	Polytests	<b>No. du Certificat :</b>	<b>122-2E3F09-151-1649</b>
<b>Adresse :</b>	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	<b>Accréditation CCN n. :</b>	668
<b>Méthode :</b>	ISO 17025	<b>Certification CLAS n. :</b>	2010-01
		<b>Modèle de Balance :</b>	AR2140
		<b>Date d'étalonnage :</b>	14-09-2015
		<b>Date du prochain étalonnage :</b>	14-09-2016

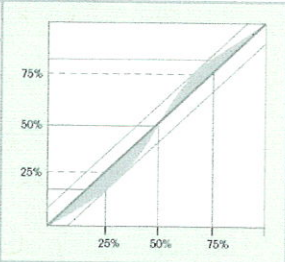
### TEST D'EXCENTRICITÉ:

Poids Test: 100 g Tolérance 0.0004 g  
(Note: Le Poids Test est taré au centre du plateau de pesée)

Position	Avant Ajustement	Après Ajustement	
1: Centre:	0.0000 g	---	
2: Avant Gauche:	0.0000 g	---	
3: Arrière Gauche:	0.0000 g	---	
4: Arrière Droit:	0.0000 g	---	
5: Avant Droit:	0.0000 g	---	
<b>Résultats</b>	<b>0.0000 g</b>	<b>---</b>	
<b>STATUT</b>	<b>CONFORME</b>	<b>N/A</b>	

### TEST DE LINÉARITÉ:

Méthode: Substitution Plage: 210 g Poids Test: 50 g Tolérance: 0.0002 g

Pré-Charge	Avant Ajustement	Après Ajustement	
0.0000 g	50.0003 g	---	
50.0000 g	49.9999 g	---	
100.0000 g	49.9999 g	---	
150.0000 g	50.0003 g	---	
---	---	---	
---	---	---	
<b>Résultats</b>	<b>0.00020 g</b>	<b>---</b>	
<b>STATUT</b>	<b>CONFORME</b>	<b>N/A</b>	

### TEST DE SENSIBILITÉ:

Valeur de masse conventionnelle: 199.9998 g Tolérance: 0.0004 g

	Avant Ajustement	Après Ajustement	
Lecture:	199.9999 g	---	$S = \frac{\Delta W}{\Delta m}$
<b>Résultats:</b>	<b>0.0001 g</b>	<b>---</b>	
<b>STATUT</b>	<b>CONFORME</b>	<b>N/A</b>	

## CERTIFICAT D'ÉTALONNAGE

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<b>Client :</b>	Polytests	<b>No. du Certificat :</b>	<b>122-2E3F09-151-1649</b>
<b>Adresse :</b>	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	<b>Accréditation CCN n. :</b>	668
<b>Méthode :</b>	ISO 17025	<b>Certification CLAS n. :</b>	2010-01
		<b>Modèle de Balance :</b>	AR2140
		<b>Date d'étalonnage :</b>	14-09-2015
		<b>Date du prochain étalonnage :</b>	14-09-2016

### TEST DE RÉPÉTABILITÉ:

#### AVANT AJUSTEMENT:

Charge Utilisée:  
100.0000 g

Tolérance:  
0.00010 g

Résolution d'affichage:  
0.0001 g

Moyenne:  
100.00041 g

Écart-type:  
**0.00003 g**

#	Vide	Chargé	Différence
1	0.0000 g	100.0004 g	100.0004 g
2	0.0000 g	100.0005 g	100.0005 g
3	0.0000 g	100.0004 g	100.0004 g
4	0.0000 g	100.0004 g	100.0004 g
5	0.0000 g	100.0004 g	100.0004 g
6	0.0000 g	100.0004 g	100.0004 g
7	0.0000 g	100.0004 g	100.0004 g
8	0.0000 g	100.0004 g	100.0004 g
9	0.0000 g	100.0004 g	100.0004 g
10	0.0000 g	100.0004 g	100.0004 g

Statut : **CONFORME**

#### APRÈS AJUSTEMENT:

Charge Utilisée:  
---

Tolérance:  
0.00010 g

Résolution d'affichage:  
0.0001 g

Moyenne:  
---

Écart-type:  
---

#	Vide	Chargé	Différence
1	---	---	---
2	---	---	---
3	---	---	---
4	---	---	---
5	---	---	---
6	---	---	---
7	---	---	---
8	---	---	---
9	---	---	---
10	---	---	---

Statut : **N/A**



## CERTIFICAT D'ÉTALONNAGE

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### INCERTITUDE AVANT AJUSTEMENT :

$$U_c = \sqrt{(u_{(cr)})^2 + s_p^2 + u_{(l)}^2 + u_{(dr)}^2 + u_{(s)}^2}$$

- u(cr)** = Incertitude reliée à l'étalon utilisé
- Sp** = Incertitude de l'écart-type
- u(l)** = Incertitude associée à la linéarité
- u(dr)** = Incertitude associée à résolution si Sp = 0
- u(s)** = Incertitude liée à la sensibilité (span)

Valeur	Incertitude	Incertitude (%)
12.5000 g	0.00016 g	0.001288 %
25.0000 g	0.00016 g	0.000650 %
50.0000 g	0.00017 g	0.000336 %
100.0000 g	0.00019 g	0.000189 %
200.0000 g	0.00048 g	0.000238 %

### INCERTITUDE APRÈS AJUSTEMENT :

Valeur	Incertitude	Incertitude (%)
---	---	---
---	---	---
---	---	---
---	---	---

### NOTES :

De ces valeurs d'incertitudes, seule la valeur surlignée est calculée selon ISO17025:2005, les autres étant estimées jusqu'au résultat de l'incertitude minimale. Dans le calcul de cette l'incertitude, l'écart-type utilisé est de 0,577d (où d est la précision d'affichage de la balance) lorsque cet écart-type est plus inférieur à 0,577d.



## CERTIFICAT D'ÉTALONNAGE

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### RÉFÉRENCE

ENSEMBLE DE RÉFÉRENCE:

Référence	No de série	Fabricant	Date d'étalonnage
1mg - 5kg	DK000A161	Dispersion Laboratoire	21-08-2015

### INCERTITUDES:

Les incertitudes que nous retrouvons comprennent :

3. *L'incertitude associée à l'étalon utilisé.*
2. *L'incertitude associée à l'écart-type.*
1. *L'incertitude associée à l'opération de pesage.*
4. *L'incertitude associée à la résolution de l'appareil.*

L'incertitude de l'opération de pesage comprend la reproductibilité à long terme.

Les incertitudes précisées dans ce rapport sont des incertitudes élargies représentant un niveau de confiance d'approximativement 95 %, obtenu en multipliant ensemble l'incertitude-type composée par un facteur de couverture de  $k = 2$ . Pour de plus amples renseignements, veuillez consulter la publication GUM (Guide pour l'expression de l'incertitude de mesure, édition de 1995).

### TRAÇABILITÉ

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### REMARQUES:





## CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-047 05/02/15

CLIENT		SPÉCIFICATION DE CALIBRATION	
Compagnie:	Services Polytests Inc	Procédure de service:	4IN9101
Adresse:	695 B rue Gaudette	Précision requise:	+/-2°C
	St-Jean-sur-Richelieu, Québec, J3B 7S7	Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Enregistreur	Type d'entrée:	Temp
Manufacturier:	Keithley	Type de sortie:	Digitale
No. Model:	2700	Type de mesure:	Température
No. Série:	1217093	Gamme:	Divers
Emplacement:	N.A.	Conditions Enviro:	Normale

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Fluke 744	No. du certificat d'étalonnage:	AC15011147-8180008
No. Série:	8180008	Dernière date d'étalonnage:	15-Jan-15
Certificat fait par:	Alpha Controls	Prochaine date d'étalonnage:	15-Apr-15

Commentaire:

RÉSULTAT D'ÉTALONNAGE						
Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Incertitude Élargie	Commentaire
Voir Commentaire						
Conditions Environnementales:			Température: 20 °C	Humidité: 24 %RH		
Type d'Étalonnage: Data Acquisition system Conforme						
Carte1: EM-154						
Carte2: EM-015						

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabricant. Le système qualité de l'entreprise est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour effectuer l'étalonnage est retraçable au CNRC et/ou au NIST. Le degré d'incertitude est basé sur un niveau de confiance=95%, K=2.

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT		CONFORMITÉ D'ÉTALONNAGE		
Date d'Étalonnage:	5 Février 2015	Conforme:	Avant	Après
Date du prochain Étalonnage:	5 Février 2016		X	X
Date d'émission du certificat:	5 Février 2015	Non Conforme:		

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Numéro d'accréditation du CCN: # 669. Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

Martin Langlais - Technicien

2015-02-15



**Instrumentation  
Saint-Laurent** inc.  
Accrédité ISO 17025



80 rue de la montagne  
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(Québec), J0N 1M0  
Tél: (450) 473-6169  
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Email: inst.st-laurent@videotron.ca

## CERTIFICAT D'ÉTALONNAGE

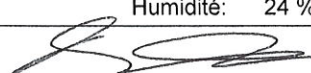
No.Certificat: CE-EM-015 05/02/15

CLIENT		SPÉCIFICATION DE CALIBRATION	
Compagnie:	Services Polytests Inc	Procédure de service:	4IN9101
Adresse:	695 B rue Gaudette	Précision requise:	+/- 2°C
	St-Jean-sur-Richelieu, Québec, J3B 7S7	Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Enregistreur	Type d'entrée:	Temp
Manufacturier:	Keithley	Type de sortie:	Digitale
No. Model:	7700	Type de mesure:	Température
No. Série:	1213648	Gamme:	Divers
Emplacement:	EM-047	Conditions Enviro:	Normale

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Fluke 744	No. du certificat d'étalonnage:	AC15011147-8180008
No. Série:	8180008	Dernière date d'étalonnage:	15-Jan-15
Certificat fait par:	Alpha Controls	Prochaine date d'étalonnage:	15-Apr-15
Commentaire:			

RÉSULTAT D'ÉTALONNAGE						
Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Incertitude Élargie	Commentaire
-190.0 °C	-190.0 °C	-190.3 °C	-0.3 °C	-190.3 °C	1.0 °C	Input#1TypeK
0.0 °C	0.0 °C	-0.2 °C	-0.2 °C	-0.2 °C	1.0 °C	Input#1TypeK
750.0 °C	750.0 °C	749.8 °C	-0.2 °C	749.8 °C	1.0 °C	Input#1TypeK
100.0 °C	100.0 °C	99.9 °C	-0.1 °C	99.9 °C	1.0 °C	Input#2 TypeJ
100.0 °C	100.0 °C	100.0 °C	0.0 °C	100.0 °C	1.0 °C	Input#3 TypeJ
100.0 °C	100.0 °C	99.9 °C	-0.1 °C	99.9 °C	1.0 °C	Input#4 TypeJ
100.0 °C	100.0 °C	99.9 °C	-0.1 °C	99.9 °C	1.0 °C	Input#5TypeJ
100.0 °C	100.0 °C	99.9 °C	-0.1 °C	99.9 °C	1.0 °C	Input#6TypeJ
100.0 °C	100.0 °C	99.9 °C	-0.1 °C	99.9 °C	1.0 °C	Input#7TypeJ
100.0 °C	100.0 °C	99.9 °C	-0.1 °C	99.9 °C	1.0 °C	Input#8TypeJ
100.0 °C	100.0 °C	99.9 °C	-0.1 °C	99.9 °C	1.0 °C	Input#9TypeJ
100.0 °C	100.0 °C	99.9 °C	-0.1 °C	99.9 °C	1.0 °C	Input#10TypeJ
100.0 °C	100.0 °C	99.7 °C	-0.3 °C	99.7 °C	1.0 °C	Input#11TypeJ
100.0 °C	100.0 °C	99.8 °C	-0.2 °C	99.8 °C	1.0 °C	Input#12TypeJ
100.0 °C	100.0 °C	99.8 °C	-0.2 °C	99.8 °C	1.0 °C	Input#13 TypeJ
100.0 °C	100.0 °C	99.8 °C	-0.2 °C	99.8 °C	1.0 °C	Input#14TypeJ
100.0 °C	100.0 °C	99.9 °C	-0.1 °C	99.9 °C	1.0 °C	Input#15 TypeJ
100.0 °C	100.0 °C	99.9 °C	-0.1 °C	99.9 °C	1.0 °C	Input#16TypeJ
100.0 °C	100.0 °C	99.9 °C	-0.1 °C	99.9 °C	1.0 °C	Input#17TypeJ
100.0 °C	100.0 °C	99.9 °C	-0.1 °C	99.9 °C	1.0 °C	Input#18TypeJ
100.0 °C	100.0 °C	99.9 °C	-0.1 °C	99.9 °C	1.0 °C	Input#19TypeJ
100.0 °C	100.0 °C	100.1 °C	0.1 °C	100.1 °C	1.0 °C	Input#20TypeJ
12.000 mA	12.000 mA	12.001 mA	0.001 mA	12.001 mA	1.00 mA	Input#21
12.000 mA	12.000 mA	12.002 mA	0.002 mA	12.002 mA	1.00 mA	Input#22
Conditions Environnementales:      Température: 20 °C      Humidité: 24 %RH						

 2015-02-16 5F09101



**Instrumentation  
Saint-Laurent** inc.  
Accrédité ISO 17025



80 rue de la montagne  
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## CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-015 05/02/15

CLIENT	
Compagnie:	Services Polytests Inc
Adresse:	695 B rue Gaudette
	St-Jean-sur-Richelieu, Québec, J3B 7S7

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	4IN9101
Précision requise:	+/- 2°C
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Enregistreur	Type d'entrée:	Temp
Manufacturier:	Keithley	Type de sortie:	Digitale
No. Model:	7700	Type de mesure:	Température
No. Série:	1213648	Gamme:	Divers
Emplacement:	EM-047	Conditions Enviro:	Normale

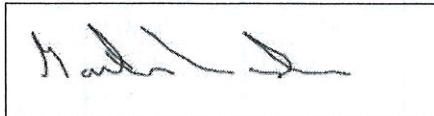
Type d'Étalonnage:

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabricant. Le système qualité de l'entreprise est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour effectuer l'étalonnage est retraçable au CNRC et/ou au NIST. Le degré d'incertitude est basé sur un niveau de confiance=95%, K=2.

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	5 Février 2015
Date du prochain Étalonnage:	5 Février 2016
Date d'émission du certificat:	5 Février 2015

CONFORMITÉ D'ÉTALONNAGE		
	Avant	Après
Conforme:	X	X
Non Conforme:		

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Numéro d'accréditation du CCN: # 669. Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.



Martin Langlais - Technicien



**Instrumentation  
Saint-Laurent**  
inc.  
Accrédité ISO 17025



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Email: inst.st-laurent@videotron.ca

## CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-012 05/02/15

CLIENT	
Compagnie:	Services Polytests Inc
Adresse:	695 B rue Gaudette St-Jean-sur-Richelieu, Québec, J3B 7S7

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	4IN9101
Précision requise:	+/- 2°C
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Enregistreur	Type d'entrée:	Divers
Manufacturier:	Keithley	Type de sortie:	Digitale
No. Model:	2750	Type de mesure:	Température
No. Série:	977470	Gamme:	Divers
Emplacement:	N.A.	Conditions Enviro:	Normale

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Fluke 744	No. du certificat d'étalonnage:	AC15011147-8180008
No. Série:	8180008	Dernière date d'étalonnage:	15-Jan-15
Certificat fait par:	Alpha Controls	Prochaine date d'étalonnage:	15-Apr-15
Commentaire:			


RÉSULTAT D'ÉTALONNAGE						
Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Incertitude Élargie	Commentaire
Voir Commentaire						
Conditions Environnementales:			Température: 20 °C	Humidité: 24 %RH		
Type d'Étalonnage: Data Acquisition system Conforme Carte1: EM-185						

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabricant. Le système qualité de l'entreprise est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour effectuer l'étalonnage est retraçable au CNRC et/ou au NIST. Le degré d'incertitude est basé sur un niveau de confiance=95%, K=2.

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	5 Février 2015
Date du prochain Étalonnage:	5 Février 2016
Date d'émission du certificat:	5 Février 2015

CONFORMITÉ D'ÉTALONNAGE		
	Avant	Après
Conforme:	X	X
Non Conforme:		

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Numéro d'accréditation du CCN: # 669. Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.



Martin Langlais - Technicien





**Instrumentation  
Saint-Laurent** inc.  
Accrédité ISO 17025



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## CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-007 06/02/15

CLIENT	
Compagnie:	Services Polytests Inc
Adresse:	695 B rue Gaudette St-Jean-sur-Richelieu, Québec, J3B 7S7

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	4IN9106
Précision requise:	+/- 0.25"H2O
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Indicateur	Type d'entrée:	Pression
Manufacturier:	Dwyer	Type de sortie:	Digitale
No. Model:	MS-321-LCD	Type de mesure:	Pression
No. Série:	E23S020111/12	Gamme:	0-0.5"H2O
Emplacement:	N.A.	Conditions Enviro:	Normale

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Setra	No. du certificat d'étalonnage:	AC15011147-2784759
No. Série:	2784759	Dernière date d'étalonnage:	15-Jan-15
Certificat fait par:	Alpha Controls	Prochaine date d'étalonnage:	15-Jan-16
Commentaire:			

RÉSULTAT D'ÉTALONNAGE						
Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Incertitude Élargie	Commentaire
0.0000 "H2O	0.0000 "H2O	0.0000 "H2O	0.0000 "H2O	0.0000 "H2O	0.25 "H2O	ajuste span
0.1500 "H2O	0.1500 "H2O	0.1462 "H2O	-0.0038 "H2O	0.1485 "H2O	0.25 "H2O	
0.2500 "H2O	0.2500 "H2O	0.2444 "H2O	-0.0056 "H2O	0.2488 "H2O	0.25 "H2O	
0.3500 "H2O	0.3500 "H2O	0.3447 "H2O	-0.0053 "H2O	0.3494 "H2O	0.25 "H2O	
0.5000 "H2O	0.5000 "H2O	0.4968 "H2O	-0.0032 "H2O	0.4998 "H2O	0.25 "H2O	
Conditions Environnementales:      Température: 20 °C      Humidité: 28 %RH						
Type d'Étalonnage:						

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabriquant. Le système qualité de l'entreprise est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour effectuer l'étalonnage est retraçable au CNRC et/ou au NIST. Le degré d'incertitude est basé sur un niveau de confiance=95%, K=2.

### DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT

Date d'Étalonnage:	6 Février 2015
Date du prochain Étalonnage:	6 Février 2016
Date d'émission du certificat:	6 Février 2015

### CONFORMITÉ D'ÉTALONNAGE

	Avant	Après
Conforme:	X	X
Non Conforme:		

Le Service d'évaluation des laboratoires d'étalonnage (GLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Numéro d'accréditation du CCN: # 669. Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

Martin Langlais - Technicien



## CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-006 06/02/15

CLIENT		SPÉCIFICATION DE CALIBRATION	
Compagnie:	Services Polytests Inc	Procédure de service:	4IN9106
Adresse:	695 B rue Gaudette	Précision requise:	+/-0.25"H2O
	St-Jean-sur-Richelieu, Québec, J3B 7S7	Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Indicateur	Type d'entrée:	Pression
Manufacturier:	Dwyer	Type de sortie:	Digitale
No. Model:	MS-321-LCD	Type de mesure:	Pression
No. Série:	E47U020014	Gamme:	0-0.5"H2O
Emplacement:	N.A.	Conditions Enviro:	Normale

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Setra	No. du certificat d'étalonnage:	AC15011147-2784759
No. Série:	2784759	Dernière date d'étalonnage:	15-Jan-15
Certificat fait par:	Alpha Controls	Prochaine date d'étalonnage:	15-Jan-16

Commentaire:

RÉSULTAT D'ÉTALONNAGE						
Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Incertitude Élargie	Commentaire
0.0000 "H2O	0.000 "H2O	0.000 "H2O	0.000 "H2O	0.000 "H2O	0.25 "H2O	
0.1500 "H2O	0.150 "H2O	0.145 "H2O	-0.005 "H2O	0.145 "H2O	0.25 "H2O	
0.2500 "H2O	0.250 "H2O	0.242 "H2O	-0.008 "H2O	0.242 "H2O	0.25 "H2O	
0.3500 "H2O	0.350 "H2O	0.347 "H2O	-0.003 "H2O	0.347 "H2O	0.25 "H2O	
0.5000 "H2O	0.500 "H2O	0.498 "H2O	-0.002 "H2O	0.498 "H2O	0.25 "H2O	

Conditions Environnementales: Température: 20 °C Humidité: 28 %RH

Type d'Étalonnage:

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabricant. Le système qualité de l'entreprise est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour effectuer l'étalonnage est retraçable au CNRC et/ou au NIST. Le degré d'incertitude est basé sur un niveau de confiance=95%, K=2.

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	6 Février 2015
Date du prochain Étalonnage:	6 Février 2016
Date d'émission du certificat:	6 Février 2015

CONFORMITÉ D'ÉTALONNAGE		
	Avant	Après
Conforme:	X	X
Non Conforme:		

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Numéro d'accréditation du CCN: # 669. Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

Martin Langlais - Technicien

2015-02-16



## CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-001 06/02/15

CLIENT	
Compagnie:	Services Polytests Inc
Adresse:	695 B rue Gaudette St-Jean-sur-Richelieu, Québec, J3B 7S7

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	4IN9101
Précision requise:	+/- 2.0°C
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Enregistreur	Type d'entrée:	Temp
Manufacturier:	Fluke	Type de sortie:	Digitale
No. Model:	52-II	Type de mesure:	Température
No. Série:	90630037	Gamme:	Divers
Emplacement:	N.A.	Conditions Enviro:	Normale

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Fluke 744	No. du certificat d'étalonnage:	AC15011147-8180008
No. Série:	8180008	Dernière date d'étalonnage:	15-Jan-15
Certificat fait par:	Alpha Controls	Prochaine date d'étalonnage:	15-Apr-15

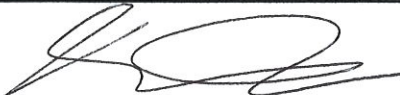
Commentaire:

### RÉSULTAT D'ÉTALONNAGE

Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Incertitude Élargie	Commentaire
0.0 °C	0.0 °C	0.0 °C	0.0 °C	0.00 °C	1.0 °C	T1 typeJ
125.0 °C	125.0 °C	125.0 °C	0.0 °C	125.0 °C	1.0 °C	T1 typeJ
250.0 °C	250.0 °C	250.0 °C	0.0 °C	250.0 °C	1.0 °C	T1 typeJ
375.0 °C	375.0 °C	375.0 °C	0.0 °C	375.0 °C	1.0 °C	T1 typeJ
500.0 °C	500.0 °C	500.0 °C	0.0 °C	500.0 °C	1.0 °C	T1 typeJ
0.0 °C	0.0 °C	0.0 °C	0.0 °C	0.0 °C	1.0 °C	T2 typeJ
125.0 °C	125.0 °C	125.0 °C	0.0 °C	125.0 °C	1.0 °C	T2 typeJ
250.0 °C	250.0 °C	250.0 °C	0.0 °C	250.0 °C	1.0 °C	T2 typeJ
375.0 °C	375.0 °C	375.0 °C	0.0 °C	375.0 °C	1.0 °C	T2 typeJ
500.0 °C	500.0 °C	500.0 °C	0.0 °C	500.0 °C	1.0 °C	T2 typeJ
0.0 °C	0.0 °C	0.0 °C	0.0 °C	0.0 °C	1.0 °C	T1 typeK
125.0 °C	125.0 °C	125.0 °C	0.0 °C	125.0 °C	1.0 °C	T1 typeK
250.0 °C	250.0 °C	250.0 °C	0.0 °C	250.0 °C	1.0 °C	T1 typeK
375.0 °C	375.0 °C	375.0 °C	0.0 °C	375.0 °C	1.0 °C	T1 typeK
500.0 °C	500.0 °C	500.0 °C	0.0 °C	500.0 °C	1.0 °C	T1 typeK
0.0 °C	0.0 °C	0.0 °C	0.0 °C	0.0 °C	1.0 °C	T2 typeK
125.0 °C	125.0 °C	125.0 °C	0.0 °C	125.0 °C	1.0 °C	T2 typeK
250.0 °C	250.0 °C	250.0 °C	0.0 °C	250.0 °C	1.0 °C	T2 typeK
375.0 °C	375.0 °C	375.0 °C	0.0 °C	375.0 °C	1.0 °C	T2 typeK
500.0 °C	500.0 °C	500.0 °C	0.0 °C	500.0 °C	1.0 °C	T2 typeK

Conditions Environnementales: Température: 20 °C Humidité: 28 %RH

Type d'Étalonnage:

 2015-02-06

5F09101



## CERTIFICAT D'ÉTALONNAGE

No.Certificat: CE-EM-001 06/02/15

CLIENT	
Compagnie:	Services Polytests Inc
Adresse:	695 B rue Gaudette
	St-Jean-sur-Richelieu, Québec, J3B 7S7

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	4IN9101
Précision requise:	+/- 2.0°C
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Enregistreur	Type d'entrée:	Temp
Manufacturier:	Fluke	Type de sortie:	Digitale
No. Model:	52-II	Type de mesure:	Température
No. Série:	90630037	Gamme:	Divers
Emplacement:	N.A.	Conditions Enviro:	Normale

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabricant. Le système qualité de l'entreprise est conforme aux exigences de la norme ISO 17025 et les étalons utilisés pour effectuer l'étalonnage est retraçable au CNRC et/ou au NIST. Le degré d'incertitude est basé sur un niveau de confiance=95%, K=2.

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	6 Février 2015
Date du prochain Étalonnage:	6 Février 2016
Date d'émission du certificat:	6 Février 2015

CONFORMITÉ D'ÉTALONNAGE		
	Avant	Après
Conforme:	X	X
Non Conforme:		

Le Service d'évaluation des laboratoires d'étalonnage (CLAS) du Conseil national de recherches du Canada (CNRC) a évalué et certifié la capacité d'étalonnage du laboratoire et la traçabilité au Système international d'unités (SI) ou à des étalons acceptables selon le CLAS. Le présent certificat d'étalonnage est délivré conformément aux conditions de certification du CLAS et aux conditions d'accréditation du Conseil canadien des normes (CCN). Numéro d'accréditation du CCN: # 669. Le CLAS et le CCN ne garantissent pas l'exactitude des étalonnages individuels effectués par les laboratoires accrédités.

Martin Langlais - Technicien



## **Example Calculations**

## Validation du fichier de calcul avec les équations provenant des normes:

ASTM E2515-11

CSA B415.1-10

## Dry burn rate (BR)

### Equation used

B415.1, 13.4

$$BR = \left[ \frac{60W_{WD}}{\theta} \right] \left[ \frac{100 - \%M_W}{100} \right]$$

### Nomenclature

BR Dry wood burn rate, kg/hr (lb/hr)

$W_{WD}$  Total mass of wood burned (wet basis) during the test run, kg (lb)

$\theta$  Total time of test run, minutes

$\%M_W$  Average moisture in test fuel charge, wet basis, %

To convert from dry basis to wet basis: % moisture wet basis =

$$\frac{100 (\% \text{ dry reading})}{(100 + \% \text{ dry reading})}$$

### Sample calculation

#### Data

$W_{WD}$  26,5 lbs

$\theta$  121 min

$\%M_W$  5,57 %

#### Calculation

BR 5,630 Dry kg/hr

## Volume of gas sample corrected to dry standard conditions ( $V_{m(std)}$ )

### Equation used

ASTM 2515, equation 6

$$V_{m(std)} = K_1 V_m Y \left[ \frac{P_{bar} + \left( \frac{\Delta H}{13.6} \right)}{T_m} \right]$$

### Nomenclature

$V_{m(std)}$	Volume of gas sample , corrected to standard conditions, dscm <sup>3</sup> (dscf)
$K_1$	17.64 R/in Hg
$V_m$	Volume of gas sample
$Y$	DGM calibration factor
$P_{bar}$	Barometric pressure mmHg (in Hg)
$\Delta H$	Average pressure at the outlet of the dry gas meter mm water (in. Water)
$T_m$	Absolute average dry gas meter temperature K (R)

### Sample calculation

#### Data

$V_m$	20,27 dcf
$Y$	1,015
$P_{bar}$	30,03 in Hg
$\Delta H$	-0,4912 in Hg
$T_m$	548,8 R

#### Calculation

$V_{m(std)}$	19,54 dscf
--------------	------------

## Total amount of particulate matter collected ( $m_n$ )

### Equation used

ASTM 2515, equation 12

$$m_n = F_1 + F_2 + \Delta PF$$

### Nomenclature

$m_n$	Total amount of particulate matter collected, mg
$F_1$	Particulate matter collected on front filter, mg
$F_2$	Particulate matter collected on second filter, mg
$\Delta PF$	Post-test weight gain of probe and filter holder assembly, mg

### Sample calculation

#### Data

$F_1$	0,0015 g
$F_2$	0,000 g
$\Delta PF$	0,001 g

#### Calculation

$m_n$	2,100 mg
-------	----------

Calculation based of train 2 data

## Particulate concentration ( $C_s$ )

### Equation used

ASTM 2515, equation 13

$$C_s = (0,001 \text{ g/mg}) \times \left( \frac{m_n}{V_{m(\text{std})}} \right)$$

### Nomenclature

$C_s$	Concentration of particulate matter in stack gas or dilution tunnel, dry basis, corrected to standard conditions, $\text{g/dsm}^3$ (g/dscf)
$m_n$	Total amount of particulate matter collected in the sampling train, mg
$V_{m(\text{std})}$	Volume of gas sample measured corrected to dry standard conditions, $\text{dsm}^3$ (dscf)

### Sample calculation

#### Data

$m_n$	2,100 mg
$V_{m(\text{std})}$	19,54 dscf

#### Calculation

$C_s$	0,000107 g/dscf
-------	-----------------

Calculation based of train 2 data

## Particulate concentration for room air ( $C_r$ )

### Equation used

ASTM 2515, equation 14

$$C_r = (0,001 \text{ g/mg}) \times \left( \frac{m_r}{V_{mr(std)}} \right)$$

### Nomenclature

$C_r$	Concentration of particulate matter in room air, dry basis, corrected to standard conditions, g/dsm <sup>3</sup> (g/dscf)
$m_r$	Total amount of particulate matter collected in the sampling train, mg
$V_{mr(std)}$	Volume of room air sample measured corrected to dry standard conditions, dsm <sup>3</sup> (dscf)

### Sample calculation

#### Data

$m_r$	0,000 mg
$V_{mr(std)}$	19,54 dscf

#### Calculation

$C_r$	0,000000 g/dscf
-------	-----------------

Calculation based of train 2 data

## Adjustment factor for alternative pitot tube placement ( $F_p$ )

### Equation used

ASTM 2515, equation 1

$$F_p = \frac{V_{strav}}{V_{scent}}$$

### Nomenclature

$V_{strav}$	Average gas velocity cacluated after the Pitot tube traverse
$V_{scent}$	Average gas velocity at the center of the dilution tunnel cacluated after the multi-point Pitot traverse
$F_p$	Adjustment factor for center of tunnel pitot tube placement

### Sample calculation

#### Data

$V_{strav}$	0,043375
$V_{scent}$	0,0435

#### Calculation

$F_p$	0,997126
-------	----------

## Average dilution tunnel gas velocity ( $V_S$ )

### Equation used

ASTM 2515, equation 9

$$V_S = F_p K_p C_p (\sqrt{\Delta P})_{avg} \sqrt{\frac{T_S}{P_S M_S}}$$

### Nomenclature

$V_S$	Average dilution tunnel gas velocity, m/s (ft/s)
$K_p$	Pitot tube constant For the metric units: $34.97 \text{ m/sec} \left[ \frac{(\frac{g}{g\text{-mole}})(\text{mm Hg})}{(^{\circ}\text{K})(\text{mm H}_2\text{O})} \right]^{1/2}$ For English units: $85.49 \text{ ft/sec} \left[ \frac{(\frac{\text{lb}}{\text{lb-mole}})(\text{in Hg})}{(^{\circ}\text{R})(\text{in H}_2\text{O})} \right]^{1/2}$
$C_p$	Pitot tube coefficient (use 0.99 for standard pitot tube, 0.84 may be used for S-type tubes constructed according to Method 2 specifications)
$F_p$	Pitot tube correction factor
$(\sqrt{\Delta P})_{avg}$	Average square root of each individual velocity head ( $\Delta P$ )
$P_{bar}$	Barometric pressure at measurement site, mm H <sub>2</sub> O (in. H <sub>2</sub> O)
$P_g$	Stack static pressure, mm Hg (in. Hg)
$P_S$	Absolute dilution tunnel static gas pressure, mm Hg (in. Hg), or $P_{bar} + P_g$
$M_S$	Molecular weight of dilution tunnel gas, wet basis, g/g-mole (lb/lb-mol) may be assumed to be 28.78 or 29 for CSA B415
$t_s$	Dilution tunnel temperature, °C (°F)
$T_S$	Absolute dilution tunnel temperature, °K (°R), or $273 + t_s$ for metric units, $460 + t_s$ for I

### Sample calculation

#### Data

$K_p$	85,49
$C_p$	0,99
$F_p$	0,997
$(\sqrt{\Delta P})_{avg}$	0,2198 in H <sub>2</sub> O <sup>1/2</sup>



$P_{bar}$	30,03 in Hg
$P_g$	0,22 in H <sub>2</sub> O
$P_s$	30,05 in Hg
$M_s$	29 lb/lb-mol
$t_s$	105,14 F
$T_s$	565,14 R

### **Calculation**

$V_s$	14,94 ft/s
-------	------------

## **Average dilution tunnel gas flow rate (Qstd)**

### **Equation used**

ASTM 2515, equation 3

$$Q_{std} = 60(1 - B_{ws})V_s A \left( \frac{T_{std}}{T_s} \right) \left( \frac{P_s}{P_{std}} \right)$$

### **Nomenclature**

$Q_{std}$	Total gas flow rate corrected to dry standard conditions, dsm <sup>3</sup> /min (dscf/min)
60	Conversion factor minutes per hour
$B_{ws}$	Water vapour in the dilution tunnel stream, proportion by volume (may be assumed to be 2%)
$V_s$	Average dilution tunnel gas velocity, m/s (ft/s)
A	Cross-sectional area of dilution tunnel, m <sup>2</sup> (ft <sup>2</sup> )
$T_{std}$	Standard absolute temperature, 293 °K (528°R)
$T_s$	Absolute average dilution tunnel temperature, °K (°R), or 273 + $t_s$ for metric units, 460 + $t_s$ for English units
$t_s$	Dilution tunnel temperature, °C (°F)
$P_s$	Absolute dilution tunnel static gas pressure, mm Hg (in. Hg), or $P_{bar} + P_g$
$P_{bar}$	Barometric pressure at measurement site, mm Hg (in. Hg)
$P_g$	Dilution tunnel static pressure, mm Hg (in. Hg)
$P_{std}$	Standard absolute pressure, 760 mm Hg (29.92 in. Hg)

### **Sample calculation**

#### **Data**

$B_{ws}$	0,02
$V_s$	14,94
A	0,35 ft <sup>2</sup>

$T_{std}$	528 R
$T_S$	565,14 R
$P_S$	30,048 in Hg
$P_{std}$	29,92 in Hg

### Calculation

$Q_{std}$	287,69 dscf/min
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## Particulate emission rate (E)

### Equation used

$$E = (C_S - C_r)Q_{std}$$

### Nomenclature

E	Particulate emission rate, g/hr
$C_S$	Concentration of particulate matter in stack gas or dilution tunnel gas, dry basis corrected to standard conditions, g/dscm <sup>3</sup> (g/dscf)
$C_r$	Concentration of particulate matter in room air, g/dscm <sup>3</sup> (g/dscf)
$Q_{std}$	Total gas flow rate, dry basis corrected to standard conditions, dsm <sup>3</sup> /min (dscf/min)

### Sample calculation

#### Data

$C_S$	0,000107 g/dscf
$C_r$	0,000000 g/dscf
$Q_{std}$	287,69 dscf/min

#### Calculation

E	0,03 g/min
E	1,86 g/h

Calculation based on train 2 data.

## Total particulate emission rate ( $E_T$ )

### Equation used

ASTM 2515, equation 15

$$E_T = (C_S - C_r)Q_{std}\theta$$

### Nomenclature

$E_T$	Total particulate emission, g
$C_S$	Concentration of particulate matter in stack gas or dilution tunnel gas, dry basis corrected to standard conditions, g/dscm <sup>3</sup> (g/dscf)
$C_r$	Concentration of particulate matter in room air, g/dscm <sup>3</sup> (g/dscf)
$Q_{std}$	Total gas flow rate, dry basis corrected to standard conditions, dsm <sup>3</sup> /min (dscf/min)
$\theta$	Total sampling time, min

### Sample calculation

#### Data

$C_S$	0,000107 g/dscf
$C_r$	0,000000 g/dscf
$Q_{std}$	287,69 dscf/min
$\theta$	121 min

#### Calculation

E	3,74 g
---	--------

Calculation based on train 2 data.

## Average gas velocity in dilution tunnel during each min interval, i, of the test run

### Equation used

ASTM 2515, equation 10

$$v_{si} = F_p K_p C_p \sqrt{\Delta p_i} \sqrt{\frac{T_{si}}{P_s M_s}}$$

### Nomenclature

$v_{si}$	Average gas velocity in dilution tunnel during each min interval, i of the test run m/sec (ft/sec)
$F_p$	Pitot tube correction factor
$K_p$	Pitot tube constant For the metric units: $34.97 \text{ m/sec} \left[ \frac{(\frac{g}{g\text{-mole}})(\text{mm Hg})}{(^{\circ}\text{K})(\text{mm H}_2\text{O})} \right]^{1/2}$ For English units: $85.49 \text{ ft/sec} \left[ \frac{(\frac{\text{lb}}{\text{lb-mole}})(\text{in Hg})}{(^{\circ}\text{R})(\text{in H}_2\text{O})} \right]^{1/2}$
$C_p$	Pitot tube coefficient (use 0.99 for standard pitot tube, 0.84 may be used for S-type tubes constructed according to Method 2 specifications)
$\Delta p_i$	Velocity pressure in the dilution tunnel as measured with the Pitot tube during each min interval, i, of the test run
$T_{si}$	Absolute average gas temperature in the dilution tunnel during the $i^{\text{th}}$ minutes interval, K (R)
$P_s$	Absolute dilution tunnel static gas pressure, mm Hg (in. Hg), or $P_{\text{bar}} + P_g$
$M_s$	Molecular weight of dilution tunnel gas, wet basis, g/g-mole (lb/lb-mol) may be assumed to be 28.78

## Sample calculation

### Data

i=1		i=2	
$F_p$	0,997	$F_p$	0,997
$K_p$	85,49	$K_p$	85,49
$C_p$	0,99	$C_p$	0,99
$\Delta p_i$	0,047 in H <sub>2</sub> O	$\Delta p_i$	0,049 in H <sub>2</sub> O
$T_{Si}$	564,4 R	$T_{Si}$	564,5 R
$P_S$	30,05 in Hg	$P_S$	30,05 in Hg
$M_S$	29 lb/lb-mol	$M_S$	29 lb/lb-mol

### Calculation

i=1		i=2	
$V_{Si}$	14,78 ft/sec	$V_{Si}$	14,97 ft/sec

## Percent of proportional sampling rate (PR)

### Equation used

B415, equation 13.1

$$PR = \left( \frac{\theta V_{mi(std)} V_S T_m T_{Si}}{\theta_i V_m V_{Si} T_{mi} T_S} \right) \times 100$$

### Nomenclature

PR	Percent of proportional sampling rate (%)
$\theta$	Total sampling time, min
$\theta_i$	Time of interval, 1 min
$V_m$	Volume of gas sample measured by the DGM, dsm <sup>3</sup> (dscf)
$V_{mi(std)}$	Volume of gas sample measured by the digital mass flow controller during the i <sup>th</sup> 1 minutes interval, dsm <sup>3</sup> (dscf)
$V_S$	Average gas velocity in the dilution tunnel, ft/min
$V_{Si}$	Average gas velocity in the dilution tunnel during the i <sup>th</sup> 10 minutes interval, ft/min
$T_m$	Absolute average digital mass flow controller temperature, K (R)
$T_{mi}$	Absolute average digital mass flow controller temperature during the i <sup>th</sup> 1 minutes interval, K (R)
$T_S$	Absolute average gas temperature in the dilution tunnel, K (R)
$T_{Si}$	Absolute average gas temperature in the dilution tunnel during the i <sup>th</sup> 1 minutes interval, K (R)

## Sample calculation

### Data

train =1			train =2		
$\theta$	121	min	$\theta$	121	min
$\theta_i$	1	min	$\theta_i$	1	min
$V_m$	20,05	dcf	$V_m$	19,55	dcf
$V_{mi(std)}$	0,166	cuft	$V_{mi(std)}$	0,1621	cuft
$V_s$	14,95	ft/sec	$V_s$	14,95	ft/sec
$V_{Si}$	14,786	ft/sec	$V_{Si}$	14,786	ft/sec
$T_m$	550,4	R	$T_m$	548,8	R
$T_{mi}$	548,56	R	$T_{mi}$	547,08	R
$T_s$	565,14	R	$T_s$	565,14	R
$T_{Si}$	564,4	R	$T_{Si}$	564,5	R

### Calculation

train=1		train=2	
PR	101,4 %	PR	101,6 %

## Filter face velocity check

### Equation used

$$FV_{max} = \frac{V_{mL}}{1} \times \frac{1}{F_A}$$

### Nomenclature

$FV_{max}$	Maximum filter face velocity during the test run, m/min (ft/min)
$V_{mL}$	Largest 1 minute interval metered gas volume value recorded during the test run, $dm^3$ (dcf)
$F_A$	Filter area exposed to gas sample during train operation, $m^2$ ( $ft^2$ )

## Sample calculation

### Data

$V_{mL}$	0,159 dcf
----------	-----------

F<sub>A</sub> 0,0116 ft<sup>2</sup>

### **Calculation**

FV<sub>max</sub> 13,74 ft/min

## **Dual train precision**

### **Equation used**

$$\frac{\text{Train 1} - \text{average train 1 and train 2}}{\text{average train 1 and train 2}} \times 100 \leq 7.5\%$$

### **Nomenclature**

Dual train precision Deviation between emission's train 1 and 2  
Train 1 Total emission for train 1  
Train 2 Total emission for train 2

### **Sample calculation**

### **Data**

Train 1	3,47 g
Train 2	3,74 g

### **Calculation**

Dual train precision	3,74 %
-------------------------	--------

## **Analyzer drift checks**

### **Equation used**

$$Drift = \frac{\Delta R}{span} \times 100$$

### **Nomenclature**

Drift	The change in analyzer response to calibration gas over the duration of the test run relative to the instrument range, %
$\Delta R$	The difference between the analyzer response at the end of the test run and the known calibration gas value, ppmv or %
Span	The upper limit of the instrument range, ppmv or %

### **Sample calculation**

### **Data**



$\Delta R$	0,015 %
Span	5 %

### **Calculation**

Drift	0,30 %
-------	--------

Calculated with CO concentration values.

## **Change in enthalpy ( $\Delta h$ )**

### **Equation used**

*B415, equation E-1*

$$\Delta h = \Delta t(1.006 + 1.84x)$$

### **Nomenclature**

$\Delta h$	change in enthalpy, kJ/kg
$\Delta t$	temperature rise, °C
1,006	specific heat of air, kJ/kg°C
1,84	specific heat of water vapour, kJ/kg°C
x	humidity ratio, kg/kg = 0,012 as per CSA B415,1-10

### **Sample calculation**

## Data

$\Delta t$  39,76 °C  
 $x$  0,012 kg/kg

dans la colonne k, c'est entré direct comme ça, ça ne vient de nulle part

## Calculation

$i=2$   
 $\Delta h$  40,87 kJ/kg

## Velocity (V)

### Equation used

*B415, equation E-3*

$$V = F_p \times C_p \times 34.97 \times \sqrt{\Delta P} \times \sqrt{\frac{T}{28.56(P_{bar} + P_s)}}$$

### Nomenclature

$V$  Velocity, m/s  
 $F_p$  Pitot tube calibration factor  
 $C_p$  Pitot factor, 0.99 for a standard Pitot tube or as determined by calibration for a Type S Pitot tube  
34,97 Pitot tube constant  
 $\Delta P$  velocity pressure, mm H<sub>2</sub>O  
 $T$  temperature, K

28,56	molecular weight of air
$P_{\text{bar}}$	barometric pressure, mm Hg
$P_{\text{s}}$	duct static pressure, mm Hg

## Sample calculation

### Data

$F_p$	1,75
$C_p$	0,84
$\Delta P$	1,64 mm H <sub>2</sub> O
T	343,73 K
$P_{\text{bar}}$	762,81 mm Hg
$P_{\text{s}}$	0,04 mm Hg

### Calculation

i=2	
V	8,27 m/s

## Mass flow rate (kg/h)

### Equation used

B415, equation E-4

$$m = 3600VA\rho$$

### Nomenclature

m	mass flow rate, kg/h
Vstd	air flow velocity, m/s (standard)
3600	number of seconds per hour
A	duct cross-sectional area, m <sup>2</sup>
$\rho$	density of air at standard temperature and pressure (use 1.204 kg/m <sup>3</sup> )

## Sample calculation

### Data

Vstd	7,08 m/s
A	0,08 m <sup>2</sup>
ρ	1,20 kg/m <sup>3</sup>

### Calculation

i=2	
m	2348,83 kg/h

## Rate of heat release into the circulating air (kJ/h)

### Equation used

B415, equation E-5

$$\Delta e = \Delta h \times m$$

### Nomenclature

Δe	rate of heat release into the circulating air, kJ/h
Δh	change in enthalpy, kJ/kg
m	mass flow rate, kg/h

## Sample calculation

### Data

i=2  
 $\Delta h$  40,87 kJ/kg  
m 2348,83 kg/h

### Calculation

i=2  
 $\Delta e$  96008,15 kJ/h

## Delivered heat output over any time interval (kJ)

### Equation used

B415, equation E-6

$$E_t = \sum (\Delta e \times i) \quad \text{for } i=t_1 \text{ to } t_2$$

### Nomenclature

$E_t$  delivered heat output over any time interval  $t_2-t_1$ , kJ  
 $\Delta e$  rate of heat release into the circulating air, kJ/h  
i time interval for each measurement, h

## Sample calculation

### Data

i=2	
$\Delta e$	96008,15 kJ/h
i	0,02 h

### Calculation

i=2 to 3	
$E_t$	1600,14 kJ

## Heat output over a burn (Btu/h)

### Equation used

B415, equation E-8

$$E_d = \sum (E_t) \text{ for } t = t_0 \text{ to } t_{final}$$

### Nomenclature

$E_d$	heat output over a burn, kJ/h (Btu/h)
$E_t$	delivered heat output over any time interval $t_2-t_1$ , kJ

## Sample calculation

### Data

i=2

$E_t$  1600,14 kJ

### Calculation

$E_d$  197737 kJ/h  
187428 Btu/h

## Efficiency (%)

### Equation used

*B415, equation E-9*

$$\text{Efficiency, \%} = 100 \times E_d / I$$

### Nomenclature

$E_d$  heat output over a burn, kJ/h (Btu/h)

I                    Input energy (fuel calorific value as-fired times weight of fuel charge), kJ/kg (Btu/lb)

## Sample calculation

### Data

$E_d$	187428 Btu
I	217480 Btu

### Calculation

Efficiency	86,2 %
------------	--------



*Model: AutoPelletAir  
Maine Energy System  
8 Airport Road, Bethel, Maine 04217, USA*

## **Section 3**

### **Owner's Manual**

Provided Directly to Omni By MESY  
(Safety project)

# **Section 4**

## **Test Data by Run**

## Paramètres

Tous les facteurs de corrections et autres paramètres qui peuvent être modifiés par l'utilisateur du fichier sont regroupés ici.

Code verrouillage:

### Description du test

Test standard	B415
Run #	1
Date	01-09-2015
Technicien	m.m
Project #	PI-20112

### Description de l'unité

Manufacturier	MESY	
Modèle	Autopellet air	
Combustion system	Pellet	
Appliance type	pellet furnace	
Firebox volume	na	cu ft.
Appliance weight empty	na	lbs
Appliance weight full	na	lbs

### Paramètres du test

Logging time	1	min
Manufacturer's rated heat output	100 000	BTU/h Donnée fournie par le manfacturier
Targeted category	4	
Targeted output	100000	BTU/h
Cp steel	0,1	BTU/lb-°F

### Calibration Factor (flow meter)

Q obt (L/min)	Fc	
0,95	1	Dimensionless
1,9	1	Dimensionless
3,76	1	Dimensionless
11,35	1	Dimensionless
22,7	1	Dimensionless

1,028

### Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	1,007	Dimensionless
Equipment number (DGM #1):	EM-178	
Calibration Factor (DGM #2):	1,015	Dimensionless
Equipment number (DGM #2):	EM-179	

### Tunnel

Targeted tunnel flow rate	240	scfm
Tunnel diameter	8	in.
Molecular weight	29	May be assumed to be 28,56 (EPA) 28,78 (HYDRONIC)
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

### Fournaise

Fp	1,7500000	
Outlet section		
H	13,000	in
W	9,125	in
Section	0,8238	sqft
Surface duct	0,076532105	m2

<b>Project nu.</b>	PI-20112
<b>Date</b>	01-09-2015
<b>Technicien</b>	m.m

### Fuel data

Fuel type	Dimension
Fuel specie	Other
HHV	20214,0 kJ/kg
%C	50,4
%H	6,1
%O	42,9
%Ash	0,4
HHV	8691,0 Btu/lb
LHV	8178,0 Btu/lb

Default Fuel Values		
	D. Fir	Oak/Maple
<b>HHV</b>	19 810	19 887
<b>%C</b>	48,73	50
<b>%H</b>	6,87	6,6
<b>%O</b>	43,9	42,9
<b>%Ash</b>	0,5	0,5
<b>HHV (Btu/lb)</b>	8519	8552
<b>LHV (Btu/lb)</b>	7451	7480

## Overall Efficiency

### Totaux

Qout:	187428	Btu
Qin(HHV):	217480	Btu
Heat output rate:	92178	Btu/hr
Qin(LHV)	204643	Btu

### Emission rates

Et:	3,6084	grams
Eg/MJ:	0,0182	
Elb/MM Btu output:	0,0424	
Elb/MM Btu Input	0,0366	
Eg/kg	0,3179	
Eg/h	1,79	g/h

### Delivered efficiency

ndel (HHV)	86,2%
ndel (LHV)	91,6%



	Start	End
Barometer (kPa):	101,7	101,7
Barometer (in.Hg):	30,031999	30,0319987
Dry Bulb (F):	80,6	87,1
Humidity (%):	52,2	47,5
Air velocity (ft/min)	20	19

DGM #1	Final:	10271,403 cuft
	Initial:	10250,252 cuft
DGM #2	Final:	8797,648 cuft
	Initial:	8777,374 cuft

	Final:	290853,750	Liter
	Initial:	290254,810	Liter
	Final:	249121,650	Liter
	Initial:	248547,540	Liter

Numéro de la ligne dans "Raw data" à partir duquel les données du VRAI test commencent

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Autres données à rentrer: dans preload data, load data, traverse et filter set weight

Pression statique (mmHg)	0,037
Pression statique (in.H2O)	0,200
consomation electrique (KWatt)	0,736

<b>Project nu.</b>	PI-20112
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**FUEL LOAD DATA SHEET, CSA B415**

Test Load Weight:

Lower Ideal Upper

#### ##### #####

\* For boilers, a loading density factor of 10 lb/ft3 is applied

Load Volume:  cu. ft

Loading Density: #VALEUR! lbs./ft3

Number of Spaces:

Load Density (wet): #DIV/0! lbs./ft3

Spacer weight:  lbs

Dry Wood Density: #DIV/0! lbs./ft3

Piece Size (in):			Weight lbs	Meter Moisture Content				Ave. MC x	Volume	Ave. MC
Thick	Wide	Length		Dry Uncorrected %				Weight	Cubic Inches	%
			26,50	5,90				156,35	0,00	5,9
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
SUM MCx								156,35		5,9 %

Test Load Weight:  lbs.

Dry Weight:  kg.

Average Moisture Content: %

Dry:  Dry(EPA) 5,90  
 Dry(B415) 5,90

Must be 18-28

Wet:   
 must be 15,2-22

Coal Bed Range:  lbs. to

lbs.

TEST CHARGE:

Coal bed weight:   
 Must be between 10 and 25% of test load

lbs.

Project nu. PI-20112  
 Date 01-09-2015  
 Technician AL



## Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,16 in. H2O  
 Barometer: 29,900 in. Hg

### Pour un tunnel de 12" et plus, prendre 6 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center			0,0000
B center			0,0000
A1			0,0000
A2			0,0000
A3			0,0000
A4			0,0000
A5			0,0000
A6			0,0000
B1			0,0000
B2			0,0000
B3			0,0000
B4			0,0000
B5			0,0000
B6			0,0000
AVERAGE		#DIV/0!	0,0000

PITOT CONSTANT=  
0,998

### Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,044	79,0	0,2098
B center	0,043	79,1	0,2074
A1	0,040	79,1	0,2000
A2	0,048	79,0	0,2191
A3	0,042	79,3	0,2049
A4	0,041	79,4	0,2025
B1	0,046	79,5	0,2145
B2	0,043	79,5	0,2074
B3	0,043	79,5	0,2074
B4	0,044	79,6	0,2098
AVERAGE	0,0434	79,3	0,2082

<b>Project nu.</b>	PI-20112
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<b>Technicien</b>	<span style="border: 1px solid red; padding: 2px;">m.m</span>

## Filter set weight

	System 1 (g) 1st hour				System 1 (g)				System 2 (g)				Ambient blank (g)	Date	Heure
	probe	front	back	gasket	probe	front	back	gasket	probe	front	back	gasket	Filter		
Before (1)															
Before (2)															
Before (3)	108,963	0,1225	0,1242	10,1303	108,844	0,1239	0,1218	10,3216	108,7481	0,1219	0,1229	10,1259	0,1219	2015-08-31	17:00
Before (4)	108,963	0,1224	0,1243	10,1303	108,844	0,1238	0,122	10,3217	108,7482	0,1219	0,123	10,1258	0,1218	2015-09-01	14:30
After (1)	108,9631	0,1235	0,1243	10,1326	108,844	0,1249	0,1221	10,3272	108,7484	0,1234	0,123	10,13	0,1218	2015-09-01	19:30
After (2)	108,963	0,1234	0,1243	10,1303	108,844	0,1248	0,122	10,3226	108,7482	0,1234	0,123	10,1264	0,1218	2015-09-15	16:00
After (3)	108,963	0,1234	0,1243	10,1303	108,844	0,1248	0,122	10,3227	108,7482	0,1234	0,123	10,1264	0,1218	2015-09-21	16:00
After (4)															
After (5)															
After (6)	108,963	0,1234	0,1243	10,1303	108,844	0,1248	0,122	10,3217	108,7482	0,1234	0,123	10,1264	0,1218	2015-09-21	16:00
Difference	0,0000	0,0010	0,0000	0,0000	0,0000	0,0010	0,0000	0,0000	0,0000	0,0015	0,0000	0,0006	0,0000		
Total (mg)		1				2				2,1			0		
Total ajusté (mg)		<b>1,00</b>				<b>2,00</b>				<b>2,10</b>					

<b>Project nu.</b>	PI-20112
<b>Date</b>	01-09-2015
<b>Technicien</b>	M.M

SFBA EPA EMISSION RESULTS				RESULTS		
			<b>Average emission rate:</b>	1,8	g/hr	
<b>Test Duration:</b>			121	min		
			Burn Rate :	5,628	Dry kg/hr	
PRESSURE FACTOR:	DGM 1	0,98122	BAROMETRIC PRESSURE			
	DGM 2	0,98733	Average:	30,032	in Hg	
TEMPERATURE FACTORS			Start:	30,032	in Hg	
	DGM 1	0,95930	End:	30,032	in Hg	
	DGM 2	0,96210	DRY GAS METER VALUES			
VOLUMES SAMPLED			DGM #1	Final:	10271,403	Cuft
	DGM 1	20,04678		Initial:	10250,252	Cuft
	DGM 2	19,54781	DGM #2	Final:	8797,648	Cuft
TOTAL TUNNEL VOLUME :	34831			Initial:	8777,374	Cuft
SAMPLE RATIOS			TEMPERATURES			
Sample Train 1:	1737,488		DGM #1	550,402 °R		
Sample Train 2:	1781,838		DGM #2	548,798 °R		
TOTAL EMISSIONS			CALIBRATION FACTORS			
Sample Train 1	3,47		DGM #1	1,0069		
Sample Train 2	3,74		DGM #2	1,0150		
EMISSION RATES			TUNNEL FLOW RATE:			
Sample Train 1	1,72		287,860			
Sample Train 2	1,86		Dscfm			
1st hour emission rate	1,74		PARTICULATE CATCH			
			Total Sample Train 1:			
			2,00			
			Total Sample Train 2:			
			2,10			
			Total Sample Train 1 1st hour:			
			1,00			
DEVIATION:		3,70%				
Cs	Train 1	Train 2				
	9,977E-05	0,000107429				

Particulates Calculations

	Start	End
Barometer (in.Hg):	30,032	30,032
Dry Bulb (F):	80,6	87,1
Humidity (%):	52,2	47,5
Air velocity (Ft/min)	20	19
<b>Test Duration:</b>	<b>121</b>	min

Average Stove Temperature:		#####							
Moisture content of wood (wet basis):		0,00							
		Average	0,01	10,77	9,19	212,67	88,68	105,14	
*		*	*	*	*	*1	*2	*3	
Elapsed		Weight				Flue	Room	Tunnel	
Time	Raw data row	Remaining	CO	CO <sub>2</sub>	O <sub>2</sub>	Gas	Temp	Dry Bulb	
min		lbs	%	%	%	°F	°F	°F	
0,00	226,00	26,6	0,0	11,6	8,5	209,9	86,2	103,9	
1,0	227,0	26,3	0,0	11,8	8,2	210,3	86,4	104,4	
2,0	228,0	26,2	0,0	10,9	9,1	210,0	86,8	104,5	
3,0	229,0	25,9	0,0	11,4	8,7	210,5	86,9	105,1	
4,0	230,0	25,7	0,0	9,3	10,7	210,3	87,2	104,9	
5,0	231,0	25,6	0,0	12,0	7,9	210,4	87,3	105,1	
6,0	232,0	25,3	0,0	11,2	8,8	210,5	87,7	105,0	
7,0	233,0	25,2	0,0	10,9	9,1	210,7	87,6	105,4	
8,0	234,0	24,8	0,0	11,0	8,9	210,8	88,1	105,6	
9,0	235,0	24,6	0,0	11,5	8,5	211,3	88,1	105,7	
10,0	236,0	24,4	0,0	12,1	7,8	211,8	88,1	105,8	
11,0	237,0	24,2	0,0	10,5	9,4	211,8	88,1	105,9	
12,0	238,0	23,9	0,0	10,2	9,7	211,6	88,1	105,9	
13,0	239,0	23,8	0,0	10,1	10,2	211,3	88,1	106,3	
14,0	240,0	23,5	0,0	10,2	9,8	211,4	88,1	105,9	
15,0	241,0	23,4	0,0	10,1	9,8	210,8	88,5	105,2	
16,0	242,0	23,0	0,0	10,1	10,1	210,8	88,5	105,4	
17,0	243,0	22,9	0,0	11,6	8,3	211,4	89,0	105,9	
18,0	244,0	22,7	0,0	10,8	8,9	210,9	88,6	106,0	
19,0	245,0	22,4	0,0	10,4	9,6	211,1	88,5	105,6	
20,0	246,0	22,3	0,0	11,9	8,1	211,5	88,4	105,5	
21,0	247,0	22,0	0,0	11,6	8,3	211,2	88,5	106,1	
22,0	248,0	21,7	0,0	11,4	8,5	211,8	89,2	106,3	
23,0	249,0	21,5	0,0	11,5	8,4	212,2	89,1	106,4	
24,0	250,0	21,3	0,0	11,1	8,9	212,7	88,9	106,5	
25,0	251,0	21,1	0,0	9,9	10,0	212,1	88,8	106,5	
26,0	252,0	20,9	0,0	10,7	9,3	212,6	89,1	106,3	
27,0	253,0	20,6	0,0	11,4	8,4	212,5	89,2	105,7	
28,0	254,0	20,4	0,0	11,6	8,3	213,2	89,2	105,9	
29,0	255,0	20,2	0,0	11,3	8,6	213,2	89,1	105,5	
30,0	256,0	19,8	0,0	11,1	8,9	213,3	89,1	105,6	
31,0	257,0	19,6	0,0	11,5	8,4	213,6	89,1	105,2	
32,0	258,0	19,4	0,0	10,8	8,9	213,3	88,9	105,4	
33,0	259,0	19,2	0,0	10,4	9,5	213,3	88,6	105,2	
34,0	260,0	19,0	0,0	11,5	8,4	213,8	88,8	105,2	
35,0	261,0	18,8	0,0	10,7	9,3	213,9	88,9	105,5	
36,0	262,0	18,6	0,0	11,0	9,0	214,1	89,0	105,7	
37,0	263,0	18,4	0,0	11,5	8,4	214,0	88,9	106,0	
38,0	264,0	18,2	0,0	10,0	10,0	213,7	89,2	105,9	
39,0	265,0	17,9	0,0	10,6	9,4	213,9	89,1	106,0	
40,0	266,0	17,7	0,0	10,5	9,5	213,8	89,1	105,9	
41,0	267,0	17,5	0,0	11,7	8,2	214,3	89,0	106,3	
42,0	268,0	17,3	0,0	10,9	9,0	213,7	89,3	106,0	
43,0	269,0	17,1	0,0	11,0	9,0	214,4	89,4	106,2	
44,0	270,0	16,8	0,0	10,4	9,2	213,7	89,3	105,9	
45,0	271,0	16,6	0,0	8,7	11,3	213,5	89,9	106,5	
46,0	272,0	16,4	0,0	9,8	10,1	213,6	89,4	106,4	
47,0	273,0	16,2	0,0	9,9	10,1	213,5	89,3	106,1	
48,0	274,0	16,1	0,0	9,6	10,4	212,7	89,4	106,0	
49,0	275,0	15,7	0,0	10,5	9,4	212,8	89,9	106,4	
50,0	276,0	15,6	0,0	10,5	9,5	212,7	89,7	106,6	
51,0	277,0	15,3	0,0	10,2	9,8	212,6	89,8	106,3	

Particulates Calculations

52,0	278,0	15,2	0,0	9,5	10,5	212,3	89,6	106,5
53,0	279,0	14,9	0,0	10,2	9,8	212,4	90,1	107,0
54,0	280,0	14,8	0,0	11,4	8,5	212,8	90,1	107,0
55,0	281,0	14,4	0,0	11,3	8,6	213,2	89,5	106,8
56,0	282,0	14,3	0,0	12,7	7,1	213,1	89,5	106,3
57,0	283,0	14,1	0,0	11,4	8,5	213,2	89,5	106,0
58,0	284,0	13,7	0,0	11,4	8,5	213,7	89,4	105,9
59,0	285,0	13,5	0,0	11,5	8,4	213,5	89,3	105,8
60,0	286,0	13,2	0,0	10,5	9,4	213,5	89,2	105,8
61,0	287,0	13,1	0,0	10,3	9,7	213,4	89,6	105,6
62,0	288,0	12,8	0,0	10,0	9,9	213,1	89,4	105,3
63,0	289,0	12,6	0,0	11,4	8,5	213,8	89,4	105,3
64,0	290,0	12,4	0,0	11,4	8,6	213,8	89,3	105,3
65,0	291,0	12,2	0,0	11,0	8,8	214,0	89,3	105,5
66,0	292,0	12,0	0,0	9,7	10,1	213,6	89,2	105,4
67,0	293,0	11,8	0,0	10,3	9,8	213,4	89,6	105,5
68,0	294,0	11,6	0,0	10,6	9,3	213,4	89,2	105,1
69,0	295,0	11,2	0,0	10,8	9,1	213,4	89,2	105,3
70,0	296,0	11,2	0,0	10,0	10,0	213,0	89,3	105,0
71,0	297,0	10,9	0,0	10,6	9,5	213,0	89,1	105,2
72,0	298,0	10,7	0,0	11,8	8,1	213,4	89,2	105,4
73,0	299,0	10,4	0,0	11,5	8,5	213,7	88,8	105,5
74,0	300,0	10,2	0,0	10,3	9,8	213,5	88,9	105,0
75,0	301,0	10,0	0,0	10,5	9,4	213,5	88,9	105,2
76,0	302,0	9,8	0,0	10,2	9,6	213,2	88,9	105,0
77,0	303,0	9,5	0,0	12,1	7,8	214,0	88,8	105,0
78,0	304,0	9,3	0,0	10,3	9,7	213,8	88,8	105,0
79,0	305,0	9,1	0,0	10,2	9,8	213,6	89,0	104,9
80,0	306,0	9,0	0,0	10,2	9,8	213,9	88,7	105,0
81,0	307,0	8,7	0,0	11,8	8,2	214,0	88,8	105,1
82,0	308,0	8,5	0,0	11,0	8,9	213,8	88,8	104,7
83,0	309,0	8,2	0,0	9,5	10,5	212,8	88,6	104,3
84,0	310,0	8,1	0,0	10,8	9,2	213,3	89,2	104,5
85,0	311,0	7,7	0,0	10,7	9,3	213,6	89,0	104,4
86,0	312,0	7,6	0,0	10,3	9,7	213,2	88,9	104,4
87,0	313,0	7,3	0,0	10,6	9,4	213,5	88,6	104,5
88,0	314,0	7,1	0,0	10,8	9,2	213,6	88,7	104,3
89,0	315,0	7,0	0,0	9,5	10,5	212,9	88,9	104,3
90,0	316,0	6,7	0,0	10,3	9,7	212,7	88,6	104,4
91,0	317,0	6,5	0,0	9,6	10,7	212,4	88,6	104,5
92,0	318,0	6,3	0,0	10,9	9,0	212,7	88,5	104,2
93,0	319,0	6,2	0,0	10,7	9,2	212,4	88,4	103,8
94,0	320,0	5,9	0,0	10,9	9,1	212,3	88,4	103,6
95,0	321,0	5,6	0,0	10,9	9,2	212,8	88,3	103,7
96,0	322,0	5,4	0,0	10,2	9,7	212,8	88,3	103,5
97,0	323,0	5,2	0,0	10,0	10,1	212,7	88,3	103,5
98,0	324,0	5,0	0,0	10,4	9,6	212,7	88,0	103,4
99,0	325,0	4,8	0,0	10,1	9,9	212,2	88,0	103,4
100,0	326,0	4,5	0,0	10,0	10,0	212,2	88,1	103,6
101,0	327,0	4,4	0,0	11,3	8,8	211,8	88,2	103,6
102,0	328,0	4,1	0,0	12,1	7,8	211,9	88,2	103,8
103,0	329,0	3,9	0,0	11,6	8,4	211,9	88,2	103,8
104,0	330,0	3,7	0,0	11,3	8,7	212,4	88,2	103,7
105,0	331,0	3,5	0,0	9,9	10,1	212,0	87,9	104,2
106,0	332,0	3,2	0,0	10,6	9,4	211,9	87,8	104,2
107,0	333,0	3,0	0,0	11,3	8,9	212,7	87,8	104,0
108,0	334,0	2,8	0,0	10,5	9,5	212,2	88,2	104,2
109,0	335,0	2,6	0,0	11,8	8,1	212,6	88,1	104,2
110,0	336,0	2,2	0,0	12,0	7,9	212,7	88,1	104,1
111,0	337,0	2,2	0,0	11,1	8,9	212,6	87,9	103,8
112,0	338,0	1,9	0,0	10,7	9,3	212,6	87,8	103,8
113,0	339,0	1,7	0,0	10,2	9,6	212,8	87,9	103,9
114,0	340,0	1,5	0,0	10,2	9,9	212,7	88,1	103,8
115,0	341,0	1,2	0,0	11,3	8,7	212,4	88,4	103,9
116,0	342,0	1,0	0,0	10,8	9,1	212,3	88,4	104,4
117,0	343,0	0,9	0,0	9,8	10,3	212,4	88,4	104,1
118,0	344,0	0,5	0,0	11,7	8,4	213,1	87,8	104,7
119,0	345,0	0,4	0,0	10,0	9,8	212,7	88,1	104,0
120,0	346,0	0,1	0,0	10,5	9,4	212,7	88,1	104,1
121,0	347,0	0,0	0,0	10,9	9,4	212,4	88,6	104,2

Particulates Calculations



Max  
89,98

Max  
86,58

0,17	90,57	90,23	85,22	0,16	88,61	88,99	83,33	0,05	0,03
Mass flow 1	Mass flow 1	Mass flow 1	Filter 1	Mass flow 2	Mass flow 2	Mass flow 2	Filter 2	Tunnel Velocity	Flue draft
Reading	Inlet T	Outlet T	Temp	Reading	Inlet T	Outlet T	Temp	Pressure	Pressure
								in wc	in wc
cuft/min	oF	oF	oF	cuft/min	oF	oF	oF	in wc	in wc
0,17	88,59	88,36	86,05	0,16	86,90	87,15	85,12	0,05	0,03
0,17	88,67	88,45	86,15	0,16	86,97	87,19	85,21	0,05	0,03
0,17	88,76	88,49	86,29	0,16	87,12	87,25	85,34	0,05	0,03
0,17	88,89	88,52	86,46	0,16	87,25	87,29	85,49	0,05	0,03
0,17	89,00	88,55	86,61	0,16	87,42	87,41	85,60	0,05	0,03
0,17	89,14	88,60	86,79	0,16	87,61	87,52	85,78	0,05	0,03
0,17	89,30	88,67	86,97	0,16	87,83	87,67	85,93	0,05	0,03
0,17	89,46	88,74	87,12	0,16	88,04	87,80	86,08	0,05	0,03
0,17	89,58	88,81	87,30	0,16	88,21	87,87	86,25	0,05	0,03
0,17	89,73	88,88	87,48	0,16	88,32	87,95	86,42	0,05	0,03
0,17	89,81	88,91	87,61	0,16	88,39	88,00	86,58	0,05	0,03
0,17	89,91	88,99	86,70	0,16	88,48	88,09	86,12	0,05	0,03
0,17	89,98	89,05	85,55	0,16	88,55	88,13	84,98	0,05	0,03
0,17	90,06	89,09	84,71	0,16	88,61	88,19	84,21	0,05	0,03
0,17	90,12	89,14	84,07	0,16	88,70	88,32	83,71	0,05	0,03
0,17	90,19	89,20	83,56	0,16	88,79	88,41	83,28	0,05	0,03
0,17	90,27	89,28	83,25	0,16	88,88	88,49	82,99	0,05	0,03
0,17	90,31	89,32	83,00	0,16	88,87	88,51	82,76	0,05	0,03
0,17	90,37	89,39	82,74	0,16	88,95	88,64	82,60	0,05	0,03
0,17	90,45	89,45	82,62	0,16	88,97	88,68	82,50	0,05	0,03
0,17	90,46	89,46	82,48	0,16	88,98	88,72	82,40	0,05	0,03
0,17	90,49	89,53	82,38	0,16	89,01	88,76	82,32	0,05	0,03
0,17	90,51	89,56	82,32	0,16	89,00	88,78	82,26	0,05	0,03
0,17	90,60	89,65	82,27	0,16	89,10	88,84	82,25	0,05	0,03
0,17	90,66	89,70	82,26	0,16	89,16	88,90	82,26	0,05	0,03
0,17	90,70	89,75	82,22	0,16	89,25	88,93	82,25	0,05	0,03
0,17	90,77	89,79	82,30	0,16	89,26	89,03	82,28	0,05	0,03
0,17	90,78	89,83	82,27	0,16	89,24	89,03	82,28	0,05	0,03
0,17	90,76	89,87	82,31	0,16	89,20	89,06	82,27	0,05	0,03
0,17	90,80	89,90	82,34	0,16	89,25	89,12	82,34	0,05	0,03
0,17	90,79	89,95	82,37	0,16	89,22	89,11	82,36	0,05	0,03
0,17	90,78	89,98	82,39	0,16	89,21	89,16	82,35	0,05	0,03
0,17	90,70	89,99	82,39	0,16	89,09	89,14	82,34	0,05	0,03
0,17	90,59	89,95	82,42	0,16	88,94	89,11	82,36	0,05	0,03
0,17	90,53	89,96	82,50	0,16	88,83	89,09	82,38	0,05	0,03
0,17	90,52	89,96	82,52	0,16	88,84	89,07	82,42	0,05	0,03
0,17	90,60	90,02	82,56	0,16	88,88	89,08	82,43	0,05	0,03
0,17	90,68	90,05	82,59	0,16	89,00	89,14	82,45	0,05	0,03
0,17	90,77	90,14	82,61	0,16	89,13	89,24	82,47	0,05	0,03
0,17	90,83	90,16	82,67	0,16	89,21	89,25	82,48	0,05	0,03
0,17	90,87	90,21	82,69	0,16	89,19	89,24	82,53	0,05	0,03
0,17	90,91	90,24	82,77	0,16	89,25	89,35	82,59	0,05	0,03
0,17	90,94	90,29	82,75	0,16	89,32	89,38	82,57	0,05	0,03
0,17	91,01	90,33	82,79	0,16	89,36	89,41	82,61	0,05	0,03
0,17	91,04	90,38	82,77	0,16	89,37	89,45	82,64	0,05	0,03
0,17	91,10	90,40	82,87	0,16	89,45	89,47	82,70	0,05	0,03
0,17	91,17	90,47	82,89	0,16	89,52	89,50	82,71	0,05	0,03
0,17	91,15	90,48	82,93	0,16	89,42	89,51	82,75	0,05	0,03
0,17	91,15	90,51	82,96	0,16	89,43	89,50	82,78	0,05	0,03
0,17	91,20	90,54	83,01	0,16	89,48	89,53	82,85	0,05	0,03
0,17	91,27	90,57	83,04	0,16	89,54	89,54	82,86	0,05	0,03
0,17	91,32	90,64	83,03	0,16	89,61	89,61	82,89	0,05	0,03

Particulates Calculations

0,17	91,36	90,65	83,09	0,16	89,61	89,60	82,93	0,05	0,03
0,17	91,38	90,69	83,15	0,16	89,63	89,62	82,97	0,05	0,03
0,17	91,44	90,72	83,15	0,16	89,67	89,64	83,02	0,05	0,03
0,17	91,48	90,76	83,20	0,16	89,71	89,67	83,05	0,05	0,03
0,17	91,47	90,79	83,21	0,16	89,73	89,71	83,11	0,05	0,03
0,17	91,41	90,80	83,23	0,16	89,64	89,67	83,13	0,05	0,03
0,17	91,26	90,77	83,29	0,16	89,40	89,65	83,17	0,05	0,03
0,17	91,17	90,74	83,29	0,16	89,30	89,59	83,21	0,05	0,03
0,17	91,10	90,74	89,98	0,16	89,20	89,57	83,23	0,05	0,03
0,17	91,12	90,75	89,97	0,16	89,27	89,62	83,28	0,05	0,03
0,17	91,22	90,81	89,51	0,16	89,35	89,66	83,30	0,05	0,03
0,17	91,27	90,84	89,17	0,16	89,38	89,70	83,33	0,05	0,03
0,17	91,29	90,87	88,89	0,16	89,39	89,69	83,32	0,05	0,03
0,17	91,32	90,88	88,65	0,16	89,39	89,72	83,34	0,05	0,03
0,17	91,35	90,90	88,42	0,16	89,44	89,75	83,34	0,05	0,03
0,17	91,40	90,93	88,23	0,16	89,48	89,79	83,36	0,05	0,03
0,17	91,45	90,98	88,04	0,16	89,50	89,80	83,37	0,05	0,03
0,17	91,44	90,97	87,87	0,16	89,47	89,81	83,36	0,05	0,03
0,17	91,42	91,00	87,74	0,16	89,45	89,79	83,36	0,05	0,03
0,17	91,37	90,99	87,64	0,16	89,39	89,75	83,39	0,05	0,03
0,17	91,30	90,97	87,52	0,16	89,26	89,73	83,38	0,05	0,03
0,17	91,19	90,96	87,47	0,16	89,09	89,67	83,42	0,05	0,03
0,17	91,00	90,93	87,41	0,16	88,86	89,59	83,43	0,05	0,03
0,17	90,84	90,88	87,31	0,16	88,65	89,50	83,43	0,05	0,03
0,17	90,72	90,84	87,22	0,16	88,52	89,48	83,44	0,05	0,03
0,17	90,63	90,83	87,16	0,16	88,40	89,39	83,44	0,05	0,03
0,17	90,58	90,77	87,08	0,16	88,36	89,35	83,43	0,05	0,03
0,17	90,54	90,75	87,05	0,16	88,26	89,27	83,46	0,05	0,03
0,17	90,48	90,72	86,99	0,16	88,17	89,19	83,46	0,05	0,03
0,17	90,49	90,70	86,95	0,16	88,21	89,16	83,46	0,05	0,03
0,17	90,60	90,72	86,89	0,16	88,34	89,20	83,47	0,05	0,03
0,17	90,68	90,75	86,83	0,16	88,47	89,24	83,45	0,05	0,03
0,17	90,78	90,77	86,85	0,16	88,55	89,28	83,47	0,05	0,03
0,17	90,87	90,81	87,14	0,16	88,68	89,33	83,44	0,05	0,03
0,17	90,89	90,83	86,63	0,16	88,69	89,30	83,44	0,05	0,03
0,17	90,86	90,82	86,35	0,16	88,62	89,29	83,42	0,05	0,03
0,17	90,79	90,79	86,17	0,16	88,56	89,25	83,39	0,05	0,03
0,17	90,84	90,81	86,07	0,16	88,58	89,30	83,40	0,05	0,03
0,17	90,91	90,80	85,99	0,16	88,63	89,33	83,39	0,05	0,03
0,17	90,92	90,83	85,96	0,16	88,67	89,34	83,38	0,05	0,03
0,17	90,86	90,82	85,90	0,16	88,52	89,27	83,38	0,05	0,03
0,17	90,81	90,79	85,86	0,16	88,46	89,24	83,35	0,05	0,03
0,17	90,76	90,79	85,82	0,16	88,43	89,21	83,32	0,05	0,03
0,17	90,71	90,75	85,77	0,16	88,30	89,14	83,30	0,05	0,03
0,17	90,67	90,72	85,76	0,16	88,23	89,08	83,29	0,05	0,03
0,17	90,62	90,71	85,74	0,16	88,18	89,02	83,29	0,05	0,03
0,17	90,46	90,65	85,75	0,16	87,95	88,91	83,25	0,05	0,03
0,17	90,34	90,60	85,71	0,16	87,80	88,85	83,25	0,05	0,03
0,17	90,31	90,57	85,73	0,16	87,79	88,84	83,26	0,05	0,03
0,17	90,32	90,56	85,72	0,16	87,81	88,83	83,22	0,05	0,03
0,17	90,28	90,54	85,72	0,16	87,75	88,80	83,19	0,05	0,03
0,17	90,17	90,49	85,76	0,16	87,62	88,69	83,22	0,05	0,03
0,17	90,07	90,47	85,79	0,16	87,48	88,66	83,20	0,05	0,03
0,17	89,99	90,43	85,82	0,16	87,35	88,60	83,19	0,05	0,03
0,17	89,90	90,40	85,89	0,16	87,25	88,55	83,20	0,05	0,03
0,17	89,90	90,41	85,90	0,16	87,27	88,59	83,22	0,05	0,03
0,17	90,02	90,44	85,86	0,16	87,46	88,63	83,18	0,05	0,03
0,17	90,13	90,47	85,86	0,16	87,62	88,66	83,19	0,05	0,03
0,17	90,12	90,43	85,90	0,16	87,59	88,61	83,18	0,05	0,03
0,17	90,08	90,42	85,91	0,16	87,53	88,57	83,19	0,05	0,03
0,17	90,12	90,41	85,92	0,16	87,56	88,58	83,16	0,05	0,03
0,17	90,07	90,39	85,95	0,16	87,49	88,54	83,18	0,05	0,03
0,17	90,04	90,38	85,97	0,16	87,45	88,55	83,17	0,05	0,03
0,17	90,12	90,42	85,93	0,16	87,59	88,62	83,16	0,05	0,03
0,17	90,21	90,46	85,93	0,16	87,68	88,66	83,17	0,05	0,03
0,17	90,22	90,43	85,99	0,16	87,70	88,62	83,16	0,05	0,03
0,17	90,17	90,43	86,04	0,16	87,59	88,60	83,16	0,05	0,03
0,17	90,09	90,40	86,03	0,16	87,48	88,56	83,17	0,05	0,03
0,17	90,05	90,38	86,04	0,16	87,43	88,48	83,17	0,05	0,03
0,17	90,12	90,41	86,03	0,16	87,54	88,56	83,18	0,05	0,03

Particulates Calculations

Test Duration (min):	121 min
Total Gas Volume (System 1):	19,451 Scuft
Total Gas Volume (System 2):	19,218 Scuft
Average Barometric Pressure:	30,031999 in.Hg
Molecular Weight:	29 Lb/lb mole
Pitot Correction:	0,9981867 Dimensionless
Calibration Factor (DGM #1):	1,0069 Dimensionless
Calibration Factor (DGM #2):	1,015 Dimensionless
(1) VS:	0,0816605
(2) VS:	0,082653

	0,17			0,16			105,14	Filter	Filter
	DGM 1	DGM 1	DGM 1	DGM 2	DGM 2	DGM 2	Tunnel	Face	Face
Elapsed Time	Reading	Inlet T	Outlet T	Reading	Inlet T	Outlet T	Dry Bulb	Velocity	Velocity
min	Cuft/min	°F	°F	Cuft/min	°F	°F	°F	Ft/sec	Ft/sec
0,00	0,166	88,59	88,36	0,162	86,898	87,155	103,877		
1,00	0,166	88,67	88,45	0,162	86,966	87,188	104,357	13,91	13,74
2,00	0,166	88,76	88,49	0,162	87,118	87,250	104,537	13,90	13,73
3,00	0,166	88,89	88,52	0,162	87,249	87,293	105,115	13,89	13,73
4,00	0,166	89,00	88,55	0,162	87,417	87,410	104,876	13,90	13,73
5,00	0,166	89,14	88,60	0,162	87,605	87,523	105,074	13,92	13,73
6,00	0,166	89,30	88,67	0,162	87,831	87,672	104,985	13,92	13,72
7,00	0,166	89,46	88,74	0,162	88,038	87,798	105,405	13,90	13,72
8,00	0,165	89,58	88,81	0,162	88,208	87,872	105,626	13,87	13,71
9,00	0,166	89,73	88,88	0,162	88,320	87,945	105,660	13,87	13,71
10,00	0,166	89,81	88,91	0,162	88,388	87,996	105,827	13,88	13,71
11,00	0,166	89,91	88,99	0,162	88,480	88,086	105,939	13,87	13,71
12,00	0,166	89,98	89,05	0,162	88,548	88,126	105,927	13,88	13,71
13,00	0,166	90,06	89,09	0,162	88,612	88,190	106,292	13,88	13,70
14,00	0,165	90,12	89,14	0,162	88,697	88,320	105,857	13,86	13,70
15,00	0,165	90,19	89,20	0,162	88,793	88,414	105,209	13,84	13,70
16,00	0,166	90,27	89,28	0,162	88,878	88,495	105,432	13,84	13,70
17,00	0,165	90,31	89,32	0,162	88,865	88,514	105,889	13,84	13,70
18,00	0,165	90,37	89,39	0,162	88,950	88,639	106,003	13,83	13,69
19,00	0,166	90,45	89,45	0,162	88,970	88,676	105,567	13,85	13,69
20,00	0,166	90,46	89,46	0,162	88,982	88,722	105,543	13,87	13,69
21,00	0,166	90,49	89,53	0,162	89,006	88,762	106,058	13,87	13,69
22,00	0,166	90,51	89,56	0,162	88,998	88,781	106,311	13,85	13,69
23,00	0,165	90,60	89,65	0,162	89,097	88,836	106,416	13,84	13,69
24,00	0,166	90,66	89,70	0,162	89,157	88,896	106,524	13,84	13,69
25,00	0,166	90,70	89,75	0,162	89,253	88,933	106,475	13,85	13,69
26,00	0,166	90,77	89,79	0,162	89,259	89,031	106,324	13,85	13,68
27,00	0,166	90,78	89,83	0,162	89,238	89,034	105,669	13,86	13,68
28,00	0,166	90,76	89,87	0,162	89,198	89,061	105,936	13,87	13,68
29,00	0,166	90,80	89,90	0,162	89,255	89,117	105,534	13,86	13,68
30,00	0,166	90,79	89,95	0,162	89,221	89,113	105,640	13,85	13,68
31,00	0,166	90,78	89,98	0,162	89,211	89,161	105,211	13,86	13,68
32,00	0,166	90,70	89,99	0,162	89,095	89,139	105,434	13,86	13,68
33,00	0,166	90,59	89,95	0,162	88,939	89,112	105,166	13,85	13,69
34,00	0,166	90,53	89,96	0,162	88,826	89,094	105,200	13,86	13,69
35,00	0,166	90,52	89,96	0,162	88,838	89,071	105,549	13,86	13,69
36,00	0,166	90,60	90,02	0,162	88,877	89,083	105,732	13,86	13,69
37,00	0,166	90,68	90,05	0,162	89,002	89,144	105,966	13,87	13,69
38,00	0,166	90,77	90,14	0,162	89,135	89,244	105,923	13,85	13,68
39,00	0,166	90,83	90,16	0,162	89,212	89,252	106,020	13,84	13,68
40,00	0,166	90,87	90,21	0,162	89,193	89,240	105,939	13,84	13,68
41,00	0,166	90,91	90,24	0,162	89,254	89,348	106,323	13,85	13,68
42,00	0,166	90,94	90,29	0,162	89,319	89,381	106,041	13,87	13,68
43,00	0,166	91,01	90,33	0,162	89,362	89,405	106,246	13,87	13,68
44,00	0,166	91,04	90,38	0,162	89,370	89,454	105,907	13,87	13,68
45,00	0,166	91,10	90,40	0,162	89,455	89,471	106,481	13,85	13,68
46,00	0,166	91,17	90,47	0,162	89,520	89,501	106,411	13,85	13,67
47,00	0,166	91,15	90,48	0,162	89,417	89,507	106,051	13,85	13,68
48,00	0,166	91,15	90,51	0,162	89,434	89,502	105,956	13,85	13,68
49,00	0,166	91,20	90,54	0,162	89,481	89,534	106,377	13,84	13,67
50,00	0,166	91,27	90,57	0,162	89,543	89,538	106,596	13,83	13,67
51,00	0,166	91,32	90,64	0,162	89,612	89,609	106,336	13,86	13,67



Particulates Calculations

52,00	0,166	91,36	90,65	0,162	89,613	89,602	106,478	13,88	13,67
53,00	0,166	91,38	90,69	0,162	89,634	89,617	106,981	13,87	13,67
54,00	0,166	91,44	90,72	0,162	89,669	89,643	107,046	13,85	13,67
55,00	0,166	91,48	90,76	0,162	89,706	89,673	106,752	13,85	13,67
56,00	0,166	91,47	90,79	0,162	89,727	89,708	106,348	13,85	13,67
57,00	0,166	91,41	90,80	0,162	89,639	89,674	106,003	13,83	13,67
58,00	0,166	91,26	90,77	0,162	89,404	89,650	105,898	13,85	13,67
59,00	0,166	91,17	90,74	0,162	89,299	89,589	105,819	13,86	13,68
60,00	0,166	91,10	90,74	0,162	89,198	89,569	105,771	13,86	13,68
61,00	0,166	91,12	90,75	0,162	89,268	89,619	105,608	13,86	13,68
62,00	0,166	91,22	90,81	0,162	89,348	89,662	105,315	13,85	13,67
63,00	0,166	91,27	90,84	0,162	89,384	89,703	105,295	13,85	13,67
64,00	0,166	91,29	90,87	0,162	89,390	89,686	105,307	13,86	13,67
65,00	0,166	91,32	90,88	0,162	89,390	89,725	105,507	13,86	13,67
66,00	0,166	91,35	90,90	0,162	89,439	89,747	105,387	13,86	13,67
67,00	0,166	91,40	90,93	0,162	89,477	89,790	105,484	13,85	13,67
68,00	0,166	91,45	90,98	0,162	89,499	89,802	105,147	13,83	13,67
69,00	0,166	91,44	90,97	0,162	89,470	89,806	105,267	13,82	13,67
70,00	0,166	91,42	91,00	0,162	89,453	89,793	105,032	13,82	13,67
71,00	0,166	91,37	90,99	0,162	89,393	89,752	105,212	13,83	13,67
72,00	0,166	91,30	90,97	0,162	89,263	89,729	105,357	13,85	13,67
73,00	0,166	91,19	90,96	0,162	89,088	89,672	105,546	13,85	13,68
74,00	0,166	91,00	90,93	0,162	88,863	89,591	105,017	13,85	13,68
75,00	0,166	90,84	90,88	0,162	88,654	89,502	105,163	13,85	13,68
76,00	0,166	90,72	90,84	0,162	88,521	89,483	104,960	13,85	13,69
77,00	0,166	90,63	90,83	0,162	88,404	89,394	105,034	13,84	13,69
78,00	0,166	90,58	90,77	0,162	88,358	89,346	104,980	13,84	13,69
79,00	0,166	90,54	90,75	0,162	88,256	89,268	104,885	13,85	13,69
80,00	0,166	90,48	90,72	0,162	88,175	89,192	105,045	13,86	13,69
81,00	0,166	90,49	90,70	0,162	88,207	89,161	105,081	13,85	13,69
82,00	0,166	90,60	90,72	0,162	88,340	89,199	104,656	13,85	13,69
83,00	0,166	90,68	90,75	0,162	88,467	89,240	104,256	13,85	13,69
84,00	0,166	90,78	90,77	0,162	88,553	89,278	104,457	13,84	13,69
85,00	0,166	90,87	90,81	0,162	88,680	89,334	104,373	13,84	13,69
86,00	0,166	90,89	90,83	0,162	88,688	89,305	104,371	13,85	13,69
87,00	0,166	90,86	90,82	0,162	88,624	89,294	104,454	13,87	13,69
88,00	0,166	90,79	90,79	0,162	88,557	89,247	104,314	13,87	13,69
89,00	0,166	90,84	90,81	0,162	88,577	89,301	104,306	13,85	13,69
90,00	0,166	90,91	90,80	0,162	88,626	89,334	104,425	13,84	13,69
91,00	0,166	90,92	90,83	0,162	88,668	89,340	104,538	13,83	13,69
92,00	0,166	90,86	90,82	0,162	88,524	89,270	104,206	13,84	13,69
93,00	0,166	90,81	90,79	0,162	88,463	89,237	103,819	13,84	13,69
94,00	0,166	90,76	90,79	0,162	88,430	89,213	103,634	13,83	13,69
95,00	0,166	90,71	90,75	0,162	88,300	89,138	103,724	13,84	13,69
96,00	0,166	90,67	90,72	0,162	88,234	89,082	103,472	13,86	13,69
97,00	0,166	90,62	90,71	0,162	88,184	89,024	103,522	13,86	13,70
98,00	0,166	90,46	90,65	0,162	87,949	88,910	103,435	13,85	13,70
99,00	0,166	90,34	90,60	0,162	87,802	88,851	103,415	13,85	13,70
100,00	0,166	90,31	90,57	0,162	87,786	88,842	103,556	13,86	13,70
101,00	0,166	90,32	90,56	0,162	87,808	88,834	103,562	13,86	13,70
102,00	0,166	90,28	90,54	0,162	87,746	88,800	103,761	13,86	13,70
103,00	0,166	90,17	90,49	0,162	87,617	88,694	103,821	13,87	13,71
104,00	0,166	90,07	90,47	0,162	87,478	88,661	103,749	13,86	13,71
105,00	0,166	89,99	90,43	0,162	87,350	88,595	104,173	13,86	13,71
106,00	0,166	89,90	90,40	0,162	87,248	88,552	104,247	13,86	13,71
107,00	0,166	89,90	90,41	0,162	87,273	88,586	104,046	13,87	13,71
108,00	0,166	90,02	90,44	0,162	87,458	88,630	104,168	13,88	13,71
109,00	0,166	90,13	90,47	0,162	87,617	88,656	104,175	13,87	13,71
110,00	0,166	90,12	90,43	0,162	87,587	88,605	104,070	13,87	13,71
111,00	0,166	90,08	90,42	0,162	87,534	88,569	103,758	13,88	13,71
112,00	0,166	90,12	90,41	0,162	87,560	88,579	103,796	13,87	13,71
113,00	0,166	90,07	90,39	0,162	87,492	88,539	103,916	13,86	13,71
114,00	0,166	90,04	90,38	0,162	87,448	88,551	103,787	13,86	13,71
115,00	0,166	90,12	90,42	0,162	87,595	88,621	103,935	13,86	13,71
116,00	0,166	90,21	90,46	0,162	87,682	88,665	104,396	13,86	13,71
117,00	0,166	90,22	90,43	0,162	87,695	88,624	104,070	13,87	13,71
118,00	0,166	90,17	90,43	0,162	87,588	88,602	104,694	13,89	13,71
119,00	0,166	90,09	90,40	0,162	87,479	88,563	103,966	13,88	13,71
120,00	0,166	90,05	90,38	0,162	87,426	88,483	104,101	13,88	13,71
121,00	0,166	90,12	90,41	0,162	87,538	88,564	104,172	13,87	13,71

Particulates Calculations

(ASTM E2515 Formula)

Tunnel area (ft <sup>2</sup> ):	0,349
Wood moisture (% wet):	5,57
Load Weight (lbs wet):	26,5
Burn Rate (Dry kg/hr):	5,628
Final Temperature (DGM #1) Degrees Rankin:	550,402
Final Temperature (DGM #2) Degrees Rankin:	548,798
Average Tunnel Temperature Degrees Rankin:	565,138
Average Tunnel Velocity (feet per second):	14,96
Standardized Tunnel Flow (dscfm):	287,85977

	Average 14,96	Average Inlet + Outlet	Average Inlet + Outlet	Average	Average	#1	#2	Average 0,220
Delta-P (in. H2O)	Tunnel Velocity	Temp. Meter 1	Temp. Meter 2	100,12	100,34	System 1 Vol.Std.	System 2 Vol.Std.	SQRT Delta-P
				PR1	PR2			Time
in. H2O	Ft/Sec	Deg. R	Deg. R	%	%	(ft3)	(ft3)	min
0,048	14,906	548,5	547,0			0,161	0,159	0 0,2192401
0,047	14,802	548,6	547,1	101,37	101,61	0,161	0,159	1 0,217614
0,049	14,994	548,6	547,2	100,08	100,33	0,161	0,159	2 0,2203948
0,049	15,110	548,7	547,3	99,34	99,65	0,161	0,159	3 0,2220001
0,049	15,061	548,8	547,4	99,80	99,91	0,161	0,159	4 0,2213135
0,049	15,001	548,9	547,6	100,34	100,32	0,161	0,159	5 0,220394
0,047	14,810	549,0	547,8	101,48	101,56	0,161	0,159	6 0,2176139
0,046	14,656	549,1	547,9	102,54	102,67	0,161	0,159	7 0,2152692
0,048	14,930	549,2	548,0	100,34	100,80	0,161	0,159	8 0,2192426
0,049	15,043	549,3	548,1	99,97	100,03	0,161	0,159	9 0,2209032
0,049	15,011	549,4	548,2	99,92	100,27	0,161	0,159	10 0,2203948
0,048	14,854	549,5	548,3	101,12	101,32	0,161	0,159	11 0,2180796
0,049	15,043	549,5	548,3	99,91	100,04	0,161	0,159	12 0,2208545
0,049	15,082	549,6	548,4	99,65	99,84	0,161	0,159	13 0,2213446
0,049	15,151	549,6	548,5	98,87	99,28	0,161	0,159	14 0,222456
0,048	14,924	549,7	548,6	100,25	100,65	0,161	0,159	15 0,2192495
0,048	14,927	549,8	548,7	100,31	100,66	0,161	0,159	16 0,2192406
0,047	14,743	549,8	548,7	101,53	102,00	0,161	0,159	17 0,2164463
0,049	15,044	549,9	548,8	99,54	99,96	0,160	0,159	18 0,2208548
0,047	14,818	549,9	548,8	101,19	101,40	0,161	0,159	19 0,2176145
0,049	15,147	550,0	548,9	99,16	99,18	0,161	0,159	20 0,2224569
0,047	14,697	550,0	548,9	102,01	102,31	0,161	0,159	21 0,2157421
0,048	14,970	550,0	548,9	100,17	100,49	0,161	0,159	22 0,2197034
0,050	15,237	550,1	549,0	98,36	98,73	0,161	0,159	23 0,2235955
0,049	15,083	550,2	549,0	99,52	99,75	0,161	0,159	24 0,2213143
0,049	15,082	550,2	549,1	99,42	99,73	0,161	0,159	25 0,2213149
0,049	15,049	550,3	549,1	99,71	99,91	0,161	0,159	26 0,2208554
0,049	15,040	550,3	549,1	99,74	99,86	0,161	0,159	27 0,220855
0,049	15,122	550,3	549,1	99,39	99,36	0,161	0,159	28 0,222002
0,049	15,069	550,3	549,2	99,30	99,63	0,161	0,159	29 0,221315
0,048	14,961	550,4	549,2	100,23	100,37	0,161	0,159	30 0,2197038
0,048	14,967	550,4	549,2	100,14	100,25	0,161	0,159	31 0,219878
0,049	15,068	550,3	549,1	99,45	99,63	0,161	0,159	32 0,2213151
0,048	14,955	550,3	549,0	100,11	100,35	0,161	0,159	33 0,2197039
0,049	15,002	550,2	549,0	99,95	100,05	0,161	0,159	34 0,2203961
0,048	14,928	550,2	549,0	100,35	100,61	0,161	0,159	35 0,2192411
0,047	14,820	550,3	549,0	101,32	101,37	0,161	0,159	36 0,2176152
0,049	15,075	550,4	549,1	99,58	99,68	0,161	0,159	37 0,2213147
0,050	15,179	550,5	549,2	98,67	98,97	0,161	0,159	38 0,2228411
0,046	14,616	550,5	549,2	102,53	102,79	0,161	0,159	39 0,2145634
0,049	15,044	550,5	549,2	99,53	99,86	0,161	0,159	40 0,2208557
0,049	15,049	550,6	549,3	99,78	99,88	0,161	0,159	41 0,2208554
0,047	14,697	550,6	549,3	102,16	102,21	0,161	0,159	42 0,2157426
0,050	15,203	550,7	549,4	98,87	98,83	0,161	0,159	43 0,2231422
0,048	14,854	550,7	549,4	101,00	101,09	0,161	0,159	44 0,2180809
0,049	15,082	550,8	549,5	99,47	99,65	0,161	0,159	45 0,2213151
0,049	15,081	550,8	549,5	99,49	99,64	0,161	0,159	46 0,2213154
0,049	15,039	550,8	549,5	99,70	99,86	0,161	0,159	47 0,2207713
0,049	15,122	550,8	549,5	99,12	99,30	0,161	0,159	48 0,2220014
0,049	15,018	550,9	549,5	99,76	100,05	0,161	0,159	49 0,2203959
0,047	14,704	550,9	549,5	101,99	102,22	0,160	0,159	50 0,2157424
0,049	15,127	551,0	549,6	99,44	99,30	0,161	0,159	51 0,2220019

Particulates Calculations

0,049	15,082	551,0	549,6	99,70	99,62	0,161	0,159	52	0,2213153
0,049	15,057	551,0	549,6	99,78	99,87	0,161	0,159	53	0,2208561
0,050	15,276	551,1	549,7	98,25	98,45	0,161	0,159	54	0,2240503
0,049	15,054	551,1	549,7	99,79	99,84	0,161	0,159	55	0,2208558
0,049	15,080	551,1	549,7	99,40	99,59	0,161	0,159	56	0,2213156
0,048	14,934	551,1	549,7	100,22	100,51	0,160	0,159	57	0,2192421
0,048	14,933	551,0	549,5	100,56	100,53	0,161	0,159	58	0,2192414
0,049	15,042	551,0	549,4	99,66	99,80	0,161	0,159	59	0,2208558
0,048	14,963	550,9	549,4	100,25	100,33	0,161	0,159	60	0,2197042
0,048	14,950	550,9	549,4	100,22	100,37	0,161	0,159	61	0,2195509
0,049	15,004	551,0	549,5	99,80	99,95	0,161	0,159	62	0,2203967
0,048	14,957	551,1	549,5	100,06	100,26	0,161	0,159	63	0,2197039
0,047	14,815	551,1	549,5	101,24	101,22	0,161	0,159	64	0,2176166
0,048	14,959	551,1	549,6	100,17	100,28	0,161	0,159	65	0,2197037
0,048	14,847	551,1	549,6	101,02	101,00	0,161	0,159	66	0,2180808
0,048	14,959	551,2	549,6	99,98	100,26	0,161	0,159	67	0,2197035
0,049	15,064	551,2	549,7	99,20	99,50	0,160	0,159	68	0,2213152
0,048	14,925	551,2	549,6	100,06	100,45	0,160	0,159	69	0,2192408
0,048	14,922	551,2	549,6	100,10	100,43	0,160	0,159	70	0,2192419
0,048	14,955	551,2	549,6	100,01	100,25	0,160	0,159	71	0,2197031
0,049	15,067	551,1	549,5	99,45	99,54	0,161	0,159	72	0,2213151
0,048	14,849	551,1	549,4	100,84	101,06	0,161	0,159	73	0,2180806
0,049	15,031	551,0	549,2	99,62	99,77	0,161	0,159	74	0,2208555
0,049	15,064	550,9	549,1	99,33	99,60	0,161	0,159	75	0,2213149
0,048	14,921	550,8	549,0	100,27	100,54	0,161	0,159	76	0,2192418
0,049	15,031	550,7	548,9	99,49	99,83	0,161	0,159	77	0,2208514
0,047	14,763	550,7	548,9	101,26	101,65	0,161	0,159	78	0,216914
0,049	15,029	550,6	548,8	99,66	99,84	0,161	0,159	79	0,2208551
0,049	15,110	550,6	548,7	99,13	99,35	0,161	0,159	80	0,2220021
0,047	14,764	550,6	548,7	101,38	101,69	0,161	0,159	81	0,216914
0,049	14,995	550,7	548,8	99,79	100,03	0,161	0,159	82	0,2203951
0,049	14,990	550,7	548,9	99,67	99,98	0,161	0,159	83	0,2203953
0,048	14,945	550,8	548,9	99,93	100,30	0,161	0,159	84	0,2197028
0,048	14,913	550,8	549,0	100,24	100,48	0,161	0,159	85	0,2192412
0,049	14,991	550,9	549,0	99,76	99,96	0,161	0,159	86	0,2203934
0,049	15,055	550,8	549,0	99,54	99,56	0,161	0,159	87	0,2213142
0,049	15,022	550,8	548,9	99,62	99,76	0,161	0,159	88	0,2208549
0,049	15,022	550,8	548,9	99,48	99,76	0,161	0,159	89	0,2208546
0,047	14,755	550,9	549,0	101,24	101,57	0,161	0,159	90	0,216914
0,049	15,056	550,9	549,0	99,19	99,56	0,160	0,159	91	0,2213139
0,048	14,832	550,8	548,9	100,76	101,03	0,161	0,159	92	0,2180774
0,049	15,015	550,8	548,9	99,40	99,73	0,161	0,159	93	0,220855
0,048	14,935	550,8	548,8	99,79	100,24	0,160	0,159	94	0,2197033
0,049	14,983	550,7	548,7	99,67	99,95	0,161	0,159	95	0,220395
0,048	14,822	550,7	548,7	100,87	101,00	0,161	0,159	96	0,2180797
0,048	14,823	550,7	548,6	100,65	101,02	0,161	0,159	97	0,2180801
0,048	14,822	550,6	548,4	100,77	101,04	0,161	0,159	98	0,2180796
0,049	15,041	550,5	548,3	99,17	99,58	0,161	0,159	99	0,2213141
0,049	15,012	550,4	548,3	99,57	99,81	0,161	0,159	100	0,2208544
0,049	15,012	550,4	548,3	99,42	99,80	0,161	0,159	101	0,2208549
0,048	14,905	550,4	548,3	100,38	100,57	0,161	0,159	102	0,219241
0,048	14,827	550,3	548,2	100,84	101,13	0,161	0,159	103	0,21808
0,047	14,794	550,3	548,1	101,01	101,35	0,161	0,159	104	0,2176134
0,047	14,752	550,2	548,0	101,44	101,74	0,161	0,159	105	0,2169128
0,049	14,990	550,2	547,9	99,75	100,15	0,161	0,159	106	0,2203947
0,047	14,798	550,2	547,9	101,17	101,41	0,161	0,159	107	0,2176147
0,047	14,720	550,2	548,0	101,76	101,94	0,161	0,159	108	0,2164457
0,049	14,989	550,3	548,1	99,83	100,10	0,161	0,159	109	0,2203947
0,047	14,798	550,3	548,1	101,20	101,38	0,161	0,159	110	0,2176144
0,048	14,937	550,3	548,1	100,21	100,39	0,161	0,159	111	0,2197134
0,048	14,890	550,3	548,1	100,36	100,71	0,161	0,159	112	0,219017
0,049	14,980	550,2	548,0	99,74	100,13	0,161	0,159	113	0,2203168
0,049	14,984	550,2	548,0	99,79	100,09	0,161	0,159	114	0,2203943
0,047	14,797	550,3	548,1	101,07	101,36	0,161	0,159	115	0,2176146
0,048	14,945	550,3	548,2	100,02	100,43	0,161	0,159	116	0,2197017
0,049	15,050	550,3	548,2	99,56	99,67	0,161	0,159	117	0,2213133
0,049	15,027	550,3	548,1	99,89	99,95	0,161	0,159	118	0,220854
0,048	14,939	550,2	548,0	100,13	100,42	0,161	0,159	119	0,2197021
0,047	14,799	550,2	548,0	101,24	101,41	0,161	0,159	120	0,2176139
0,048	14,910	550,3	548,1	100,29	100,64	0,161	0,159	121	0,2192402

CSA B415.1 OE Calculations

Manufacturer: MESY  
 Model: Autopellet air

Run: 1  
 Project #: PI-20112  
 Test Duration: 121 min

	HHV	LHV
Eff	87,69%	93,77%
Comb Eff	99,50%	99,50%
HT Eff	88,13%	94,24%
Output	101 117	kJ/h
Burn Rate	5,70	kg/h
Grams CO	9	g
Input	115 316	kJ/h
MC wet	5,57	

Ultimate CO<sub>2</sub>  
 CO<sub>2-ult</sub> 20,28  
 F<sub>0</sub>  
 1,029

CSA B415.1 OE Calculations

		Air Fuel Ratio (A/F)	
Overall Heating Efficiency:	87,69%	Dry Molecular Weight ( $M_d$ )	30,12
Combustion Efficiency:	99,50%	Dry Moles Exhaust Gas ( $N_r$ ):	367,00 %HC
Heat Transfer Efficiency:	88,13%	Air Fuel Ratio (A/F)	10,54 0,8

Heat Output:	95 920 Btu/h	101 117 kJ/h
Heat Input:	109 390 Btu/h	115 316 kJ/h
Burn Duration:	2,00 h	
Burn Rate:	12,57 lb/h	5,705 kg/h
Stack Temp:	212,7 Deg. F	100,4 Deg. C

## Paramètres

Tous les facteurs de corrections et autres paramètres qui peuvent être modifiés par l'utilisateur du fichier sont regroupés ici.

Code verrouillage:

### Description du test

Test standard	B415
Run #	2
Date	02-09-2015
Technicien	m.m
Project #	PI-20112

### Description de l'unité

Manufacturier	MESY	
Modèle	Autopelletair	
Combustion system	Pellet	
Appliance type	pellet furnace	
Firebox volume	na	cu ft.
Appliance weight empty	na	lbs
Appliance weight full	na	lbs

### Paramètres du test

Logging time	1	min
Manufacturer's rated heat output	100 000	BTU/h Donnée fournie par le manfacturier
Targeted category	3	
Targeted output	65000	BTU/h
Cp steel	0,1	BTU/lb-°F

### Calibration Factor (flow meter)

Q obt (L/min)	Fc	
0,95	1	Dimensionless
1,9	1	Dimensionless
3,76	1	Dimensionless
11,35	1	Dimensionless
22,7	1	Dimensionless

1,028

### Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	1,007	Dimensionless
Equipment number (DGM #1):	EM-178	
Calibration Factor (DGM #2):	1,015	Dimensionless
Equipment number (DGM #2):	EM-179	

### Tunnel

Targeted tunnel flow rate	280	scfm
Tunnel diameter	8	in.
Molecular weight	29	May be assumed to be 28,56 (EPA) 28,78 (HYDRONIC)
Pitot tube type	Standard	Si B-415 = 29
Pitot tube coefficient	0,99	Dimensionless

### Fournaise

Fp	1,8500000	
Outlet section		
H	13,0000	in
W	9,1250	in
Section	0,8238	sqft
Surface duct	0,076532105	m2

<b>Project nu.</b>	PI-20112
<b>Date</b>	02-09-2015
<b>Technicien</b>	<input type="text" value="mm"/>

### Fuel data

Fuel type	Dimension
Fuel specie	Other
HHV	20214,0 kJ/kg
%C	50,4
%H	6,1
%O	42,9
%Ash	0,4
HHV	8691,0 Btu/lb
LHV	8178,0 Btu/lb

Default Fuel Values		
	D. Fir	Oak/Maple
HHV	19 810	19 887
%C	48,73	50
%H	6,87	6,6
%O	43,9	42,9
%Ash	0,5	0,5
HHV (Btu/lb)	8519	8552
LHV (Btu/lb)	7451	7480

## OverallEfficiency

### Totaux

Qout:	129603 Btu
Qin(HHV):	144824 Btu
Heat output rate:	61716 Btu/hr
Qin(LHV)	136275 Btu

### Emission rates

Et:	2,1 grams
Eg/MJ:	0,015
EIb/MM Btu output:	0,035
EIb/MM Btu Input	0,031
Eg/kg	0,273
Eg/h	0,989 g/h

### Delivered efficiency

ndel (HHV)	89,5%
ndel (LHV)	95,1%

		Load	Load	V	V	m	Delta h	Delta e	Et		Qout/h (avg)	Qout/h (i)	Target	
Time	Raw data row	Fuel weight	in	out	Standard									
(min)		(lbs)	°F	°F	m/s	Kg/hr	KJ/Kg	KJ/h	KJ	MJ	(Btu/h)(avg)	(Btu/h)(i)	(Btu/h)avg	
0,00	281,00	17,65	80,19	127,97	8,028	7,23	2398	27,25	65352	1089	1,09	61945	61945	
1,00	282,00	17,61	80,54	127,93	7,926	7,14	2368	27,03	64007	1067	1,07	61308	60670	65000
2,00	283,00	17,41	80,46	128,13	7,854	7,07	2346	27,19	63766	1063	1,06	61019	60442	65000
3,00	284,00	17,11	80,17	128,28	8,110	7,30	2422	27,44	66451	1108	1,11	61511	62987	65000
4,00	285,00	17,01	80,42	128,46	7,990	7,19	2385	27,40	65337	1089	1,09	61595	61931	65000
5,00	286,00	16,91	80,41	128,58	7,742	6,96	2310	27,47	63475	1058	1,06	61357	60166	65000
6,00	287,00	16,81	80,84	128,51	7,894	7,10	2356	27,19	64061	1068	1,07	61266	60722	65000
7,00	288,00	16,71	79,80	128,18	7,824	7,04	2337	27,59	64470	1074	1,07	61246	61109	65000
8,00	289,00	16,51	80,26	128,26	7,951	7,16	2374	27,38	65003	1083	1,08	61287	61614	65000
9,00	290,00	16,51	80,31	127,99	7,714	6,95	2304	27,19	62656	1044	1,04	61098	59390	65000
10,00	291,00	16,21	80,04	127,93	7,987	7,19	2386	27,31	65168	1086	1,09	61159	61771	65000
11,00	292,00	16,11	79,45	127,91	7,874	7,09	2353	27,64	65022	1084	1,08	61198	61632	65000
12,00	293,00	15,99	79,31	127,79	8,027	7,23	2399	27,65	66324	1105	1,11	61327	62867	65000
13,00	294,00	15,81	80,74	128,25	7,900	7,11	2359	27,10	63911	1065	1,07	61273	60579	65000
14,00	295,00	15,71	80,82	128,31	7,713	6,94	2303	27,08	62369	1039	1,04	61129	59118	65000
15,00	296,00	15,71	79,72	128,04	7,796	7,02	2329	27,56	64172	1070	1,07	61111	60827	65000
16,00	297,00	15,40	80,92	128,51	7,827	7,04	2336	27,14	63402	1057	1,06	61051	60097	65000
17,00	298,00	15,31	81,45	128,67	7,790	7,01	2324	26,93	62593	1043	1,04	60955	59330	65000
18,00	299,00	15,20	81,79	129,27	7,935	7,13	2365	27,08	64051	1068	1,07	60942	60711	65000
19,00	300,00	15,01	80,94	128,77	7,986	7,18	2383	27,28	65001	1083	1,08	60976	61613	65000
20,00	301,00	14,90	80,52	128,60	7,934	7,14	2368	27,42	64928	1082	1,08	61003	61543	65000
21,00	302,00	14,71	79,82	128,43	7,750	6,97	2314	27,72	64141	1069	1,07	60994	60797	65000
22,00	303,00	14,71	80,26	128,71	7,880	7,09	2351	27,63	64958	1083	1,08	61019	61572	65000
23,00	304,00	14,46	80,68	129,17	7,636	6,86	2276	27,66	62961	1049	1,05	60963	59678	65000
24,00	305,00	14,31	80,73	129,23	7,757	6,97	2312	27,67	63971	1066	1,07	60950	60636	65000
25,00	306,00	14,14	80,81	129,48	7,900	7,10	2354	27,76	65340	1089	1,09	60988	61934	65000
26,00	307,00	14,10	81,01	129,42	7,909	7,10	2357	27,61	65066	1084	1,08	61013	61674	65000
27,00	308,00	13,91	80,55	129,06	7,719	6,94	2302	27,66	63678	1061	1,06	60990	60358	65000
28,00	309,00	13,71	80,47	128,84	7,998	7,19	2386	27,59	65819	1097	1,10	61038	62387	65000
29,00	310,00	13,61	80,72	129,21	7,868	7,07	2365	27,66	64865	1081	1,08	61053	61483	65000
30,00	311,00	13,41	81,28	129,55	7,863	7,06	2343	27,53	64503	1075	1,08	61056	61140	65000
31,00	312,00	13,21	80,90	129,55	7,745	6,96	2307	27,74	64018	1067	1,07	61044	60680	65000
32,00	313,00	13,11	80,53	129,53	8,039	7,22	2395	27,95	66940	1116	1,12	61117	63451	65000
33,00	314,00	12,91	80,64	129,60	7,760	6,97	2312	27,92	64550	1076	1,08	61119	61185	65000
34,00	315,00	12,91	80,53	129,85	7,954	7,14	2368	28,13	66621	1110	1,11	61177	63148	65000
35,00	316,00	12,71	81,24	130,20	8,029	7,20	2389	27,92	66721	1112	1,11	61234	63443	65000
36,00	317,00	12,61	81,82	130,87	7,609	6,82	2262	27,98	63277	1055	1,05	61200	59978	65000
37,00	318,00	12,31	82,41	131,11	8,020	7,18	2383	27,78	66199	1103	1,10	61241	62748	65000
38,00	319,00	12,21	82,07	131,21	7,844	7,02	2330	28,03	65317	1089	1,09	61258	61912	65000
39,00	320,00	12,11	80,95	130,85	8,033	7,20	2388	28,46	67973	1133	1,13	61337	64429	65000
40,00	321,00	12,01	81,14	130,82	7,730	6,93	2298	28,33	65116	1085	1,09	61347	61721	65000
41,00	322,00	11,91	80,78	130,72	7,972	7,15	2371	28,48	67515	1125	1,13	61410	63995	65000
42,00	323,00	11,75	81,32	130,69	7,863	7,05	2338	28,15	65831	1097	1,10	61433	62399	65000
43,00	324,00	11,51	81,24	130,70	7,959	7,13	2367	28,21	66755	1113	1,11	61475	63275	65000
44,00	325,00	11,51	81,78	130,78	7,839	7,03	2331	27,95	65135	1086	1,09	61481	61740	65000
45,00	326,00	11,31	81,33	130,26	7,797	6,99	2320	27,90	64743	1079	1,08	61478	61367	65000
46,00	327,00	11,30	81,10	130,29	7,868	7,06	2341	28,06	65687	1095	1,09	61495	62262	65000
47,00	328,00	11,10	81,44	130,46	7,906	7,09	2352	27,96	65765	1096	1,10	61512	62337	65000
48,00	329,00	10,81	80,96	130,25	7,956	7,14	2368	28,11	66556	1109	1,11	61544	63086	65000
49,00	330,00	10,71	81,05	130,43	7,921	7,10	2356	28,17	66374	1106	1,11	61572	62914	65000
50,00	331,00	10,61	81,19	130,15	7,778	6,98	2315	27,92	64637	1077	1,08	61566	61268	65000
51,00	332,00	10,51	80,97	129,87	8,008	7,19	2385	27,89	66499	1108	1,11	61594	63032	65000
52,00	333,00	10,31	81,10	130,05	7,761	6,96	2310	27,92	64496	1075	1,07	61585	61134	65000
53,00	334,00	10,21	80,85	129,75	8,040	7,22	2395	27,89	66782	1113	1,11	61617	63300	65000
54,00	335,00	10,01	81,60	129,98	8,128	7,30	2420	27,59	66770	1113	1,11	61648	63289	65000
55,00	336,00	10,01	81,21	129,78	7,887	7,08	2349	27,70	65067	1084	1,08	61648	61675	65000
56,00	337,00	9,81	80,99	129,53	7,951	7,14	2369	27,68	65587	1093	1,09	61657	62168	65000
57,00	338,00	9,69	80,82	129,28	7,930	7,13	2364	27,64	65331	1089	1,09	61662	61925	65000
58,00	339,00	9,51	81,38	129,27	7,955	7,15	2371	27,32	64777	1080	1,08	61657	61400	65000
59,00	340,00	9,51	82,59	129,88	7,888	7,08	2349	26,97	63353	1056	1,06	61631	60051	65000
60,00	341,00	9,21	82,00	129,60	8,028	7,21	2392	27,15	64930	1082	1,08	61629	61545	65000
61,00	342,00	9,01	82,25	129,65	7,759	6,97	2311	27,03	62478	1041	1,04	61590	59221	65000
62,00	343,00	8,96	81,30	129,53	7,987	7,17	2380	27,51	65465	1091	1,09	61598	62053	65000
63,00	344,00	8,81	81,15	129,35	7,922	7,12	2361	27,49	64905	1082	1,08	61596	61521	65000
64,00	345,00	8,71	80,91	129,12	7,957	7,15	2373	27,49	65228	1087	1,09	61600	61828	65000
65,00	346,00	8,51	81,07	128,95	8,135	7,31	2426	27,30	66249	1104	1,10	61618	62795	65000
66,00	347,00	8,40	81,89	129,50	7,833	7,04	2334	27,15	63368	1056	1,06	61595	60065	65000
67,00	348,00	8,30	81,37	128,95	7,881	7,09	2350	27,14	63787	1063	1,06	61578	60462	65000
68,00	349,00	8,11	81,41	129,14	8,000	7,19	2385	27,22	64926	1082	1,08	61578	61541	65000
69,00	350,00	7,99	82,75	129,50	7,799	7,01	2324	26,66	61961	1033	1,03	61537	58731	65000
70,00	351,00	7,91	81,36	129,40	7,750	6,96	2309	27,40	63270	1054	1,05	61515	59971	65000
71,00	352,00	7,70	82,11	129,68	7,745	6,95	2307	27,13	62590	1043	1,04	61485	59327	65000
72,00	353,00	7,60	82,78	130,24	8,044	7,22	2394	27,06	64784	1080	1,08	61484	61407	65000
73,00	354,00	7,41	81,98	130,13	7,867	7,06	2342	27,47	64311	1072	1,07	61476	60958	65000
74,00	355,00	7,31	81,65	130,07	7,861	7,05	2340	27,62	64623	1077	1,08	61473	61254	65000
75,00	356,00	7,20	82,13	130,68	7,893	7,08	2347	27,69	64993	1083	1,08	61475	61605	65000
76,00	357,00	7,00	82,13	130,65	8,183	7,34	2433	27,68	67349	1122	1,12	61506	63838	65000
77,00	358,00	6,81	81,84	130,94	8,048	7,21	2392	28,00	66993	1117	1,12	61531	63500	65000
78,00	359,00	6,71	81,61	130,86	7,842	7,03	2331	28,09						



OverallEfficiency

108,00	389,00	2,40	82,17	131,89	7,759	6,94	2303	28,36	65292	1088	1,09	61689	61888	65000
109,00	390,00	2,30	82,63	131,91	8,015	7,17	2379	28,11	66860	1114	1,11	61704	63375	65000
110,00	391,00	2,20	82,99	132,07	7,954	7,11	2360	27,99	66046	1101	1,10	61712	62603	65000
111,00	392,00	2,00	82,41	131,84	7,953	7,11	2360	28,19	66533	1109	1,11	61724	63064	65000
112,00	393,00	1,84	83,21	131,56	8,038	7,19	2387	27,58	65817	1097	1,10	61730	62386	65000
113,00	394,00	1,70	83,24	131,69	7,929	7,10	2354	27,63	65040	1084	1,08	61729	61650	65000
114,00	395,00	1,60	83,96	132,12	8,021	7,17	2379	27,47	65351	1089	1,09	61731	61944	65000
115,00	396,00	1,40	82,85	131,72	8,039	7,19	2386	27,87	66502	1108	1,11	61743	63035	65000
116,00	397,00	1,13	82,85	131,74	7,785	6,97	2311	27,89	64441	1074	1,07	61737	61082	65000
117,00	398,00	1,10	83,28	131,80	7,683	6,87	2280	27,68	63106	1052	1,05	61721	59816	65000
118,00	399,00	0,99	82,78	131,46	7,964	7,13	2365	27,76	65668	1094	1,09	61725	62244	65000
119,00	400,00	0,90	82,32	131,02	8,018	7,18	2383	27,77	66173	1103	1,10	61733	62724	65000
120,00	401,00	0,70	82,16	130,66	7,959	7,13	2367	27,66	65473	1091	1,09	61736	62059	65000
121,00	402,00	0,60	82,19	130,61	7,959	7,14	2367	27,62	65372	1090	1,09	61738	61964	65000
122,00	403,00	0,40	82,94	130,82	7,729	6,93	2298	27,30	62741	1046	1,05	61720	59470	65000
123,00	404,00	0,30	82,27	130,72	8,030	7,20	2388	27,63	65968	1099	1,10	61726	62529	65000
124,00	405,00	0,10	83,10	130,77	7,909	7,09	2351	27,19	63929	1065	1,07	61717	60596	65000
125,00	406,00	0,00	82,39	130,72	7,922	7,10	2356	27,57	64935	1082	1,08	61716	61549	65000

	Start	End
Barometer (kPa):	101,6	101,4
Barometer (in.Hg):	30,002469	29,94340873
Dry Bulb (F):	76,4	86
Humidity (%):	69,3	57
Air velocity (ft/min)	18	19

DGM #1	Final:	10292,634	cuft
	Initial:	10271,444	cuft
DGM #2	Final:	8818,128	cuft
	Initial:	8797,719	cuft

	Final:	291454,920	Liter
	Initial:	290854,910	Liter
	Final:	249701,580	Liter
	Initial:	249123,640	Liter

Numéro de la ligne dans "Raw data" à partir duquel les données du VRAI test commencent

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Autres données à rentrer: dans preload data, load data, traverse et filter set weight

Pression statique (mmHg)	0,037
Pression statique (in.H2O)	0,200
consomation électrique (KWatt)	0,678

<b>Project nu.</b>	PI-20112
<b>Date</b>	02-09-2015
<b>Technicien</b>	m.m

**Preload data sheet**

Test Load Weight:

Lower      Ideal      Upper

##### ##### #VALEUR!

\* For boilers, a loading density factor of 10 lb/ft3 is applied

Load Volume:  cu. ft      Loading Density: #VALEUR!      lbs./ft3

Number of Spaces:       Load Density (wet): #DIV/0!      lbs./ft3  
 Spacer weight (lbs):       Dry Wood Density: #DIV/0!

Piece Size (in):			Weight lbs	Meter Moisture Content				Ave. MC x Weight	Volume Cubic Inches
Thick	Wide	x Length		Dry Uncorrected %					
			8,8	5,9				51,92	0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00
SUM MC:								51,92	

PreTest Load Weight:  lbs.

Dry Weight:  kg.

Dry:       Average Moisture Content: %      Wet:   
Must be 18-28      must be 15,2-22

**Project nu.** PI-20112  
**Date** 02-09-2015  
**Technicien**

**FUEL LOAD DATA SHEET, CSA B415**

Test Load Weight:

Lower Ideal Upper

#### ##### #####

\* For boilers, a loading density factor of 10 lb/ft3 is applied

Load Volume:  cu. ft

Loading Density: #VALEUR! lbs./ft3

Number of Spaces:   
 Spacer weight:  lbs

Load Density (wet): #DIV/0! lbs./ft3  
 Dry Wood Density: #DIV/0! lbs./ft3

Piece Size (in):			Weight lbs	Meter Moisture Content				Ave. MC x	Volume	Ave. MC
Thick	Wide	Length		Dry Uncorrected %				Weight	Cubic Inches	%
			17,65	5,90				104,11628	0,00	5,9
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
SUM MCx								104,11628		5,9 %

Test Load Weight:  lbs.

Dry Weight:  kg.

Average Moisture Content: %

Dry:  Dry(EPA) 5,90  
 Dry(B415) 5,90

Must be 18-28

Wet:   
 must be 15,2-22

Coal Bed Range:  lbs. to  lbs.

TEST CHARGE:

Coal bed weight:  lbs.  
 Must be between 10 and 25% of test load

Project nu. PI-20112  
 Date 02-09-2015  
 Technician AL

## Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,17 in. H2O  
 Barometer: 29,900 in. Hg

**Pour un tunnel de 12" et plus, prendre 6 lectures**

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center			0,0000
B center			0,0000
A1			0,0000
A2			0,0000
A3			0,0000
A4			0,0000
A5			0,0000
A6			0,0000
B1			0,0000
B2			0,0000
B3			0,0000
B4			0,0000
B5			0,0000
B6			0,0000
AVERAGE		#DIV/0!	0,0000

PITOT CONSTANT=  
0,999

**Pour un tunnel moins de 12", prendre 4 lectures**

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,048	78,0	0,2191
B center	0,047	78,3	0,2168
A1	0,047	78,1	0,2168
A2	0,050	78,1	0,2236
A3	0,053	78,2	0,2302
A4	0,047	78,2	0,2168
B1	0,048	78,3	0,2191
B2	0,049	78,3	0,2214
B3	0,045	78,4	0,2121
B4	0,041	78,4	0,2025
AVERAGE	0,0475	78,2	0,2178

<b>Project nu.</b>	PI-20112
<b>Date</b>	02-09-2015
<b>Technicien</b>	<span style="border: 1px solid red; padding: 2px;">m.m</span>

## Filter set weight

	System 1 (g) 1st hour				System 1 (g)				System 2 (g)				Ambient blank (g)	Date	Heure
	probe	front	back	gasket	probe	front	back	gasket	probe	front	back	gasket	Filter		
Before (1)															
Before (2)															
Before (3)	108,7839	0,1261	0,1263	10,3686	108,756	0,1252	0,1294	10,4308	109,0984	0,129	0,1215	10,2243	0,1254	2015-09-01	17:00
Before (4)	108,784	0,126	0,1264	10,3688	108,756	0,1253	0,1295	10,431	109,0984	0,1292	0,1214	10,2245	0,1255	2015-09-02	09:00
After (1)	108,7841	0,1261	0,1267	10,3722	108,756	0,1255	0,1296	10,4351	109,0986	0,1301	0,1214	10,2275	0,1255	2015-09-02	15:00
After (2)	108,784	0,1262	0,1264	10,3694	108,756	0,1256	0,1295	10,4314	109,0984	0,13	0,1214	10,2248	0,1256	2015-09-15	16:15
After (3)	108,784	0,1262	0,1264	10,3692	108,756	0,1256	0,1295	10,4313	109,0984	0,13	0,1214	10,2248	0,1255	2015-09-21	16:00
After (4)															
After (5)															
After (6)	108,784	0,1262	0,1264	10,3692	108,756	0,1256	0,1295	10,4313	109,0984	0,13	0,1214	10,2248	0,1255	2015-09-21	16:00
Difference	0,0000	0,0002	0,0000	0,0004	0,0000	0,0003	0,0000	0,0003	0,0000	0,0008	0,0000	0,0003	0,0000		
Total (mg)		0,6				1,2				1,1			0		
Total ajusté (mg)		<b>0,60</b>				<b>1,20</b>				<b>1,10</b>			<b>0,00</b>		

<b>Project nu.</b>	PI-20112
<b>Date</b>	02-09-2015
<b>Technicien</b>	M.M

SFBA EPA EMISSION RESULTS

RESULTS

**Average emission rate:** 1,0 g/hr

Burn Rate : 3,628 Dry kg/hr

**Test Duration:** 125 min

PRESSURE FACTOR: DGM 1 0,97840  
DGM 2 0,98549

TEMPERATURE FACTORS  
DGM 1 0,96969  
DGM 2 0,97404

VOLUMES SAMPLED  
DGM 1 20,24180 Scft  
DGM 2 19,88534 Scft

TOTAL TUNNEL VOLUME : 35961 Scft

SAMPLE RATIOS  
Sample Train 1: 1776,578  
Sample Train 2: 1808,425

TOTAL EMISSIONS  
Sample Train 1 2,13 g  
Sample Train 2 1,99 g

EMISSION RATES  
Sample Train 1 1,02 g/hr  
Sample Train 2 0,95 g/hr

1st hour emission rate 1,07 g/hr

DEVIATION: 3,46%

Cs Train 1 Train 2  
5,928E-05 5,53171E-05

BAROMETRIC PRESSURE  
Average: 29,973 in Hg  
Start: 30,002 in Hg  
End: 29,943 in Hg

DRY GAS METER VALUES

DGM #1 Final: 10292,634 Cuft  
Initial: 10271,444 Cuft

DGM #2 Final: 8818,128 Cuft  
Initial: 8797,719 Cuft

TEMPERATURES  
DGM #1 544,502 °R  
DGM #2 542,074 °R

CALIBRATION FACTORS  
DGM #1 1,0069  
DGM #2 1,0150

TUNNEL FLOW RATE: 287,689 Dscfm

PARTICULATE CATCH  
Total Sample Train 1: 1,20 mg  
Total Sample Train 2: 1,10 mg  
Total Sample Train 1 1st hour: 0,60 mg

Particulates Calculations

Average Stove Temperature: #####								
Moisture content of wood (wet basis): 0,00								
		Average	#DIV/0!	10,88	9,13	159,63	83,54	90,98
*		*	*	*	*	*1	*2	*3
Elapsed		Weight				Flue	Room	Tunnel
Time	Raw data row	Remaining	CO	CO <sub>2</sub>	O <sub>2</sub>	Gas	Temp	Dry Bulb
min		lbs	%	%	%	°F	°F	°F
0,00	281,00	17,6	0,0	10,7	9,3	158,9	82,2	89,8
1,0	282,0	17,6	0,0	11,4	8,6	158,9	82,1	89,9
2,0	283,0	17,4	0,0	11,9	8,2	159,4	82,1	90,2
3,0	284,0	17,1	0,0	11,4	8,6	159,2	82,0	90,0
4,0	285,0	17,0	0,0	10,8	9,2	159,1	82,2	90,0
5,0	286,0	16,9	0,0	10,3	9,8	158,9	81,7	89,9
6,0	287,0	16,8	0,0	10,4	9,6	158,5	81,9	90,1
7,0	288,0	16,7	0,0	9,9	10,2	158,1	81,9	89,5
8,0	289,0	16,5	0,0	9,9	10,2	157,9	81,6	89,7
9,0	290,0	16,5	0,0	11,2	8,9	158,1	81,8	89,3
10,0	291,0	16,2	0,0	10,9	9,1	158,4	81,8	89,4
11,0	292,0	16,1	0,0	11,7	8,3	158,6	81,6	89,6
12,0	293,0	16,0	0,0	10,7	9,3	158,4	81,9	89,8
13,0	294,0	15,8	0,0	10,9	9,2	158,6	81,8	89,5
14,0	295,0	15,7	0,0	10,5	9,6	158,3	81,9	89,7
15,0	296,0	15,7	0,0	10,0	10,1	158,5	82,2	89,8
16,0	297,0	15,4	0,0	11,1	9,0	158,5	82,3	90,0
17,0	298,0	15,3	0,0	10,6	9,4	158,4	82,4	90,0
18,0	299,0	15,2	0,0	10,6	9,5	158,2	82,4	90,1
19,0	300,0	15,0	0,0	10,9	9,1	158,3	82,7	90,1
20,0	301,0	14,9	0,0	10,6	9,4	158,2	82,4	90,2
21,0	302,0	14,7	0,0	11,4	8,7	158,8	82,3	90,4
22,0	303,0	14,7	0,0	11,9	8,2	159,4	82,4	90,5
23,0	304,0	14,5	0,0	11,0	9,2	159,0	82,3	90,4
24,0	305,0	14,3	0,0	10,7	9,4	158,7	82,5	90,5
25,0	306,0	14,1	0,0	10,9	9,1	158,8	82,6	90,5
26,0	307,0	14,1	0,0	10,4	9,6	158,6	82,6	90,0
27,0	308,0	13,9	0,0	9,7	10,3	158,4	82,4	90,4
28,0	309,0	13,7	0,0	10,8	9,2	158,6	82,3	90,3
29,0	310,0	13,6	0,0	11,6	8,5	159,0	82,4	90,3
30,0	311,0	13,4	0,0	12,1	8,0	159,6	82,9	90,1
31,0	312,0	13,2	0,0	11,6	8,4	159,6	82,9	90,3
32,0	313,0	13,1	0,0	11,2	8,8	159,5	82,5	90,6
33,0	314,0	12,9	0,0	11,2	8,9	159,7	82,7	90,7
34,0	315,0	12,9	0,0	11,1	8,9	159,9	82,3	90,7
35,0	316,0	12,7	0,0	11,4	8,6	159,8	82,4	90,6
36,0	317,0	12,6	0,0	11,7	8,3	160,1	82,5	90,3
37,0	318,0	12,3	0,0	11,4	8,7	160,2	82,7	90,0
38,0	319,0	12,2	0,0	11,4	8,7	159,9	83,0	90,0
39,0	320,0	12,1	0,0	11,2	8,9	160,3	83,1	90,4
40,0	321,0	12,0	0,0	11,0	9,0	160,0	83,6	90,6
41,0	322,0	11,9	0,0	10,6	9,4	159,8	83,3	90,6
42,0	323,0	11,7	0,0	10,7	9,3	159,6	83,3	90,7
43,0	324,0	11,5	0,0	10,3	9,8	159,6	82,9	90,9
44,0	325,0	11,5	0,0	10,8	9,2	159,9	83,0	90,6
45,0	326,0	11,3	0,0	10,8	9,1	159,9	83,3	90,6
46,0	327,0	11,3	0,0	10,6	9,5	159,9	83,0	90,6
47,0	328,0	11,1	0,0	11,7	8,3	160,0	83,3	90,7
48,0	329,0	10,8	0,0	11,4	8,6	159,9	83,2	90,6
49,0	330,0	10,7	0,0	10,3	9,7	159,7	83,2	90,6
50,0	331,0	10,6	0,0	10,6	9,5	159,5	83,0	90,4
51,0	332,0	10,5	0,0	10,4	9,6	159,7	83,3	90,5
52,0	333,0	10,3	0,0	10,5	9,6	159,7	83,3	90,8
53,0	334,0	10,2	0,0	10,8	9,2	159,8	83,3	90,8
54,0	335,0	10,0	0,0	10,7	9,4	159,9	83,4	90,7
55,0	336,0	10,0	0,0	10,2	9,8	159,3	83,4	90,5
56,0	337,0	9,8	0,0	10,4	9,6	159,3	83,4	90,8
57,0	338,0	9,7	0,0	11,1	8,9	159,5	83,2	90,9
58,0	339,0	9,5	0,0	10,6	9,5	159,3	83,4	91,2
59,0	340,0	9,5	0,0	10,8	9,2	159,4	83,8	91,5
60,0	341,0	9,2	0,0	10,2	9,8	159,4	83,8	91,4
61,0	342,0	9,0	0,0	11,1	8,9	159,5	83,8	91,3
62,0	343,0	9,0	0,0	10,8	9,2	159,5	84,0	91,3
63,0	344,0	8,8	0,0	10,0	10,1	159,1	84,2	90,7
64,0	345,0	8,7	0,0	10,5	9,5	159,0	83,5	90,8
65,0	346,0	8,5	0,0	10,3	9,7	159,2	83,1	90,8



Particulates Calculations

66,0	347,0	8,4	0,0	10,4	9,7	159,1	83,2	91,1
67,0	348,0	8,3	0,0	10,6	9,4	158,9	83,5	90,5
68,0	349,0	8,1	0,0	10,9	9,1	159,0	83,7	90,5
69,0	350,0	8,0	0,0	11,2	8,8	159,1	84,0	90,6
70,0	351,0	7,9	0,0	10,8	9,2	159,1	84,0	90,7
71,0	352,0	7,7	0,0	10,7	9,3	159,4	83,9	90,2
72,0	353,0	7,6	0,0	11,4	8,6	159,4	83,8	91,0
73,0	354,0	7,4	0,0	11,3	8,7	159,4	84,1	90,6
74,0	355,0	7,3	0,0	12,0	8,0	159,7	84,1	90,9
75,0	356,0	7,2	0,0	11,8	8,1	159,8	83,8	91,4
76,0	357,0	7,0	0,0	11,1	8,9	160,1	84,6	91,1
77,0	358,0	6,8	0,0	11,3	8,8	160,1	84,4	91,3
78,0	359,0	6,7	0,0	10,9	9,0	160,2	84,4	91,6
79,0	360,0	6,5	0,0	10,7	9,3	159,9	83,9	91,4
80,0	361,0	6,3	0,0	10,2	9,8	159,8	84,2	91,5
81,0	362,0	6,2	0,0	10,4	9,6	159,6	84,3	91,5
82,0	363,0	6,1	0,0	10,3	9,7	159,9	84,4	91,4
83,0	364,0	6,0	0,0	10,2	9,8	159,8	84,4	91,3
84,0	365,0	5,9	0,0	10,2	9,8	159,8	84,6	90,7
85,0	366,0	5,7	0,0	9,9	10,1	159,2	84,9	91,3
86,0	367,0	5,6	0,0	10,4	9,6	159,4	85,5	91,3
87,0	368,0	5,4	0,0	10,6	9,4	159,7	84,7	91,4
88,0	369,0	5,3	0,0	11,3	8,6	159,8	84,2	91,5
89,0	370,0	5,1	0,0	12,0	7,9	160,2	84,2	91,8
90,0	371,0	5,0	0,0	11,0	8,9	160,1	84,5	91,4
91,0	372,0	4,8	0,0	10,8	9,2	159,7	84,2	91,3
92,0	373,0	4,8	0,0	10,3	9,8	159,6	83,9	91,5
93,0	374,0	4,6	0,0	10,8	9,1	159,5	84,1	91,4
94,0	375,0	4,4	0,0	11,5	8,5	159,9	84,4	91,7
95,0	376,0	4,2	0,0	11,2	8,8	159,8	84,8	91,5
96,0	377,0	4,2	0,0	11,4	8,6	160,3	84,4	91,4
97,0	378,0	3,9	0,0	11,5	8,5	159,9	84,1	91,6
98,0	379,0	3,9	0,0	11,7	8,2	160,1	83,9	91,8
99,0	380,0	3,7	0,0	11,3	8,6	160,0	84,3	91,7
100,0	381,0	3,5	0,0	11,2	8,7	160,1	84,2	91,6
101,0	382,0	3,3	0,0	11,4	8,6	160,2	84,1	91,9
102,0	383,0	3,2	0,0	11,2	8,7	160,3	84,2	91,7
103,0	384,0	3,1	0,0	11,0	9,0	160,2	84,7	91,8
104,0	385,0	3,0	0,0	10,9	9,1	160,4	84,6	91,8
105,0	386,0	2,8	0,0	11,2	8,8	160,6	84,4	91,8
106,0	387,0	2,7	0,0	11,4	8,6	160,8	84,2	92,0
107,0	388,0	2,4	0,0	11,8	8,1	161,2	84,1	92,2
108,0	389,0	2,4	0,0	10,7	9,3	161,1	84,3	92,1
109,0	390,0	2,3	0,0	10,1	9,9	161,0	84,7	92,3
110,0	391,0	2,2	0,0	10,6	9,5	160,8	84,8	92,4
111,0	392,0	2,0	0,0	11,0	9,0	161,0	84,8	92,5
112,0	393,0	1,8	0,0	10,7	9,3	161,0	84,9	92,7
113,0	394,0	1,7	0,0	10,9	9,1	161,0	84,8	92,4
114,0	395,0	1,6	0,0	10,9	9,1	160,9	85,0	92,6
115,0	396,0	1,4	0,0	11,5	8,5	161,1	85,4	92,7
116,0	397,0	1,1	0,0	11,3	8,6	161,3	85,2	92,1
117,0	398,0	1,1	0,0	10,2	9,8	160,6	85,2	92,5
118,0	399,0	1,0	0,0	10,3	9,6	160,3	85,5	92,5
119,0	400,0	0,9	0,0	10,3	9,7	160,5	85,1	92,4
120,0	401,0	0,7	0,0	10,3	9,7	160,4	84,9	92,3
121,0	402,0	0,6	0,0	10,8	9,1	160,5	85,0	92,5
122,0	403,0	0,4	0,0	10,5	9,5	160,5	84,8	92,3
123,0	404,0	0,3	0,0	10,7	9,3	160,5	84,7	92,2
124,0	405,0	0,1	0,0	11,0	9,0	160,4	84,6	91,9
125,0	406,0	0,0	0,0	11,1	8,9	160,4	84,7	91,6

Particulates Calculations

85,04

84,33

0,16	84,76	84,25	83,41	0,16	82,29	81,86	82,86	0,05	0,21
Mass flow 1	Mass flow 1	Mass flow 1	Filter 1	Mass flow 2	Mass flow 2	Mass flow 2	Filter 2	Tunnel Veloc	Flue draft
Reading	Inlet T	Outlet T	Temp	Reading	Inlet T	Outlet T	Temp	Pressure	Pressure
cuft/min	oF	oF	oF	cuft/min	oF	oF	oF	in wc	in wc
0,16	83,08	82,64	81,00	0,16	80,74	80,38	80,54	0,05	0,20
0,16	83,15	82,79	81,06	0,16	80,82	80,40	80,59	0,05	0,20
0,16	83,19	82,82	81,08	0,16	80,82	80,44	80,60	0,05	0,20
0,16	83,26	82,88	81,11	0,16	80,95	80,56	80,64	0,05	0,20
0,16	83,24	82,90	81,18	0,16	80,83	80,46	80,66	0,05	0,20
0,16	83,20	82,88	81,21	0,16	80,75	80,46	80,72	0,05	0,21
0,16	83,22	82,88	81,24	0,16	80,81	80,47	80,76	0,05	0,21
0,16	83,27	82,90	81,28	0,16	80,85	80,47	80,79	0,05	0,20
0,16	83,23	82,88	81,28	0,16	80,74	80,36	80,88	0,05	0,20
0,16	83,19	82,86	81,30	0,16	80,72	80,34	80,93	0,05	0,20
0,16	83,19	82,85	81,33	0,16	80,68	80,32	80,95	0,05	0,20
0,16	83,19	82,86	81,34	0,16	80,65	80,29	81,01	0,05	0,20
0,16	83,14	82,82	81,38	0,16	80,58	80,28	81,05	0,05	0,20
0,16	83,18	82,84	81,39	0,16	80,67	80,31	81,09	0,05	0,20
0,16	83,24	82,88	81,47	0,16	80,74	80,38	81,15	0,05	0,21
0,16	83,29	82,92	81,55	0,16	80,86	80,48	81,20	0,05	0,21
0,16	83,43	83,00	81,68	0,16	81,09	80,64	81,27	0,05	0,20
0,16	83,51	83,07	81,72	0,16	81,17	80,71	81,34	0,05	0,20
0,16	83,61	83,15	81,79	0,16	81,29	80,83	81,43	0,05	0,20
0,16	83,70	83,22	81,88	0,16	81,41	80,94	81,50	0,05	0,21
0,16	83,73	83,23	81,90	0,16	81,40	80,95	81,53	0,05	0,21
0,16	83,74	83,26	81,96	0,16	81,40	80,98	81,61	0,05	0,21
0,16	83,79	83,31	81,95	0,16	81,47	81,04	81,66	0,05	0,21
0,16	83,76	83,33	81,98	0,16	81,39	81,02	81,68	0,05	0,20
0,16	83,82	83,36	82,03	0,16	81,50	81,07	81,75	0,05	0,21
0,16	83,87	83,41	82,08	0,16	81,53	81,15	81,80	0,05	0,21
0,16	83,88	83,41	82,16	0,16	81,50	81,13	81,85	0,05	0,20
0,16	83,88	83,42	82,16	0,16	81,50	81,13	81,92	0,05	0,20
0,16	83,88	83,44	82,19	0,16	81,48	81,13	81,96	0,05	0,20
0,16	83,86	83,43	82,22	0,16	81,45	81,10	82,01	0,05	0,21
0,16	83,93	83,48	82,25	0,16	81,55	81,17	82,04	0,05	0,21
0,16	83,97	83,49	82,35	0,16	81,59	81,17	82,09	0,05	0,20
0,16	83,97	83,50	82,36	0,16	81,55	81,17	82,16	0,05	0,21
0,16	83,94	83,51	82,40	0,16	81,50	81,15	82,17	0,05	0,21
0,16	83,91	83,50	82,37	0,16	81,41	81,10	82,19	0,05	0,21
0,16	83,87	83,49	82,38	0,16	81,39	81,10	82,24	0,05	0,21
0,16	83,94	83,55	82,41	0,16	81,56	81,21	82,27	0,05	0,20
0,16	84,02	83,59	82,49	0,16	81,63	81,23	82,30	0,05	0,21
0,16	84,06	83,60	82,55	0,16	81,70	81,28	82,38	0,05	0,21
0,16	84,16	83,67	82,67	0,16	81,84	81,39	82,45	0,05	0,21
0,16	84,24	83,72	82,72	0,16	81,95	81,47	82,47	0,05	0,21
0,16	84,34	83,78	82,74	0,16	82,08	81,57	82,51	0,05	0,20
0,16	84,36	83,81	82,74	0,16	82,07	81,61	82,54	0,05	0,21
0,16	84,39	83,87	82,74	0,16	82,12	81,66	82,57	0,05	0,21
0,16	84,45	83,91	82,75	0,16	82,13	81,68	82,62	0,05	0,21
0,16	84,40	83,91	82,81	0,16	82,04	81,66	82,64	0,05	0,21
0,16	84,39	83,92	82,80	0,16	82,01	81,67	82,65	0,05	0,20
0,16	84,42	83,95	82,77	0,16	82,03	81,69	82,70	0,05	0,20
0,16	84,39	83,96	82,78	0,16	81,99	81,68	82,69	0,05	0,20
0,16	84,42	83,99	82,81	0,16	82,01	81,71	82,73	0,05	0,21
0,16	84,43	84,00	82,82	0,16	82,06	81,74	82,77	0,05	0,21
0,16	84,44	83,99	82,86	0,16	82,06	81,72	82,78	0,05	0,21
0,16	84,49	84,04	82,90	0,16	82,12	81,77	82,81	0,05	0,21
0,16	84,49	84,03	82,92	0,16	82,07	81,71	82,85	0,05	0,21
0,16	84,48	84,05	82,90	0,16	82,04	81,69	82,85	0,05	0,21
0,16	84,57	84,07	82,92	0,16	82,16	81,75	82,86	0,04	0,21
0,16	84,59	84,08	82,88	0,16	82,18	81,70	82,91	0,05	0,21
0,16	84,58	84,08	82,91	0,16	82,15	81,71	82,89	0,05	0,21
0,16	84,65	84,11	82,98	0,16	82,24	81,77	82,93	0,05	0,21
0,16	84,73	84,17	82,98	0,16	82,36	81,84	82,97	0,05	0,21
0,16	84,87	84,24	84,79	0,16	82,55	82,01	83,01	0,05	0,21
0,16	84,90	84,29	84,89	0,16	82,61	82,04	83,04	0,05	0,21
0,16	85,05	84,38	84,88	0,16	82,81	82,18	83,09	0,05	0,21
0,16	85,10	84,43	84,81	0,16	82,83	82,19	83,11	0,05	0,20
0,16	85,03	84,41	84,68	0,16	82,62	82,12	83,14	0,05	0,21
0,16	84,95	84,36	84,53	0,16	82,46	82,00	83,15	0,05	0,21

Particulates Calculations

0,16	84,90	84,36	84,39	0,16	82,42	81,99	83,16	0,05	0,20
0,16	84,96	84,39	84,34	0,16	82,50	82,03	83,18	0,05	0,21
0,16	85,02	84,43	84,26	0,16	82,59	82,08	83,16	0,05	0,21
0,16	85,02	84,44	84,23	0,16	82,58	82,08	83,20	0,05	0,21
0,16	85,07	84,46	84,27	0,16	82,64	82,15	83,24	0,05	0,21
0,16	85,13	84,52	84,29	0,16	82,70	82,21	83,26	0,05	0,21
0,16	85,13	84,56	84,22	0,16	82,72	82,25	83,27	0,05	0,21
0,16	85,22	84,60	84,21	0,16	82,83	82,33	83,32	0,05	0,21
0,16	85,31	84,67	84,20	0,16	82,95	82,41	83,34	0,05	0,21
0,16	85,34	84,69	84,18	0,16	82,96	82,43	83,34	0,05	0,21
0,16	85,39	84,74	84,20	0,16	82,98	82,44	83,36	0,05	0,21
0,16	85,46	84,78	84,22	0,16	83,10	82,53	83,41	0,05	0,21
0,16	85,51	84,82	84,26	0,16	83,14	82,54	83,43	0,05	0,21
0,16	85,52	84,84	84,24	0,16	83,08	82,52	83,47	0,05	0,21
0,16	85,54	84,85	84,23	0,16	83,08	82,53	83,45	0,05	0,21
0,16	85,53	84,85	84,25	0,16	83,06	82,55	83,50	0,05	0,21
0,16	85,53	84,89	84,32	0,16	83,11	82,57	83,54	0,05	0,21
0,16	85,56	84,93	84,40	0,16	83,12	82,61	83,57	0,05	0,21
0,16	85,58	84,95	84,40	0,16	83,13	82,62	83,61	0,05	0,21
0,16	85,65	84,98	84,46	0,16	83,18	82,70	83,66	0,05	0,21
0,16	85,75	85,10	84,57	0,16	83,38	82,86	83,74	0,05	0,21
0,16	85,73	85,09	84,57	0,16	83,28	82,78	83,76	0,05	0,21
0,16	85,62	85,04	84,52	0,16	83,04	82,65	83,76	0,05	0,21
0,16	85,61	85,02	84,50	0,16	83,01	82,62	83,77	0,05	0,21
0,16	85,60	85,02	84,50	0,16	83,00	82,65	83,81	0,05	0,21
0,16	85,58	85,03	84,50	0,16	82,98	82,63	83,79	0,05	0,20
0,16	85,48	84,99	84,45	0,16	82,83	82,50	83,82	0,05	0,21
0,16	85,45	84,98	84,44	0,16	82,83	82,50	83,82	0,05	0,21
0,16	85,50	85,00	84,45	0,16	82,88	82,53	83,83	0,05	0,20
0,16	85,57	85,03	84,51	0,16	83,01	82,60	83,85	0,05	0,21
0,16	85,58	85,05	84,52	0,16	82,95	82,53	83,87	0,05	0,21
0,16	85,52	85,03	84,49	0,16	82,85	82,47	83,89	0,05	0,21
0,16	85,45	85,01	84,45	0,16	82,74	82,40	83,89	0,05	0,21
0,16	85,42	85,00	84,48	0,16	82,70	82,37	83,90	0,05	0,21
0,16	85,41	84,97	84,49	0,16	82,73	82,37	83,89	0,05	0,21
0,16	85,41	85,00	84,48	0,16	82,77	82,40	83,91	0,05	0,21
0,16	85,53	85,06	84,50	0,16	82,95	82,52	83,91	0,05	0,21
0,16	85,67	85,13	84,56	0,16	83,13	82,65	83,96	0,05	0,21
0,16	85,71	85,18	84,60	0,16	83,14	82,62	84,00	0,05	0,21
0,16	85,68	85,15	84,56	0,16	83,00	82,58	83,97	0,05	0,21
0,16	85,63	85,12	84,56	0,16	82,93	82,51	84,00	0,05	0,21
0,16	85,58	85,11	84,56	0,16	82,83	82,46	84,00	0,05	0,21
0,16	85,64	85,14	84,61	0,16	82,97	82,55	84,00	0,05	0,21
0,16	85,75	85,19	84,71	0,16	83,14	82,64	84,07	0,05	0,21
0,16	85,79	85,25	84,75	0,16	83,17	82,67	84,08	0,05	0,21
0,16	85,87	85,29	84,80	0,16	83,33	82,76	84,10	0,05	0,21
0,16	85,85	85,32	84,84	0,16	83,22	82,74	84,11	0,05	0,21
0,16	85,94	85,36	84,83	0,16	83,34	82,82	84,13	0,05	0,21
0,16	86,04	85,44	84,85	0,16	83,48	82,92	84,16	0,05	0,21
0,16	86,13	85,48	84,93	0,16	83,59	82,97	84,18	0,05	0,20
0,16	86,06	85,47	84,92	0,16	83,44	82,90	84,20	0,05	0,21
0,16	86,08	85,47	84,96	0,16	83,41	82,95	84,22	0,05	0,21
0,16	86,16	85,55	85,01	0,16	83,57	83,00	84,28	0,05	0,21
0,16	86,15	85,53	85,04	0,16	83,52	83,00	84,30	0,05	0,21
0,16	86,12	85,53	85,00	0,16	83,48	82,94	84,30	0,05	0,21
0,16	86,07	85,50	84,97	0,16	83,37	82,95	84,27	0,05	0,21
0,16	86,05	85,51	84,97	0,16	83,32	82,94	84,29	0,05	0,20
0,16	86,07	85,55	84,96	0,16	83,37	82,96	84,32	0,05	0,21
0,16	86,08	85,56	84,92	0,16	83,43	83,00	84,32	0,05	0,21
0,16	86,14	85,59	84,93	0,16	83,47	83,03	84,33	0,05	0,21

Particulates Calculations

	0,16				0,16				90,98	Filter	Filter
Elapsed	DGM 1	DGM 1	DGM 1	DGM 2	DGM 2	DGM 2	Tunnel		Face	Face	
Time	Reading	Inlet T	Outlet T	Reading	Inlet T	Outlet T	Dry Bulb		Velocity	Velocity	
min	Cuft/min	°F	°F	Cuft/min	°F	°F	°F		Ft/sec	Ft/sec	
0,00	0,162	83,08	82,64	0,160	80,739	80,375	89,788				
1,00	0,162	83,15	82,79	0,160	80,819	80,403	89,893		13,66	13,69	
2,00	0,162	83,19	82,82	0,160	80,819	80,444	90,228		13,66	13,69	
3,00	0,162	83,26	82,88	0,160	80,955	80,558	90,006		13,67	13,69	
4,00	0,162	83,24	82,90	0,160	80,830	80,456	90,023		13,69	13,69	
5,00	0,161	83,20	82,88	0,160	80,747	80,457	89,885		13,67	13,69	
6,00	0,161	83,22	82,88	0,160	80,809	80,471	90,077		13,63	13,69	
7,00	0,162	83,27	82,90	0,160	80,848	80,475	89,531		13,64	13,69	
8,00	0,162	83,23	82,88	0,160	80,741	80,364	89,700		13,67	13,69	
9,00	0,162	83,19	82,86	0,160	80,716	80,342	89,341		13,67	13,69	
10,00	0,162	83,19	82,85	0,160	80,678	80,315	89,450		13,67	13,69	
11,00	0,162	83,19	82,86	0,160	80,654	80,292	89,648		13,68	13,69	
12,00	0,161	83,14	82,82	0,160	80,583	80,279	89,829		13,66	13,70	
13,00	0,162	83,18	82,84	0,160	80,665	80,312	89,524		13,65	13,69	
14,00	0,161	83,24	82,88	0,160	80,743	80,384	89,742		13,65	13,69	
15,00	0,162	83,29	82,92	0,160	80,862	80,479	89,842		13,65	13,69	
16,00	0,161	83,43	83,00	0,160	81,086	80,643	89,968		13,65	13,68	
17,00	0,162	83,51	83,07	0,160	81,171	80,712	90,049		13,66	13,68	
18,00	0,162	83,61	83,15	0,160	81,290	80,828	90,062		13,67	13,68	
19,00	0,162	83,70	83,22	0,160	81,413	80,941	90,121		13,65	13,68	
20,00	0,162	83,73	83,23	0,160	81,398	80,947	90,171		13,64	13,68	
21,00	0,162	83,74	83,26	0,160	81,400	80,982	90,416		13,64	13,68	
22,00	0,161	83,79	83,31	0,160	81,466	81,044	90,462		13,64	13,67	
23,00	0,162	83,76	83,33	0,160	81,385	81,017	90,439		13,64	13,67	
24,00	0,162	83,82	83,36	0,160	81,499	81,065	90,465		13,65	13,67	
25,00	0,162	83,87	83,41	0,160	81,530	81,155	90,477		13,66	13,67	
26,00	0,162	83,88	83,41	0,160	81,500	81,127	89,961		13,65	13,67	
27,00	0,162	83,88	83,42	0,160	81,496	81,132	90,360		13,64	13,67	
28,00	0,162	83,88	83,44	0,160	81,484	81,127	90,282		13,64	13,67	
29,00	0,161	83,86	83,43	0,160	81,446	81,099	90,316		13,64	13,67	
30,00	0,162	83,93	83,48	0,160	81,551	81,166	90,107		13,64	13,67	
31,00	0,162	83,97	83,49	0,160	81,594	81,172	90,322		13,64	13,67	
32,00	0,162	83,97	83,50	0,160	81,551	81,167	90,637		13,65	13,67	
33,00	0,162	83,94	83,51	0,160	81,499	81,148	90,664		13,65	13,67	
34,00	0,162	83,91	83,50	0,160	81,411	81,103	90,680		13,65	13,67	
35,00	0,162	83,87	83,49	0,160	81,389	81,103	90,614		13,64	13,67	
36,00	0,161	83,94	83,55	0,160	81,559	81,211	90,310		13,63	13,67	
37,00	0,161	84,02	83,59	0,160	81,626	81,232	89,965		13,61	13,67	
38,00	0,162	84,06	83,60	0,160	81,702	81,278	89,977		13,62	13,67	
39,00	0,161	84,16	83,67	0,160	81,836	81,385	90,436		13,63	13,66	
40,00	0,162	84,24	83,72	0,160	81,947	81,472	90,630		13,63	13,66	
41,00	0,162	84,34	83,78	0,160	82,077	81,571	90,646		13,64	13,66	
42,00	0,161	84,36	83,81	0,160	82,073	81,606	90,747		13,63	13,66	
43,00	0,161	84,39	83,87	0,160	82,117	81,662	90,931		13,61	13,66	
44,00	0,162	84,45	83,91	0,160	82,125	81,684	90,638		13,62	13,66	
45,00	0,161	84,40	83,91	0,160	82,044	81,665	90,648		13,62	13,66	
46,00	0,162	84,39	83,92	0,160	82,014	81,669	90,621		13,64	13,66	
47,00	0,162	84,42	83,95	0,160	82,032	81,688	90,708		13,64	13,66	
48,00	0,162	84,39	83,96	0,160	81,988	81,684	90,642		13,63	13,66	
49,00	0,161	84,42	83,99	0,160	82,013	81,715	90,615		13,63	13,66	
50,00	0,161	84,43	84,00	0,160	82,055	81,736	90,400		13,61	13,66	
51,00	0,161	84,44	83,99	0,160	82,059	81,717	90,461		13,61	13,66	
52,00	0,162	84,49	84,04	0,160	82,120	81,769	90,754		13,62	13,65	
53,00	0,161	84,49	84,03	0,160	82,066	81,708	90,823		13,61	13,66	
54,00	0,162	84,48	84,05	0,160	82,044	81,695	90,694		13,62	13,66	
55,00	0,162	84,57	84,07	0,160	82,157	81,748	90,517		13,63	13,65	
56,00	0,162	84,59	84,08	0,160	82,177	81,705	90,766		13,63	13,65	
57,00	0,161	84,58	84,08	0,160	82,149	81,712	90,913		13,62	13,65	
58,00	0,161	84,65	84,11	0,160	82,243	81,770	91,196		13,60	13,65	
59,00	0,161	84,73	84,17	0,160	82,362	81,839	91,518		13,60	13,65	
60,00	0,161	84,87	84,24	0,160	82,555	82,006	91,364		13,60	13,65	
61,00	0,162	84,90	84,29	0,160	82,606	82,038	91,255		13,61	13,64	
62,00	0,161	85,05	84,38	0,160	82,807	82,176	91,326		13,60	13,64	
63,00	0,162	85,10	84,43	0,160	82,830	82,193	90,731		13,60	13,64	
64,00	0,162	85,03	84,41	0,160	82,617	82,121	90,816		13,61	13,64	
65,00	0,161	84,95	84,36	0,160	82,461	81,999	90,844		13,60	13,65	

Particulates Calculations

66,00	0,161	84,90	84,36	0,160	82,422	81,989	91,109	13,59	13,65
67,00	0,161	84,96	84,39	0,160	82,496	82,033	90,461	13,59	13,65
68,00	0,161	85,02	84,43	0,160	82,588	82,081	90,526	13,60	13,64
69,00	0,161	85,02	84,44	0,160	82,581	82,082	90,627	13,60	13,64
70,00	0,161	85,07	84,46	0,160	82,639	82,155	90,666	13,58	13,64
71,00	0,161	85,13	84,52	0,160	82,705	82,207	90,213	13,56	13,64
72,00	0,161	85,13	84,56	0,160	82,719	82,247	90,953	13,57	13,64
73,00	0,161	85,22	84,60	0,160	82,829	82,330	90,602	13,58	13,64
74,00	0,161	85,31	84,67	0,160	82,948	82,407	90,909	13,56	13,64
75,00	0,161	85,34	84,69	0,160	82,962	82,431	91,381	13,56	13,63
76,00	0,161	85,39	84,74	0,160	82,980	82,443	91,142	13,57	13,63
77,00	0,161	85,46	84,78	0,160	83,104	82,527	91,337	13,57	13,63
78,00	0,161	85,51	84,82	0,160	83,139	82,543	91,595	13,58	13,63
79,00	0,161	85,52	84,84	0,160	83,075	82,516	91,433	13,58	13,63
80,00	0,161	85,54	84,85	0,160	83,076	82,528	91,505	13,58	13,63
81,00	0,161	85,53	84,85	0,160	83,061	82,551	91,535	13,56	13,63
82,00	0,161	85,53	84,89	0,160	83,108	82,574	91,401	13,53	13,63
83,00	0,161	85,56	84,93	0,160	83,120	82,614	91,338	13,53	13,63
84,00	0,161	85,58	84,95	0,160	83,128	82,623	90,730	13,56	13,63
85,00	0,161	85,65	84,98	0,160	83,181	82,695	91,324	13,57	13,63
86,00	0,161	85,75	85,10	0,160	83,376	82,864	91,334	13,55	13,62
87,00	0,161	85,73	85,09	0,160	83,276	82,778	91,412	13,55	13,63
88,00	0,161	85,62	85,04	0,160	83,042	82,646	91,546	13,56	13,63
89,00	0,161	85,61	85,02	0,160	83,013	82,617	91,845	13,54	13,63
90,00	0,161	85,60	85,02	0,160	83,003	82,654	91,424	13,55	13,63
91,00	0,161	85,58	85,03	0,160	82,984	82,632	91,318	13,55	13,63
92,00	0,161	85,48	84,99	0,160	82,827	82,496	91,465	13,55	13,64
93,00	0,161	85,45	84,98	0,160	82,825	82,496	91,405	13,56	13,64
94,00	0,161	85,50	85,00	0,160	82,884	82,530	91,672	13,57	13,63
95,00	0,161	85,57	85,03	0,160	83,015	82,595	91,496	13,56	13,63
96,00	0,161	85,58	85,05	0,160	82,948	82,533	91,365	13,55	13,63
97,00	0,161	85,52	85,03	0,160	82,854	82,475	91,562	13,53	13,63
98,00	0,161	85,45	85,01	0,160	82,742	82,396	91,793	13,54	13,64
99,00	0,161	85,42	85,00	0,160	82,704	82,367	91,708	13,56	13,64
100,00	0,161	85,41	84,97	0,160	82,732	82,368	91,561	13,58	13,64
101,00	0,161	85,41	85,00	0,160	82,767	82,403	91,895	13,57	13,64
102,00	0,161	85,53	85,06	0,160	82,954	82,520	91,691	13,55	13,63
103,00	0,161	85,67	85,13	0,160	83,134	82,654	91,768	13,53	13,63
104,00	0,161	85,71	85,18	0,160	83,135	82,617	91,816	13,52	13,63
105,00	0,161	85,68	85,15	0,160	82,996	82,580	91,784	13,55	13,63
106,00	0,161	85,63	85,12	0,160	82,929	82,507	92,033	13,56	13,63
107,00	0,161	85,58	85,11	0,160	82,832	82,457	92,178	13,56	13,64
108,00	0,161	85,64	85,14	0,160	82,968	82,547	92,113	13,55	13,63
109,00	0,161	85,75	85,19	0,160	83,143	82,636	92,343	13,53	13,63
110,00	0,161	85,79	85,25	0,160	83,167	82,669	92,427	13,53	13,63
111,00	0,161	85,87	85,29	0,160	83,326	82,758	92,450	13,51	13,63
112,00	0,161	85,85	85,32	0,160	83,224	82,743	92,686	13,53	13,63
113,00	0,161	85,94	85,36	0,160	83,337	82,821	92,379	13,55	13,62
114,00	0,161	86,04	85,44	0,160	83,483	82,921	92,645	13,54	13,62
115,00	0,161	86,13	85,48	0,160	83,589	82,970	92,715	13,54	13,62
116,00	0,161	86,06	85,47	0,160	83,437	82,895	92,106	13,53	13,62
117,00	0,161	86,08	85,47	0,160	83,408	82,949	92,530	13,52	13,62
118,00	0,161	86,16	85,55	0,160	83,570	83,000	92,485	13,52	13,62
119,00	0,161	86,15	85,53	0,160	83,519	82,996	92,448	13,52	13,62
120,00	0,161	86,12	85,53	0,160	83,478	82,938	92,291	13,52	13,62
121,00	0,161	86,07	85,50	0,160	83,366	82,945	92,539	13,52	13,62
122,00	0,161	86,05	85,51	0,160	83,325	82,941	92,323	13,52	13,62
123,00	0,161	86,07	85,55	0,160	83,372	82,964	92,183	13,54	13,62
124,00	0,161	86,08	85,56	0,160	83,428	82,996	91,924	13,53	13,62
125,00	0,161	86,14	85,59	0,160	83,473	83,030	91,555	13,52	13,62

Particulates Calculations

	Average	Average	Average						Average
	14,61	Inlet +	Inlet +						0,217
		Outlet	Outlet	Average	Average	#1	#2		
Delta-P	Tunnel	Temp.	Temp.	99,62	100,55	System 1	System 2		SQRT
(in. H2O)	Velocity	Meter 1	Meter 2	Proportional Rates		Vol.Std.	Vol.Std.		Delta-P
Tunnel				PR1	PR2			Time	
in. H2O	Ft/Sec	Deg. R	Deg. R	%	%	(ft3)	(ft3)	min	(in H2O)2
0,047	14,594	542,9	540,6			0,158	0,159	0	0,2169016
0,048	14,705	543,0	540,6	99,18	99,96	0,158	0,159	1	0,2185336
0,047	14,600	543,0	540,6	99,99	100,74	0,158	0,159	2	0,2169016
0,048	14,707	543,1	540,8	99,37	99,95	0,159	0,159	3	0,2185352
0,048	14,707	543,1	540,6	99,44	99,97	0,159	0,159	4	0,2185342
0,047	14,642	543,0	540,6	99,51	100,40	0,159	0,159	5	0,2176031
0,048	14,755	543,0	540,6	98,63	99,65	0,158	0,159	6	0,2192422
0,047	14,591	543,1	540,7	99,97	100,68	0,158	0,159	7	0,2169018
0,048	14,703	543,1	540,6	99,23	99,96	0,159	0,159	8	0,2185344
0,048	14,667	543,0	540,5	99,47	100,14	0,159	0,159	9	0,2180688
0,048	14,699	543,0	540,5	99,26	99,95	0,159	0,159	10	0,2185341
0,046	14,434	543,0	540,5	101,18	101,82	0,159	0,159	11	0,2145517
0,048	14,751	543,0	540,4	98,75	99,67	0,158	0,159	12	0,2192299
0,049	14,856	543,0	540,5	98,11	98,91	0,158	0,159	13	0,2208432
0,047	14,641	543,1	540,6	99,53	100,39	0,158	0,159	14	0,2176032
0,048	14,782	543,1	540,7	98,63	99,42	0,158	0,159	15	0,2196915
0,046	14,438	543,2	540,9	100,93	101,78	0,158	0,159	16	0,2145513
0,047	14,566	543,3	540,9	100,33	100,88	0,158	0,159	17	0,2164344
0,048	14,676	543,4	541,1	99,49	100,11	0,159	0,159	18	0,2180689
0,047	14,598	543,5	541,2	99,85	100,63	0,158	0,159	19	0,216902
0,047	14,568	543,5	541,2	100,07	100,85	0,158	0,159	20	0,2164345
0,048	14,790	543,5	541,2	98,64	99,37	0,158	0,159	21	0,219691
0,048	14,791	543,5	541,3	98,54	99,36	0,158	0,159	22	0,2196918
0,047	14,650	543,5	541,2	99,59	100,32	0,158	0,159	23	0,2176035
0,048	14,682	543,6	541,3	99,39	100,10	0,158	0,159	24	0,2180688
0,048	14,713	543,6	541,3	99,32	99,87	0,158	0,159	25	0,2185346
0,048	14,706	543,6	541,3	99,05	99,83	0,158	0,159	26	0,2185344
0,048	14,758	543,6	541,3	98,76	99,55	0,158	0,159	27	0,2192314
0,047	14,569	543,7	541,3	100,09	100,83	0,158	0,159	28	0,2164355
0,048	14,711	543,6	541,3	99,05	99,87	0,158	0,159	29	0,2185346
0,049	14,864	543,7	541,4	98,05	98,79	0,158	0,159	30	0,2208437
0,049	14,867	543,7	541,4	98,13	98,80	0,158	0,159	31	0,2208537
0,047	14,574	543,7	541,4	100,22	100,85	0,158	0,159	32	0,2164361
0,048	14,684	543,7	541,3	99,37	100,10	0,158	0,159	33	0,2180694
0,047	14,653	543,7	541,3	99,63	100,33	0,158	0,159	34	0,2176049
0,048	14,715	543,7	541,2	99,09	99,90	0,158	0,159	35	0,2185354
0,047	14,570	543,7	541,4	99,96	100,81	0,158	0,159	36	0,2164356
0,048	14,675	543,8	541,4	99,02	100,02	0,158	0,159	37	0,2180699
0,046	14,438	543,8	541,5	100,91	101,65	0,158	0,159	38	0,2145512
0,047	14,603	543,9	541,6	99,72	100,56	0,158	0,158	39	0,216904
0,047	14,526	544,0	541,7	100,49	101,11	0,158	0,158	40	0,2157308
0,045	14,304	544,1	541,8	101,99	102,66	0,158	0,158	41	0,2124291
0,047	14,607	544,1	541,8	99,72	100,55	0,158	0,158	42	0,216903
0,046	14,387	544,1	541,9	101,25	102,11	0,158	0,158	43	0,2136043
0,045	14,303	544,2	541,9	101,85	102,65	0,158	0,158	44	0,2124131
0,047	14,574	544,2	541,9	99,90	100,75	0,158	0,158	45	0,2164354
0,048	14,684	544,2	541,8	99,55	100,00	0,158	0,158	46	0,2180693
0,046	14,417	544,2	541,9	101,05	101,86	0,158	0,158	47	0,2140927
0,047	14,574	544,2	541,8	100,12	100,75	0,158	0,158	48	0,2164358
0,047	14,574	544,2	541,9	99,88	100,75	0,158	0,158	49	0,2164363
0,046	14,412	544,2	541,9	100,92	101,83	0,158	0,158	50	0,2140782
0,046	14,445	544,2	541,9	100,75	101,61	0,158	0,158	51	0,2145524
0,047	14,528	544,3	541,9	100,34	101,07	0,158	0,158	52	0,2157308
0,047	14,608	544,3	541,9	99,63	100,54	0,158	0,158	53	0,2169039
0,046	14,454	544,3	541,9	100,90	101,59	0,158	0,158	54	0,2146496
0,045	14,253	544,3	542,0	102,25	102,98	0,158	0,158	55	0,211696
0,047	14,654	544,3	541,9	99,45	100,20	0,158	0,158	56	0,2176045
0,047	14,530	544,3	541,9	100,22	101,09	0,158	0,158	57	0,2157309
0,045	14,310	544,4	542,0	101,73	102,68	0,158	0,158	58	0,2124139
0,046	14,459	544,4	542,1	100,79	101,67	0,158	0,158	59	0,2145527
0,047	14,542	544,6	542,3	100,18	101,02	0,158	0,158	60	0,2158269
0,046	14,455	544,6	542,3	100,86	101,60	0,158	0,158	61	0,2145524
0,047	14,615	544,7	542,5	99,52	100,48	0,158	0,158	62	0,2169039
0,047	14,654	544,8	542,5	99,37	100,09	0,158	0,158	63	0,2176023
0,047	14,576	544,7	542,4	99,91	100,67	0,158	0,158	64	0,2164361
0,048	14,687	544,7	542,2	99,01	99,94	0,158	0,158	65	0,2180703

Particulates Calculations

0,047	14,533	544,6	542,2	100,06	101,05	0,158	0,158	66	0,2157379
0,047	14,524	544,7	542,3	100,11	100,98	0,158	0,158	67	0,2157306
0,046	14,446	544,7	542,3	100,67	101,53	0,158	0,158	68	0,2145524
0,047	14,652	544,7	542,3	99,26	100,12	0,158	0,158	69	0,2176048
0,047	14,606	544,8	542,4	99,33	100,43	0,158	0,158	70	0,2169038
0,047	14,521	544,8	542,5	99,82	100,92	0,157	0,158	71	0,2157316
0,047	14,610	544,8	542,5	99,50	100,44	0,157	0,158	72	0,2169035
0,048	14,762	544,9	542,6	98,39	99,32	0,158	0,158	73	0,2192312
0,046	14,451	545,0	542,7	100,30	101,50	0,157	0,158	74	0,2145523
0,046	14,393	545,0	542,7	100,99	101,99	0,157	0,158	75	0,2136047
0,046	14,422	545,1	542,7	100,72	101,74	0,157	0,158	76	0,2140788
0,045	14,344	545,1	542,8	101,36	102,31	0,157	0,158	77	0,2128913
0,048	14,775	545,2	542,8	98,44	99,36	0,157	0,158	78	0,2192315
0,048	14,695	545,2	542,8	98,97	99,89	0,157	0,158	79	0,2180709
0,048	14,727	545,2	542,8	98,80	99,68	0,158	0,158	80	0,2185367
0,047	14,586	545,2	542,8	99,44	100,65	0,157	0,158	81	0,2164372
0,048	14,694	545,2	542,8	98,60	99,88	0,157	0,158	82	0,2180711
0,047	14,583	545,2	542,9	99,32	100,62	0,157	0,158	83	0,2164364
0,046	14,416	545,3	542,9	100,81	101,67	0,157	0,158	84	0,2140785
0,048	14,693	545,3	542,9	98,86	99,85	0,157	0,158	85	0,2180706
0,047	14,662	545,4	543,1	98,94	100,03	0,157	0,158	86	0,2176053
0,048	14,694	545,4	543,0	98,85	99,84	0,157	0,158	87	0,2180709
0,048	14,696	545,3	542,8	98,82	99,88	0,157	0,158	88	0,2180711
0,047	14,590	545,3	542,8	99,41	100,67	0,157	0,158	89	0,2164368
0,049	14,881	545,3	542,8	97,63	98,62	0,157	0,158	90	0,2208457
0,047	14,662	545,3	542,8	98,90	100,08	0,157	0,158	91	0,2176059
0,046	14,458	545,2	542,7	100,40	101,55	0,157	0,158	92	0,2145532
0,047	14,557	545,2	542,7	99,82	100,85	0,157	0,158	93	0,2160283
0,047	14,666	545,2	542,7	99,12	100,14	0,157	0,158	94	0,2176058
0,047	14,617	545,3	542,8	99,35	100,42	0,157	0,158	95	0,2169044
0,047	14,584	545,3	542,7	99,43	100,64	0,157	0,158	96	0,2164367
0,046	14,427	545,3	542,7	100,38	101,78	0,157	0,158	97	0,2140793
0,047	14,668	545,2	542,6	99,06	100,17	0,157	0,158	98	0,2176056
0,048	14,777	545,2	542,5	98,39	99,43	0,157	0,158	99	0,2192322
0,048	14,694	545,2	542,6	99,03	99,95	0,157	0,158	100	0,2180378
0,047	14,622	545,2	542,6	99,34	100,50	0,157	0,158	101	0,2169048
0,046	14,430	545,3	542,7	100,61	101,77	0,157	0,158	102	0,2140965
0,047	14,589	545,4	542,9	99,26	100,65	0,157	0,158	103	0,2164369
0,048	14,700	545,4	542,9	98,60	99,90	0,157	0,158	104	0,2180712
0,047	14,621	545,4	542,8	99,52	100,45	0,157	0,158	105	0,2169044
0,048	14,734	545,4	542,7	98,58	99,74	0,157	0,158	106	0,2185366
0,047	14,547	545,3	542,6	100,02	101,06	0,157	0,158	107	0,2157332
0,047	14,672	545,4	542,8	98,87	100,17	0,157	0,158	108	0,2176059
0,048	14,738	545,5	542,9	98,57	99,74	0,157	0,158	109	0,2185368
0,047	14,676	545,5	542,9	98,81	100,16	0,157	0,158	110	0,2176054
0,047	14,677	545,6	543,0	98,81	100,14	0,157	0,158	111	0,217606
0,046	14,474	545,6	543,0	100,44	101,60	0,157	0,158	112	0,2145536
0,046	14,406	545,6	543,1	100,95	102,00	0,157	0,158	113	0,2136055
0,047	14,679	545,7	543,2	98,98	100,13	0,157	0,158	114	0,2176055
0,048	14,712	545,8	543,3	98,81	99,91	0,157	0,158	115	0,2180715
0,048	14,704	545,8	543,2	98,56	99,87	0,157	0,158	116	0,2180716
0,048	14,788	545,8	543,2	98,16	99,38	0,157	0,158	117	0,2192327
0,047	14,677	545,9	543,3	98,87	100,10	0,157	0,158	118	0,2176069
0,047	14,677	545,8	543,3	98,76	100,10	0,157	0,158	119	0,2176063
0,047	14,627	545,8	543,2	99,20	100,42	0,157	0,158	120	0,2169051
0,047	14,552	545,8	543,2	99,63	101,00	0,157	0,158	121	0,2157328
0,048	14,738	545,8	543,1	98,52	99,69	0,157	0,158	122	0,2185372
0,046	14,436	545,8	543,2	100,56	101,74	0,157	0,158	123	0,2140802
0,046	14,432	545,8	543,2	100,39	101,71	0,157	0,158	124	0,2140805
0,047	14,635	545,9	543,3	99,05	100,22	0,157	0,158	125	0,2171695

CSA B415.1 OE Calculations

Manufacturer: MESY  
 Model: Autopelletair

Run: 2  
 Project #: PI-20112  
 Test Duration: 125 min

	HHV	LHV
Eff	89,44%	95,64%
Comb Eff	99,50%	99,50%
HT Eff	89,89%	96,12%
Output	65 611	kJ/h
Burn Rate	3,63	kg/h
Grams CO	-2	g
Input	73 359	kJ/h
MC wet	5,57	

Ultimate CO<sub>2</sub>  
 CO<sub>2-ult</sub> 20,28  
 F<sub>0</sub>  
 1,029



CSA B415.1 OE Calculations

		Air Fuel Ratio (A/F)	
Overall Heating Efficiency:	89,44%	Dry Molecular Weight ( $M_d$ )	30,13
Combustion Efficiency:	99,50%	Dry Moles Exhaust Gas ( $N_r$ ):	363,87 %HC
Heat Transfer Efficiency:	89,89%	Air Fuel Ratio (A/F)	10,45 0,8

Heat Output:	62 239 Btu/h	65 611 kJ/h
Heat Input:	69 589 Btu/h	73 359 kJ/h
Burn Duration:	2,08 h	
Burn Rate:	8,00 lb/h	3,629 kg/h
Stack Temp:	159,6 Deg. F	70,9 Deg. C

## Paramètres

Tous les facteurs de corrections et autres paramètres qui peuvent être modifiés par l'utilisateur du fichier sont regroupés ici.

Code verrouillage:

### Description du test

Test standard	B415
Run #	3
Date	03-09-2015
Technicien	m.m
Project #	PI-20112

### Description de l'unité

Manufacturier	MESY	
Modèle	Autopelletair	
Combustion system	Pellet	
Appliance type	pellet furnace	
Firebox volume	na	cu ft.
Appliance weight empty	na	lbs
Appliance weight full	na	lbs

### Paramètres du test

Logging time	1	min
Manufacturer's rated heat output	110 000	BTU/h Donnée fournie par le manfacturier
Targeted category	2	
Targeted output	48400	BTU/h
Cp steel	0,1	BTU/lb-°F

### Calibration Factor (flow meter)

Q obt (L/min)	Fc	
0,95	1	Dimensionless
1,9	1	Dimensionless
3,76	1	Dimensionless
11,35	1	Dimensionless
22,7	1	Dimensionless

1,028

### Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	1,007	Dimensionless
Equipment number (DGM #1):	EM-178	
Calibration Factor (DGM #2):	1,015	Dimensionless
Equipment number (DGM #2):	EM-179	

### Tunnel

Targeted tunnel flow rate	280	scfm
Tunnel diameter	8	in.
Molecular weight	29	May be assumed to be 28,56 (EPA) 28,78 (HYDRONIC)
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

### Fournaise

Fp	2,2000000	
Outlet section		
H	11,000	in
W	9,125	in
Section	0,6970	sqft
Surface duct	0,064757935	m2

<b>Project nu.</b>	PI-20112
<b>Date</b>	03-09-2015
<b>Technicien</b>	mm

### Fuel data

Fuel type	Dimension	
Fuel specie	Other	
HHV	20214,0	kJ/kg
%C	50,4	
%H	6,1	
%O	42,9	
%Ash	0,4	
HHV	8691,0	Btu/lb
LHV	8178,0	Btu/lb

Default Fuel Values		
	D. Fir	Oak/Maple
HHV	19 810	19 887
%C	48,73	50
%H	6,87	6,6
%O	43,9	42,9
%Ash	0,5	0,5
HHV (Btu/lb)	8519	8552
LHV (Btu/lb)	7451	7480

	Start	End
Barometer (kPa):	101,3	101,5
Barometer (in.Hg):	29,913879	29,972939
Dry Bulb (F):	77,2	84,2
Humidity (%):	73,3	42,2
Air velocity (ft/min)	22	20

DGM #1	Final: ##### cuft
	Initial: ##### cuft
DGM #2	Final: 8838,553 cuft
	Initial: 8818,198 cuft

	Final: 292054,180	Liter
	Initial: 291456,360	Liter
	Final: 250279,950	Liter
	Initial: 249703,550	Liter

Numéro de la ligne dans "Raw data" à partir duquel les données du VRAI test commencent

225

Autres données à rentrer: dans preload data, load data, traverse et filter set weight

Pression statique (mmHg)	0,037
Pression statique (in.H2O)	0,200
consommation électrique (KWatt)	0,561

<b>Project nu.</b>	PI-20112
<b>Date</b>	03-09-2015
<b>Technicien</b>	m.m

## OverallEfficiency

### Totaux

Qout:	95611 Btu
Qin(HHV):	107618 Btu
Heat output rate:	45529 Btu/hr
Qin(LHV)	101265 Btu

### Emission rates

Et:	1,8 grams
Eg/MJ:	0,0179
EIb/MM Btu output:	0,0416
EIb/MM Btu Input	0,0370
Eg/kg	0,3213
Eg/h	0,866 g/h

### Delivered efficiency

ndel (HHV)	88,8%
ndel (LHV)	94,4%

Table with 14 columns: Time, Raw data row, Fuel weight, Load in, Load out, V, V Standard, m, Delta h, Delta e, Et, MJ, Qout/h (avg), Qout/h (i), Target. Rows contain numerical data for time intervals from 0.00 to 107.00.

## OverallEfficiency

108,00	333,00	1,90	80,53	126,40	7,363	6,63	1861	26	48754	813	0,81	45451	46212	48400
109,00	334,00	1,70	80,29	126,55	7,404	6,66	1871	26	49431	824	0,82	45463	46854	48400
110,00	335,00	1,60	80,57	126,99	7,366	6,62	1860	27	49299	822	0,82	45475	46729	48400
111,00	336,00	1,60	80,67	127,21	7,153	6,43	1805	27	47983	800	0,80	45475	45482	48400
112,00	337,00	1,40	80,55	127,42	7,119	6,40	1796	27	48082	801	0,80	45476	45575	48400
113,00	338,00	1,30	80,79	127,40	7,301	6,56	1842	27	49029	817	0,82	45484	46473	48400
114,00	339,00	1,20	81,06	127,64	7,270	6,53	1833	27	48777	813	0,81	45491	46234	48400
115,00	340,00	1,10	80,77	127,47	7,370	6,62	1859	27	49583	826	0,83	45504	46999	48400
116,00	341,00	1,00	80,65	127,41	7,502	6,74	1893	27	50551	843	0,84	45525	47916	48400
117,00	342,00	0,90	80,29	127,45	7,269	6,53	1834	27	49387	823	0,82	45536	46812	48400
118,00	343,00	0,80	80,23	127,31	7,108	6,39	1793	27	48228	804	0,80	45537	45713	48400
119,00	344,00	0,70	81,14	127,64	7,200	6,47	1816	27	48220	804	0,80	45538	45707	48400
120,00	345,00	0,60	81,02	127,46	7,099	6,38	1791	27	47503	792	0,79	45534	45027	48400
121,00	346,00	0,46	81,47	127,64	7,063	6,35	1781	26	46967	783	0,78	45526	44518	48400
122,00	347,00	0,40	81,48	127,38	7,291	6,55	1839	26	48223	804	0,80	45527	45709	48400
123,00	348,00	0,30	81,03	126,99	7,420	6,67	1873	26	49170	820	0,82	45536	46607	48400
124,00	349,00	0,20	80,72	126,97	7,362	6,62	1859	26	49092	818	0,82	45544	46532	48400
125,00	350,00	0,00	81,30	126,97	6,995	6,29	1766	26	46068	768	0,77	45529	43666	48400

**Preload data sheet**

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Test Load Weight:

Lower Ideal Upper

\* For boilers, a loading density factor of 10 lb/ft<sup>3</sup> is applied

Load Volume:  cu. ft

Loading Density: #VALEUR! lbs./ft<sup>3</sup>

Number of Spaces:

Load Density (wet): #DIV/0! lbs./ft<sup>3</sup>

Spacer weight (lbs):

Dry Wood Density: #DIV/0!

Piece Size (in):			Weight lbs	Meter Moisture Content				Ave. MC x	Volume
Thick	Wide	x Length		Dry Uncorrected %				Weight	Cubic Inches
			6,5	5,9				38,35	0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00

SUM MC: 38,35

PreTest Load Weight:  lbs.

Dry Weight:  kg.

Dry:

Average Moisture Content: %

Must be 18-28

Wet:

must be 15,2-22

Project nu. PI-20112  
Date 03-09-2015  
Technicien

**FUEL LOAD DATA SHEET, CSA B415**

Test Load Weight:

Lower Ideal Upper

#### #####

\* For boilers, a loading density factor of 10 lb/ft3 is applied

Load Volume:  cu. ft

Loading Density: #VALEUR! lbs./ft3

Number of Spaces:

Load Density (wet): #DIV/0! lbs./ft3

Spacer weight:  lbs

Dry Wood Density: #DIV/0! lbs./ft3

Piece Size (in):			Weight lbs	Meter Moisture Content				Ave. MC x	Volume	Ave. MC
Thick	Wide	Length		Dry Uncorrected %				Weight	Cubic Inches	%
			13,11	5,90				77,368073	0,00	5,9
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
							SUM MCx	77,368073		5,9 %

Test Load Weight:  lbs.

Dry Weight:  kg.

Average Moisture Content: %

Dry:  Dry(EPA) 5,90  
                    Dry(B415) 5,90

Must be 18-28

Wet:   
 must be 15,2-22

Coal Bed Range:  lbs. to

lbs.

TEST CHARGE:

Coal bed weight:  lbs.

Must be between 10 and 25% of test load

Project nu.	PI-20112
Date	03-09-2015
Technician	AL



## Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,16 in. H2O  
 Barometer: 29,900 in. Hg

**Pour un tunnel de 12" et plus, prendre 6 lectures**

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center			0,0000
B center			0,0000
A1			0,0000
A2			0,0000
A3			0,0000
A4			0,0000
A5			0,0000
A6			0,0000
B1			0,0000
B2			0,0000
B3			0,0000
B4			0,0000
B5			0,0000
B6			0,0000
AVERAGE		#DIV/0!	0,0000

PITOT CONSTANT=  
0,995

**Pour un tunnel moins de 12", prendre 4 lectures**

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,047	78,4	0,2168
B center	0,047	78,8	0,2168
A1	0,040	78,8	0,2000
A2	0,050	78,7	0,2236
A3	0,045	78,8	0,2121
A4	0,048	78,8	0,2191
B1	0,048	78,9	0,2191
B2	0,049	78,5	0,2214
B3	0,046	78,5	0,2145
B4	0,047	78,4	0,2168
AVERAGE	0,0466	78,7	0,2158

<b>Project nu.</b>	PI-20112
<b>Date</b>	03-09-2015
<b>Technicien</b>	<span style="border: 1px solid red; padding: 2px;">m.m</span>

## Filter set weight

	System 1 (g) 1st hour				System 1 (g)				System 2 (g)				Ambient blank (g)	Date	Heure
	probe	front	back	gasket	probe	front	back	gasket	probe	front	back	gasket	Filter		
Before (1)															
Before (2)															
Before (3)	61,4591	0,1261	0,1263	10,241	61,3837	0,1249	0,1233	10,2168	61,3786	0,1251	0,1222	10,9955	0,127	2015-09-02	17:00
Before (4)	61,4593	0,1261	0,1265	10,2412	61,3837	0,125	0,1233	10,2169	61,3787	0,1252	0,1222	10,9956	0,1272	2015-09-03	07:15
After (1)	61,4594	0,1262	0,1266	10,2446	61,384	0,1251	0,1236	10,2206	61,3788	0,1256	0,1223	10,9995	0,1273	2015-09-03	16:00
After (2)	61,4593	0,1262	0,1265	10,2418	61,3837	0,1251	0,1234	10,2173	61,3787	0,1256	0,1222	10,9963	0,1273	2015-09-15	16:30
After (3)	61,4593	0,1262	0,1265	10,2417	61,3837	0,1251	0,1233	10,2173	61,3787	0,1256	0,1222	10,9963	0,1273	2015-09-21	16:30
After (4)															
After (5)															
After (6)	61,4593	0,1262	0,1265	10,2417	61,3837	0,1251	0,1233	10,2173	61,3787	0,1256	0,1222	10,9963	0,1273	2015-09-21	16:30
Difference	0,0000	0,0001	0,0000	0,0005	0,0000	0,0001	0,0000	0,0004	0,0000	0,0004	0,0000	0,0007	0,0001		
Total (mg)		0,6				1,1				1,1				0,1	
Total ajusté (mg)		<b>0,50</b>				<b>1,00</b>				<b>1,00</b>					

<b>Project nu.</b>	PI-20112
<b>Date</b>	03-09-2015
<b>Technicien</b>	M.M

SFBA EPA EMISSION RESULTS				RESULTS	
			<b>Average emission rate:</b>		0,9 g/hr
<b>Test Duration:</b> 125 min			Burn Rate :		2,696 Dry kg/hr
PRESSURE FACTOR:	DGM 1	0,97738	BAROMETRIC PRESSURE		
	DGM 2	0,98491	Average: 29,943 in Hg		
TEMPERATURE FACTORS			Start: 29,914 in Hg		
	DGM 1	0,97440	End: 29,973 in Hg		
	DGM 2	0,97953	DRY GAS METER VALUES		
VOLUMES SAMPLED			DGM #1	Final:	10313,796 Cuft
	DGM 1	20,24481 Scft		Initial:	10292,684 Cuft
	DGM 2	19,93234 Scft	DGM #2	Final:	8838,553 Cuft
TOTAL TUNNEL VOLUME :	36252 Scft			Initial:	8818,198 Cuft
SAMPLE RATIOS			TEMPERATURES		
	Sample Train 1:	1790,692	DGM #1	541,873 °R	
	Sample Train 2:	1818,763	DGM #2	539,036 °R	
TOTAL EMISSIONS			CALIBRATION FACTORS		
	Sample Train 1	1,79 g	DGM #1	1,0069	
	Sample Train 2	1,82 g	DGM #2	1,0150	
EMISSION RATES			TUNNEL FLOW RATE:		
	Sample Train 1	0,86 g/hr	290,018 Dscfm		
	Sample Train 2	0,87 g/hr	PARTICULATE CATCH		
1st hour emission rate	0,90 g/hr		Total Sample Train 1: 1,00 mg		
			Total Sample Train 2: 1,00 mg		
			Total Sample Train 1 1st hour: 0,50 mg		
DEVIATION:		0,78%			
Cs	Train 1	Train 2			
	4,94E-05	5,01697E-05			

Particulates Calculations

		Average	0,00	10,78	9,40	142,22	82,08	86,15
*		*	*	*	*	*1	*2	*3
Elapsed		Weight				Flue	Room	Tunnel
Time	Raw data row	Remaining	CO	CO <sub>2</sub>	O <sub>2</sub>	Gas	Temp	Dry Bulb
min		lbs	%	%	%	°F	°F	°F
0,00	225,00	13,1	0,0	10,1	10,2	140,6	79,9	84,2
1,0	226,0	13,0	0,0	10,6	9,7	140,5	80,0	84,5
2,0	227,0	12,9	0,0	11,3	8,9	140,9	80,2	84,8
3,0	228,0	12,8	0,0	11,2	9,0	141,3	80,3	84,8
4,0	229,0	12,7	0,0	11,8	8,3	141,9	80,2	84,0
5,0	230,0	12,5	0,0	11,4	8,8	141,8	80,2	83,1
6,0	231,0	12,4	0,0	11,2	9,1	141,3	80,2	82,7
7,0	232,0	12,3	0,0	10,6	9,6	141,5	80,3	83,1
8,0	233,0	12,3	0,0	11,6	8,6	141,6	80,4	83,8
9,0	234,0	12,1	0,0	11,9	8,3	142,2	80,8	84,3
10,0	235,0	12,0	0,0	11,2	8,9	141,9	80,7	84,6
11,0	236,0	12,0	0,0	11,0	9,2	141,9	80,5	84,7
12,0	237,0	11,8	0,0	10,6	9,6	141,4	80,6	84,9
13,0	238,0	11,7	0,0	10,6	9,6	141,3	80,7	85,1
14,0	239,0	11,7	0,0	10,9	9,3	141,1	80,8	85,1
15,0	240,0	11,5	0,0	10,8	9,4	141,1	80,6	84,5
16,0	241,0	11,4	0,0	11,1	9,2	141,0	80,4	84,1
17,0	242,0	11,3	0,0	11,1	9,1	141,8	80,5	84,4
18,0	243,0	11,2	0,0	11,7	8,5	142,3	80,9	84,7
19,0	244,0	11,1	0,0	11,3	8,8	142,3	81,0	85,0
20,0	245,0	11,0	0,0	11,1	9,0	142,1	81,0	85,0
21,0	246,0	10,9	0,0	11,2	9,0	142,0	81,0	85,4
22,0	247,0	10,8	0,0	11,1	9,2	141,8	81,2	85,5
23,0	248,0	10,7	0,0	11,7	8,5	142,9	81,3	85,7
24,0	249,0	10,5	0,0	11,4	8,8	143,0	81,3	85,8
25,0	250,0	10,5	0,0	11,6	8,5	143,2	81,2	85,9
26,0	251,0	10,3	0,0	10,9	9,2	142,7	81,2	86,0
27,0	252,0	10,3	0,0	10,7	9,4	142,1	81,3	86,1
28,0	253,0	10,1	0,0	10,8	9,5	142,1	81,6	86,3
29,0	254,0	10,1	0,0	10,8	9,4	142,0	81,6	86,2
30,0	255,0	10,0	0,0	10,8	9,4	142,0	81,9	86,4
31,0	256,0	9,9	0,0	10,4	9,8	142,0	81,7	86,2
32,0	257,0	9,8	0,0	10,8	9,4	142,1	81,7	86,3
33,0	258,0	9,6	0,0	10,7	9,6	142,3	81,9	86,1
34,0	259,0	9,6	0,0	10,4	9,9	142,2	81,6	86,2
35,0	260,0	9,5	0,0	10,9	9,2	142,2	81,7	86,4
36,0	261,0	9,3	0,0	10,4	9,7	141,8	81,8	86,3
37,0	262,0	9,3	0,0	9,6	10,7	141,4	82,2	86,4
38,0	263,0	9,2	0,0	9,7	10,6	141,5	82,2	86,4
39,0	264,0	9,1	0,0	10,3	9,9	141,3	81,9	86,1
40,0	265,0	8,9	0,0	10,0	10,2	141,4	81,9	86,4
41,0	266,0	8,9	0,0	9,7	10,6	141,1	82,4	86,6
42,0	267,0	8,7	0,0	10,2	10,0	141,3	82,4	86,6
43,0	268,0	8,7	0,0	10,7	9,5	141,7	82,2	86,5
44,0	269,0	8,5	0,0	10,9	9,2	141,7	82,3	85,6
45,0	270,0	8,5	0,0	11,0	9,2	141,8	82,0	84,9
46,0	271,0	8,4	0,0	10,6	9,5	141,4	81,9	84,3
47,0	272,0	8,3	0,0	9,9	10,3	141,2	81,8	84,2
48,0	273,0	8,2	0,0	10,2	10,0	141,3	81,7	84,8
49,0	274,0	8,0	0,0	10,6	9,7	141,5	82,0	85,4
50,0	275,0	7,9	0,0	10,9	9,3	142,0	81,9	85,5
51,0	276,0	7,9	0,0	10,6	9,6	141,8	81,9	85,9
52,0	277,0	7,7	0,0	10,8	9,4	141,9	82,1	86,0
53,0	278,0	7,6	0,0	10,9	9,3	142,2	82,2	86,1
54,0	279,0	7,5	0,0	10,9	9,3	142,2	82,4	86,4
55,0	280,0	7,4	0,0	11,2	9,0	141,9	82,1	86,3
56,0	281,0	7,3	0,0	10,9	9,2	141,8	82,0	86,0
57,0	282,0	7,2	0,0	10,6	9,6	141,6	81,7	86,3
58,0	283,0	7,1	0,0	10,7	9,6	141,8	81,8	86,4
59,0	284,0	7,0	0,0	10,6	9,6	141,7	82,0	85,8
60,0	285,0	6,9	0,0	11,0	9,1	142,1	82,2	86,3
61,0	286,0	6,8	0,0	10,3	9,9	142,0	82,1	86,5
62,0	287,0	6,7	0,0	10,7	9,4	142,3	82,3	86,7
63,0	288,0	6,6	0,0	11,0	9,3	142,3	82,3	85,8
64,0	289,0	6,5	0,0	10,5	9,6	141,9	82,1	85,9
65,0	290,0	6,4	0,0	10,2	10,0	142,0	82,1	86,3
66,0	291,0	6,3	0,0	10,2	10,0	141,4	82,2	86,0
67,0	292,0	6,2	0,0	9,9	10,3	141,4	81,9	85,2

Particulates Calculations

68,0	293,0	6,1	0,0	9,8	10,4	141,0	81,9	85,7
69,0	294,0	6,1	0,0	10,1	10,1	141,1	82,0	86,1
70,0	295,0	5,8	0,0	10,0	10,2	141,1	82,4	86,1
71,0	296,0	5,9	0,0	10,2	9,9	141,8	82,5	86,4
72,0	297,0	5,7	0,0	11,5	8,6	142,1	82,6	86,9
73,0	298,0	5,6	0,0	11,7	8,4	142,4	82,6	87,1
74,0	299,0	5,5	0,0	11,9	8,2	142,8	82,8	86,8
75,0	300,0	5,3	0,0	11,8	8,3	142,6	82,8	86,1
76,0	301,0	5,3	0,0	11,1	9,1	142,5	82,6	85,9
77,0	302,0	5,2	0,0	10,8	9,3	142,0	82,3	86,1
78,0	303,0	5,0	0,0	9,8	10,4	141,8	82,5	86,6
79,0	304,0	4,9	0,0	10,5	9,8	141,9	82,5	87,0
80,0	305,0	4,8	0,0	10,8	9,4	142,1	82,8	86,9
81,0	306,0	4,8	0,0	10,5	9,6	142,1	82,9	87,3
82,0	307,0	4,6	0,0	10,2	10,0	142,2	83,1	87,3
83,0	308,0	4,5	0,0	10,9	9,4	142,4	83,0	87,2
84,0	309,0	4,4	0,0	11,4	8,6	142,9	82,7	87,2
85,0	310,0	4,3	0,0	11,3	8,8	142,8	82,8	87,2
86,0	311,0	4,3	0,0	10,9	9,3	142,7	82,8	87,3
87,0	312,0	4,1	0,0	10,4	9,8	142,8	82,7	87,3
88,0	313,0	4,0	0,0	10,2	9,9	142,8	82,7	87,2
89,0	314,0	3,9	0,0	10,2	9,9	142,6	82,9	87,3
90,0	315,0	3,8	0,0	10,0	10,2	142,3	82,9	87,2
91,0	316,0	3,7	0,0	10,3	9,9	142,1	82,7	86,9
92,0	317,0	3,6	0,0	10,7	9,5	142,5	82,8	87,2
93,0	318,0	3,5	0,0	11,4	8,7	142,7	82,7	87,2
94,0	319,0	3,4	0,0	10,6	9,5	142,5	82,8	87,2
95,0	320,0	3,3	0,0	9,9	10,4	142,0	82,9	87,2
96,0	321,0	3,1	0,0	10,2	10,0	142,3	82,8	87,3
97,0	322,0	3,1	0,0	10,7	9,5	142,1	82,9	86,5
98,0	323,0	2,9	0,0	11,3	8,8	142,7	82,7	85,6
99,0	324,0	2,8	0,0	11,4	8,7	142,9	82,3	86,4
100,0	325,0	2,7	0,0	11,4	8,7	143,1	82,5	86,9
101,0	326,0	2,6	0,0	10,9	9,2	142,7	82,6	87,2
102,0	327,0	2,6	0,0	10,7	9,4	143,1	82,9	87,2
103,0	328,0	2,4	0,0	10,8	9,3	142,9	83,1	87,4
104,0	329,0	2,3	0,0	10,4	9,7	142,6	83,2	87,4
105,0	330,0	2,1	0,0	10,2	10,0	142,4	83,1	87,2
106,0	331,0	2,1	0,0	10,4	9,8	143,0	83,0	87,1
107,0	332,0	2,0	0,0	11,3	8,8	142,9	82,6	87,1
108,0	333,0	1,9	0,0	11,8	8,4	143,2	82,7	87,6
109,0	334,0	1,7	0,0	12,1	7,9	144,0	83,0	87,6
110,0	335,0	1,6	0,0	11,8	8,3	144,3	82,9	87,2
111,0	336,0	1,6	0,0	11,6	8,4	143,8	83,0	87,4
112,0	337,0	1,4	0,0	10,5	9,7	143,3	83,0	87,5
113,0	338,0	1,3	0,0	10,6	9,6	143,3	83,2	87,0
114,0	339,0	1,2	0,0	10,9	9,2	143,3	83,1	86,4
115,0	340,0	1,1	0,0	10,7	9,5	143,3	83,0	85,6
116,0	341,0	1,0	0,0	11,3	8,8	144,0	83,0	85,9
117,0	342,0	0,9	0,0	11,4	8,7	144,0	83,2	86,6
118,0	343,0	0,8	0,0	10,8	9,3	143,6	83,0	87,1
119,0	344,0	0,7	0,0	10,6	9,5	143,4	83,1	86,9
120,0	345,0	0,6	0,0	10,3	9,9	143,4	83,0	87,5
121,0	346,0	0,5	0,0	10,2	10,0	143,1	83,0	87,4
122,0	347,0	0,4	0,0	10,2	9,9	142,9	83,2	87,7
123,0	348,0	0,3	0,0	10,2	10,0	143,2	83,4	88,0
124,0	349,0	0,2	0,0	10,6	9,5	143,3	83,3	88,0
125,0	350,0	0,0	0,0	10,7	9,5	143,0	83,2	87,0

Particulates Calculations

0,16	82,14	81,60	81,15	0,16	79,29	78,79	81,12	0,05	0,21
Mass flow 1	Mass flow 1	Mass flow 1	Filter 1	Mass flow 2	Mass flow 2	Mass flow 2	Filter 2	Tunnel Veloc	Flue draft
Reading	Inlet T	Outlet T	Temp	Reading	Inlet T	Outlet T	Temp	Pressure	Pressure
								in wc	in wc
cuft/min	oF	oF	oF	cuft/min	oF	oF	oF	in wc	in wc
0,16	80,24	79,72	79,20	0,16	77,62	77,07	79,12	0,05	0,20
0,16	80,33	79,95	79,19	0,16	77,69	77,11	79,17	0,05	0,21
0,16	80,38	80,00	79,23	0,16	77,70	77,17	79,27	0,05	0,20
0,16	80,34	80,01	79,27	0,16	77,60	77,17	79,33	0,05	0,20
0,16	80,34	80,01	79,28	0,16	77,60	77,19	79,36	0,05	0,20
0,16	80,42	80,04	79,30	0,16	77,69	77,21	79,34	0,05	0,20
0,16	80,43	80,05	79,32	0,16	77,64	77,16	79,35	0,04	0,20
0,16	80,43	80,07	79,34	0,16	77,64	77,19	79,38	0,04	0,20
0,16	80,41	80,06	79,38	0,16	77,61	77,15	79,44	0,04	0,21
0,16	80,48	80,09	79,40	0,16	77,71	77,20	79,50	0,04	0,20
0,16	80,52	80,11	79,44	0,16	77,73	77,23	79,56	0,04	0,20
0,16	80,47	80,11	79,47	0,16	77,68	77,22	79,62	0,04	0,20
0,16	80,53	80,14	79,52	0,16	77,75	77,29	79,68	0,04	0,20
0,16	80,64	80,22	79,54	0,16	77,95	77,40	79,73	0,04	0,20
0,16	80,69	80,26	79,58	0,16	77,97	77,42	79,79	0,05	0,21
0,16	80,66	80,24	79,60	0,16	77,87	77,39	79,81	0,04	0,21
0,16	80,60	80,24	79,61	0,16	77,79	77,39	79,81	0,04	0,20
0,16	80,71	80,29	79,64	0,16	77,99	77,47	79,85	0,05	0,21
0,16	80,78	80,31	79,67	0,16	78,04	77,49	79,88	0,05	0,20
0,16	80,72	80,31	79,71	0,16	77,91	77,46	79,94	0,05	0,20
0,16	80,71	80,30	79,74	0,16	77,93	77,45	79,99	0,05	0,21
0,16	80,84	80,38	79,79	0,16	78,14	77,59	80,04	0,05	0,21
0,16	80,99	80,45	79,82	0,16	78,36	77,72	80,08	0,05	0,20
0,16	81,12	80,54	79,88	0,16	78,51	77,84	80,15	0,05	0,20
0,16	81,29	80,65	79,91	0,16	78,72	77,98	80,18	0,05	0,21
0,16	81,43	80,73	79,93	0,16	78,92	78,11	80,24	0,05	0,21
0,16	81,51	80,79	79,96	0,16	79,01	78,18	80,30	0,05	0,21
0,16	81,59	80,88	80,01	0,16	79,06	78,27	80,33	0,05	0,20
0,16	81,61	80,90	80,10	0,16	79,01	78,31	80,40	0,05	0,20
0,16	81,66	80,96	80,12	0,16	79,04	78,40	80,45	0,05	0,20
0,16	81,63	80,99	80,17	0,16	78,93	78,37	80,49	0,05	0,20
0,16	81,55	80,98	80,22	0,16	78,76	78,32	80,53	0,05	0,21
0,16	81,59	81,02	80,27	0,16	78,84	78,36	80,57	0,05	0,21
0,16	81,64	81,04	80,31	0,16	78,87	78,37	80,61	0,05	0,21
0,16	81,59	81,04	80,34	0,16	78,80	78,36	80,64	0,05	0,21
0,16	81,67	81,08	80,39	0,16	78,93	78,42	80,68	0,05	0,21
0,16	81,83	81,16	80,44	0,16	79,19	78,57	80,76	0,05	0,21
0,16	81,96	81,23	80,49	0,16	79,34	78,63	80,80	0,05	0,21
0,16	81,96	81,27	80,50	0,16	79,29	78,67	80,82	0,05	0,21
0,16	81,84	81,24	80,55	0,16	79,06	78,56	80,87	0,05	0,21
0,16	81,88	81,26	80,60	0,16	79,18	78,63	80,87	0,05	0,21
0,16	81,93	81,28	80,63	0,16	79,21	78,64	80,94	0,05	0,21
0,16	81,97	81,33	80,69	0,16	79,24	78,65	80,99	0,05	0,21
0,16	81,91	81,31	80,71	0,16	79,10	78,57	81,01	0,05	0,21
0,16	81,87	81,32	80,72	0,16	79,06	78,62	81,01	0,05	0,21
0,16	81,90	81,33	80,75	0,16	79,13	78,62	80,98	0,05	0,21
0,16	82,02	81,41	80,74	0,16	79,29	78,71	80,96	0,05	0,21
0,16	82,04	81,44	80,76	0,16	79,35	78,74	80,97	0,05	0,21
0,16	82,13	81,50	80,78	0,16	79,47	78,81	80,99	0,05	0,21
0,16	82,21	81,54	80,79	0,16	79,51	78,83	81,05	0,05	0,21
0,16	82,12	81,52	80,82	0,16	79,37	78,78	81,06	0,05	0,21
0,16	82,11	81,54	80,85	0,16	79,33	78,80	81,10	0,05	0,21
0,16	82,04	81,53	80,84	0,16	79,16	78,72	81,10	0,05	0,21
0,16	81,95	81,51	80,89	0,16	79,02	78,67	81,15	0,05	0,21
0,16	81,95	81,50	80,88	0,16	79,03	78,70	81,17	0,05	0,21
0,16	81,99	81,52	80,93	0,16	79,05	78,69	81,19	0,05	0,21
0,16	81,91	81,49	80,92	0,16	78,90	78,60	81,19	0,05	0,21
0,16	81,98	81,51	80,92	0,16	79,05	78,70	81,19	0,05	0,21
0,16	82,02	81,53	80,95	0,16	79,12	78,72	81,26	0,05	0,21
0,16	81,99	81,53	80,94	0,16	79,04	78,69	81,22	0,05	0,21
0,16	82,05	81,57	83,58	0,16	79,19	78,75	81,25	0,05	0,21
0,16	82,14	81,64	83,63	0,16	79,27	78,82	81,30	0,05	0,21
0,16	82,13	81,64	83,55	0,16	79,21	78,78	81,33	0,05	0,21
0,16	82,10	81,64	83,37	0,16	79,17	78,76	81,33	0,05	0,21
0,16	82,18	81,68	83,17	0,16	79,28	78,86	81,29	0,05	0,21
0,16	82,30	81,73	83,04	0,16	79,48	78,92	81,32	0,05	0,21
0,16	82,26	81,71	82,89	0,16	79,31	78,85	81,34	0,05	0,21
0,16	82,19	81,70	82,71	0,16	79,22	78,83	81,34	0,05	0,21

Particulates Calculations

0,16	82,28	81,76	82,58	0,16	79,39	78,92	81,32	0,05	0,21
0,16	82,40	81,79	82,51	0,16	79,57	78,98	81,39	0,05	0,21
0,16	82,55	81,89	82,48	0,16	79,79	79,14	81,40	0,05	0,21
0,16	82,69	81,98	82,48	0,16	79,98	79,26	81,48	0,05	0,21
0,16	82,74	82,04	82,42	0,16	79,99	79,27	81,52	0,05	0,21
0,16	82,76	82,07	82,32	0,16	79,92	79,27	81,57	0,05	0,21
0,16	82,65	82,04	82,21	0,16	79,72	79,20	81,57	0,05	0,21
0,16	82,61	82,04	82,16	0,16	79,68	79,23	81,55	0,05	0,21
0,16	82,72	82,09	82,10	0,16	79,80	79,26	81,55	0,05	0,21
0,16	82,70	82,08	82,03	0,16	79,80	79,30	81,57	0,05	0,21
0,16	82,75	82,13	82,00	0,16	79,85	79,35	81,61	0,05	0,21
0,16	82,79	82,14	82,00	0,16	79,88	79,36	81,66	0,05	0,21
0,16	82,89	82,21	82,00	0,16	80,04	79,49	81,68	0,05	0,21
0,16	83,01	82,28	81,99	0,16	80,19	79,57	81,72	0,05	0,21
0,16	83,10	82,34	81,96	0,16	80,28	79,63	81,75	0,05	0,21
0,16	83,02	82,33	81,84	0,16	80,11	79,57	81,74	0,05	0,21
0,16	82,91	82,31	81,82	0,16	79,96	79,53	81,77	0,05	0,21
0,16	82,96	82,33	81,81	0,16	80,02	79,56	81,79	0,05	0,21
0,16	82,92	82,33	81,80	0,16	79,93	79,53	81,79	0,05	0,21
0,16	82,93	82,35	81,80	0,16	79,91	79,49	81,82	0,05	0,21
0,16	82,93	82,34	81,76	0,16	79,96	79,50	81,81	0,05	0,21
0,16	83,00	82,37	81,77	0,16	80,05	79,56	81,87	0,05	0,21
0,16	82,92	82,35	81,75	0,16	79,88	79,48	81,88	0,05	0,21
0,16	82,87	82,35	81,72	0,16	79,83	79,47	81,84	0,05	0,21
0,16	82,89	82,36	81,74	0,16	79,84	79,45	81,88	0,05	0,21
0,16	82,82	82,31	81,70	0,16	79,69	79,36	81,90	0,05	0,21
0,16	82,73	82,28	81,67	0,16	79,51	79,29	81,90	0,05	0,21
0,16	82,76	82,28	81,68	0,16	79,63	79,30	81,91	0,05	0,21
0,16	82,81	82,29	81,69	0,16	79,67	79,36	81,92	0,05	0,21
0,16	82,75	82,30	81,65	0,16	79,59	79,29	81,93	0,05	0,21
0,16	82,64	82,27	81,65	0,16	79,48	79,27	81,86	0,05	0,21
0,16	82,77	82,32	81,63	0,16	79,72	79,36	81,87	0,05	0,20
0,16	82,82	82,34	81,69	0,16	79,75	79,36	81,92	0,05	0,20
0,16	82,91	82,37	81,70	0,16	79,88	79,41	81,93	0,05	0,20
0,16	82,92	82,38	81,73	0,16	79,86	79,40	81,97	0,05	0,20
0,16	83,01	82,44	81,74	0,16	80,04	79,50	81,96	0,05	0,20
0,16	83,03	82,48	81,77	0,16	80,01	79,52	82,04	0,05	0,20
0,16	83,09	82,52	81,78	0,16	80,12	79,61	82,04	0,05	0,20
0,16	83,10	82,55	81,76	0,16	80,14	79,59	82,04	0,05	0,20
0,16	83,17	82,58	81,75	0,16	80,25	79,70	82,04	0,05	0,20
0,16	83,24	82,63	81,78	0,16	80,29	79,73	82,08	0,05	0,20
0,16	83,20	82,61	81,79	0,16	80,22	79,68	82,09	0,05	0,21
0,16	83,12	82,61	81,77	0,16	80,07	79,63	82,07	0,05	0,21
0,16	83,14	82,61	81,76	0,16	80,06	79,62	82,08	0,05	0,20
0,16	83,18	82,65	81,79	0,16	80,17	79,72	82,12	0,05	0,20
0,16	83,12	82,62	81,84	0,16	80,05	79,66	82,12	0,05	0,21
0,16	83,11	82,64	81,84	0,16	80,09	79,67	82,10	0,05	0,21
0,16	83,18	82,68	81,87	0,16	80,12	79,68	82,11	0,05	0,20
0,16	83,23	82,71	81,86	0,16	80,23	79,75	82,10	0,05	0,21
0,16	83,28	82,72	81,89	0,16	80,27	79,78	82,13	0,05	0,20
0,16	83,32	82,78	81,93	0,16	80,33	79,82	82,18	0,05	0,20
0,16	83,28	82,75	81,90	0,16	80,27	79,79	82,17	0,05	0,20
0,16	83,38	82,81	81,93	0,16	80,40	79,91	82,20	0,05	0,21
0,16	83,40	82,85	81,99	0,16	80,45	79,95	82,25	0,05	0,20
0,16	83,53	82,93	82,02	0,16	80,62	80,07	82,27	0,05	0,20
0,16	83,64	82,97	82,08	0,16	80,75	80,15	82,35	0,05	0,20
0,16	83,63	83,01	82,12	0,16	80,72	80,17	82,36	0,05	0,20
0,16	83,55	83,01	82,08	0,16	80,52	80,14	82,39	0,05	0,20

Particulates Calculations

	0,16			0,16			86,15	Filter	Filter
								Face	Face
Elapsed	DGM 1	DGM 1	DGM 1	DGM 2	DGM 2	DGM 2	Tunnel	Velocity	Velocity
Time	Reading	Inlet T	Outlet T	Reading	Inlet T	Outlet T	Dry Bulb	DGM 1	DGM 2
min	Cuft/min	°F	°F	Cuft/min	°F	°F	°F	Ft/sec	Ft/sec
0,00	0,163	80,24	79,72	0,160	77,616	77,074	84,206		
1,00	0,163	80,33	79,95	0,160	77,691	77,115	84,466	13,83	13,76
2,00	0,163	80,38	80,00	0,160	77,699	77,169	84,805	13,83	13,76
3,00	0,163	80,34	80,01	0,160	77,603	77,165	84,762	13,81	13,76
4,00	0,163	80,34	80,01	0,160	77,598	77,187	84,029	13,82	13,76
5,00	0,163	80,42	80,04	0,160	77,688	77,210	83,086	13,83	13,76
6,00	0,163	80,43	80,05	0,160	77,641	77,156	82,684	13,83	13,76
7,00	0,163	80,43	80,07	0,160	77,643	77,191	83,134	13,83	13,76
8,00	0,163	80,41	80,06	0,160	77,615	77,146	83,779	13,82	13,76
9,00	0,163	80,48	80,09	0,160	77,714	77,200	84,342	13,81	13,76
10,00	0,163	80,52	80,11	0,160	77,730	77,227	84,601	13,84	13,76
11,00	0,163	80,47	80,11	0,160	77,679	77,216	84,737	13,84	13,76
12,00	0,163	80,53	80,14	0,160	77,754	77,288	84,890	13,82	13,76
13,00	0,163	80,64	80,22	0,160	77,946	77,402	85,075	13,82	13,75
14,00	0,163	80,69	80,26	0,160	77,972	77,421	85,094	13,83	13,75
15,00	0,163	80,66	80,24	0,160	77,871	77,389	84,474	13,84	13,75
16,00	0,163	80,60	80,24	0,160	77,786	77,391	84,056	13,82	13,75
17,00	0,163	80,71	80,29	0,160	77,988	77,472	84,351	13,80	13,75
18,00	0,163	80,78	80,31	0,160	78,038	77,489	84,741	13,80	13,75
19,00	0,163	80,72	80,31	0,160	77,915	77,463	84,984	13,81	13,75
20,00	0,163	80,71	80,30	0,160	77,926	77,451	84,975	13,81	13,75
21,00	0,163	80,84	80,38	0,160	78,140	77,595	85,393	13,82	13,75
22,00	0,163	80,99	80,45	0,160	78,360	77,718	85,541	13,82	13,74
23,00	0,163	81,12	80,54	0,160	78,508	77,845	85,671	13,80	13,74
24,00	0,163	81,29	80,65	0,160	78,719	77,980	85,780	13,80	13,73
25,00	0,163	81,43	80,73	0,160	78,917	78,106	85,884	13,79	13,73
26,00	0,163	81,51	80,79	0,160	79,013	78,184	86,010	13,80	13,73
27,00	0,163	81,59	80,88	0,160	79,057	78,274	86,135	13,81	13,73
28,00	0,163	81,61	80,90	0,160	79,006	78,313	86,306	13,80	13,73
29,00	0,163	81,66	80,96	0,160	79,036	78,400	86,199	13,80	13,72
30,00	0,163	81,63	80,99	0,160	78,928	78,366	86,368	13,80	13,73
31,00	0,163	81,55	80,98	0,160	78,758	78,323	86,236	13,80	13,73
32,00	0,163	81,59	81,02	0,160	78,839	78,364	86,336	13,79	13,73
33,00	0,163	81,64	81,04	0,160	78,865	78,374	86,081	13,79	13,73
34,00	0,163	81,59	81,04	0,160	78,801	78,359	86,215	13,80	13,73
35,00	0,163	81,67	81,08	0,160	78,928	78,420	86,384	13,81	13,73
36,00	0,163	81,83	81,16	0,160	79,189	78,571	86,307	13,81	13,72
37,00	0,163	81,96	81,23	0,160	79,335	78,634	86,410	13,79	13,72
38,00	0,163	81,96	81,27	0,160	79,288	78,670	86,384	13,78	13,72
39,00	0,163	81,84	81,24	0,160	79,063	78,558	86,052	13,78	13,72
40,00	0,163	81,88	81,26	0,160	79,179	78,629	86,374	13,78	13,72
41,00	0,163	81,93	81,28	0,160	79,208	78,639	86,557	13,79	13,72
42,00	0,163	81,97	81,33	0,160	79,240	78,653	86,601	13,79	13,72
43,00	0,163	81,91	81,31	0,160	79,098	78,569	86,469	13,80	13,72
44,00	0,163	81,87	81,32	0,160	79,064	78,617	85,575	13,79	13,72
45,00	0,163	81,90	81,33	0,160	79,128	78,625	84,914	13,79	13,72
46,00	0,163	82,02	81,41	0,160	79,292	78,708	84,306	13,77	13,72
47,00	0,163	82,04	81,44	0,160	79,350	78,742	84,242	13,76	13,72
48,00	0,163	82,13	81,50	0,160	79,474	78,807	84,750	13,77	13,71
49,00	0,163	82,21	81,54	0,160	79,513	78,834	85,353	13,76	13,71
50,00	0,163	82,12	81,52	0,160	79,368	78,780	85,526	13,77	13,71
51,00	0,163	82,11	81,54	0,160	79,330	78,801	85,935	13,79	13,71
52,00	0,163	82,04	81,53	0,160	79,162	78,723	85,965	13,79	13,72
53,00	0,163	81,95	81,51	0,160	79,017	78,669	86,065	13,77	13,72
54,00	0,163	81,95	81,50	0,160	79,029	78,698	86,351	13,78	13,72
55,00	0,163	81,99	81,52	0,160	79,053	78,689	86,336	13,78	13,72
56,00	0,163	81,91	81,49	0,160	78,902	78,603	86,046	13,79	13,72
57,00	0,163	81,98	81,51	0,160	79,054	78,698	86,317	13,79	13,72
58,00	0,163	82,02	81,53	0,160	79,119	78,723	86,353	13,79	13,72
59,00	0,163	81,99	81,53	0,160	79,038	78,688	85,844	13,80	13,72
60,00	0,163	82,05	81,57	0,160	79,190	78,746	86,254	13,79	13,72
61,00	0,163	82,14	81,64	0,160	79,265	78,820	86,500	13,78	13,72
62,00	0,163	82,13	81,64	0,160	79,205	78,780	86,693	13,78	13,72
63,00	0,163	82,10	81,64	0,160	79,174	78,763	85,831	13,78	13,72
64,00	0,163	82,18	81,68	0,160	79,281	78,859	85,928	13,79	13,71
65,00	0,163	82,30	81,73	0,160	79,481	78,917	86,317	13,80	13,71
66,00	0,163	82,26	81,71	0,160	79,314	78,851	86,018	13,79	13,71
67,00	0,163	82,19	81,70	0,160	79,222	78,834	85,178	13,77	13,72



Particulates Calculations

68,00	0,163	82,28	81,76	0,160	79,395	78,924	85,690	13,76	13,71
69,00	0,163	82,40	81,79	0,160	79,566	78,975	86,082	13,76	13,71
70,00	0,163	82,55	81,89	0,160	79,794	79,138	86,137	13,76	13,70
71,00	0,163	82,69	81,98	0,160	79,976	79,263	86,393	13,76	13,70
72,00	0,163	82,74	82,04	0,160	79,988	79,272	86,899	13,76	13,70
73,00	0,163	82,76	82,07	0,160	79,915	79,266	87,071	13,77	13,70
74,00	0,163	82,65	82,04	0,160	79,719	79,202	86,824	13,76	13,70
75,00	0,163	82,61	82,04	0,160	79,681	79,226	86,109	13,75	13,70
76,00	0,162	82,72	82,09	0,160	79,796	79,257	85,882	13,74	13,70
77,00	0,163	82,70	82,08	0,160	79,803	79,304	86,138	13,74	13,70
78,00	0,163	82,75	82,13	0,160	79,854	79,353	86,644	13,76	13,70
79,00	0,163	82,79	82,14	0,160	79,876	79,365	86,986	13,75	13,70
80,00	0,163	82,89	82,21	0,160	80,041	79,489	86,930	13,74	13,70
81,00	0,163	83,01	82,28	0,160	80,193	79,568	87,303	13,74	13,69
82,00	0,162	83,10	82,34	0,160	80,280	79,634	87,299	13,73	13,69
83,00	0,162	83,02	82,33	0,160	80,112	79,570	87,203	13,73	13,69
84,00	0,162	82,91	82,31	0,160	79,957	79,533	87,198	13,72	13,70
85,00	0,163	82,96	82,33	0,160	80,019	79,564	87,243	13,73	13,70
86,00	0,162	82,92	82,33	0,160	79,935	79,533	87,281	13,72	13,70
87,00	0,162	82,93	82,35	0,160	79,914	79,489	87,271	13,70	13,70
88,00	0,162	82,93	82,34	0,160	79,960	79,495	87,245	13,71	13,70
89,00	0,162	83,00	82,37	0,160	80,053	79,564	87,327	13,72	13,70
90,00	0,162	82,92	82,35	0,160	79,875	79,479	87,166	13,72	13,70
91,00	0,162	82,87	82,35	0,160	79,834	79,473	86,933	13,72	13,70
92,00	0,162	82,89	82,36	0,160	79,840	79,453	87,244	13,71	13,70
93,00	0,163	82,82	82,31	0,160	79,687	79,361	87,233	13,71	13,70
94,00	0,163	82,73	82,28	0,160	79,514	79,287	87,182	13,74	13,71
95,00	0,162	82,76	82,28	0,160	79,631	79,299	87,221	13,73	13,70
96,00	0,163	82,81	82,29	0,160	79,674	79,356	87,251	13,72	13,70
97,00	0,162	82,75	82,30	0,160	79,594	79,295	86,456	13,72	13,70
98,00	0,162	82,64	82,27	0,160	79,478	79,271	85,586	13,72	13,71
99,00	0,162	82,77	82,32	0,160	79,716	79,363	86,366	13,72	13,70
100,00	0,162	82,82	82,34	0,160	79,754	79,357	86,907	13,71	13,70
101,00	0,162	82,91	82,37	0,160	79,882	79,410	87,192	13,71	13,70
102,00	0,162	82,92	82,38	0,160	79,858	79,404	87,208	13,72	13,70
103,00	0,162	83,01	82,44	0,160	80,037	79,497	87,437	13,71	13,70
104,00	0,162	83,03	82,48	0,160	80,013	79,523	87,428	13,69	13,70
105,00	0,162	83,09	82,52	0,160	80,121	79,612	87,231	13,68	13,69
106,00	0,162	83,10	82,55	0,160	80,137	79,586	87,119	13,70	13,69
107,00	0,162	83,17	82,58	0,160	80,247	79,700	87,137	13,68	13,69
108,00	0,162	83,24	82,63	0,160	80,291	79,729	87,611	13,68	13,69
109,00	0,162	83,20	82,61	0,160	80,219	79,682	87,570	13,70	13,69
110,00	0,162	83,12	82,61	0,160	80,071	79,634	87,165	13,70	13,69
111,00	0,163	83,14	82,61	0,160	80,063	79,622	87,429	13,72	13,69
112,00	0,162	83,18	82,65	0,160	80,171	79,722	87,491	13,72	13,69
113,00	0,162	83,12	82,62	0,160	80,047	79,664	87,035	13,71	13,69
114,00	0,162	83,11	82,64	0,160	80,087	79,674	86,439	13,67	13,69
115,00	0,162	83,18	82,68	0,160	80,123	79,680	85,621	13,66	13,69
116,00	0,162	83,23	82,71	0,160	80,234	79,750	85,889	13,67	13,69
117,00	0,162	83,28	82,72	0,160	80,267	79,784	86,559	13,68	13,69
118,00	0,162	83,32	82,78	0,160	80,327	79,816	87,097	13,68	13,69
119,00	0,162	83,28	82,75	0,160	80,274	79,786	86,935	13,66	13,69
120,00	0,161	83,38	82,81	0,160	80,398	79,911	87,468	13,64	13,69
121,00	0,162	83,40	82,85	0,160	80,455	79,953	87,410	13,63	13,69
122,00	0,161	83,53	82,93	0,160	80,621	80,068	87,681	13,62	13,68
123,00	0,161	83,64	82,97	0,160	80,754	80,153	88,006	13,61	13,68
124,00	0,161	83,63	83,01	0,160	80,719	80,174	87,970	13,62	13,68
125,00	0,161	83,55	83,01	0,160	80,524	80,136	87,012	13,62	13,68

Particulates Calculations

		Outlet	Outlet	Average	Average	#1	#2		
Delta-P	Tunnel	Temp.	Temp.	100,41	100,34	System 1	System 2		SQRT
(in. H2O)	Velocity	Meter 1	Meter 2	Proportional Rates		Vol.Std.	Vol.Std.		Delta-P
Tunnel				PR1	PR2			Time	
in. H2O	Ft/Sec	Deg. R	Deg. R	%	%	(ft3)	(ft3)	min	(in H2O) <sup>2</sup>
0,046	14,250	540,0	537,3			0,160	0,160	0	0,2135988
0,046	14,364	540,1	537,4	102,44	102,04	0,160	0,160	1	0,2152532
0,047	14,478	540,2	537,4	101,46	101,30	0,160	0,160	2	0,216897
0,046	14,320	540,2	537,4	102,57	102,42	0,160	0,160	3	0,214546
0,047	14,389	540,2	537,4	102,05	101,79	0,160	0,160	4	0,2157286
0,046	14,345	540,2	537,4	102,18	101,92	0,160	0,160	5	0,2152536
0,043	13,845	540,2	537,4	105,85	105,53	0,160	0,160	6	0,2078202
0,042	13,604	540,3	537,4	107,81	107,48	0,160	0,160	7	0,2041256
0,042	13,662	540,2	537,4	107,23	107,16	0,160	0,160	8	0,2048701
0,043	13,817	540,3	537,5	106,37	106,06	0,160	0,160	9	0,2070805
0,042	13,738	540,3	537,5	107,15	106,71	0,161	0,160	10	0,2058586
0,042	13,624	540,3	537,4	107,89	107,63	0,160	0,160	11	0,2041262
0,045	14,131	540,3	537,5	104,04	103,79	0,160	0,160	12	0,2116897
0,044	14,070	540,4	537,7	104,51	104,25	0,160	0,160	13	0,2107293
0,047	14,403	540,5	537,7	102,32	101,83	0,160	0,160	14	0,2157257
0,045	14,126	540,4	537,6	104,04	103,72	0,161	0,160	15	0,2116902
0,045	14,088	540,4	537,6	104,07	103,93	0,160	0,160	16	0,2112101
0,045	14,172	540,5	537,7	103,46	103,34	0,160	0,160	17	0,2124075
0,046	14,257	540,5	537,8	102,98	102,80	0,160	0,160	18	0,2135992
0,046	14,260	540,5	537,7	103,02	102,83	0,160	0,160	19	0,2135988
0,046	14,260	540,5	537,7	103,08	102,83	0,160	0,160	20	0,2135989
0,046	14,329	540,6	537,9	102,80	102,38	0,160	0,159	21	0,2145466
0,045	14,220	540,7	538,0	103,39	103,16	0,160	0,159	22	0,2128856
0,045	14,221	540,8	538,2	103,41	103,15	0,160	0,159	23	0,2128849
0,047	14,412	541,0	538,3	101,99	101,77	0,160	0,159	24	0,2157258
0,047	14,414	541,1	538,5	101,90	101,75	0,160	0,159	25	0,2157261
0,049	14,788	541,2	538,6	99,54	99,18	0,160	0,159	26	0,221299
0,048	14,608	541,2	538,7	100,79	100,41	0,160	0,159	27	0,2185852
0,049	14,761	541,3	538,7	99,59	99,40	0,160	0,159	28	0,2208396
0,049	14,867	541,3	538,7	99,08	98,66	0,160	0,159	29	0,2224422
0,048	14,577	541,3	538,6	100,92	100,67	0,160	0,159	30	0,2180659
0,049	14,788	541,3	538,5	99,51	99,22	0,160	0,159	31	0,221256
0,049	14,792	541,3	538,6	99,35	99,20	0,160	0,159	32	0,2212996
0,049	14,835	541,3	538,6	99,12	98,87	0,160	0,159	33	0,2219865
0,049	14,760	541,3	538,6	99,81	99,40	0,160	0,159	34	0,2208408
0,049	14,762	541,4	538,7	99,81	99,40	0,160	0,159	35	0,2208402
0,049	14,792	541,5	538,9	99,56	99,15	0,160	0,159	36	0,2212999
0,049	14,793	541,6	539,0	99,34	99,14	0,160	0,159	37	0,2212994
0,049	14,839	541,6	539,0	99,01	98,83	0,160	0,159	38	0,2219871
0,048	14,572	541,5	538,8	100,79	100,60	0,160	0,159	39	0,2180657
0,048	14,654	541,6	538,9	100,29	100,08	0,160	0,159	40	0,2192268
0,047	14,470	541,6	538,9	101,75	101,39	0,160	0,159	41	0,2164326
0,050	14,948	541,7	538,9	98,44	98,15	0,160	0,159	42	0,2235808
0,048	14,655	541,6	538,8	100,45	100,10	0,160	0,159	43	0,219226
0,050	15,010	541,6	538,8	97,81	97,58	0,160	0,159	44	0,2247128
0,050	14,925	541,6	538,9	98,28	98,01	0,160	0,159	45	0,2235807
0,048	14,657	541,7	539,0	99,73	99,66	0,160	0,159	46	0,2196885
0,048	14,626	541,7	539,0	99,99	99,86	0,160	0,159	47	0,2192266
0,049	14,828	541,8	539,1	98,80	98,57	0,160	0,159	48	0,2221542
0,049	14,748	541,9	539,2	99,27	99,21	0,160	0,159	49	0,2208411
0,046	14,378	541,8	539,1	102,14	101,82	0,160	0,159	50	0,2152559
0,049	14,787	541,8	539,1	99,42	99,07	0,160	0,159	51	0,2213009
0,048	14,662	541,8	538,9	100,22	99,95	0,160	0,159	52	0,2194222
0,049	14,835	541,7	538,8	98,86	98,82	0,160	0,159	53	0,2219873
0,048	14,685	541,7	538,9	100,20	99,88	0,160	0,159	54	0,2196885
0,050	14,914	541,8	538,9	98,43	98,33	0,160	0,159	55	0,2231271
0,048	14,681	541,7	538,8	100,24	99,87	0,160	0,159	56	0,2196888
0,048	14,654	541,7	538,9	100,22	100,08	0,160	0,159	57	0,2192269
0,049	14,762	541,8	538,9	99,73	99,34	0,160	0,159	58	0,2208413
0,049	14,755	541,8	538,9	99,63	99,31	0,160	0,159	59	0,2208413
0,050	14,944	541,8	539,0	98,32	98,11	0,160	0,159	60	0,2235818
0,048	14,656	541,9	539,0	100,27	100,06	0,160	0,159	61	0,2192272
0,048	14,659	541,9	539,0	100,30	100,09	0,160	0,159	62	0,2192275
0,049	14,831	541,9	539,0	98,99	98,77	0,160	0,159	63	0,2219879
0,048	14,648	541,9	539,1	100,39	100,01	0,160	0,159	64	0,2192275
0,048	14,654	542,0	539,2	100,40	100,02	0,160	0,159	65	0,2192274
0,049	14,834	542,0	539,1	98,99	98,77	0,160	0,159	66	0,2219876
0,049	14,853	541,9	539,0	98,63	98,50	0,160	0,159	67	0,2224436

Particulates Calculations

0,049	14,753	542,0	539,2	99,32	99,24	0,160	0,159	68	0,220841
0,048	14,650	542,1	539,3	100,13	99,98	0,160	0,159	69	0,2192287
0,049	14,759	542,2	539,5	99,43	99,22	0,160	0,159	70	0,2208414
0,049	14,762	542,3	539,6	99,44	99,22	0,160	0,159	71	0,2208419
0,048	14,699	542,4	539,6	99,94	99,73	0,160	0,159	72	0,2197973
0,049	14,772	542,4	539,6	99,55	99,28	0,160	0,159	73	0,2208409
0,049	14,802	542,3	539,5	99,21	99,05	0,160	0,159	74	0,2213505
0,049	14,759	542,3	539,5	99,26	99,22	0,159	0,159	75	0,2208408
0,048	14,570	542,4	539,5	100,43	100,45	0,159	0,159	76	0,2180666
0,049	14,759	542,4	539,6	99,35	99,20	0,159	0,159	77	0,2208433
0,047	14,549	542,4	539,6	100,92	100,72	0,160	0,159	78	0,2176016
0,048	14,662	542,5	539,6	100,05	100,00	0,159	0,159	79	0,2192268
0,049	14,834	542,5	539,8	98,89	98,81	0,159	0,159	80	0,2218001
0,048	14,698	542,6	539,9	99,86	99,77	0,159	0,159	81	0,2196897
0,049	14,882	542,7	540,0	98,54	98,52	0,159	0,159	82	0,2224441
0,048	14,588	542,7	539,8	100,48	100,51	0,159	0,159	83	0,218067
0,048	14,619	542,6	539,7	100,27	100,31	0,159	0,159	84	0,2185322
0,048	14,666	542,6	539,8	100,06	99,99	0,159	0,159	85	0,2192282
0,047	14,558	542,6	539,7	100,63	100,75	0,159	0,159	86	0,2176016
0,049	14,851	542,6	539,7	98,54	98,76	0,159	0,159	87	0,2219885
0,048	14,666	542,6	539,7	99,88	100,00	0,159	0,159	88	0,2192278
0,049	14,775	542,7	539,8	99,27	99,26	0,159	0,159	89	0,2208411
0,049	14,880	542,6	539,7	98,46	98,56	0,159	0,159	90	0,2224448
0,050	14,892	542,6	539,7	98,39	98,44	0,159	0,159	91	0,2226702
0,047	14,557	542,6	539,6	100,48	100,76	0,159	0,159	92	0,2176022
0,048	14,697	542,6	539,5	99,82	99,83	0,159	0,159	93	0,2196903
0,048	14,696	542,5	539,4	99,88	99,85	0,159	0,159	94	0,2196897
0,049	14,774	542,5	539,5	99,12	99,32	0,159	0,159	95	0,2208419
0,050	14,927	542,5	539,5	98,28	98,29	0,159	0,159	96	0,2231284
0,049	14,763	542,5	539,4	99,08	99,25	0,159	0,159	97	0,220841
0,048	14,597	542,5	539,4	100,16	100,23	0,159	0,159	98	0,2185326
0,049	14,869	542,5	539,5	98,34	98,51	0,159	0,159	99	0,2224443
0,049	14,846	542,6	539,6	98,63	98,76	0,159	0,159	100	0,2219881
0,049	14,850	542,6	539,6	98,65	98,77	0,159	0,159	101	0,2219884
0,049	14,773	542,6	539,6	99,27	99,28	0,159	0,159	102	0,2208417
0,048	14,669	542,7	539,8	99,79	100,01	0,159	0,159	103	0,2192288
0,049	14,854	542,8	539,8	98,42	98,76	0,159	0,159	104	0,2219932
0,049	14,805	542,8	539,9	98,79	99,04	0,159	0,159	105	0,2213015
0,047	14,575	542,8	539,9	100,46	100,58	0,159	0,159	106	0,2178861
0,048	14,618	542,9	540,0	99,79	100,26	0,159	0,159	107	0,2185325
0,048	14,633	542,9	540,0	100,07	100,24	0,159	0,159	108	0,2186566
0,049	14,886	542,9	540,0	98,32	98,54	0,159	0,159	109	0,2224447
0,049	14,773	542,9	539,9	99,12	99,24	0,159	0,159	110	0,220842
0,048	14,669	542,9	539,8	99,99	99,99	0,159	0,159	111	0,2192292
0,048	14,669	542,9	539,9	99,93	99,98	0,159	0,159	112	0,2192282
0,049	14,802	542,9	539,9	98,79	99,02	0,159	0,159	113	0,2213016
0,049	14,840	542,9	539,9	98,14	98,66	0,159	0,159	114	0,2219884
0,049	14,752	542,9	539,9	98,66	99,09	0,158	0,159	115	0,2208424
0,047	14,556	543,0	540,0	100,16	100,46	0,159	0,159	116	0,2178567
0,048	14,657	543,0	540,0	99,64	99,88	0,159	0,159	117	0,2192283
0,048	14,586	543,0	540,1	100,11	100,46	0,159	0,159	118	0,2180674
0,047	14,475	543,0	540,0	100,73	101,21	0,159	0,159	119	0,2164339
0,048	14,669	543,1	540,2	99,24	99,94	0,158	0,159	120	0,2192285
0,048	14,668	543,1	540,2	99,35	99,93	0,158	0,159	121	0,2192253
0,049	14,780	543,2	540,3	98,39	99,20	0,158	0,159	122	0,2208421
0,049	14,815	543,3	540,5	98,34	99,00	0,158	0,159	123	0,2213019
0,048	14,712	543,3	540,4	99,00	99,69	0,158	0,159	124	0,2197689
0,048	14,616	543,3	540,3	99,55	100,18	0,158	0,159	125	0,2185329

CSA B415.1 OE Calculations

Manufacturer: MESY  
 Model: Autopelletair

Run: 3  
 Project #: PI-20112  
 Test Duration: 125 min

	HHV	LHV
Eff	89,98%	96,22%
Comb Eff	99,50%	99,50%
HT Eff	90,43%	96,70%
Output	49 050	kJ/h
Burn Rate	2,70	kg/h
Grams CO	-1	g
Input	54 512	kJ/h
MC wet	5,57	

Ultimate CO<sub>2</sub>  
 CO<sub>2-ult</sub> 20,28  
 F<sub>0</sub>  
 1,029

CSA B415.1 OE Calculations

		Air Fuel Ratio (A/F)	
Overall Heating Efficiency:	89,98%	Dry Molecular Weight ( $M_d$ )	30,12
Combustion Efficiency:	99,50%	Dry Moles Exhaust Gas ( $N_r$ ):	367,13 %HC
Heat Transfer Efficiency:	90,43%	Air Fuel Ratio (A/F)	10,55 0,8

Heat Output:	46 529 Btu/h	49 050 kJ/h
Heat Input:	51 711 Btu/h	54 512 kJ/h
Burn Duration:	2,08 h	
Burn Rate:	5,94 lb/h	2,697 kg/h
Stack Temp:	142,2 Deg. F	61,2 Deg. C

## Paramètres

Tous les facteurs de corrections et autres paramètres qui peuvent être modifiés par l'utilisateur du fichier sont regroupés ici.

Code verrouillage:

### Description du test

Test standard	B415
Run #	4
Date	03-09-2015
Technicien	m.m
Project #	PI-20112

### Description de l'unité

Manufacturier	MESY	
Modèle	Autopellet air	
Combustion system	Pellet	
Appliance type	pellet furnace	
Firebox volume	na	cu ft.
Appliance weight empty	na	lbs
Appliance weight full	na	lbs

### Paramètres du test

Logging time	1	min
Manufacturer's rated heat output	100 000	BTU/h Donnée fournie par le manfacturier
Targeted category	4	
Targeted output	100000	BTU/h
Cp steel	0,1	BTU/lb-°F

### Calibration Factor (flow meter)

Q obt (L/min)	Fc	
0,95	1	Dimensionless
1,9	1	Dimensionless
3,76	1	Dimensionless
11,35	1	Dimensionless
22,7	1	Dimensionless

### Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	1,007	Dimensionless
Equipment number (DGM #1):	EM-178	
Calibration Factor (DGM #2):	1,015	Dimensionless
Equipment number (DGM #2):	EM-179	

### Tunnel

Targeted tunnel flow rate	280	scfm
Tunnel diameter	8	in.
Molecular weight	29	May be assumed to be 28,56 (EPA) 28,78 (HYDRONIC)
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

### Fournaise

Fp	2,600000	
Outlet section		
H	9,000	in
W	9,125	in
Section	0,5703	sqft
Surface duct	0,052983765	m2

<b>Project nu.</b>	PI-20112
<b>Date</b>	03-09-2015
<b>Technicien</b>	mm

### Fuel data

Fuel type	Dimension
Fuel specie	Other
HHV	20214,0 kJ/kg
%C	50,4
%H	6,1
%O	42,9
%Ash	0,4
HHV	8691,0 Btu/lb
LHV	8178,0 Btu/lb

Default Fuel Values		
	D. Fir	Oak/Maple
HHV	19 810	19 887
%C	48,73	50
%H	6,87	6,6
%O	43,9	42,9
%Ash	0,5	0,5
HHV (Btu/lb)	8519	8552
LHV (Btu/lb)	7451	7480

Key in data

	Start	End
Barometer (kPa):	101,5	101
Barometer (in.Hg):	29,972939	29,8252888
Dry Bulb (F):	84,2	86,3
Humidity (%):	42,2	28,9
Air velocity (ft/min)	21	19

DGM #1	Final: 10335,915 cuft	Final: 292680,520
	Initial: 10315,178 cuft	Initial: 292093,310
DGM #2	Final: 8859,800 cuft	Final: 250881,590
	Initial: 8839,908 cuft	Initial: 250318,310

Numéro de la ligne dans "Raw data" à partir duquel les données du VRAI test commencent

Autres données à rentrer: dans preload data, load data, traverse et filter set weight

Pression statique (mmHg)	0,037
Pression statique (in.H2O)	0,200
consommation électrique (KWatt)	0,530

<b>Project nu.</b>	PI-20112
<b>Date</b>	03-09-2015
<b>Technicien</b>	m.m

Liter  
Liter

Liter  
Liter

199



## Overall Efficiency

### Totaux

Qout:	60494 Btu
Qin(HHV):	68039 Btu
Heat output rate:	29509 Btu/hr
Qin(LHV)	64023 Btu

### Emission rates

Et:	3,3 grams
Eg/MJ:	0,052
EIb/MM Btu output:	0,122
EIb/MM Btu Input	0,108
Eg/kg	0,940
Eg/h	1,642 g/h

### Delivered efficiency

ndel (HHV)	88,9%
ndel (LHV)	94,5%



OverallEfficiency

108,00	307,00	0,99	82,99	121,29	6,79	6,18	1419	22	31041	517	0,52	29457	29423	100000
109,00	308,00	0,89	82,56	121,08	7,05	6,42	1474	22	32436	541	0,54	29469	30745	100000
110,00	309,00	0,79	82,64	120,93	6,79	6,18	1420	22	31051	518	0,52	29469	29432	100000
111,00	310,00	0,73	82,65	121,06	7,09	6,46	1482	22	32524	542	0,54	29481	30829	100000
112,00	311,00	0,69	82,58	120,79	6,75	6,15	1412	22	30806	513	0,51	29478	29200	100000
113,00	312,00	0,59	82,37	120,72	7,05	6,42	1475	22	32306	538	0,54	29489	30622	100000
114,00	313,00	0,49	82,41	120,69	7,05	6,42	1475	22	32252	538	0,54	29498	30571	100000
115,00	314,00	0,48	82,56	120,59	7,10	6,46	1485	22	32242	537	0,54	29507	30561	100000
116,00	315,00	0,39	82,67	120,54	7,00	6,38	1464	22	31669	528	0,53	29511	30018	100000
117,00	316,00	0,29	84,06	120,77	6,71	6,11	1404	21	29432	491	0,49	29498	27898	100000
118,00	317,00	0,29	82,77	120,50	6,96	6,34	1456	22	31367	523	0,52	29500	29732	100000
119,00	318,00	0,29	82,82	120,44	7,02	6,39	1468	21	31549	526	0,53	29503	29905	100000
120,00	319,00	0,11	82,87	120,50	6,70	6,11	1403	21	30152	503	0,50	29496	28580	100000
121,00	320,00	0,09	82,64	120,42	7,09	6,46	1485	22	32037	534	0,53	29503	30367	100000
122,00	321,00	0,00	82,54	120,26	7,09	6,46	1484	22	31971	533	0,53	29509	30304	100000

**FUEL LOAD DATA SHEET, CSA B415**

Test Load Weight:

Lower Ideal Upper

#### ##### #####

\* For boilers, a loading density factor of 10 lb/ft3 is applied

Load Volume:  cu. ft

Loading Density: #VALEUR! lbs./ft3

Number of Spaces:   
 Spacer weight:  lbs

Load Density (wet): #DIV/0! lbs./ft3  
 Dry Wood Density: #DIV/0! lbs./ft3

Piece Size (in):			Weight lbs	Meter Moisture Content				Ave. MC x	Volume	Ave. MC
Thick	Wide	Length		Dry Uncorrected %				Weight	Cubic Inches	%
			8,29	5,90				48,914503	0,00	5,9
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
									0,00	
SUM MCx								48,914503		5,9 %

Test Load Weight:  lbs.

Dry Weight:  kg.

Average Moisture Content: %

Dry:  Dry(EPA) 5,90  
 Dry(B415) 5,90

Must be 18-28

Wet:   
 must be 15,2-22

Coal Bed Range:  lbs. to

lbs.

TEST CHARGE:

Coal bed weight:  lbs.  
 Must be between 10 and 25% of test load

Project nu. PI-20112  
 Date 03-09-2015  
 Technician AL

**Preload data sheet**

Test Load Weight:

Lower Ideal Upper

#### ##### #VALEUR!

\* For boilers, a loading density factor of 10 lb/ft3 is applied

Load Volume: 0,0000 cu. ft Loading Density: #VALEUR! lbs./ft3

Number of Spaces: 0 Load Density (wet): #DIV/0! lbs./ft3  
 Spacer weight (lbs): 0 Dry Wood Density: #DIV/0!

Piece Size (in):			Weight lbs	Meter Moisture Content				Ave. MC x Weight	Volume Cubic Inches
Thick	Wide	x Length		Dry Uncorrected %					
			4,15	5,9				24,485	0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00
									0,00

SUM MC: 24,485

PreTest Load Weight: 4,15 lbs.

Dry Weight: 1,78 kg.

Average Moisture Content: %

Dry: 5,90

5,90  
Must be 18-28

Wet: 5,57  
must be 15,2-22

**Project nu.** PI-20112  
**Date** 03-09-2015  
**Technicien** AL

## Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,16 in. H2O  
 Barometer: 29,900 in. Hg

**Pour un tunnel de 12" et plus, prendre 6 lectures**

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center			0,0000
B center			0,0000
A1			0,0000
A2			0,0000
A3			0,0000
A4			0,0000
A5			0,0000
A6			0,0000
B1			0,0000
B2			0,0000
B3			0,0000
B4			0,0000
B5			0,0000
B6			0,0000
AVERAGE		#DIV/0!	0,0000

PITOT CONSTANT=  
0,994

**Pour un tunnel moins de 12", prendre 4 lectures**

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,047	78,4	0,2168
B center	0,047	78,8	0,2168
A1	0,040	78,8	0,2000
A2	0,047	78,7	0,2168
A3	0,050	78,8	0,2236
A4	0,045	78,8	0,2121
B1	0,048	78,9	0,2191
B2	0,049	78,5	0,2214
B3	0,046	78,5	0,2145
B4	0,047	78,4	0,2168
AVERAGE	0,0465	78,7	0,2155

<b>Project nu.</b>	PI-20112
<b>Date</b>	03-09-2015
<b>Technicien</b>	<span style="border: 1px solid red; padding: 2px;">m.m</span>

## Filter set weight

	System 1 (g) 1st hour				System 1 (g)				System 2 (g)				Ambient blank (g)	Date	Heure
	probe	front	back	gasket	probe	front	back	gasket	probe	front	back	gasket	Filter		
Before (1)															
Before (2)															
Before (3)	94,644	0,1231	0,1279	10,457	93,7296	0,1281	0,1224	10,3261	108,9538	0,1289	0,1288	10,3017	0,1278	2015-09-02	19:30
Before (4)	94,6442	0,123	0,1278	10,457	93,7297	0,1281	0,1224	10,3263	108,9538	0,1288	0,1288	10,3017	0,1278	2015-09-03	15:00
After (1)	94,6443	0,124	0,1281	10,4581	93,7298	0,1291	0,1224	10,3278	108,9538	0,1298	0,1288	10,3029	0,1278	2015-09-03	20:00
After (2)	94,6442	0,1239	0,1278	10,4571	93,7297	0,129	0,1224	10,3264	108,9538	0,1298	0,1288	10,3026	0,1278	2015-09-15	17:00
After (3)	94,6442	0,1239	0,1278	10,4571	93,7297	0,1289	0,1224	10,3264	108,9538	0,1298	0,1288	10,3026	0,1278	2015-09-21	17:00
After (4)															
After (5)															
After (6)	94,6442	0,1239	0,1278	10,4571	93,7297	0,1289	0,1224	10,3264	108,9538	0,1298	0,1288	10,3026	0,1278	2015-09-21	17:00
Difference	0,0000	0,0009	0,0000	0,0001	0,0000	0,0008	0,0000	0,0001	0,0000	0,0010	0,0000	0,0009	0,0000		
Total (mg)		1				1,9				1,9					0
Total ajusté (mg)		<b>1,00</b>				<b>1,90</b>				<b>1,90</b>					

<b>Project nu.</b>	PI-20112
<b>Date</b>	03-09-2015
<b>Technicien</b>	M.M

SFBA EPA EMISSION RESULTS

RESULTS

**Average emission rate:** 1,6 g/hr

Burn Rate : 1,746 Dry kg/hr

**Test Duration:** 122 min

PRESSURE FACTOR: DGM 1 0,97729  
DGM 2 0,98404

TEMPERATURE FACTORS  
DGM 1 0,96643  
DGM 2 0,97181

VOLUMES SAMPLED  
DGM 1 19,737 Scft  
DGM 2 19,327 Scft

TOTAL TUNNEL VOLUME : 34285 Scft

SAMPLE RATIOS  
Sample Train 1: 1737,034  
Sample Train 2: 1773,902

TOTAL EMISSIONS  
Sample Train 1 3,30 g  
Sample Train 2 3,37 g

EMISSION RATES  
Sample Train 1 1,62 g/hr  
Sample Train 2 1,66 g/hr

1st hour emission rate 1,74 g/hr

DEVIATION: 1,05%

Cs Train 1 Train 2  
9,626E-05 9,83072E-05

BAROMETRIC PRESSURE  
Average: 29,899 in Hg  
Start: 29,973 in Hg  
End: 29,825 in Hg

DRY GAS METER VALUES

DGM #1 Final: 10335,9 Cuft  
Initial: 10315,2 Cuft

DGM #2 Final: 8859,8 Cuft  
Initial: 8839,9 Cuft

TEMPERATURES  
DGM #1 546,342 °R  
DGM #2 543,318 °R

CALIBRATION FACTORS  
DGM #1 1,0069  
DGM #2 1,0150

TUNNEL FLOW RATE: 281,021 Dscfm

PARTICULATE CATCH  
Total Sample Train 1: 1,90 mg  
Total Sample Train 2: 1,90 mg  
Total Sample Train 1 1st hour: 1,00 mg



Particulates Calculations

Average Stove Temperature: #####									
Moisture content of wood (wet basis):		0,00							
		Average	0,01	8,77	11,25	122,21	85,69	89,63	
*		*	*	*	*	*1	*2	*3	
Elapsed		Weight				Flue	Room	Tunnel	
Time	Raw data row	Remaining	CO	CO <sub>2</sub>	O <sub>2</sub>	Gas	Temp	Dry Bulb	
min		lbs	%	%	%	°F	°F	°F	
0,00	199,00	8,3	0,0	8,8	11,2	120,9	85,1	88,0	
1,0	200,0	8,3	0,0	8,8	11,2	121,8	85,1	88,8	
2,0	201,0	8,2	0,0	8,2	11,9	122,6	85,1	89,2	
3,0	202,0	8,1	0,0	8,1	12,0	123,1	85,3	89,4	
4,0	203,0	8,1	0,0	8,3	11,8	122,7	85,3	89,6	
5,0	204,0	8,0	0,0	8,6	11,4	122,5	85,3	89,1	
6,0	205,0	7,9	0,0	8,6	11,5	122,5	85,3	89,4	
7,0	206,0	7,8	0,0	8,6	11,4	122,6	85,6	89,6	
8,0	207,0	7,7	0,0	8,8	11,3	122,9	85,6	89,7	
9,0	208,0	7,6	0,0	8,8	11,3	123,0	85,5	89,6	
10,0	209,0	7,6	0,0	8,8	11,3	123,7	85,6	89,8	
11,0	210,0	7,5	0,0	8,4	11,6	124,1	85,6	89,5	
12,0	211,0	7,5	0,0	8,0	12,0	123,9	85,9	89,6	
13,0	212,0	7,4	0,0	8,4	11,6	122,6	85,8	89,6	
14,0	213,0	7,3	0,0	8,6	11,4	122,3	85,7	89,9	
15,0	214,0	7,3	0,0	8,9	11,1	122,4	85,6	89,5	
16,0	215,0	7,3	0,0	9,0	11,0	122,2	85,7	89,5	
17,0	216,0	7,2	0,0	8,8	11,2	122,2	85,3	89,5	
18,0	217,0	7,1	0,0	8,8	11,2	122,1	85,4	89,2	
19,0	218,0	7,1	0,0	8,7	11,4	122,0	85,2	89,3	
20,0	219,0	6,9	0,0	8,6	11,5	122,0	85,3	89,3	
21,0	220,0	6,9	0,0	8,8	11,2	121,8	85,3	88,4	
22,0	221,0	6,8	0,0	8,5	11,5	121,7	85,0	88,1	
23,0	222,0	6,7	0,0	8,5	11,5	121,6	85,4	88,7	
24,0	223,0	6,7	0,0	8,7	11,3	122,1	85,3	88,6	
25,0	224,0	6,7	0,0	8,3	11,7	122,5	85,3	89,1	
26,0	225,0	6,6	0,0	8,0	12,1	122,3	85,2	89,2	
27,0	226,0	6,5	0,0	7,9	12,1	122,3	85,2	89,2	
28,0	227,0	6,4	0,0	7,9	12,2	122,2	85,6	89,3	
29,0	228,0	6,4	0,0	8,1	12,0	122,4	85,4	89,2	
30,0	229,0	6,3	0,0	8,2	11,8	122,1	85,4	88,9	
31,0	230,0	6,3	0,0	8,5	11,6	122,4	85,7	89,1	
32,0	231,0	6,2	0,0	8,3	11,8	122,3	85,8	89,4	
33,0	232,0	6,1	0,0	8,1	11,9	122,4	86,0	89,5	
34,0	233,0	6,0	0,0	8,1	12,0	122,1	85,8	89,6	
35,0	234,0	6,0	0,0	8,0	12,1	122,0	85,8	89,6	
36,0	235,0	5,9	0,0	8,2	11,9	122,0	85,7	89,3	
37,0	236,0	5,8	0,0	8,5	11,6	122,2	85,7	89,4	
38,0	237,0	5,8	0,0	8,4	11,6	122,1	85,9	89,5	
39,0	238,0	5,8	0,0	8,4	11,6	122,4	85,8	89,6	
40,0	239,0	5,7	0,0	8,3	11,7	122,3	85,8	89,6	
41,0	240,0	5,6	0,0	8,2	11,9	122,2	85,9	89,6	
42,0	241,0	5,5	0,0	8,3	11,8	122,4	85,9	89,6	
43,0	242,0	5,4	0,0	8,6	11,4	122,5	86,0	89,7	
44,0	243,0	5,4	0,0	9,0	10,9	122,7	85,9	89,7	
45,0	244,0	5,3	0,0	8,5	11,5	122,6	85,7	89,4	
46,0	245,0	5,2	0,0	8,4	11,6	122,6	85,7	88,9	
47,0	246,0	5,2	0,0	8,3	11,7	122,5	85,8	88,5	
48,0	247,0	5,1	0,0	8,2	11,8	122,3	85,8	88,7	
49,0	248,0	5,0	0,0	8,2	11,9	122,2	85,9	88,5	
50,0	249,0	5,0	0,0	8,1	11,9	122,2	85,4	87,8	
51,0	250,0	4,9	0,0	8,4	11,7	122,2	85,3	87,9	
52,0	251,0	4,8	0,0	8,5	11,5	122,4	85,5	88,2	
53,0	252,0	4,7	0,0	8,4	11,6	122,4	85,6	88,6	
54,0	253,0	4,7	0,0	8,3	11,8	122,4	85,8	88,6	
55,0	254,0	4,6	0,0	8,2	11,9	122,3	85,6	88,3	
56,0	255,0	4,6	0,0	8,2	11,9	122,3	85,6	88,5	
57,0	256,0	4,5	0,0	8,6	11,4	122,4	85,5	88,7	
58,0	257,0	4,4	0,0	8,6	11,5	122,5	85,5	88,9	
59,0	258,0	4,4	0,0	8,7	11,3	122,5	85,5	89,0	
60,0	259,0	4,3	0,0	8,9	11,2	122,2	85,4	89,1	
61,0	260,0	4,2	0,0	9,2	10,9	122,2	85,5	89,1	
62,0	261,0	4,1	0,0	9,5	10,5	122,4	85,6	89,2	
63,0	262,0	4,0	0,0	9,6	10,4	122,5	85,8	89,4	
64,0	263,0	4,0	0,0	9,1	10,9	122,4	85,6	89,3	
65,0	264,0	3,9	0,0	8,8	11,2	122,1	85,6	89,0	

Particulates Calculations

66,0	265,0	3,8	0,0	8,7	11,3	121,8	85,6	89,3
67,0	266,0	3,7	0,0	8,9	11,2	121,8	85,7	89,5
68,0	267,0	3,7	0,0	8,9	11,2	121,9	85,7	89,3
69,0	268,0	3,7	0,0	9,2	10,8	122,0	85,6	89,3
70,0	269,0	3,6	0,0	9,2	10,7	122,2	85,6	89,2
71,0	270,0	3,5	0,0	9,1	10,9	122,3	85,7	89,5
72,0	271,0	3,5	0,0	8,8	11,2	122,1	85,7	89,6
73,0	272,0	3,4	0,0	8,8	11,3	121,7	85,5	89,1
74,0	273,0	3,4	0,0	8,8	11,3	121,6	85,5	89,2
75,0	274,0	3,3	0,0	8,7	11,4	121,6	85,3	89,4
76,0	275,0	3,2	0,0	8,6	11,4	121,4	85,1	89,2
77,0	276,0	3,1	0,0	8,9	11,2	121,6	84,8	89,1
78,0	277,0	3,0	0,0	9,0	11,0	121,6	85,2	89,3
79,0	278,0	3,0	0,0	9,5	10,6	121,9	84,8	89,2
80,0	279,0	2,8	0,0	9,2	10,8	122,0	84,8	89,4
81,0	280,0	2,8	0,0	9,0	11,1	121,9	84,9	89,2
82,0	281,0	2,7	0,0	9,1	11,0	122,0	85,1	89,2
83,0	282,0	2,7	0,0	9,6	10,4	122,2	85,0	89,3
84,0	283,0	2,6	0,0	9,7	10,3	122,2	85,0	89,7
85,0	284,0	2,6	0,0	9,5	10,5	122,2	85,1	89,3
86,0	285,0	2,5	0,0	9,3	10,7	122,1	84,8	88,7
87,0	286,0	2,4	0,0	9,3	10,7	122,0	84,6	89,1
88,0	287,0	2,3	0,0	9,2	10,8	122,0	84,8	89,2
89,0	288,0	2,3	0,0	9,4	10,6	122,2	84,8	89,3
90,0	289,0	2,2	0,0	9,4	10,6	122,3	85,2	89,4
91,0	290,0	2,1	0,0	9,4	10,6	122,2	85,3	89,6
92,0	291,0	2,0	0,0	9,4	10,6	122,3	85,6	89,8
93,0	292,0	2,0	0,0	9,6	10,4	122,6	85,9	90,0
94,0	293,0	1,8	0,0	9,6	10,4	122,6	86,0	90,2
95,0	294,0	1,9	0,0	9,3	10,7	122,8	86,1	90,4
96,0	295,0	1,8	0,0	9,2	10,8	122,5	86,0	90,5
97,0	296,0	1,7	0,0	9,0	11,0	122,3	86,2	90,6
98,0	297,0	1,6	0,0	9,3	10,7	122,2	86,3	90,7
99,0	298,0	1,5	0,0	9,1	10,9	122,1	86,2	90,8
100,0	299,0	1,5	0,0	9,1	10,9	122,1	86,2	90,8
101,0	300,0	1,4	0,0	9,2	10,7	122,1	86,3	90,8
102,0	301,0	1,4	0,0	9,2	10,8	122,2	86,5	90,9
103,0	302,0	1,2	0,0	9,1	10,9	122,2	86,4	91,0
104,0	303,0	1,2	0,0	9,0	11,0	122,1	86,3	91,0
105,0	304,0	1,1	0,0	9,1	10,9	122,1	86,5	91,2
106,0	305,0	1,0	0,0	9,0	11,0	122,2	86,6	91,2
107,0	306,0	1,0	0,0	9,2	10,8	122,2	86,6	91,2
108,0	307,0	1,0	0,0	9,2	10,8	122,3	86,7	91,2
109,0	308,0	0,9	0,0	9,0	11,0	122,1	86,8	91,2
110,0	309,0	0,8	0,0	8,9	11,1	122,1	86,7	91,2
111,0	310,0	0,7	0,0	8,9	11,1	122,0	86,7	91,3
112,0	311,0	0,7	0,0	8,8	11,2	122,0	86,6	91,3
113,0	312,0	0,6	0,0	8,8	11,2	121,9	86,6	91,3
114,0	313,0	0,5	0,0	9,1	10,9	122,0	86,6	91,3
115,0	314,0	0,5	0,0	9,1	10,9	121,9	86,4	91,4
116,0	315,0	0,4	0,0	8,9	11,0	122,0	86,4	91,4
117,0	316,0	0,3	0,0	8,8	11,1	121,8	86,5	91,4
118,0	317,0	0,3	0,0	8,9	11,1	121,6	86,4	91,3
119,0	318,0	0,3	0,0	9,0	11,0	121,7	86,5	91,4
120,0	319,0	0,1	0,0	8,8	11,1	121,6	86,4	91,3
121,0	320,0	0,1	0,0	8,7	11,3	121,4	86,3	91,4
122,0	321,0	0,0	0,0	8,9	11,0	121,7	86,3	91,5

Particulates Calculations

87,18

85,44

0,16	86,31	86,37	85,44	0,16	83,25	83,38	85,03	0,05	0,21
Mass flow 1	Mass flow 1	Mass flow 1	Filter 1	Mass flow 2	Mass flow 2	Mass flow 2	Filter 2	Tunnel Velod	Flue draft
Reading	Inlet T	Outlet T	Temp	Reading	Inlet T	Outlet T	Temp	Pressure	Pressure
								in wc	in wc
cuft/min	oF	oF	oF	cuft/min	oF	oF	oF	in wc	in wc
0,16	86,27	86,28	85,08	0,16	83,22	83,41	84,82	0,05	0,21
0,16	86,27	86,45	85,09	0,16	83,30	83,47	84,84	0,05	0,21
0,16	86,30	86,49	85,13	0,16	83,34	83,49	84,85	0,05	0,21
0,16	86,35	86,50	85,13	0,16	83,41	83,56	84,86	0,05	0,21
0,16	86,46	86,57	85,19	0,16	83,61	83,72	84,88	0,05	0,21
0,16	86,39	86,57	85,19	0,16	83,46	83,64	84,88	0,04	0,21
0,16	86,42	86,58	85,17	0,16	83,46	83,68	84,89	0,05	0,21
0,16	86,39	86,58	85,17	0,16	83,44	83,68	84,92	0,05	0,21
0,16	86,43	86,60	85,21	0,16	83,49	83,74	84,92	0,05	0,21
0,16	86,47	86,63	85,27	0,16	83,57	83,79	84,96	0,04	0,21
0,16	86,52	86,65	85,31	0,16	83,69	83,86	84,99	0,05	0,21
0,16	86,59	86,70	85,36	0,16	83,77	83,92	85,01	0,05	0,21
0,16	86,66	86,72	85,38	0,16	83,83	83,97	85,07	0,04	0,21
0,16	86,54	86,68	85,35	0,16	83,63	83,86	85,05	0,05	0,21
0,16	86,48	86,66	85,34	0,16	83,52	83,81	85,06	0,05	0,21
0,16	86,39	86,61	85,34	0,16	83,39	83,70	85,07	0,04	0,21
0,16	86,29	86,54	85,26	0,16	83,22	83,59	85,05	0,05	0,21
0,16	86,21	86,50	85,22	0,16	83,14	83,56	85,06	0,04	0,21
0,16	86,12	86,43	85,18	0,16	82,97	83,41	85,05	0,05	0,21
0,16	86,06	86,38	85,13	0,16	82,91	83,36	85,05	0,04	0,21
0,16	85,93	86,32	85,11	0,16	82,73	83,22	85,05	0,04	0,21
0,16	85,87	86,25	85,01	0,16	82,68	83,16	85,01	0,04	0,21
0,16	85,89	86,26	84,99	0,16	82,76	83,18	85,00	0,04	0,21
0,16	85,97	86,28	85,03	0,16	82,89	83,23	85,02	0,05	0,21
0,16	85,86	86,23	85,00	0,16	82,69	83,14	85,02	0,05	0,21
0,16	85,83	86,21	85,01	0,16	82,69	83,11	85,02	0,05	0,21
0,16	85,86	86,19	84,99	0,16	82,77	83,10	85,01	0,04	0,21
0,16	85,94	86,21	84,97	0,16	82,86	83,12	85,01	0,05	0,21
0,16	86,01	86,23	85,00	0,16	83,01	83,21	85,04	0,04	0,21
0,16	86,01	86,25	84,99	0,16	82,97	83,16	85,05	0,05	0,21
0,16	85,96	86,22	84,97	0,16	82,88	83,14	85,03	0,05	0,21
0,16	86,02	86,25	85,00	0,16	82,97	83,20	85,03	0,05	0,21
0,16	85,99	86,25	85,01	0,16	82,93	83,19	85,04	0,04	0,21
0,16	86,05	86,27	85,04	0,16	83,00	83,23	85,08	0,04	0,21
0,16	86,09	86,29	85,05	0,16	83,03	83,28	85,07	0,05	0,21
0,16	86,12	86,28	85,06	0,16	83,06	83,28	85,09	0,05	0,21
0,16	86,04	86,27	85,04	0,16	82,92	83,21	85,07	0,05	0,21
0,16	86,09	86,27	85,04	0,16	83,04	83,24	85,08	0,05	0,21
0,16	86,12	86,27	85,07	0,16	83,02	83,21	85,08	0,04	0,21
0,16	86,11	86,29	85,06	0,16	83,03	83,22	85,11	0,05	0,21
0,16	86,17	86,30	85,08	0,16	83,13	83,25	85,13	0,04	0,21
0,16	86,21	86,32	85,12	0,16	83,15	83,27	85,09	0,04	0,21
0,16	86,23	86,32	85,12	0,16	83,13	83,27	85,11	0,04	0,21
0,16	86,20	86,31	85,12	0,16	83,11	83,25	85,14	0,05	0,21
0,16	86,15	86,28	85,13	0,16	83,00	83,19	85,12	0,05	0,21
0,16	86,11	86,28	85,08	0,16	82,95	83,19	85,16	0,04	0,21
0,16	86,12	86,25	85,07	0,16	82,94	83,16	85,11	0,05	0,21
0,16	86,16	86,27	85,07	0,16	83,07	83,20	85,13	0,04	0,21
0,16	86,18	86,27	85,05	0,16	83,10	83,23	85,12	0,04	0,21
0,16	86,13	86,26	85,08	0,16	82,96	83,13	85,13	0,04	0,21
0,16	86,04	86,20	85,03	0,16	82,84	83,10	85,12	0,05	0,21
0,16	85,95	86,16	84,97	0,16	82,72	83,02	85,10	0,04	0,21
0,16	85,88	86,11	84,97	0,16	82,62	82,93	85,14	0,05	0,21
0,16	85,79	86,06	85,00	0,16	82,49	82,85	85,11	0,05	0,21
0,16	85,82	86,07	85,00	0,16	82,57	82,91	85,12	0,04	0,21
0,16	85,76	86,03	84,97	0,16	82,47	82,85	85,07	0,04	0,21
0,16	85,77	86,00	84,91	0,16	82,48	82,82	85,10	0,05	0,21
0,16	85,69	85,97	84,90	0,16	82,39	82,69	85,07	0,04	0,21
0,16	85,63	85,93	84,87	0,16	82,30	82,67	85,05	0,04	0,21
0,16	85,57	85,88	84,87	0,16	82,20	82,59	85,05	0,05	0,21
0,16	85,61	85,88	84,87	0,16	82,31	82,63	85,02	0,04	0,21
0,16	85,72	85,93	84,85	0,16	82,52	82,76	85,04	0,05	0,21
0,16	85,82	85,97	87,09	0,16	82,63	82,79	85,05	0,05	0,21
0,16	85,91	86,02	87,18	0,16	82,82	82,89	85,04	0,04	0,21
0,16	85,90	86,03	87,07	0,16	82,74	82,88	85,05	0,05	0,21
0,16	85,92	86,03	86,94	0,16	82,76	82,90	85,04	0,05	0,21

Particulates Calculations

0,16	85,99	86,10	86,82	0,16	82,90	82,99	85,05	0,04	0,21
0,16	86,05	86,13	86,73	0,16	82,94	82,98	85,03	0,05	0,21
0,16	86,09	86,13	86,59	0,16	83,02	83,05	85,06	0,05	0,21
0,16	86,10	86,15	86,49	0,16	83,02	83,05	85,02	0,04	0,21
0,16	86,03	86,13	86,42	0,16	82,85	82,96	85,06	0,05	0,21
0,16	86,02	86,09	86,31	0,16	82,83	82,95	85,02	0,05	0,21
0,16	85,97	86,07	86,24	0,16	82,77	82,91	85,05	0,05	0,21
0,16	85,88	86,03	86,15	0,16	82,60	82,83	85,02	0,05	0,21
0,16	85,82	85,99	86,00	0,16	82,53	82,76	85,02	0,05	0,21
0,16	85,65	85,89	85,92	0,16	82,23	82,59	85,00	0,04	0,21
0,16	85,56	85,83	85,79	0,16	82,13	82,51	84,96	0,04	0,21
0,16	85,63	85,84	85,72	0,16	82,25	82,55	84,95	0,04	0,21
0,16	85,70	85,85	85,67	0,16	82,37	82,58	84,94	0,05	0,21
0,16	85,69	85,82	85,60	0,16	82,38	82,52	84,92	0,04	0,21
0,16	85,71	85,85	85,53	0,16	82,47	82,57	84,88	0,05	0,21
0,16	85,82	85,88	85,49	0,16	82,66	82,68	84,90	0,04	0,21
0,16	85,89	85,94	85,48	0,16	82,78	82,72	84,87	0,05	0,21
0,16	85,86	85,94	85,42	0,16	82,68	82,70	84,87	0,04	0,21
0,16	85,91	85,98	85,40	0,16	82,80	82,80	84,88	0,05	0,21
0,16	85,91	85,97	85,34	0,16	82,74	82,73	84,88	0,05	0,21
0,16	85,75	85,89	85,22	0,16	82,44	82,59	84,82	0,05	0,21
0,16	85,67	85,82	85,13	0,16	82,40	82,55	84,78	0,05	0,21
0,16	85,59	85,77	85,07	0,16	82,22	82,41	84,77	0,05	0,21
0,16	85,56	85,77	85,03	0,16	82,24	82,48	84,75	0,05	0,21
0,16	85,70	85,84	85,08	0,16	82,48	82,60	84,78	0,05	0,21
0,16	85,84	85,90	85,09	0,16	82,71	82,74	84,77	0,05	0,21
0,16	86,01	86,00	85,12	0,16	82,98	82,89	84,75	0,05	0,21
0,16	86,17	86,07	85,16	0,16	83,20	83,04	84,77	0,04	0,21
0,16	86,32	86,17	85,20	0,16	83,42	83,20	84,79	0,05	0,21
0,16	86,45	86,25	85,25	0,16	83,58	83,33	84,82	0,05	0,21
0,16	86,59	86,35	85,29	0,16	83,76	83,49	84,83	0,05	0,21
0,16	86,68	86,41	85,34	0,16	83,87	83,59	84,86	0,05	0,21
0,16	86,79	86,49	85,38	0,16	83,99	83,73	84,87	0,05	0,21
0,16	86,88	86,58	85,41	0,16	84,09	83,83	84,89	0,04	0,21
0,16	86,95	86,64	85,47	0,16	84,19	83,93	84,91	0,05	0,21
0,16	87,03	86,68	85,54	0,16	84,23	83,99	84,96	0,05	0,21
0,16	87,11	86,74	85,53	0,16	84,33	84,09	84,97	0,05	0,21
0,16	87,18	86,79	85,59	0,16	84,38	84,16	84,99	0,05	0,21
0,16	87,25	86,88	85,63	0,16	84,45	84,21	85,03	0,05	0,21
0,16	87,29	86,91	85,68	0,16	84,45	84,28	85,05	0,04	0,21
0,16	87,31	86,96	85,72	0,16	84,48	84,33	85,07	0,05	0,21
0,16	87,39	86,99	85,74	0,16	84,58	84,41	85,10	0,05	0,21
0,16	87,41	87,04	85,78	0,16	84,60	84,47	85,14	0,04	0,21
0,16	87,47	87,08	85,84	0,16	84,63	84,52	85,17	0,05	0,21
0,16	87,51	87,13	85,85	0,16	84,69	84,57	85,20	0,05	0,21
0,16	87,54	87,15	85,88	0,16	84,70	84,59	85,20	0,05	0,21
0,16	87,57	87,19	85,92	0,16	84,78	84,66	85,25	0,05	0,21
0,16	87,60	87,23	85,91	0,16	84,76	84,69	85,28	0,05	0,21
0,16	87,63	87,26	85,95	0,16	84,80	84,72	85,30	0,05	0,21
0,16	87,61	87,26	85,94	0,16	84,74	84,73	85,30	0,05	0,21
0,16	87,63	87,30	85,97	0,16	84,74	84,74	85,35	0,05	0,21
0,16	87,63	87,33	85,97	0,16	84,73	84,77	85,35	0,05	0,21
0,16	87,65	87,34	85,99	0,16	84,74	84,79	85,37	0,05	0,21
0,16	87,67	87,36	86,01	0,16	84,78	84,82	85,38	0,04	0,21
0,16	87,65	87,37	85,97	0,16	84,73	84,79	85,39	0,05	0,21
0,16	87,64	87,36	86,01	0,16	84,70	84,80	85,41	0,05	0,21
0,16	87,66	87,42	86,03	0,16	84,73	84,83	85,44	0,05	0,21

Particulates Calculations

	0,16				0,16				89,63	Filter	Filter
Elapsed	DGM 1	DGM 1	DGM 1	DGM 2	DGM 2	DGM 2	Tunnel	Dry Bulb	Velocity	Velocity	
Time	Reading	Inlet T	Outlet T	Reading	Inlet T	Outlet T			DGM 1	DGM 2	
min	Cuft/min	°F	°F	Cuft/min	°F	°F	°F	°F	Ft/sec	Ft/sec	
0,00	0,162	86,27	86,28	0,158	83,224	83,410	88,026				
1,00	0,161	86,27	86,45	0,158	83,300	83,468	88,759	13,54	13,39		
2,00	0,161	86,30	86,49	0,158	83,341	83,494	89,222	13,51	13,39		
3,00	0,161	86,35	86,50	0,158	83,411	83,563	89,356	13,50	13,39		
4,00	0,162	86,46	86,57	0,158	83,607	83,717	89,550	13,51	13,39		
5,00	0,161	86,39	86,57	0,158	83,464	83,636	89,081	13,52	13,39		
6,00	0,161	86,42	86,58	0,158	83,459	83,682	89,423	13,52	13,39		
7,00	0,161	86,39	86,58	0,158	83,437	83,676	89,603	13,53	13,39		
8,00	0,161	86,43	86,60	0,158	83,494	83,744	89,657	13,51	13,39		
9,00	0,161	86,47	86,63	0,158	83,570	83,786	89,559	13,50	13,39		
10,00	0,162	86,52	86,65	0,158	83,689	83,859	89,800	13,52	13,39		
11,00	0,161	86,59	86,70	0,158	83,765	83,924	89,535	13,52	13,38		
12,00	0,162	86,66	86,72	0,158	83,831	83,970	89,646	13,52	13,38		
13,00	0,162	86,54	86,68	0,158	83,629	83,857	89,613	13,54	13,39		
14,00	0,162	86,48	86,66	0,158	83,525	83,810	89,857	13,54	13,39		
15,00	0,161	86,39	86,61	0,158	83,387	83,700	89,516	13,51	13,39		
16,00	0,161	86,29	86,54	0,158	83,221	83,592	89,485	13,50	13,40		
17,00	0,161	86,21	86,50	0,158	83,143	83,557	89,477	13,49	13,40		
18,00	0,161	86,12	86,43	0,158	82,970	83,405	89,161	13,50	13,40		
19,00	0,161	86,06	86,38	0,158	82,910	83,360	89,251	13,51	13,40		
20,00	0,161	85,93	86,32	0,158	82,730	83,219	89,304	13,52	13,41		
21,00	0,161	85,87	86,25	0,158	82,681	83,164	88,380	13,53	13,41		
22,00	0,161	85,89	86,26	0,158	82,758	83,181	88,103	13,53	13,41		
23,00	0,161	85,97	86,28	0,158	82,895	83,232	88,694	13,51	13,40		
24,00	0,161	85,86	86,23	0,158	82,690	83,141	88,588	13,51	13,41		
25,00	0,161	85,83	86,21	0,158	82,689	83,115	89,081	13,51	13,41		
26,00	0,161	85,86	86,19	0,158	82,766	83,101	89,155	13,51	13,41		
27,00	0,161	85,94	86,21	0,158	82,860	83,123	89,223	13,53	13,41		
28,00	0,162	86,01	86,23	0,158	83,007	83,211	89,324	13,54	13,40		
29,00	0,161	86,01	86,25	0,158	82,969	83,157	89,242	13,52	13,40		
30,00	0,161	85,96	86,22	0,158	82,878	83,140	88,899	13,51	13,40		
31,00	0,161	86,02	86,25	0,158	82,967	83,200	89,116	13,52	13,40		
32,00	0,161	85,99	86,25	0,158	82,930	83,185	89,391	13,51	13,40		
33,00	0,161	86,05	86,27	0,158	82,999	83,233	89,512	13,51	13,40		
34,00	0,161	86,09	86,29	0,158	83,030	83,278	89,632	13,52	13,40		
35,00	0,161	86,12	86,28	0,158	83,058	83,277	89,622	13,53	13,40		
36,00	0,162	86,04	86,27	0,158	82,923	83,206	89,326	13,54	13,40		
37,00	0,161	86,09	86,27	0,158	83,037	83,237	89,432	13,53	13,40		
38,00	0,161	86,12	86,27	0,158	83,024	83,213	89,503	13,51	13,40		
39,00	0,161	86,11	86,29	0,158	83,028	83,222	89,587	13,52	13,40		
40,00	0,161	86,17	86,30	0,158	83,125	83,252	89,618	13,52	13,40		
41,00	0,161	86,21	86,32	0,158	83,151	83,274	89,574	13,52	13,40		
42,00	0,161	86,23	86,32	0,158	83,130	83,267	89,623	13,52	13,40		
43,00	0,162	86,20	86,31	0,158	83,112	83,250	89,681	13,54	13,40		
44,00	0,161	86,15	86,28	0,158	82,995	83,194	89,656	13,54	13,40		
45,00	0,161	86,11	86,28	0,158	82,948	83,187	89,374	13,52	13,40		
46,00	0,161	86,12	86,25	0,158	82,945	83,163	88,874	13,51	13,40		
47,00	0,161	86,16	86,27	0,158	83,075	83,198	88,495	13,51	13,40		
48,00	0,161	86,18	86,27	0,158	83,096	83,226	88,675	13,50	13,40		
49,00	0,161	86,13	86,26	0,158	82,959	83,134	88,457	13,51	13,40		
50,00	0,161	86,04	86,20	0,158	82,837	83,101	87,846	13,51	13,40		
51,00	0,161	85,95	86,16	0,158	82,717	83,021	87,909	13,52	13,41		
52,00	0,161	85,88	86,11	0,158	82,624	82,933	88,210	13,52	13,41		
53,00	0,161	85,79	86,06	0,158	82,487	82,855	88,629	13,53	13,41		
54,00	0,162	85,82	86,07	0,158	82,572	82,910	88,582	13,54	13,41		
55,00	0,162	85,76	86,03	0,158	82,473	82,846	88,262	13,55	13,41		
56,00	0,161	85,77	86,00	0,158	82,485	82,825	88,501	13,54	13,41		
57,00	0,162	85,69	85,97	0,158	82,388	82,694	88,729	13,55	13,42		
58,00	0,162	85,63	85,93	0,158	82,295	82,671	88,862	13,58	13,42		
59,00	0,162	85,57	85,88	0,158	82,196	82,594	88,992	13,60	13,42		
60,00	0,162	85,61	85,88	0,158	82,310	82,633	89,131	13,58	13,42		
61,00	0,162	85,72	85,93	0,158	82,517	82,759	89,147	13,57	13,41		
62,00	0,161	85,82	85,97	0,158	82,633	82,788	89,248	13,56	13,41		
63,00	0,161	85,91	86,02	0,158	82,817	82,893	89,427	13,54	13,41		
64,00	0,162	85,90	86,03	0,158	82,735	82,884	89,317	13,56	13,41		
65,00	0,162	85,92	86,03	0,158	82,762	82,904	89,035	13,56	13,41		

Particulates Calculations

66,00	0,162	85,99	86,10	0,158	82,903	82,991	89,307	13,55	13,41
67,00	0,162	86,05	86,13	0,158	82,944	82,982	89,531	13,55	13,41
68,00	0,162	86,09	86,13	0,158	83,019	83,053	89,303	13,56	13,40
69,00	0,161	86,10	86,15	0,158	83,017	83,046	89,279	13,55	13,40
70,00	0,161	86,03	86,13	0,158	82,854	82,957	89,236	13,53	13,41
71,00	0,161	86,02	86,09	0,158	82,829	82,952	89,476	13,54	13,41
72,00	0,162	85,97	86,07	0,158	82,765	82,914	89,570	13,55	13,41
73,00	0,162	85,88	86,03	0,158	82,603	82,830	89,116	13,56	13,41
74,00	0,162	85,82	85,99	0,158	82,531	82,763	89,191	13,57	13,41
75,00	0,162	85,65	85,89	0,158	82,232	82,587	89,379	13,57	13,42
76,00	0,161	85,56	85,83	0,158	82,128	82,506	89,163	13,56	13,42
77,00	0,162	85,63	85,84	0,158	82,253	82,545	89,116	13,55	13,42
78,00	0,162	85,70	85,85	0,158	82,371	82,577	89,257	13,57	13,42
79,00	0,162	85,69	85,82	0,158	82,377	82,521	89,215	13,56	13,42
80,00	0,162	85,71	85,85	0,158	82,473	82,572	89,366	13,56	13,42
81,00	0,162	85,82	85,88	0,158	82,659	82,680	89,202	13,56	13,41
82,00	0,162	85,89	85,94	0,158	82,782	82,722	89,244	13,56	13,41
83,00	0,161	85,86	85,94	0,158	82,683	82,699	89,271	13,56	13,41
84,00	0,161	85,91	85,98	0,158	82,803	82,796	89,682	13,54	13,41
85,00	0,162	85,91	85,97	0,158	82,743	82,729	89,272	13,55	13,41
86,00	0,162	85,75	85,89	0,158	82,444	82,590	88,690	13,56	13,42
87,00	0,162	85,67	85,82	0,158	82,398	82,555	89,113	13,56	13,42
88,00	0,162	85,59	85,77	0,158	82,217	82,415	89,221	13,57	13,42
89,00	0,161	85,56	85,77	0,158	82,245	82,477	89,348	13,56	13,42
90,00	0,162	85,70	85,84	0,158	82,484	82,600	89,386	13,55	13,42
91,00	0,162	85,84	85,90	0,158	82,709	82,737	89,624	13,56	13,41
92,00	0,162	86,01	86,00	0,158	82,978	82,891	89,833	13,54	13,41
93,00	0,162	86,17	86,07	0,158	83,199	83,037	90,020	13,54	13,40
94,00	0,162	86,32	86,17	0,158	83,424	83,200	90,165	13,54	13,40
95,00	0,162	86,45	86,25	0,158	83,576	83,328	90,371	13,56	13,39
96,00	0,162	86,59	86,35	0,158	83,757	83,490	90,496	13,58	13,39
97,00	0,162	86,68	86,41	0,158	83,870	83,587	90,573	13,59	13,39
98,00	0,162	86,79	86,49	0,158	83,985	83,728	90,692	13,58	13,38
99,00	0,162	86,88	86,58	0,158	84,095	83,831	90,795	13,56	13,38
100,00	0,162	86,95	86,64	0,158	84,186	83,927	90,796	13,57	13,38
101,00	0,162	87,03	86,68	0,158	84,234	83,987	90,807	13,56	13,38
102,00	0,162	87,11	86,74	0,158	84,328	84,090	90,881	13,57	13,37
103,00	0,162	87,18	86,79	0,158	84,385	84,158	91,011	13,58	13,37
104,00	0,162	87,25	86,88	0,158	84,454	84,214	90,953	13,57	13,37
105,00	0,162	87,29	86,91	0,158	84,451	84,280	91,161	13,57	13,37
106,00	0,162	87,31	86,96	0,158	84,479	84,333	91,189	13,58	13,37
107,00	0,162	87,39	86,99	0,158	84,576	84,409	91,165	13,58	13,37
108,00	0,162	87,41	87,04	0,158	84,596	84,466	91,241	13,58	13,36
109,00	0,162	87,47	87,08	0,158	84,628	84,518	91,194	13,58	13,36
110,00	0,163	87,51	87,13	0,158	84,695	84,573	91,157	13,59	13,36
111,00	0,163	87,54	87,15	0,158	84,705	84,594	91,284	13,61	13,36
112,00	0,163	87,57	87,19	0,158	84,778	84,661	91,269	13,61	13,36
113,00	0,162	87,60	87,23	0,158	84,762	84,690	91,283	13,59	13,36
114,00	0,163	87,63	87,26	0,158	84,800	84,722	91,262	13,58	13,36
115,00	0,163	87,61	87,26	0,158	84,743	84,726	91,398	13,60	13,36
116,00	0,163	87,63	87,30	0,158	84,735	84,739	91,382	13,60	13,36
117,00	0,163	87,63	87,33	0,158	84,733	84,768	91,389	13,60	13,36
118,00	0,163	87,65	87,34	0,158	84,741	84,786	91,327	13,61	13,36
119,00	0,163	87,67	87,36	0,158	84,777	84,817	91,402	13,63	13,36
120,00	0,163	87,65	87,37	0,158	84,726	84,791	91,336	13,63	13,36
121,00	0,163	87,64	87,36	0,158	84,696	84,804	91,417	13,62	13,36
122,00	0,163	87,66	87,42	0,158	84,732	84,825	91,465	13,62	13,36

Particulates Calculations

	Average 14,27	Average Inlet +	Average Inlet +						Average 0,213
		Outlet	Outlet	Average	Average	#1	#2		
Delta-P	Tunnel	Temp.	Temp.	100,04	99,67	System 1	System 2		SQRT
(in. H2O)	Velocity	Meter 1	Meter 2	Proportional Rates		Vol.Std.	Vol.Std.		Delta-P
Tunnel				PR1	PR2			Time	
in. H2O	Ft/Sec	Deg. R	Deg. R	%	%	(ft3)	(ft3)	min	(in H2O)2
0,046	14,399	546,3	543,3			0,157	0,155	0	0,2152158
0,046	14,412	546,4	543,4	98,71	98,49	0,157	0,155	1	0,2152617
0,045	14,259	546,4	543,4	99,60	99,63	0,157	0,155	2	0,2128912
0,047	14,530	546,4	543,5	97,81	97,79	0,157	0,155	3	0,2169044
0,046	14,368	546,5	543,7	99,18	98,90	0,157	0,155	4	0,2144512
0,045	14,178	546,5	543,6	100,29	100,16	0,157	0,155	5	0,2116966
0,047	14,531	546,5	543,6	98,02	97,78	0,157	0,155	6	0,2169046
0,047	14,533	546,5	543,6	98,04	97,80	0,157	0,155	7	0,2169045
0,046	14,376	546,5	543,6	98,88	98,87	0,157	0,155	8	0,2145528
0,044	14,071	546,6	543,7	101,13	100,99	0,157	0,155	9	0,2100096
0,045	14,235	546,6	543,8	100,16	99,85	0,157	0,155	10	0,2124136
0,046	14,311	546,6	543,8	99,44	99,25	0,157	0,155	11	0,213605
0,044	14,072	546,7	543,9	101,27	100,95	0,157	0,155	12	0,2100124
0,046	14,376	546,6	543,7	99,25	98,83	0,157	0,155	13	0,2145556
0,045	14,268	546,6	543,7	99,94	99,64	0,157	0,155	14	0,2128912
0,044	14,070	546,5	543,5	101,00	101,00	0,157	0,155	15	0,2100121
0,047	14,453	546,4	543,4	98,36	98,34	0,157	0,155	16	0,2157317
0,045	14,183	546,4	543,3	100,14	100,23	0,157	0,155	17	0,2116972
0,046	14,370	546,3	543,2	98,89	98,89	0,157	0,155	18	0,2145531
0,043	13,953	546,2	543,1	101,91	101,87	0,157	0,155	19	0,2083135
0,045	14,148	546,1	543,0	100,67	100,51	0,157	0,156	20	0,2112158
0,045	14,136	546,1	542,9	100,60	100,43	0,157	0,156	21	0,2112159
0,045	14,133	546,1	543,0	100,53	100,40	0,157	0,156	22	0,2112157
0,045	14,253	546,1	543,1	99,53	99,64	0,157	0,155	23	0,212891
0,045	14,219	546,0	542,9	100,00	99,89	0,157	0,156	24	0,2124131
0,045	14,258	546,0	542,9	99,64	99,71	0,157	0,156	25	0,2128911
0,043	13,919	546,0	542,9	102,19	102,14	0,157	0,156	26	0,2078263
0,045	14,227	546,1	543,0	100,17	99,93	0,157	0,155	27	0,2124113
0,044	14,116	546,1	543,1	101,01	100,71	0,157	0,155	28	0,2107351
0,046	14,371	546,1	543,1	98,87	98,92	0,157	0,155	29	0,214552
0,046	14,303	546,1	543,0	99,45	99,34	0,157	0,155	30	0,2136039
0,045	14,226	546,1	543,1	99,96	99,90	0,157	0,155	31	0,2124134
0,045	14,182	546,1	543,1	100,26	100,27	0,157	0,155	32	0,2116958
0,045	14,151	546,2	543,1	100,62	100,50	0,157	0,155	33	0,2112152
0,046	14,376	546,2	543,2	99,11	98,94	0,157	0,155	34	0,2145522
0,046	14,312	546,2	543,2	99,61	99,38	0,157	0,155	35	0,213604
0,045	14,261	546,2	543,1	100,04	99,70	0,157	0,155	36	0,2128905
0,046	14,310	546,2	543,1	99,41	99,36	0,157	0,155	37	0,2136036
0,045	14,151	546,2	543,1	100,60	100,50	0,157	0,155	38	0,2112151
0,045	14,232	546,2	543,1	100,04	99,94	0,157	0,155	39	0,2124125
0,045	14,184	546,2	543,2	100,44	100,27	0,157	0,155	40	0,2116953
0,045	14,184	546,3	543,2	100,31	100,26	0,157	0,155	41	0,2116956
0,044	14,074	546,3	543,2	101,22	101,05	0,157	0,155	42	0,2100451
0,046	14,377	546,3	543,2	99,35	98,94	0,157	0,155	43	0,2145523
0,045	14,246	546,2	543,1	100,03	99,86	0,157	0,155	44	0,2125999
0,045	14,149	546,2	543,1	100,53	100,49	0,157	0,155	45	0,2112145
0,046	14,413	546,2	543,1	98,66	98,56	0,157	0,155	46	0,2152594
0,045	14,170	546,2	543,1	100,11	100,17	0,157	0,155	47	0,2116952
0,044	14,060	546,2	543,2	101,01	100,99	0,157	0,155	48	0,2100112
0,045	14,137	546,2	543,0	100,41	100,41	0,157	0,155	49	0,2112146
0,045	14,209	546,1	543,0	99,92	99,81	0,157	0,155	50	0,2124123
0,044	14,098	546,1	542,9	100,66	100,62	0,157	0,156	51	0,2107345
0,045	14,246	546,0	542,8	99,75	99,65	0,157	0,156	52	0,2128899
0,045	14,238	545,9	542,7	99,95	99,81	0,157	0,156	53	0,212684
0,045	14,171	545,9	542,7	100,52	100,25	0,157	0,156	54	0,2116949
0,045	14,167	545,9	542,7	100,51	100,24	0,157	0,156	55	0,2116951
0,045	14,218	545,9	542,7	100,09	99,92	0,157	0,156	56	0,2124124
0,044	14,060	545,8	542,5	101,49	101,11	0,157	0,156	57	0,2100105
0,044	14,110	545,8	542,5	101,34	100,78	0,158	0,156	58	0,2107338
0,046	14,297	545,7	542,4	100,05	99,51	0,158	0,156	59	0,2134962
0,045	14,178	545,7	542,5	100,73	100,35	0,158	0,156	60	0,2116954
0,045	14,226	545,8	542,6	100,40	99,99	0,157	0,156	61	0,2124121
0,045	14,228	545,9	542,7	100,20	99,98	0,157	0,156	62	0,2124121
0,045	14,150	546,0	542,9	100,76	100,54	0,157	0,156	63	0,2112145
0,046	14,372	546,0	542,8	99,42	98,97	0,157	0,156	64	0,2145513
0,045	14,257	546,0	542,8	100,00	99,72	0,157	0,156	65	0,2128895

Particulates Calculations

0,045	14,148	546,0	542,9	100,90	100,51	0,157	0,156	66	0,211214
0,045	14,263	546,1	543,0	100,01	99,74	0,157	0,155	67	0,2128895
0,045	14,260	546,1	543,0	100,21	99,70	0,157	0,155	68	0,2128898
0,045	14,148	546,1	543,0	100,66	100,49	0,157	0,155	69	0,211214
0,046	14,371	546,1	542,9	99,16	98,95	0,157	0,156	70	0,2145516
0,047	14,453	546,1	542,9	98,64	98,43	0,157	0,156	71	0,2157321
0,046	14,375	546,0	542,8	99,32	98,99	0,157	0,156	72	0,2145513
0,047	14,495	546,0	542,7	98,48	98,11	0,157	0,156	73	0,2164351
0,045	14,218	545,9	542,6	100,42	100,05	0,157	0,156	74	0,2122842
0,045	14,181	545,8	542,4	100,81	100,39	0,157	0,156	75	0,2116952
0,045	14,179	545,7	542,3	100,56	100,38	0,157	0,156	76	0,2117062
0,045	14,146	545,7	542,4	100,89	100,59	0,157	0,156	77	0,2112157
0,046	14,308	545,8	542,5	99,89	99,47	0,157	0,156	78	0,2136029
0,045	14,179	545,8	542,4	100,57	100,37	0,157	0,156	79	0,2116943
0,046	14,372	545,8	542,5	99,39	99,03	0,157	0,156	80	0,2145511
0,045	14,147	545,9	542,7	100,81	100,55	0,157	0,156	81	0,2112162
0,046	14,371	545,9	542,8	99,46	98,98	0,157	0,156	82	0,2145509
0,044	14,116	545,9	542,7	100,99	100,78	0,157	0,156	83	0,2107336
0,046	14,394	545,9	542,8	99,09	98,88	0,157	0,156	84	0,214817
0,045	14,260	545,9	542,7	100,13	99,75	0,157	0,156	85	0,2128895
0,045	14,220	545,8	542,5	100,21	99,96	0,157	0,156	86	0,2124118
0,047	14,448	545,7	542,5	98,84	98,47	0,157	0,156	87	0,2157303
0,045	14,259	545,7	542,3	100,18	99,82	0,157	0,156	88	0,2128891
0,045	14,261	545,7	542,4	100,01	99,83	0,157	0,156	89	0,2128887
0,046	14,309	545,8	542,5	99,82	99,46	0,157	0,156	90	0,213603
0,046	14,312	545,9	542,7	99,70	99,45	0,157	0,156	91	0,2136027
0,045	14,267	546,0	542,9	100,03	99,77	0,157	0,156	92	0,2128889
0,045	14,157	546,1	543,1	100,81	100,54	0,157	0,155	93	0,211214
0,045	14,272	546,2	543,3	100,11	99,72	0,157	0,155	94	0,2128895
0,046	14,433	546,4	543,5	99,21	98,62	0,157	0,155	95	0,2152587
0,046	14,324	546,5	543,6	100,05	99,36	0,158	0,155	96	0,2136034
0,046	14,325	546,5	543,7	100,20	99,35	0,158	0,155	97	0,2136029
0,046	14,437	546,6	543,9	99,13	98,57	0,158	0,155	98	0,2152587
0,045	14,200	546,7	544,0	100,83	100,22	0,157	0,155	99	0,2116949
0,046	14,328	546,8	544,1	99,98	99,31	0,157	0,155	100	0,2136035
0,047	14,470	546,9	544,1	98,92	98,32	0,157	0,155	101	0,2157305
0,045	14,281	546,9	544,2	100,36	99,62	0,157	0,155	102	0,2128894
0,045	14,250	547,0	544,3	100,64	99,84	0,157	0,155	103	0,2124125
0,045	14,241	547,1	544,3	100,61	99,88	0,157	0,155	104	0,2122845
0,045	14,172	547,1	544,4	101,20	100,40	0,157	0,155	105	0,2112144
0,046	14,333	547,1	544,4	100,11	99,28	0,158	0,155	106	0,2136037
0,046	14,338	547,2	544,5	100,07	99,22	0,158	0,155	107	0,2136862
0,044	14,141	547,2	544,5	101,42	100,60	0,158	0,155	108	0,2107382
0,046	14,333	547,3	544,6	100,08	99,24	0,157	0,155	109	0,2136035
0,046	14,396	547,3	544,6	99,79	98,79	0,158	0,155	110	0,2145515
0,046	14,445	547,3	544,6	99,55	98,47	0,158	0,155	111	0,2152593
0,047	14,476	547,4	544,7	99,26	98,24	0,158	0,155	112	0,2157307
0,047	14,524	547,4	544,7	98,80	97,92	0,158	0,155	113	0,2164355
0,047	14,476	547,4	544,8	99,18	98,24	0,158	0,155	114	0,2157305
0,046	14,447	547,4	544,7	99,58	98,47	0,158	0,155	115	0,2152596
0,047	14,556	547,5	544,7	98,71	97,72	0,158	0,155	116	0,2169002
0,046	14,453	547,5	544,8	99,46	98,42	0,158	0,155	117	0,2153578
0,045	14,255	547,5	544,8	100,95	99,77	0,158	0,155	118	0,2124124
0,045	14,180	547,5	544,8	101,66	100,31	0,158	0,155	119	0,2112806
0,045	14,287	547,5	544,8	100,77	99,55	0,158	0,155	120	0,2128906
0,045	14,288	547,5	544,8	100,72	99,56	0,158	0,155	121	0,21289
0,045	14,256	547,5	544,8	101,01	99,78	0,158	0,155	122	0,2124125



CSA B415.1 OE Calculations

Manufacturer: MESY  
 Model: Autopellet air

Run: 4  
 Project #: PI-20112  
 Test Duration: 122 min

	HHV	LHV
Eff	90,55%	96,82%
Comb Eff	99,50%	99,50%
HT Eff	91,00%	97,31%
Output	31 973	kJ/h
Burn Rate	1,75	kg/h
Grams CO	5	g
Input	35 312	kJ/h
MC wet	5,57	

Ultimate CO<sub>2</sub>  
 CO<sub>2-ult</sub> 20,28  
 F<sub>0</sub>  
 1,028

CSA B415.1 OE Calculations

		Air Fuel Ratio (A/F)	
Overall Heating Efficiency:	90,55%	Dry Molecular Weight ( $M_d$ )	29,88
Combustion Efficiency:	99,50%	Dry Moles Exhaust Gas ( $N_r$ ):	443,48
Heat Transfer Efficiency:	91,00%	Air Fuel Ratio (A/F)	12,74

%HC 0,8

Heat Output:	30 330 Btu/h	31 973 kJ/h
Heat Input:	33 497 Btu/h	35 312 kJ/h
Burn Duration:	2,03 h	
Burn Rate:	3,85 lb/h	1,747 kg/h
Stack Temp:	122,2 Deg. F	50,1 Deg. C

## **Section 5**

### **Sampling Procedures and Test Results**

## **INTRODUCTION**

Maine Energy System retained Polytests services to perform CSA B415.1-10 certification testing on the AutoPellet Air furnace. The AutoPellet Air furnace is a non-catalytic, thermostatically controlled indoor central heating appliance. The firebox and heat exchanger are constructed primarily of mild steel. The burner plate and secondary combustion tube (flame tube) are made of stainless steel. The unit's enclosure is painted steel and the furnace is vented through a 6-inch diameter flue collar located in the bottom of the unit. (Example)

The testing was performed at Polytests services testing facility in St-Jean-sur-Richelieu. The unit was received in good condition and assigned and labeled with Polytests Services ID # QI\_20137. Polytests Services representative Danick Power and Maxime Martin conducted the certification testing and completed all testing by 2015-09-03.

The AutoPelletAir furnace was tested in accordance with CSA B415.1-10 as a central indoor heating appliance. Particulate emissions were measured using an ASTM E2515 sampling train consisting of two filters (front and back). The weighted average emissions of the four test runs included in the results indicate a particulate emission rate of 0.026 grams per Megajoule. Test runs were conducted in each of four burn rate categories (below 35% of maximum, 35%-53% of maximum, 53%-76% of maximum and maximum). Emissions for each of their individual test runs did not exceed the cap. Results shown in the following tables reflect results calculated using CSA B415.1-10.

Delivered output calculations and reports are redacted from this report due to the volume of the data. Each data point was logged every 60 seconds and a complete output calculation was performed automatically upon each data logging event. The complete data and calculations are available on file, and this report includes the average output result for each run as well as a calculation verification sheet.

This report is organized in accordance with the EPA-recommended outline and is summarized in the Table of Contents immediately preceding this report. The results in this report are limited to the item submitted.

**Table 1.1 – Particulate Emissions**

Run	Burn Rate (kg/hr dry)	Delivered Heat Output Rate (Btu/hr)	Emissions Rate (g/hr)	Emissions Rate (Lb/MMbtu output)	Percent of Maximum Output (%)
1	5.63	92 178	1.79	0.0424	100
2	3.63	61 716	0.99	0.035	67
3	2.70	45 529	0.87	0.0416	49
4	1.75	29 509	1.64	0.122	32

**Table 1.2 – Heat Output & Efficiency**

Run	Delivered Heat Output Rate (Btu/hr)	Heat Input Rate (Btu/hr)	Delivered Efficiency (%)	Overall Efficiency (LHV) (%)	Overall Heat Output (Btu/hr)
1	92 178	109 390	86.2	93.77	95 920
2	61 716	69 589	89.5	99.5	62 239
3	45 529	51 711	88.8	96.22	46 529
4	29 509	33 497	88.9	96.82	30 330

**Table 1.3 – Test Facility Conditions**

Run	Room Temperature (°F)		Barometric Pressure (in Hg)		Air Velocity (ft/min)	
	Before	After	Before	After	Before	After
1	81	87	30,03	30,03	20	19
2	76	86	30,00	29,94	18	19
3	77	84	29,91	29,97	22	20
4	84	86	29,97	29,83	21	19

**Table 1.4.1 – Fuel Measurement and Crib Description Summary – PRETEST**

Run	Pretest Fuel Weight (Starting weight in lbs)	Pretest Moisture (Dry basis - %)	Coal Bed Weight (lbs)
1	na	5.9	Na
2	na	5.9	Na
3	na	5.9	Na
4	na	5.9	Na

**Table 1.4.2 – Fuel Measurement and Crib Description Summary – TEST**

Run	Test Fuel Wet Basis (lbs)	Firebox Volume (ft <sup>3</sup> )	Fuel Loading Density Wet Basis (lbs/ft <sup>3</sup> )	Fuel Moisture Content Dry (%)	Piece Length (in)	2x4s Used	4x4s Used
1	26.50	Na	Na	5.9	Na	Na	Na
2	17.65	Na	Na	5.9	Na	Na	Na
3	13.11	Na	Na	5.9	Na	Na	Na
4	8.29	Na	Na	5.9	Na	Na	Na

**Table 1.5 - Dilution Tunnel Gas Measurements and Sampling Data Summary**

Run	Length of Test (min)	Average Dilution Tunnel Gas Measurements		
		Velocity (ft/sec)	Flow Rate (dscf/min)	Temperature (°F)
1	121	14.96	288	105
2	125	14.61	288	90.98
3	125	14.61	290	86.15
4	122	14.27	281	89.63

**Table 1.6 – Pretest Configuration**

Run	Output Target	Fuel Added	Fuel Removed	Time (min)
1	Maximum	Na	Na	Na
2	65% of maximum	Na	Na	Na
3	45% of maximum	Na	Na	Na
4	30% of maximum	Na	Na	Na

**Table 1.7 – Run Data**

Run	Average Dry Burn Rate (kg/hr)	Initial (Induced) Draft (H <sub>2</sub> O)	Output Target	Run Time (min)
1	5.63	0.03	Maximum	121
2	3.63	0.03	65% of maximum	125
3	2.70	0.03	45% of maximum	125
4	1.75	0.03	30% of maximum	122

**Table 1.8 – Test Configurations**

Run		Combustion Air
1	<u>Draft</u> : min 15 Pa recommended. <u>Fuel</u> : pellet <u>Primary Air</u> : 50% <u>Secondary</u> : mechanical depending on the Primary Air <u>Tertiary</u> : --- <u>Auger speed</u> : 14,4 sec ON and 8 sec OFF <u>Convection Fan</u> : fixed at 100%	Target: Maximum
2	<u>Draft</u> : min 20 Pa recommended. <u>Fuel</u> : pellet <u>Primary Air</u> : 18% <u>Secondary</u> : mechanical depending on the Primary Air <u>Tertiary</u> : --- <u>Auger speed</u> : 5 sec ON and 8 sec OFF <u>Convection Fan</u> : fixed at 100%	Target: 65%
3	<u>Draft</u> : min 20 Pa recommended. <u>Fuel</u> : pellet <u>Primary Air</u> : 11% <u>Secondary</u> : mechanical depending on the Primary Air <u>Tertiary</u> : --- <u>Auger speed</u> : 3 sec ON and 8 sec OFF <u>Convection Fan</u> : fixed at 80%	Target: 45%
4	<u>Draft</u> : min 25 Pa recommended. <u>Fuel</u> : pellet <u>Primary Air</u> : 10% <u>Secondary</u> : mechanical depending on the Primary Air <u>Tertiary</u> : --- <u>Auger speed</u> : 1,4 sec ON and 8 sec OFF <u>Convection Fan</u> : fixed at 70%	Target: 30%



**Table 1.9 – Particulate Emissions (First Hour)**

<b>Run</b>	<b>ASTM E2515 Emissions – First Hour (g/hr)</b>
1	1.74
2	1.07
3	0.90
4	1.74

**Table 1.10 – CO emission**

<b>Run</b>	<b>CSA B415.1 CO emission Gr/hr</b>
1	4.35
2	0
3	0
4	2.6
average	1.73

## **TEST RESULTS AND DISCUSSION**

A total of four test runs were performed on the AutPellet air furnace. Five runs test runs were conducted in the following categories and included in the weighted average emission level results: one below 35%, one in the 35% to 53% category; one in the 53% to 76% category; and one at maximum.

The arithmetic particulate emission rate was measured to be **0.026 g/MJ** or (0.06 Lb/MMbtu output) as calculated using CSA B415.1-10.


The proportionality results for all five test runs were acceptable. Quality check results for each test run are presented in Section 2 of this report.

The overall thermal efficiency was measured to be 89.42 % and the delivered heat efficiency was measured to be 88.35%.

## AUTHORIZED SIGNATORIES


This report has been reviewed and approved by the following authorized signatories:

### Technician:



Maxime Martin , Technician  
Polytests services

### QA Review:



Gaétan piedalue, Technical manager  
Polytests services

### Evaluation Decision:



Danick Power, Testing Manager  
Polytests services

2015-10-07

Issue Date

*Model: AutoPellet Air  
Maine Energy Systems, Inc.  
8 Airport Road  
Bethel, ME 04217*

# **Appendix B**

## **REPORT ADDENDUM (EDITION 004)**

November 6, 2020

BJ Otten and Les Otten  
Maine Energy Systems LLC  
8 Airport Rd.  
Bethel, Maine 04217  
USA

RE: AutoPellet Air 28kW warm air furnace Low Burn-Rate Verification

Dear Sirs:

Based upon an email request from Dr. Sanchez of the EPA to Maine Energy dated August 20, 2020, Maine Energy Systems LLC contacted OMNI-Test laboratories in reference to your warm air furnace appliance "AutoPellet Air" to arrange for verification testing of the low-setting burn-rate. OMNI has completed the requested testing and concluded that the appliance was not capable of consumption rates below 30% of the maximum consumption rate.

The AutoPellet Air is currently listed by OMNI-Test laboratories for certification to safety (OMNI project number 0444PH005S) and emissions certification (OMNI project number 0444PB008E). Emissions testing was originally performed by Polytests Services (report number PI-20112 dated October 2015) in accordance with CSA B415.1-10. OMNI was chosen by Maine Energy Systems LLC to provide third-party certification.


Maine energy contracted with OMNI for low burn-rate verification (quote number MAI-20062) and preparations were made for a technician from OMNI to travel to Maine Energy's Bethel, Maine facility to conduct the verification testing. Testing was performed on September 16, 2020 and consisted of tracking fuel consumption over time. The appliance was induced into a reduction of fuel consumption by means of restricting the return air to the appliance. The appliance exhibited a modulation of cycling between decreasing and increasing consumption rates until the appliance went into a shut-down mode and ceased to function. The display of the appliance indicated targets of 30% and 32% during this time. Data points, both on the high-burn condition and the turn-down condition were taken at 10-minute intervals. The results were as follows:

Calculated heat output on Maximum:  
 $112,488 \text{ Btu/hr.} * 0.8754 = \mathbf{98,472 \text{ Btu/hr.}}$

Calculated heat output on Minimum:  
 $50,638 \text{ Btu/hr.} * 0.9005 = \mathbf{45,600 \text{ Btu/hr.}}$

If you have any questions, please do not hesitate to contact **OMNI**.

Sincerely,

  
Alex Tiegs  
President

# Certification Test Report

Maine Energy Systems LLC

**Pellet-Fired Warm Air Furnace**

**Model:** AutoPellet Air

**Prepared for:** Maine Energy Systems LLC  
8 Airport Road  
Bethel, ME 04217

**Prepared by:** OMNI-Test Laboratories, Inc.  
13327 NE Airport Way  
Portland, OR 97230  
(503) 643-3788

**Test Period:** September 16, 2020

**Report Date:** November 05, 2020

**Report Number:** 0444PB008E (addendum)

*All data and information contained in this report are confidential and proprietary to Maine Energy Systems, Inc. Its significance is subject to the adequacy and representative character of the samples and to the comprehensiveness of the tests, examinations, or surveys made. The contents of this report cannot be copied or quoted, except in full, without specific, written authorization from Maine Energy Systems, Inc. and OMNI-Test Laboratories, Inc. No use of the OMNI-Test Laboratories, Inc. name, logo, or registered mark (O-TL) is permitted, except as expressly authorized by OMNI-Test Laboratories, Inc. in writing*


*Edition 004 – December 7, 2020*

*Model: AutoPellet Air  
Maine Energy Systems LLC  
8 Airport Road  
Bethel, ME 04217*

## **AUTHORIZED SIGNATORIES**

This report has been reviewed and approved by the following authorized signatories:

### **Evaluator:**



---

Ken Morgan, Technical Services Director  
OMNI-Test Laboratories, Inc.

November 5, 2020  
Issue Date

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*Model: AutoPellet Air  
Maine Energy Systems LLC  
8 Airport Road  
Bethel, ME 04217*

# **Section 1**

## **Introduction**

## **INTRODUCTION**

This is an addendum report to the original OMNI Certification Test Report 044PB008E. In that report, it is described that emissions testing was originally performed by Polytests Services (report number PI-20112 dated October 2015) in accordance with CSA B415.1-10 and that OMNI provided third-party certification. The AutoPellet Air furnace is, per the definitions of 40 CFR 60 subpart QQQQ, a “Large” non-catalytic, thermostatically controlled indoor warm air furnace. The AutoPellet Air furnace was tested in accordance with CSA B415.1-10 as a central indoor heating appliance. Particulate emissions were measured using an ASTM E2515 sampling train consisting of two filters (front and back). The average emissions of the four test runs included in the results indicated a particulate emission rate of 0.06 lbs./mmBtu output. The full test report submitted by Polytests was appended to the original certification report.

This report is organized in accordance with the EPA-recommended outline and is summarized in the Table of Contents immediately preceding this report. The results in this report are limited to the items submitted.

Maine Energy entered into discussions with the U.S. EPA regarding whether the test results from the from the October 2015 testing could be used as the basis for Step 2 (2020) approval, based on the fact that the test methodology used in the 2015 testing is identical to the methods and procedures prescribed in the 2020 requirements. However, the 2015 testing (under CSA B415.1-10) required a minimum burn-rate rate of less than 35% of the high-burn input-rate, whereas the Step 2 requirements require a minimum low-burn input-rate of 15% of the maximum input -rate. The 2015 testing low burn-rate input-rate of the AutoPellet Air Furnace was determined to be 31% of the maximum input-rate.

The outcome of the discussions between Maine Energy Systems LLC and the U.S. EPA resulted in acceptance of the original 2015 test results provided that three specific items were addressed:

1. Owner’s manual with a statement to the effect that the unit will shut off at 30% of the tested maximum (Category 4 test heat rate) and installation instructions not to modify any settings.
2. Third-party certification from an EPA approved 3<sup>rd</sup> party certifier that the unit mechanically (or software-driven) effectively shuts off/on at that level.
3. A signed statement from MESys confirming that you understand and agree to this requirement and baseline level of operation.

See ADDENDUM 1 for the complete communique between Maine Energy Systems LLC and the US EPA.

*Model: AutoPellet Air  
Maine Energy Systems LLC  
8 Airport Road  
Bethel, ME 04217*

## **Section 2**

### **Sampling Procedures and Test Results**

Maine energy contracted with OMNI to perform the low burn-rate verification and testing was performed by Riley Tiegs of OMNI-Test Laboratories at Maine Energy LLC's facility in Bethel Maine on September 16, 2020. The test consisted of tracking fuel input consumption (by mass) over time.

The appliance was induced into an automatic reduction of fuel consumption rate by means of restricting the return air to the appliance, thus decreasing the demand on the automatic control system. As the over-all reduction in fuel input progressed, the control system exhibited a modulation of cycling between various decreasing input-rates until the logic of the control system put the appliance into a shut-down mode and ceased to continue functioning after a period of 90 minutes. The display of the appliance during this time indicated targets of 30% and 32%. Data points of system mass were recorded at 10-minute intervals on the Maximum and Minimum demand conditions.

## TEST RESULTS AND DISCUSSION

A single test run was performed on the AutoPellet air furnace. The appliance was operated for a period of 130 minutes at maximum burn-rate, then the demand was reduced to induce the lowest permissible burn-rate achievable before the system shut-down.

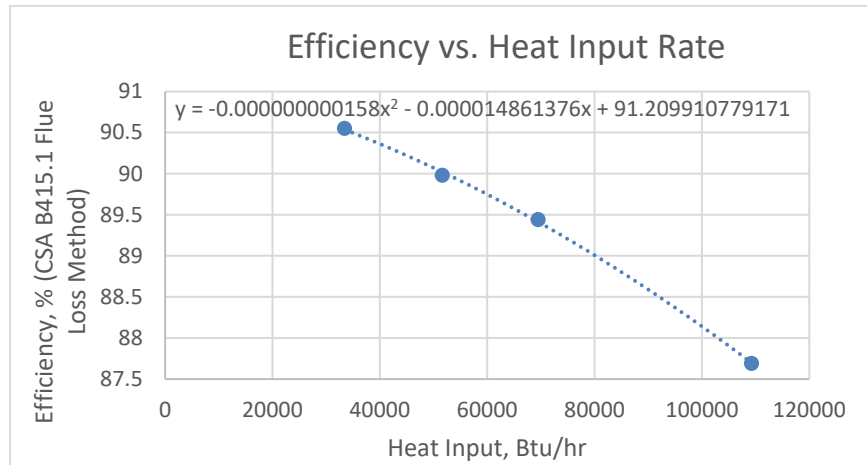
A sample of the wood pellet fuel used for this confirmation test was supplied to a third-party testing laboratory for analysis (see Twin Ports Testing Report No. USR-W220-0782-01 in Appendix 2) which included a gross calorific value (HHV) of 8,739 (dry) Btu/lb. measured using ASTM method E711.

Table 2.1 is data taken from tables 1.4.2 and 1.5 of the original test report (OMNI Test report 0444PB008E dated November 13, 2015) of the measured efficiencies at various fuel consumption rates for the AutoPellet Air.

**Table 2.1 – Efficiency at various Heat Input Rates**

Input Rate (Btu/hr)	Efficiency, % (Flue Loss Method)
109,298	87.69
69,531	89.44
51,667	89.98
33,469	90.55

The tested HHV can be used in conjunction with the previously determined CSA B415.1 stack-loss efficiency performance to interpolate the heat output at the maximum and minimum consumption rates of the confirmation tests described in this report.



The maximum fuel consumption rate (dry basis) that was obtained during this confirmation test was 5.84 kg/hr.

$$5.84 \text{ kg (dry)} * 2.2046 \text{ kg}\cdot\text{lb}^{-1} * 8,739 \text{ Btu}\cdot\text{lb}^{-1} = 112,488 \text{ Btu. /hr.}$$

The minimum fuel consumption rate (dry basis) that was obtained during this confirmation test was 1.62 kg/hr.

$$2.63 \text{ kg (dry)} * 2.2046 \text{ kg}\cdot\text{lb}^{-1} * 8,739 \text{ Btu}\cdot\text{lb}^{-1} = 50,638 \text{ Btu. /hr.}$$

The efficiencies (CSA B415.1 stack loss method) for these fuel input rates derived from the appliances heat exchanger performance, previously documented, and charted above, result in the following efficiencies for this confirmation test:

Maximum Fuel Consumption Rate:

$$-0.000000000158 * 112,488^2 - 0.000014861376 * 112,488 + 91.209910779171 = 87.54\%$$

Minimum Fuel Consumption Rate:

$$-0.000000000158 * 50,638^2 - 0.000014861376 * 31,162 + 91.209910779171 = 90.05\%$$

Calculated heat output on Maximum:

$$112,488 \text{ Btu/hr.} * 0.8754 = \mathbf{98,472 \text{ Btu/hr.}}$$

Calculated heat output on Minimum:

$$50,638 \text{ Btu/hr.} * 0.9005 = \mathbf{45,600 \text{ Btu/hr.}}$$

The percentage of heat output on minimum potential as compared to the maximum:

$$(50,638 \text{ Btu/hr.} * 0.9005) / (112,488 \text{ Btu/hr.} * 0.8754) = 46.3\%.$$

Results demonstrated that the AutoPellet Air Furnace, when operated as indicated in this report, would systematically shut down at burn rates below 30% of maximum burn-rate.

A revised manual containing the information requested by the US EPA can be found in section 2 of this report. It was reviewed and found to comply with the requirements of 40 CFR 60.

*Model: AutoPellet Air  
Maine Energy Systems LLC  
8 Airport Road  
Bethel, ME 04217*

## **Section 3**

### **Appliance Photographs and Description**

Model: AutoPellet Air  
Maine Energy Systems LLC  
8 Airport Road  
Bethel, ME 04217

**Maine Energy Systems, Inc.**  
AutoPellet Air  
**Test Date: September 16, 2020**



## PELLET FURNACE DESCRIPTION

**Appliance Manufacturer:** Maine Energy System

Pellet Furnace **Model:** AutoPellet Air

**Type:** Pellet burning hot-air furnace

## PELLET FURNACE INFORMATION

**Materials of Construction:** The firebox and heat exchanger are constructed primarily of mild steel. The burner plate and secondary combustion tube (flame tube) are made of stainless steel. The unit's enclosure is painted steel.

**Air Introduction System:** Primary combustion air enters through the combustion air blower on the burner. Secondary air enters through the same blower but is diverted to secondary combustion within the burner plenum.

**Combustion Control Mechanisms:** Combustion air is modulated by varying the combustion fan speed. The fuel delivery auger is run at varying speeds as well, to achieve the different modulation steps of the boiler as well as to control fuel / air mixture. The combustion fan varies in speed as required, again to meet the different modulation steps of the furnace.

**Combustor:** Ignition at start up is by electric heating element contained within a steel tube. Air is passed through / over the heating element and the resultant hot air is applied directly to the pellets laying on the burner plate.

**Internal Baffles:** Each fire-tube has a spiral turbulator to disrupt laminar air flow and to serve as a cleaning mechanism.

**Other Features:** A ducting plenum is located at the rear of the unit, behind the heat exchanger. A convection blower is operated at variable speeds by the temperature in this plenum and by room / load requirements.

**Flue Outlet:** The 6-inch diameter flue outlet is located in the lower rear of the unit.



*Model: AutoPellet Air  
Maine Energy Systems LLC  
8 Airport Road  
Bethel, ME 04217*

# **Section 4**

## **Test Data**

Maine Energy Systems LCC  
 AutoPellet Air Furnace  
 0444PB008E.REV001  
 16-Sep-20



## Burn-Rate Data

Time (Minutes)	Ambient (°F)	Flue (°F)	Outlet Temp (°F)	Weight (lbs)	ΔW (10 min)	ΔW Per Hour
0	64	247.5	153.4	1258.4		
10	64.1	257.4	157.1	1255.6	2.8	16.8
20	63.6	258.6	158.1	1253.4	2.2	13.2
30	64.1	260.8	158.2	1251.0	2.4	14.4
40	62.5	263.9	162.5	1247.8	3.2	19.2
50	63.1	263	160.9	1245.4	2.4	14.4
60	60.5	264.5	159.5	1243.2	2.2	13.2
70	63.5	261	157.5	1241.0	2.2	13.2
80	60.7	253.7	148.7	1238.8	2.2	13.2
90	61.3	246.8	142.6	1237	1.8	10.8
100	61.7	248.3	145.1	1235	2	12
110	62.5	250.9	150.6	1233	2	12
120	62.9	253.3	151.1	1231	2	12
130	62.3	212.8	157.5	1228.8	2.2	13.2
Averages for High Burn					2.276923	13.66154
140	62.1	222.7	167.5	1227.8	1	6
150	62.1	224.7	172.6	1226.4	1.4	8.4
160	63.1	227	160	1225.4	1	6
170	62.7	230.9	165	1224.2	1.2	7.2
180	62.3	217.8	162.1	1223.8	0.4	2.4
190	63.3	219.7	167.9	1222.6	1.2	7.2
200	64	218	156.3	1221.8	0.8	4.8
210	63.1	215.1	155.9	1220.8	1	6
220	63.4	221.4	167.8	1219.6	1.2	7.2
<i>Appliance shut down</i>						
Averages for Low Burn					1.02	6.13

RLG TGA

11/05/2020

Maine Energy EPA Confirmation Testing

Time	Ambient	Flue	Weight	OUTLET
0:00	64°	247.5	1258.4	153.4
10:00	64.1°	257.4	1255.6	157.1°
20:00	63.6	258.6	1253.4	158.1
30:00	64.1	260.8	1251.0	158.2
40:00	62.5	263.9	1247.8	162.5
50:00	63.1	263.0	1245.4	160.9
60:00	60.5	264.5	1243.2	159.5
70:00	63.5	261.0	1241.6	157.5
80:00	60.7	253.7	1238.8	148.7
90:00	61.3	246.8	1237.0	142.6
100:00	61.7	248.3	1235.0	145.1
110:00	62.5	250.9	1233.0	150.6
120:00	62.9	253.3	1231.0	151.1
130:00	62.3	212.8	1228.8	157.5
140:00	62.1	222.7	1227.8	167.5
150:00	62.1	224.7	1226.4	172.6
160:00	63.1	227.0	1225.4	160.0
170:00	62.7	230.9	1224.2	165.0
180:00	62.3	217.8	1223.8	162.1
190:00				
200:00				
210:00				
220:00				
230:00				
240:00				

7.4 lbs / 30 min  
 7.8 lbs / 30 min  
 6.2 lbs / 30 min  
 6.8 lbs / 30 min  
 Max Burn rate Reduction  
 3.4 lbs / 30 min

*Model: AutoPellet Air  
Maine Energy Systems LLC  
8 Airport Road  
Bethel, ME 04217*

## **Section 5**

### **Quality Assurance/Quality Control**

## QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

As a testing laboratory, *OMNI* follows the guidelines of ISO/IEC 17025, “General Requirements for the Competence of Testing and Calibration Laboratories,” and the quality assurance/quality control (QA/QC) procedures found in *OMNI*’s Quality Assurance Manual. As a certification organization, *OMNI* follows ISO/IEC Guide 65, “General Requirements for Bodies Operating Product Certification Systems.”

*OMNI*’s scope of accreditation includes, but is not limited to, the following:

- American National Standards Institute (ANSI) for certification of products to safety standards (Certification ID #0654).
- International Accreditation Service, Inc. (formerly ICBO ES) as a testing laboratory (TL-130).
- Standards Council of Canada (SCC) for certification of products to safety standards.
- Serving as a testing laboratory for the certification of wood heaters by the U.S. Environmental Protection Agency.

This report is issued within the scope of *OMNI*’s accreditation. Accreditation certificates are available upon request.

The manufacturing facilities and quality control system for the production of the AutoPellet Air at Maine Energy Systems, Inc. were evaluated to determine if sufficient to maintain conformance with *OMNI*’s requirements for product certification. *OMNI* has concluded that the manufacturing facilities, processes, and quality control system are adequate to produce the appliance congruous with the standards and model codes to which it was evaluated. To ensure continuing conformance, follow-up quality control inspections of finished products and manufacturing quality control will be conducted by *OMNI* as a condition of listing.

Following each quality assurance inspection, an audit form will be submitted to the manufacturer for signature indicating that the production furnaces meet the requirements, as tested by *OMNI*, of the appropriate standards or that resolutions must be made to continue listing. Failure to produce data needed for quarterly audits or unapproved changes in production that may jeopardize the safety and emissions of the appliance may result in the revocation of listing.

This report shall not be reproduced, except in full, without the written approval of OMNI-Test Laboratories, Inc.

## NIST Stopwatch Calibration, Time Proficiency Testing Procedure and Data Sheet

Date: 03/03/2020 User/Technician: Tomy Tong  Pass  Fail

NIST traceable stopwatch OMNI tracking number: 00649 Last Cal: 03/12/2019

Stopwatch to be tested for time proficiency OMNI tracking number: 00439

1. Start the NIST traceable stopwatch: at a predetermined time (i.e. 1.00 minutes), the technician shall start the watch being tested. When 15.00 seconds have passed (i.e. the NIST traceable stopwatch reads 1 minute, 15 seconds), the technician shall stop the watch being tested. Record the target time interval (i.e. 15.00 seconds). Repeat this step twice and record the data.
2. Repeat step #1 for each of the following target time intervals: 30.00 seconds, 10.00 minutes, and 30 minutes.
3. If the delta between the target time and measured time is less than 5% of the target time interval or 2.00 seconds (whichever is less), then the technician has demonstrated proficiency with the specific instrument utilized in the proficiency test. The proficiency is valid for a period of 12 months.
4. Archive the proficiency test data and information, including the effective date and expiration date of the proficiency, in the equipment record for the instrument involved.

Target time: 15.00 seconds #1 Measured time: 14.93 #2 Measured time: 14.94 #3 Measured time: 14.97  
Target time: 30.00 seconds #1 Measured time: 30.00 #2 Measured time: 30.00 #3 Measured time: 29.96  
Target time: 45.00 seconds #1 Measured time: 44.94 #2 Measured time: 44.93 #3 Measured time: 44.93  
Target time: 60.00 seconds #1 Measured time: 59.89 #2 Measured time: 59.71 #3 Measured time: 59.97  
Target time: 10.00 minutes #1 Measured time: 9'59"93 #2 Measured time: 9'59"87 #3 Measured time: 10'00"04  
Target time: 30.00 minutes #1 Measured time: 29'59"76 #2 Measured time: 29'59"96 #3 Measured time: 30'00"11

The uncertainty of measurement is  $\pm 1$  sec. This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

This calibration procedure is confirmed by the manufacturer as a proper method for evaluating the accuracy of timers.

Technician Signature: Tomy Tong Date: 03/03/2020  
Reviewed by: \_\_\_\_\_ Date: \_\_\_\_\_

## Thermocouple Readout Calibration Log

Date: 04/16/2020 OMNI Meter Identification Number: OMNI-00601 Technician: Tony Tong

		Thermocouple	Meter Response								Acceptable?	
			0	200	400	600	800	1000	2000	Yes	No	Initials
Date	Calibration Meter ID	Input		± 3EF*	± 6EF	± 9EF	± 12EF	± 15EF	± 30EF			
04/16/2020	OMNI-00373		0.5	200.3	400.4	600.3	800.3	1000	2000	X		

\*Note: Acceptance Criteria are based on EPA Method 2 Section 4.3 (1.5% agreement of readings)  
 The uncertainty of measurement is ±0.2°F at 0°F, 0.6°F at 200°F, 1.3°F at 400°F, 1.8°F at 600°F, 2.5°F at 800°F, and 3.1°F and 1000°F. This is based on the reference standard having a TAR (Test Accuracy Ratio) of at least 4:1.

Technician signature: \_\_\_\_\_ Date: \_\_\_\_\_

CARY



STATE OF MAINE  
DEPARTMENT OF AGRICULTURE, CONSERVATION & FORESTRY  
DIVISION OF QUALITY ASSURANCE AND REGULATIONS  
28 STATE HOUSE STATION  
AUGUSTA, MAINE 04333-0028

JANET T. MILLS  
GOVERNOR

Amanda E. Beal  
COMMISSIONER

Celeste Poulin  
Director

REPORT OF CALIBRATION  
MAINE TEST NUMBER 7610ME  
(40) 50 lb cast iron weights & (4) 20 lb cast iron weights  
Date of Report: June 13, 2020

SUBMITTED BY:  
Acme Scale Company  
482 River Road  
Windham, ME 04062

The mass standards described above have been compared with standards of the State of Maine, by modified substitution, and were found to be, or adjusted to within NIST Handbook 105-1 Class "F" tolerances.

Standards of the state of Maine are traceable to the National Institute of Standards and Technology through Oregon State test number OR-18-240-C. The Maine Laboratory is recognized by NIST, OWM, under the "Laboratory Metrology Program", at Mass Echelon III for 2020. Measurements by this laboratory are traceable to the National Standards at NIST.

The mass standards described above were found to have mass values at the time of test as indicated in the following tabulation. Weights received in an out of tolerance condition show a bold value in the "before adjustment" column. Weights received in good condition. The combined measurement uncertainty and measurement result have been taken in to account when issuing statements of compliance.

The uncertainties shown with reported values are calculated on the conventional mass values and expressed as the sum of the following sources of inaccuracy; (1) Type B, systematic errors relative to the reference standard and procedure used, including bias, and (2) Type A, random errors determined by the standard deviation of the measurement process. Type A and Type B uncertainties are combined by the root sum squared method and multiplied by a coverage factor of 2 (k=2) representing approximately a 95% confidence level. All mass values have been determined as "conventional mass" with respect to stainless steel density of 8.0 g/cm<sup>3</sup> at 20 °C.





Acme Scale Company  
**Maine Test Number 7610ME**  
 Page 2 of 3

Serial Number	Nominal	Correction mg	NIST Class F Tolerance mg	Uncertainty mg	Before adjustment mg
1	50 lb.	0.52	2300	280	<b>2.20</b>
2	50 lb.	-0.32	2300	280	---
3	50 lb.	0.92	2300	280	---
4	50 lb.	0.28	2300	280	<b>3.25</b>
5	50 lb.	0.32	2300	280	<b>2.45</b>
6	50 lb.	0.80	2300	280	---
7	50 lb.	0.42	2300	280	<b>2.37</b>
8	50 lb.	0.53	2300	280	---
9	50 lb.	1.30	2300	280	---
10	50 lb.	0.52	2300	280	---
11	50 lb.	1.42	2300	280	---
12	50 lb.	-1.54	2300	280	---
13	50 lb.	-0.74	2300	280	---
14	50 lb.	-0.90	2300	280	---
15	50 lb.	0.06	2300	280	---
16	50 lb.	-1.63	2300	280	---
17	50 lb.	0.38	2300	280	<b>-3.55</b>
18	50 lb.	0.76	2300	280	<b>-2.93</b>
19	50 lb.	-0.84	2300	280	---
20	50 lb.	0.72	2300	280	<b>-2.45</b>
21	50 lb.	-0.09	2300	280	---
22	50 lb.	0.55	2300	280	<b>-2.35</b>
23	50 lb.	0.47	2300	280	---
24	50 lb.	-1.85	2300	280	---
25	50 lb.	0.49	2300	280	<b>-2.07</b>
26	50 lb.	0.86	2300	280	---
27	50 lb.	0.46	2300	280	---
28	50 lb.	0.45	2300	280	<b>-2.04</b>
29	50 lb.	-1.09	2300	280	---
30	50 lb.	-1.38	2300	280	---
31	50 lb.	-1.73	2300	280	---
32	50 lb.	-1.92	2300	280	---
33	50 lb.	-1.30	2300	280	---
34	50 lb.	0.30	2300	280	---
35	50 lb.	-1.63	2300	280	---



Acme Scale Company  
**Maine Test Number 7610ME**  
 Page 3 of 3

Serial Number	Nominal	Correction mg	NIST Class F Tolerance mg	Uncertainty mg	Before adjustment mg
36	50 lb.	0.81	2300	280	---
37	50 lb.	0.88	2300	280	---
38	50 lb.	1.07	2300	280	---
39	50 lb.	-0.50	2300	280	---
40	50 lb.	0.18	2300	280	---
1	20 lb.	0.48	910	110	<b>1.32</b>
2	20 lb.	0.37	910	110	---
3	20 lb.	0.06	910	110	---
4	20 lb.	-0.16	910	110	---

Calibrations performed by this laboratory comply with the requirements of ISO/IEC 17025:2017  
**SI conversion: 1-pound avoirdupois equals 0.45359237 kilograms.**

Date Received: July 7, 2020  
 Date of Test: July 8, 2020  
 Calibration Due: July 31, 2021  
 Calibration by: Brad Bachelder



Bradford Bachelder, Metrologist

This report may not be reproduced, except in full, without written permission from this laboratory. This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, The State of Maine, or any other state or federal government agency. Calibrations performed at 333 Cony Road, Augusta ME.



# ACME SCALE CO.

482 River Road, Windham, Maine, 04062  
(207) 892-9915

## SCALE TEST REPORT

CUSTOMER INFORMATION		SCALE INFORMATION		ID#
NAME: MAINE ENERGY SYSTEMS		MANUFACTURER: RICE LAKE		
ADDRESS: 8 AIRPORT RD		MODEL# 20+355	MODEL# GATOR DECK 48x48	
BERTHEL, ME 04217		SERIAL # INDICATOR 509795	SERIAL# BASE 212148R	
		TYPE: FLOOR SCALE		
		CAPACITY, RESOLUTION: 1500 x .2 lb		
CONTACT: DAN WHEELER		DEPT./LOCATION:		
CALIBRATION DATA		STANDARDS DATA		
CAL. Frequency: ANNUAL		Weight Serial #: 1-20		
Date Cal: 9-10-2020		Date Last Cal: 7-8-2020		
Next Cal Due: 9-2021		Next CAL. Due: 7-2021		
Technician: COREY MORRISON		Traceability: 7610ME		

Scale testing is performed by technicians licensed by the Department of Agriculture Division of Weights and Measures of the State of Maine, and the State of New Hampshire, The standards used are certified annually at the State of Maine Metrology Laboratory and are traceable to the Nation Institute of Standards and Technology (N.I.S.T.) Handbook 44 Scale Code.

INCREASING LOAD TEST				DECREASING LOAD TEST			
AS FOUND		AS ADJUSTED		AS FOUND		AS ADJUSTED	
Load	Reading	Load	Reading	Load	Reading	Load	Reading
200.0 lb	200.0 lb			1000.0 lb	1000.0 lb		
400.0 lb	400.0 lb			800.0 lb	800.0 lb		
800.0 lb	800.0 lb			400.0 lb	400.0 lb		
1000.0 lb	1000.0 lb			200.0 lb	200.0 lb		
SHIFT TEST		POSITION 1	POSITION 2	POSITION 3	POSITION 4		
AS FOUND		500.0 lb	500.0 lb	500.0 lb	500.0 lb		
AS ADJUSTED							

Remarks:

Customer:

*[Signature]*

219 Technician

*[Signature]*

# ACME SCALE CO.

482 River Road • Windham, Maine • Phone/Fax (207) 892-9915

## WORK ORDER SUMMARY

Customer:

MAINE ENERGY SYSTEMS

Date: 9-10-2020

Address:

8 AIRPORT RD  
BETHEL, ME

Phone:

DAN WHEELER

Zip Code:

Work Request Number:

12105

Summary of Work Performed

Parts

- DELIVERED 4X4 RENTAL SCALE
- CALIBRATED ONSITE ; OVERALL @ 1000 LB  
STIFF @ 500 LB
- INFORMED CUSTOMER TO TAKE CARE LOADING  
+ UNLOADING TO PREVENT DAMAGE TO  
SCALE
- SCALE OK.

Supplies

Customer Signature and Date

Sam Bushman 9/10/2020

Technician Signature and Date

9-10-2020  
Cory [Signature]

*Model: AutoPellet Air  
Maine Energy Systems LLC  
8 Airport Road  
Bethel, ME 04217*

# **Section 6**

## **Owner's Manual**

Please read carefully prior  
to installing and servicing.

SAVE THESE INSTRUCTIONS

# Installation Manual

Pellet heating with vacuum  
suction system, type

**AutoPellet Air Furnace  
28**

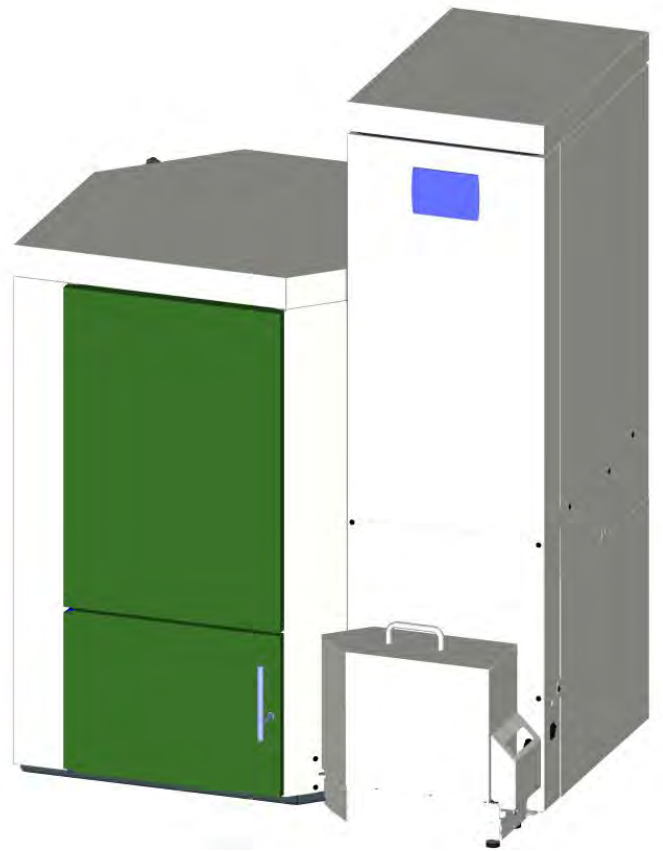
---

MESys V1.1

AutoPellet Air TOUCH

---

USA



Title: Installation Manual AutoPellet Air Furnace 17 – 28

Article number: PE 603 USA\_FA 1.0

Version valid  
from: **09/2021**

Approved: Wohlinger Christian

## Author & Manufacturer

MAINE ENERGY SYSTEMS LLC  
8 Airport Road – P.O. Box 547 Bethel  
Maine 04217

E-Mail: [info@maineenergysystems.com](mailto:info@maineenergysystems.com)  
[www.maineenergysystems.com](http://www.maineenergysystems.com)

© MAINE ENERGY SYSTEMS LLC  
Subject to modifications

Pour la version française de ce manuel, veuillez visiter notre site Web à  
[Maineenergysystems.com](http://Maineenergysystems.com).

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For warranty inquiries please send an email to [warranty@maineenergysystems.com](mailto:warranty@maineenergysystems.com) including the system's address in the subject line.

# 1 Dear Customer

**Maine Energy Systems** specializes in wood pellet heating, our company enjoys an exclusive license from ÖkoFEN to manufacture AutoPellet Air here in the USA. We represent expertise, innovation and quality. We are delighted that you have decided to purchase our product.

- This instruction manual is intended to help you operate the product safely, properly and economically.
- Please read this instruction manual completely and take note of the safety warnings.
- Keep all documentation supplied with this unit in a safe place for future reference.  
Please pass on the documentation to the new user if you decide to part with the unit at a later date.
- Installation and first start up must be carried out by an installer certified by Maine Energy Systems.
- Please contact your authorised dealer if you have any questions.



We place great importance on the development of new products. Our R&D department continues to question accepted solutions and works continually on new improvements. That is how we maintain our technological lead. We have already received several awards for our products in Austria and abroad. Our products fulfil European and USA requirements regarding quality, efficiency and emissions.



## **2 Use only for the purpose intended**

The pellet furnace is designed heat air to provide heat for buildings. It is not permissible to use the furnace for any other purpose.

The pellet furnace fulfils the requirements of UL 391-2010 and CSA B366.1-2011.

### 3 Types of safety warning sign

The warning signs use the following symbols and text.

#### Types of safety warning sign

1. Risk of injury
2. Consequences of risk
3. Avoiding risk



#### 1. Risk of injury:

Danger - indicates a situation that could lead to death or life-threatening injury.



Warning - indicates a situation that could lead life-threatening or serious injury.



Caution - indicates a situation that could lead to injury.



Note - indicates a situation that could lead to property damage.



#### 2. Consequences of risk

Effects and consequences resulting from incorrect operation.

#### 3. Avoiding risk

Observing safety instructions ensures that the heating system is operated safely.


## 4 Warnings and safety instructions


Observing safety instructions ensures that the heating system is operated safely.


### 4.1 Basic safety instructions

- Never get yourself into danger; give your own safety the utmost priority.
- Keep children away from the Furnace room and storage room.
- Observe all safety warnings on the Furnace and in this user manual.
- Observe all instructions relating to maintenance, servicing and cleaning.
- Never make any changes to the heating system or flue gas system.
- Never close or remove safety valves.

### 4.2 Warning signs

	<b>DANGER</b>
<p><b>Risk of poisoning</b>            Make sure that the pellet Furnace is supplied with sufficient combustion air.            The openings in the combustion air inlet must never be partially or completely closed.            Ventilation systems, central vacuum cleaning systems, extractor fans, air conditioning systems, flue gas blowers, dryers, fuel storage ventilation fans or similar equipment must never be allowed to draw air from the Furnace room and cause a drop in pressure.            The Furnace must be connected tight to the chimney using a flue gas tube.            Clean the chimney and the flue gas tube at regular intervals.            The Furnace room and pellet storage room must be sufficiently supplied with air and ventilated.            Before entering the storage room it must be ventilated with sufficient air and the heating system switched off</p>	

	<b>DANGER</b>
<p><b>Risk of electric shock</b>            Always disconnect / de-energize the power supply before working on the Furnace.</p>	

	<b>DANGER</b>
<p><b>Risk of explosion</b>            DO NOT BURN GARBAGE, GASOLINE, NAPHTHA, ENGINE OIL, OR OTHER INAPPROPRIATE MATERIALS.            DO NOT USE CHEMICALS OR FLUIDS TO START THE FIRE.            Switch off the heating system before filling the storage room.</p>	



## DANGER

### Risk of fire

Do not store any flammable materials in the Furnace room.  
Do not hang out any washing in the Furnace room.  
Do not operate with fuel loading or ash removal doors open.



## WARNING

### Risk of burns

Do not touch the flue gas connector or flue gas pipe.  
Do not reach into the ash chamber.  
Use gloves to empty ash box if Furnace not equipped with automatic ash compression  
Do not clean the Furnace until it has been allowed to cool down.



## CAUTION

### HOT SURFACES

Keep children away.  
Do not touch during operation.  
Do not operate if maximum draft as listed on Furnace nameplate is exceeded.  
Doing so can allow non-controlled combustion.



## CAUTION

**Risk of cut injuries due to sharp edges.**  
Use gloves for performing all work on the Furnace.

## NOTICE

### Damage to property

The pellet Furnace is suitable only for pellets which comply with PFI premium or EnPlus -A1 pellets specifications. The use of any other fuel voids your warranty and can cause damage to the pellet Furnace and chimney.

## NOTICE

### Damage to property

Do not use the heating system if it, or any of its components, come into contact with water.  
If water damage occurs, check the heating system and replace damaged parts.



## WARNING

All cover plates, enclosures, and guards must be maintained in place at all times, except during maintenance and servicing.

## 4.3 What to do in an emergency



### DANGER

**Risk to life**

Never get yourself into danger; give your own safety the utmost priority.

**What to do in the event of a fire**

- Switch off the heating system.
- Call your local fire department and or 911.
- Use approved fire extinguishers (fire protection class ABC).

**What to do if you smell smoke**

- Switch off the heating system.
- Close the doors leading to living areas.
- Ventilate the central heating room.

## 5 Prerequisites for installing a pellet Furnace

You must fulfil the following conditions before operating a fully automatic pellet Furnace.

### 5.1 Guidelines and standards for installing a pellet Furnace

Overview of standards and guidelines applying to the installation of a pellet Furnace.

Check whether you need to obtain planning permission or approval from the authorities for installing a new heating system or changing your existing system. Installation must meet all requirements for pellet fired heating systems in your specific location.

All equipment shall be installed in accordance with the instructions of the manufacturer and in a manner acceptable to the authority having jurisdiction by experienced personnel. When required by the authority having jurisdiction, such personnel shall be licensed to perform this service.


In Canada, the installation of the solid fuel furnace shall comply with the applicable requirements of CSA B365, and if changes are made to the installation of the oil furnace, these shall comply with CSA B139.

If changes are made to an electric furnace during the installation, the changes shall comply with the Canadian Electric Code. Part 1.

### 5.2 Furnace room circulating air

The pellet Furnace is installed in the Furnace room.

#### 1. Safety instructions for the Furnace room

	<b>DANGER</b>
<b>Risk of fire</b>	
Do not store flammable materials or liquids in the vicinity of the pellet Furnace.	
Do not permit unauthorised persons to enter the Furnace room - Keep children away.	
Do not operate with fuel loading or ash removal doors open.	

#### 2. Air supply and ventilation of Furnace room

The Furnace room must be fitted with air supply and ventilation openings (at least 31 inch<sup>2</sup>/200cm<sup>2</sup>). In any case you must comply with the state and local regulations

#### 3. Damage due to frost and humid air

The Furnace room must be frost-proof to ensure trouble-free operation of the heating system. The temperature of the Furnace room must not fall below 37°F and must not exceed 90°F. The air humidity in the Furnace room must not exceed 70%.

#### 4. Danger for animals

Make sure that household pets and other small animals cannot enter the Furnace room. Fit mesh over any openings.

#### 5. Flooding


If there is a risk of flooding, switch off the pellet Furnace and disconnect from the power supply before water enters the Furnace room. You must have all components that come into contact with water replaced, before you start up the pellet Furnace again.



## 5.3 Furnace room supply air

The pellet Furnace is installed in the Furnace room.

### 1. Safety instructions for the Furnace room

	DANGER
<p><b>Risk of fire</b>            Do not store flammable materials or liquids in the vicinity of the pellet Furnace.            Do not permit unauthorised persons to enter the Furnace room - Keep children away.            Do not operate with fuel loading or ash removal doors open.</p>	

### 2. Air supply and ventilation of Furnace room

The Furnace room must be fitted with air supply and ventilation openings (at least 31 inch<sup>2</sup>/200cm<sup>2</sup>). In any case you must comply with the state and local regulations

### 3. Combustion air supply

The pellet Furnace needs a supply of combustion air. The supply of combustion air can:

- a. take place using one or more air supply and ventilation openings in total min. 31 inch<sup>2</sup>.
- b. The air must not be used directly from the outside without preheating (background: This could lead to a condensation of the boiler).

Never operate the pellet Furnace if the air intake openings are partially or completely closed.

Contaminated combustion air can cause damage to the pellet Furnace. Never store or use cleaning detergents containing chlorine, nitrobenzene or halogen in the room where the heating system is installed, if combustion air is drawn directly from the room. It is recommended that no washing or drying of laundry is done in the Furnace room or where the Furnace may draw air from.

Do not hang out washing in the Furnace room.

Prevent dust from collecting at the combustion air intake to the pellet Furnace.

### 4. Damage due to frost and humid air

The Furnace room must be frost-proof to ensure trouble-free operation of the heating system. The temperature of the Furnace room must not fall below 37°F and must not exceed 90°F. The air humidity in the Furnace room must not exceed 70%.

### 5. Danger for animals

Make sure that household pets and other small animals cannot enter the Furnace room. Fit mesh over any openings.

### 6. Flooding

If there is a risk of flooding, switch off the pellet Furnace and disconnect from the power supply before water enters the Furnace room. You must have all components that come into contact with water replaced, before you start up the pellet Furnace again.

## 5.4 Flue gas system

The flue gas system consists of a chimney and a flue gas tube. The flue gas tube connects the pellet heating system to the chimney. The chimney leads the flue gas from the pellet heating system out into the open.

### 1. Design of the chimney

The dimensions and design of the chimney is very important. The chimney must be able to ensure sufficient draft to safely draw away the flue gas regardless of the status of the Furnace. Low flue gas temperatures can cause sooting and moisture damage on chimneys that are not insulated. For this reason **moisture-resistant chimneys** (stainless steel or ceramic) should be used. An existing chimney that is not damp-resistant needs to be renovated before use. Follow guidelines below:

Furnace size		Furnace
Flue gas tube diameter (at Furnace)	inch/mm	6.3/160
Flue gas temp. / rated power	°F	
Flue gas temp. / partial load	°F	
Min. draft - full load/part load	in/wc	- 0.04 / - 0.02

Chimney size	Min. Height
6in x 6in	17ft
7in x 7in	16ft
8in x 8in	16ft
6in round	19ft
7in round	17ft

## NOTICE

Person(s) operating a pellet fired furnace is/are responsible for operation in a manner that does not create a public or private nuisance condition. The manufacturer's distance and stack height recommendations and the requirements in any applicable laws or other requirements may not always be adequate to prevent nuisance conditions due to terrain or other factors.

Recommended and UL-103HT approved chimney materials are:

- a. Selkirk sure temp
- b. Supervent (JSC)
- c. Security chimneys (secure temp ASHT)

Use flue gas pipe from chimney to Furnace as required by your local code.



## CAUTION

### Unregulated combustion

Please observe that combustion air openings and flue pipes are not reduced in size or closed. Make end user aware of these guidelines and their potential danger. Clean the chimney and the flue gas tube at regular intervals. Check if the draft inducer is clean and in a good condition.

## 2. Flue gas temperature

The flue gas temperatures are approximately the same for all AutoPellet Air covered in this manual.

The dewpoint of flue gas with wood pellets (max. 10% water content) is approx. 120°F.

It is possible to increase the flue gas temperature to prevent condensation inside the chimney and avoid damage due to damp. Only authorised installers may increase the flue gas temperature.

### Note:

The increase in flue gas temperature results in reduced efficiency and thus increases fuel consumption.

## 3. Negative pressure of the chimney

The Furnace must be connected to a chimney or a vertical venting system that is capable of handling and producing a negative breaching pressure of  $-0.4$  "WC. Use a draft gauge to verify the indicated draft value, adjust barometric damper as required. Drill a small hole in the connection pipe at about 2in/ 50mm from the Furnace flue outlet and use this hole as your measuring point.

### Chimney draft

The suction effect of the chimney draft must extend all the way to the Furnace flue pipe connection. The maximum flow rate that can be drawn through the chimney limits the maximum performance of the chimney connection. The Furnace performance must be reduced if the chimney does not possess the necessary cross-section. This may only be performed by authorised personnel.

## 4. Power venter

AutoPellet Air are approved by the manufacturer for installation with the Field Controls SWGAF power venter which is approved for wood pellet burning appliances. Furnaces installed with SWGAF power venters must follow all manufacturer's installations and must comply with all applicable codes from agencies having authority over the installation.



## 5. Cleaning

Clean the flue gas tube and chimney regularly. Solid fuel burning appliances need to be cleaned frequently because soot, creosote, and ash may accumulate. The hotter the fire, the less creosote is deposited. Cleaning intervals can vary in warm periods due to this and become more frequent.



## DANGER

### Risk of chimney fire

Creosote-formation and need for removal: Low flue gas temperature can cause creosote. Creosote can condense in a relatively cool chimney. As a result, creosote residue accumulates on the flue lining. If ignited, this creosote will create an extremely hot fire. The chimney and the chimney connector should be inspected at least twice monthly during the heating season to determine if a creosote buildup has occurred. If creosote has accumulated it should be removed to reduce the risk of a chimney fire.

## NOTICE

### Oxidation of chimney

Do not use metal brushes to clean chimneys made of stainless steel.  
Your state and local regulations must be observed.

## 5.5 Safety systems

The following safety measures are the prerequisite for safe operation of your system.

### Emergency stop switch

Every heating system must be able to be switched off with an Emergency Stop switch. The Emergency Stop switch must be outside of the Furnace room.



### Safety temperature sensor

The pellet Furnace is equipped with a safety temperature sensor. This is located on the pellet Furnace. If the Furnace temperature exceeds 230°F then the heating system switches off.



## 5.6 Installation with an existing Furnace

AutoPellet Air Furnaces are not to be connected to a chimney flue serving another appliance. However, when all State and local codes allow for the sharing of chimney flues, the AutoPellet Air Furnaces and another appliance burning pellets or a different fuel can be operated simultaneously while connected to a single existing chimney or flue gas system providing the following conditions are met:

- All state and local codes permit the specific installation
- All appliances are installed in accordance with the manufacturer's installation specifications or if lacking manufacturers specifications, the appliance in question is installed in a manner commonly recognized as safe and correct for the application and circumstances
- The chimney or flue gas system must be able to handle the combustion products of either appliance and both appliances when operated simultaneously

### NOTICE

#### Avoid clearance issues that can make servicing difficult:

Be sure to follow suggested clearances when installing the AutoPellet Air Furnaces with an existing Furnace to be sure that service and cleaning can be performed adequately.



### CAUTION

#### Avoid code violations:

When connecting to or with an existing Furnace, contact the authority having jurisdiction to be sure the type of installation planned is allowed.

Document the type of Furnace that the AutoPellet Air Furnace is connected to or with.

Pellet Furnace: Make and Model number:

\_\_\_\_\_

Existing Furnace: Make and Model number:

\_\_\_\_\_



### DANGER

#### Possible escape of flue gas:

Do not connect this unit to a chimney flue serving another appliance unless multiple appliances into a single flue is authorized by all authorities having jurisdiction.

## 5.7 Additional CSA-B366.1 1-11 Requirements for Add-Ons to Gas-Fired Furnaces

There are additional requirements in Canada for adding a solid fuel fired furnace to operate when connected to a gas fired furnace.

### 5.7.1 Operation Verified

Each gas furnace must be verified for acceptable operation BEFORE and AFTER being connected to an add-on appliance by a gas fitter who is recognized by the authority having jurisdiction.

### 5.7.2 Existing Gas-Fired Certification Requirement

Do not connect to any furnace that has not been certified initially as complying with ANSI Z21.47/CSA2.3 or its precedents.

### 5.7.3 Blower requirement

Do not connect to any furnace that is not equipped with an air circulation blower.

### 5.7.4 Chimney

Do not connect, under any circumstances, to the chimney or vent serving a gas furnace or gas appliance.

### 5.7.5 Ductwork

Do not connect ductwork so that a reverse flow is possible.

### 5.7.6 Periodic Operation

Operate the gas-fired unit periodically to ensure that it will operate satisfactorily when needed.

### 5.7.7 Safety Controls

Do not relocate or bypass any of the safety controls in the original furnace installation.

### 5.7.8 Gas furnace further compliance

The gas furnace installation shall comply with the applicable requirements of CSA B365, and if changes are made to the gas furnace, including clearances for servicing, these shall comply with CSA B149.1 or CSA B149.2.

# 6 The pellet Furnace

The pellet Furnace is equipped with an automatic cleaning system and an ash box with ash compression system. The installed programmable logic controller system enables fully automatic operation and highest efficiency. We offer an optional automatic de-ashing system for the highest level of cleanliness and comfort.

## AutoPellet Air types and power ratings

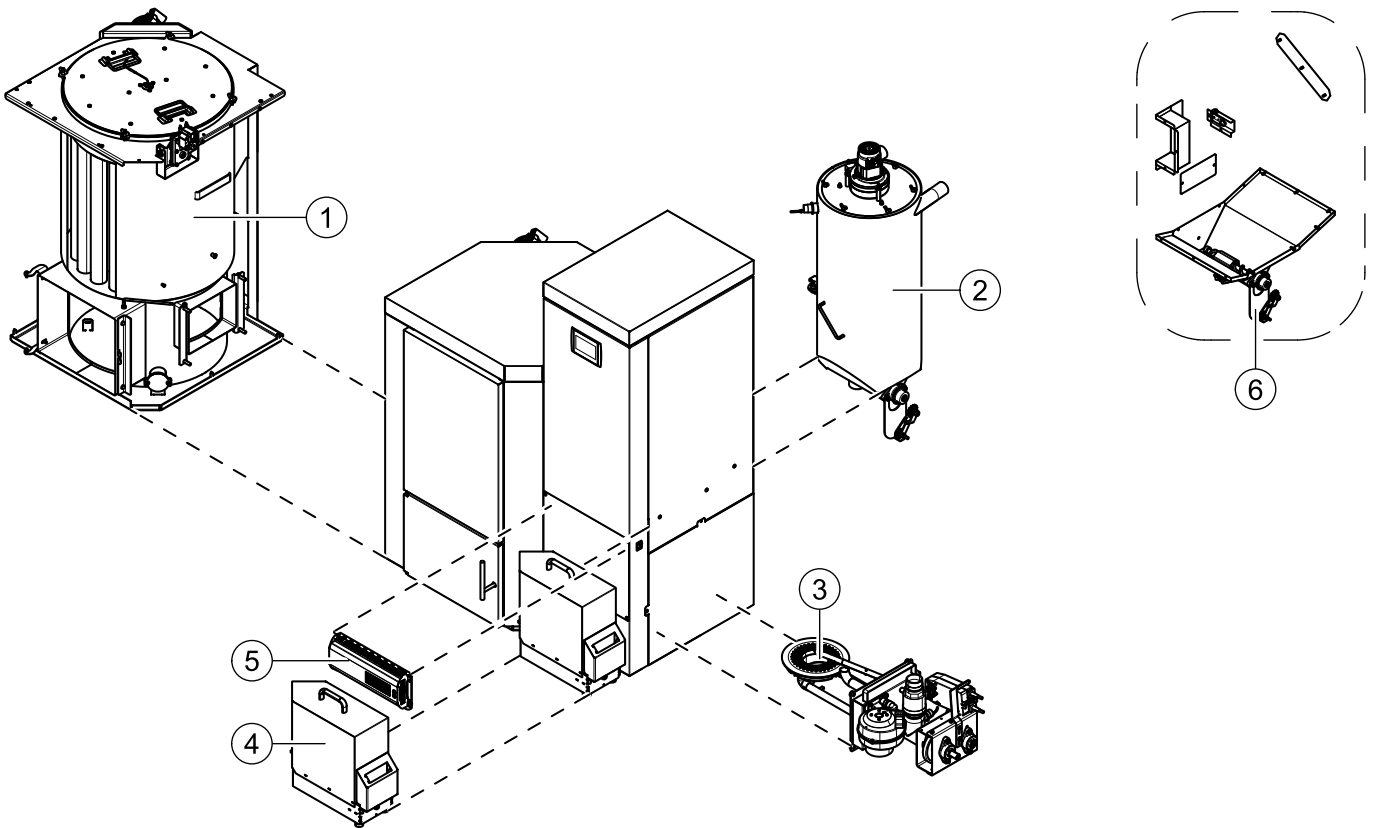
We offer the Pellet Furnace with the following power ratings:  
Suction-feed systems: 95,000 BTU/hr

All sizes / outputs of the AutoPellet Air Furnace are available with external automatic ash compression system.

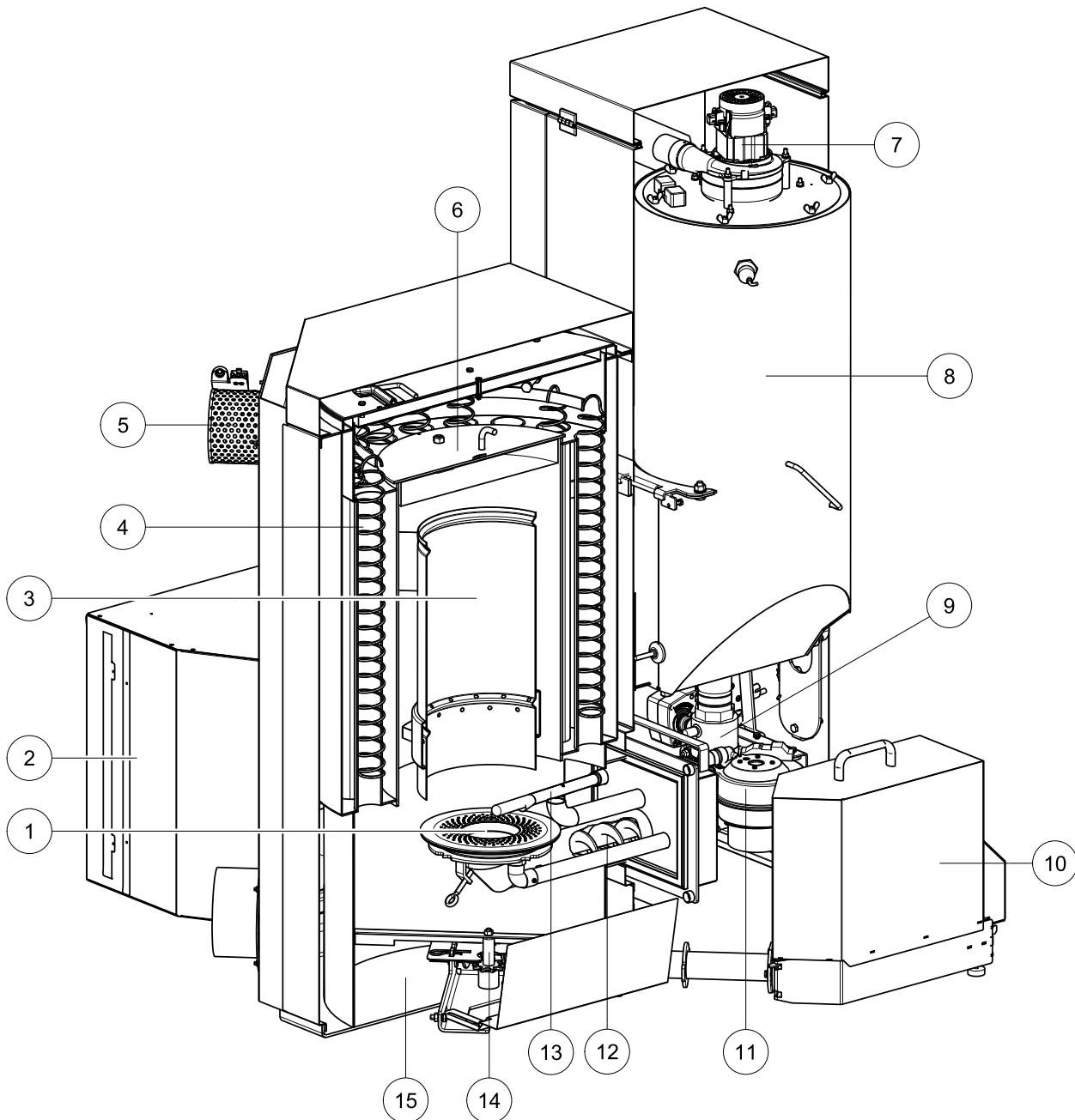
**Note:**

Refer to the data plate for the power rating of your AutoPellet Air. The data plate is located on the rear side of the AutoPellet Air. Here you will find the type designation, manufacturer’s serial number and year of build.

## Key components of the AutoPellet Air



1	Furnace (heat exchanger)
2	Vac Hopper / Day tank
3	Burner
4	External automatic ash compression system
5	Furnace controller
6	Additional parts hand filling



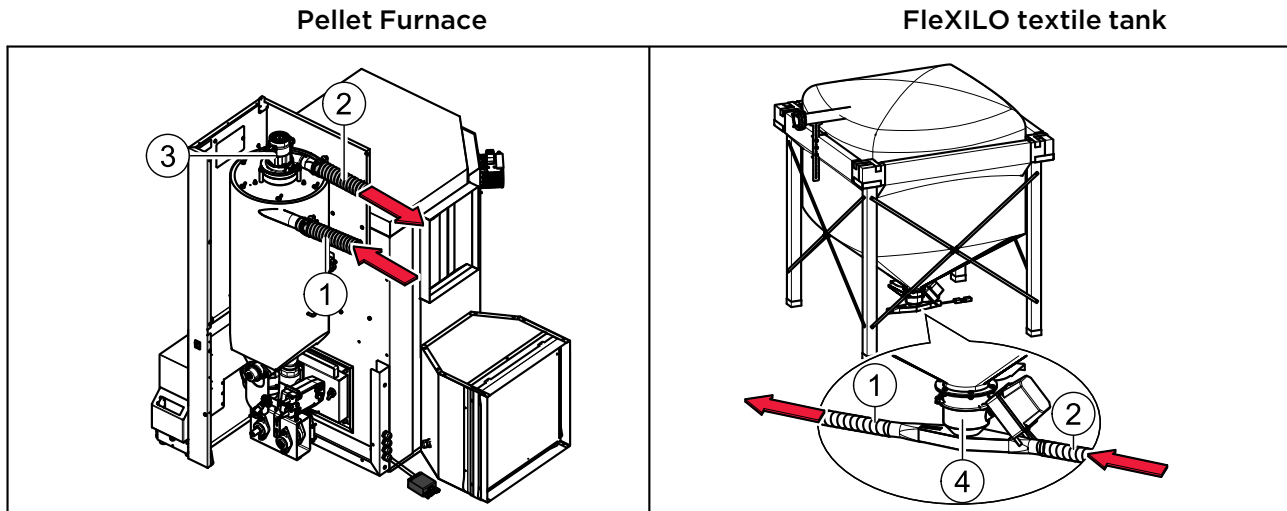
1	Burner plate	9	Fire protection - ball valve
2	Fan	10	External ash box (optional)
3	Flame tube	11	Burner fan
4	Heat exchanger	12	Burner auger
5	Flue gas fan	13	Electronic ignition
6	Combustion chamber cover	14	De-ashing system (optional)
7	Suction turbine	15	Ash chamber / Fire chamber
8	Vac hopper / Day tank		

## 6.1 Pellet suction system

The pellet suction system consists of a pellet line, an air line and a suction turbine. The suction turbine in the hopper conveys pellets in the pellet line from the storage room or textile tank to the hopper.

### Key components of pellet suction system

1	Pellet hose	Hose from textile tank to the hopper.
2	Air hose	Hosee from the suction turbine to the textile tank.
3	Suction turbine	Located above the hopper underneath the AutoPellet Air burner casing.
4	Suction switch	Located underneath the textile tank.



### 6.1.1 Assembly of the vacuum system

The pellet hose and the air hose are flexible spiral hoses made out of plastic. A copper braid avoids the static loading of the spiral hose.

**To avoid damage to the spiral hose, you must observe the following assembly guidelines:**

- Bending radius** The hose should be led as briefly as possible and with a few curves as necessarily. Bending radius may never be smaller than **12 inch**.
- Upward gradients** Max difference in height = **19 feet**  
**Note:** A difference in height of up to 10 feet can be overcome at one time. Larger differences in height must be interrupted with a 4 foot horizontal run of the pellet hose.
- Impact protection** The spiral hose can be mounted up to 19 feet exactly straight. In such cases however, it is very important to create a slight "S" in the pellet piping before a sharp curve to slow down the pellets to prevent hose damage.
- Installation in the soil and openings:** When installing pellet lines underground remember! The pellet lines are not designed for direct burial and require protection from being crushed or chewed by varmints. Protective piping should be minimum 4 inch and sealed at each end. There should be no bends greater than 15 degrees in the underground sections of the pellet hose.
- Tightness** To avoid problems with your pellet lines, it is important to have all hose connections secured completely air tight with hose clamps.
- Static neutralization** The hoses are provided with a copper braid, those the hose keeps antistatic. In order to ensure the function of the anti-statics, those copper braid must be attached at each end to the existing grounding become.
- Fire protection** At a wall break-through to the heating room must be installed a fire protection seal in the pellet- and the air hose.

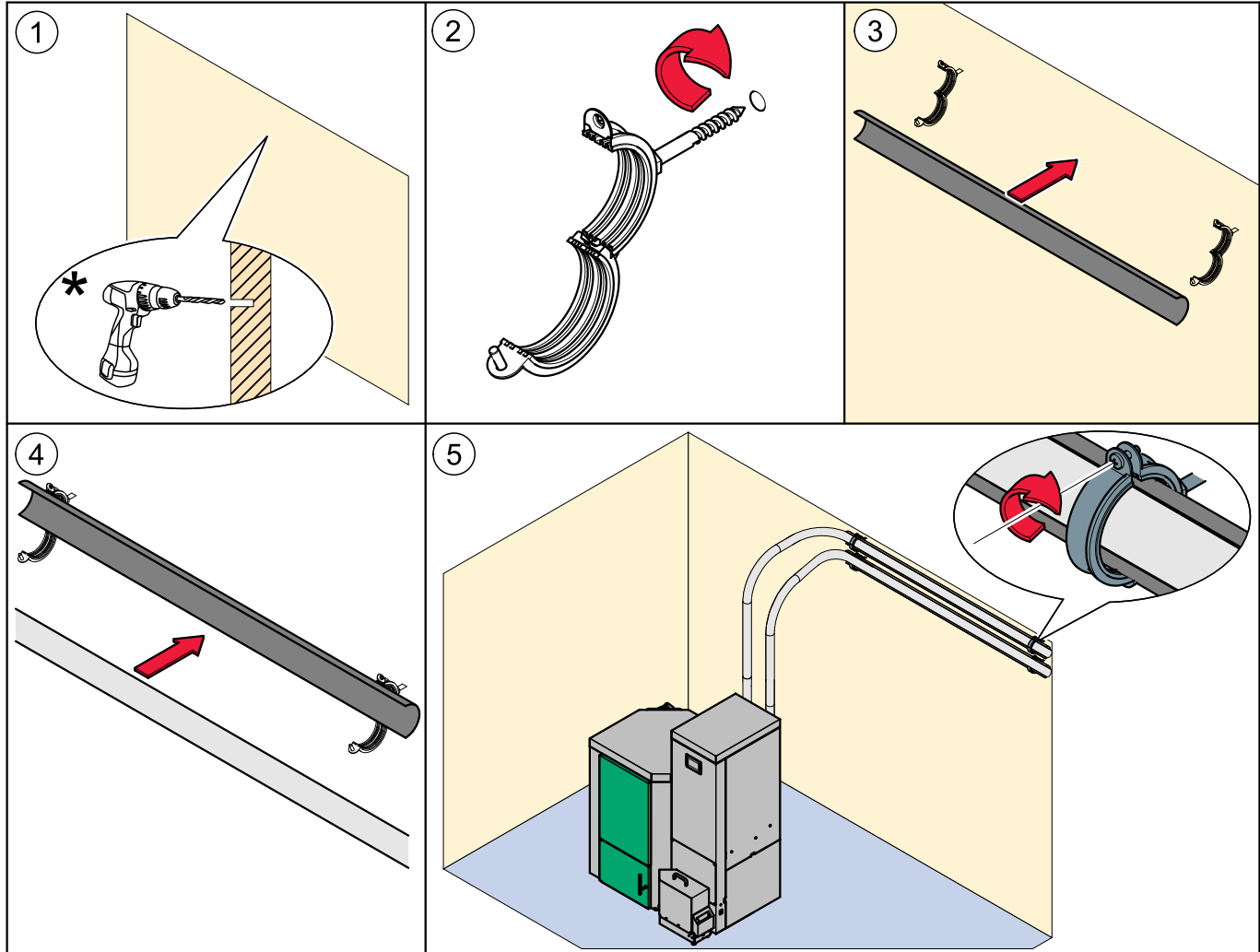


**Crossing** The pellet hose and the air hose should cross each other as few times as possible.

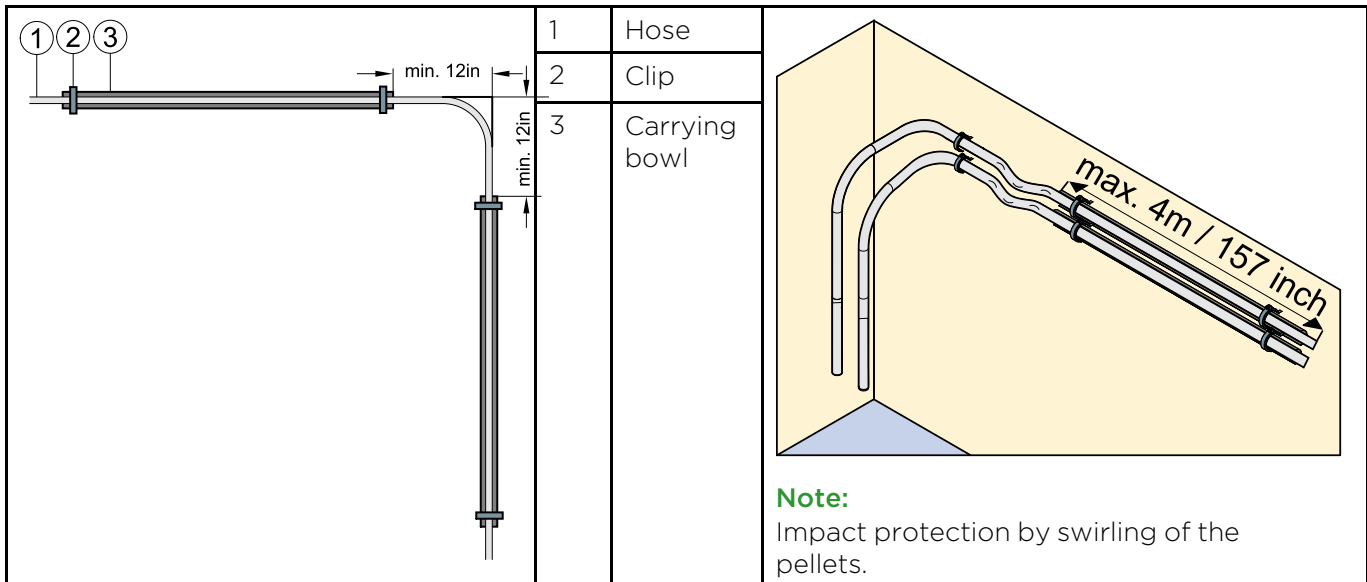
**Length of the spiral hose** The maximum total length of the spiral hose is 130 feet.  
The maximum for pellet hose and air hose are each 60 feet.

**Assembly**

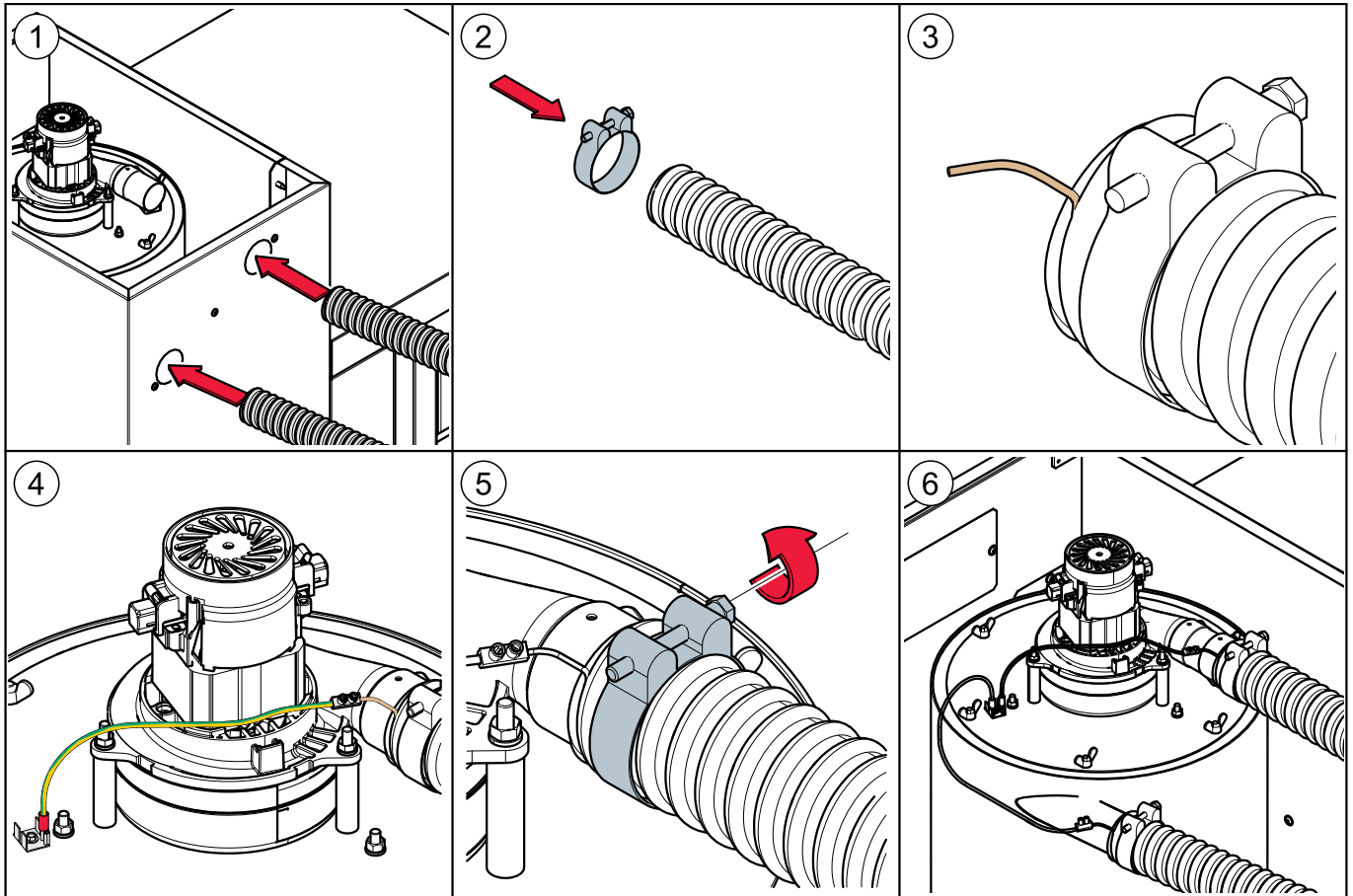
Use securing clips and carrying bowls.



\*Pay attention to the defined distances!



### Connection of the pellet and air hose to the suction turbine



## 6.2 Storage systems

For storing pellets we offer a FlexILO textile tank. FlexILO textile tanks can be located inside the Furnace room, storage room or protected from wet and sun outside.

### NOTICE

#### Damage to property and loss of warranty

The use of an AutoPellet Air Furnace with a storage or conveyor system from another manufacturer is not permissible and will result in voiding your warranty along with undependable operation.

#### 6.2.1 Flexilo textile tank

Maine Energy Systems offers various sizes and types of fabric tanks. The fabric tank supplied may vary from the example shown above.

Please refer to the installation instructions supplied for the fabric tank. Note also the instructions on setting up and filling.

#### Data motor:

Voltage	Amps	Wire size
230 volt	max. 4 amps	#14 or larger

## 7 Bringing the pellet Furnace into the Furnace room

This section describes the prerequisites as well as the working sequence required.

1. Transport
2. Notes on bringing the unit into the building
3. Casing parts
4. Dismantling the casing parts

### 7.1 Transport

We supply the pellet Furnace on a pallet. The pellet Furnace is ready to be connected. The control unit for the Furnace controller and the operating device is integrated into the control panel.

If it is not possible to bring the Furnace into the building at ground level, then you can remove the casing, the burner, the hopper and the Furnace controller. This will reduce the weight of the unit and make it easier to carry.

#### NOTICE

##### Contamination and corrosion

Make sure that the pellet Furnace is located under a roof if it needs to be stored outside before it is transported/ brought into the building. It is also necessary to transport the Furnace in a closed in truck or trailer. Furnaces transported otherwise will lose their warranty.

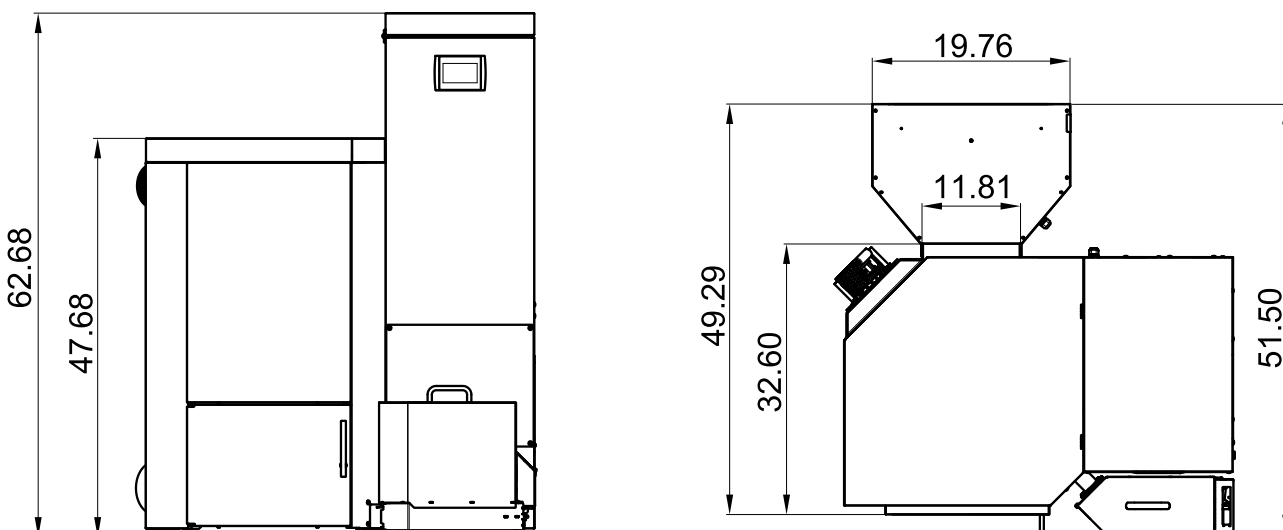
### 7.2 Notes on bringing the unit into the building

Before bringing the unit into the building, check the dimensions of all doors to ensure that the Furnace has sufficient clearance and can be set up properly.

#### Minimum door width - max. unit dimension

Furnace	28 kW	29.53 inch
---------	-------	------------

#### Furnace dimensions



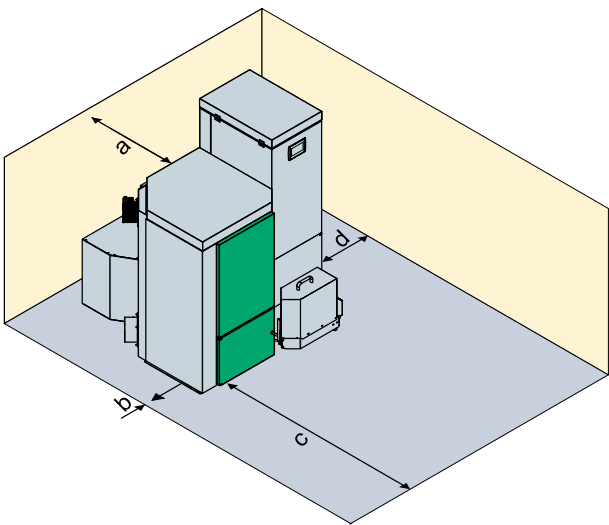
**Approximate Furnace Weight**

Furnace size	Furnace
Weight of Furnace with fan	509 lb

**Minimum clearances suggested for proper cleaning and maintenance**

**Note:**

To install the heating system properly and ensure economical operation, you need to make sure that minimum clearance dimensions indicated below are observed when setting up the Furnace. **In addition, make sure that all code requirements at the installation location are complied with relating to the minimum clearances.**



The diagram shows a furnace unit in a room corner. Dimension 'a' is the clearance from the top edge of the furnace to the ceiling. Dimension 'b' is the clearance from the side of the furnace to the wall. Dimension 'c' is the clearance from the front of the furnace to the wall. Dimension 'd' is the clearance from the burner housing to the side wall.

<b>a</b>	Minimum clearance to the edge of removable top cover of the Furnace. For flue pipe clearance, refer to applicable codes.	inch	12
<b>b</b>	Min. clearance of side of Furnace	inch	12
<b>c</b>	Min. clearance of front of Furnace	inch	20
<b>d</b>	Min. clearance to housing - burner side.	inch	10

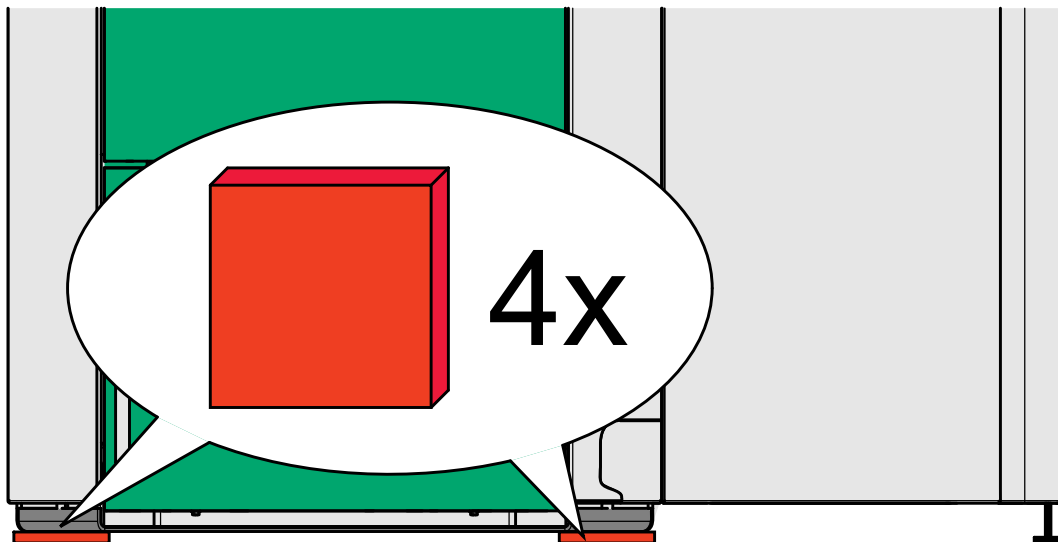
**Note:**  
Place the Furnace according to the minimum clearances to the flue pipe connection point as defined in NFPA 31, or if NFPA is not recognized, then the code pertinent to the installation location. Make sure that you also comply with local legal regulations. For clearances required for floor protection, see following page.

\*) Distance should be clarified with ventilation fitter. Recommendation Maine Energy Systems: 18 inch.

**NOTICE**

The furnace must be attached to the floor if installed in mobile housing.

### Placement of rubber plates



## NOTICE

### Loss of warranty!

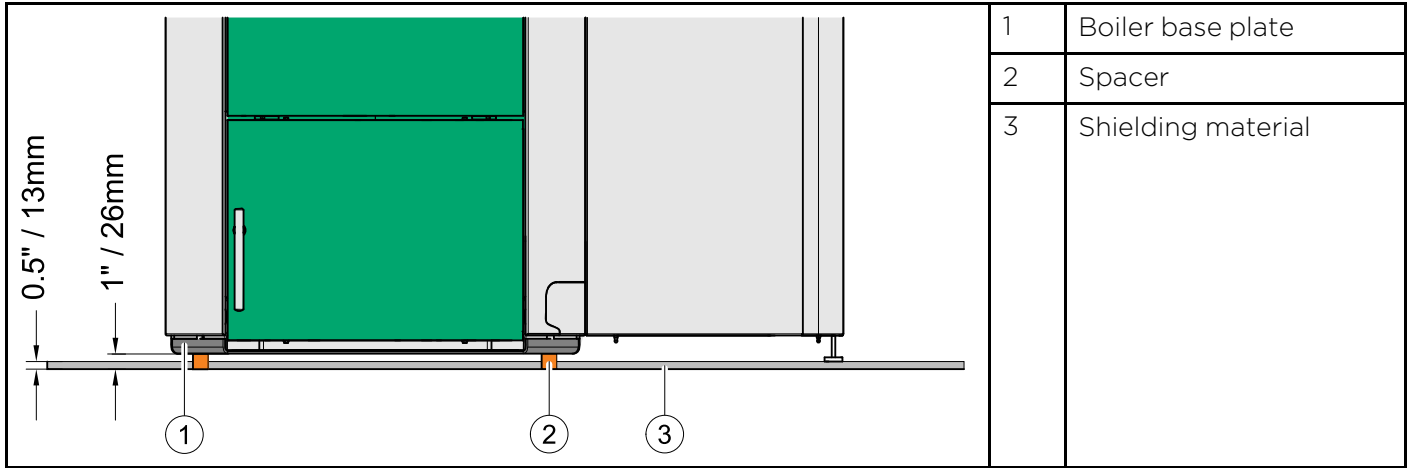
The Furnace must be placed on the supplied rubber plates.

Failure to do this may allow corrosion and will void the warranty of the Furnace vessel.

### 7.3 Flooring

The boiler room floor must be flat and level and must be able to support boiler gross weight. The floor must comply with the requirements of NFPA 31.

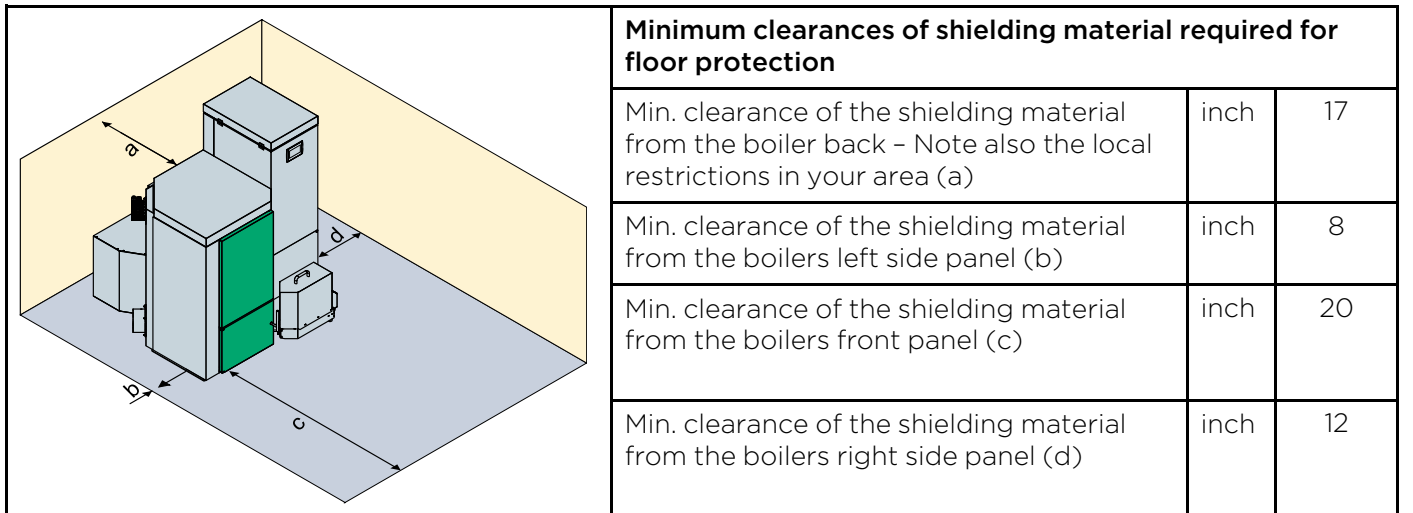
Generally the boiler should be placed on non-combustible floors. However, a shielding material can be placed underneath the boiler and the chimney connector in the case of a combustible floor like shown on the following drawing.



The spacer must be able to support the weight of the boiler and has to be non combustible. The shielding material must be equivalent to a R-value of 0.3 Km<sup>2</sup>/W or greater. For more information contact Maine Energy Systems.

## DANGER

**Risk of fire:**  
The non-combustible flooring needs to extend out to the clearances shown on the chart below.

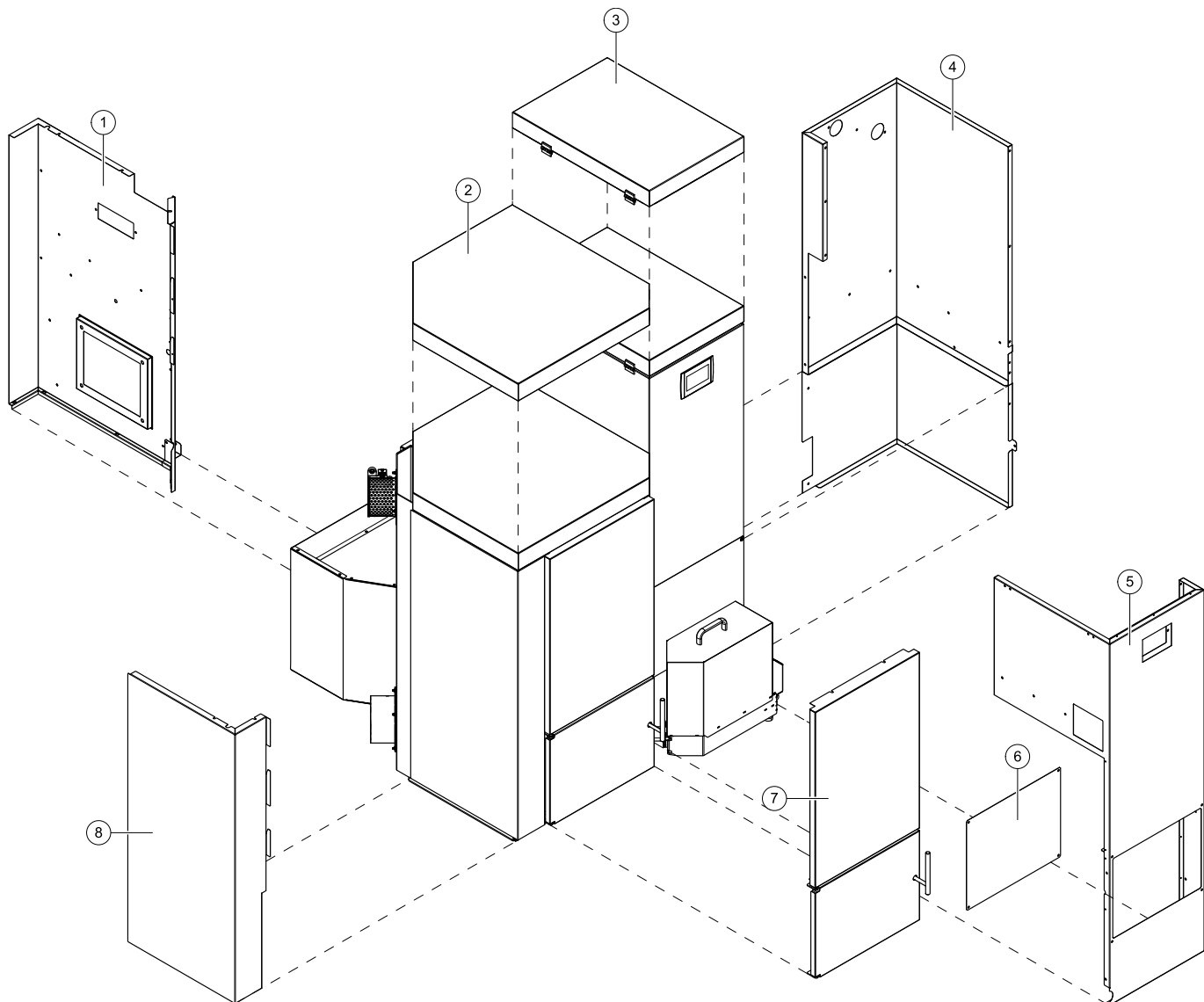


**Note:**

The floor protection must extend under the chimney connector, at least 2 inches on either side.

## 7.4 Casing parts

The Furnace is protected by a casing on all sides. The casing parts prevent contact with hot, moving and live components. They give the pellet Furnaces a unique appearance.



1	Furnace side panel with opening	6	Burner front cover
2	Furnace cover	7	Service cover
3	Burner cover	8	Furnace front panel
4	Furnace side panel	9	Furnace door
5	Right service cover	10	Furnace side panel without opening

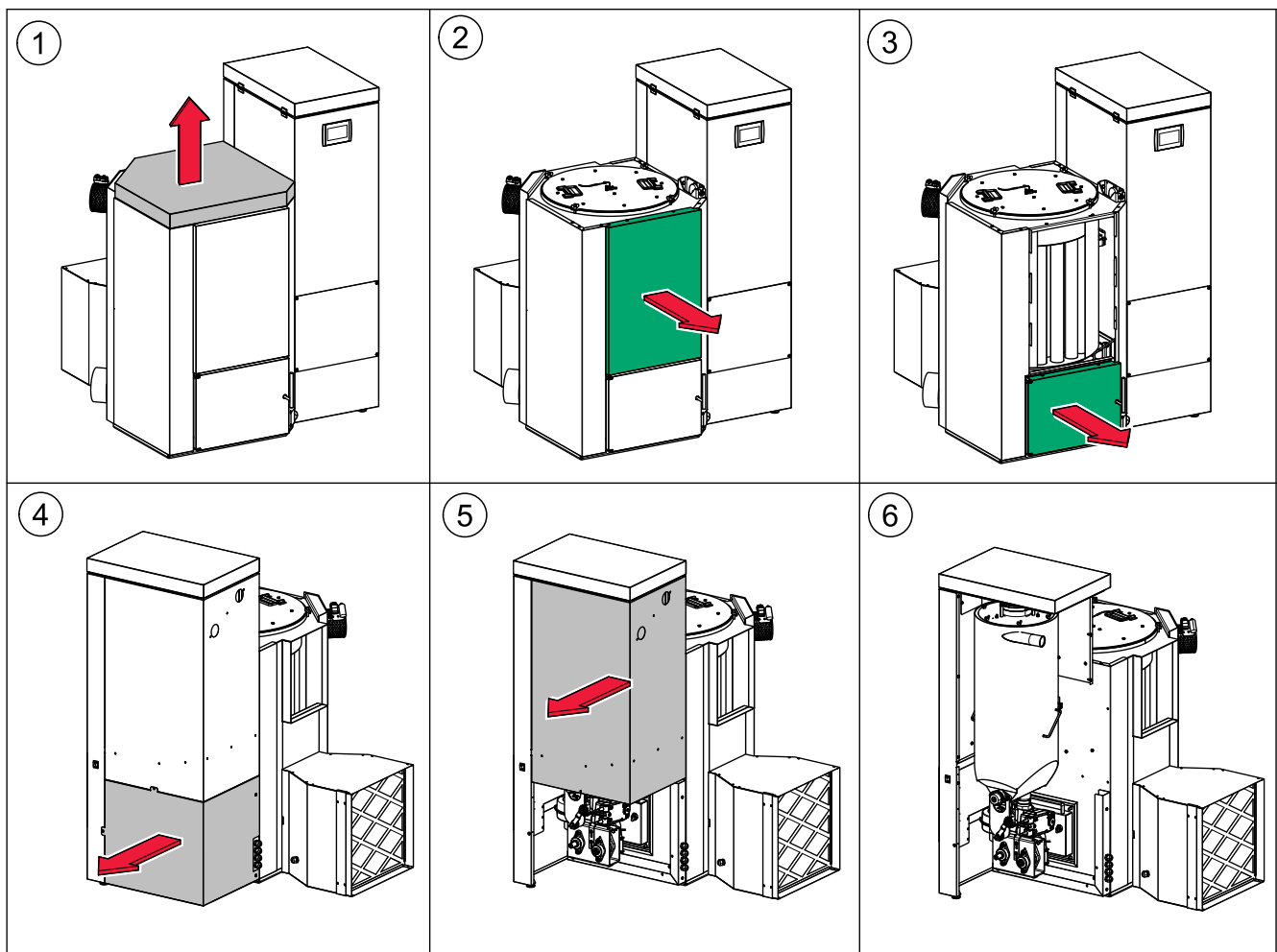
## 7.5 Removing the casing, the hopper and the burner

Dismantle the pellet Furnace as far as necessary if site conditions require, so that the unit can be brought safely into the building.

The complete dismantling of all components described here is divided into the following sections:

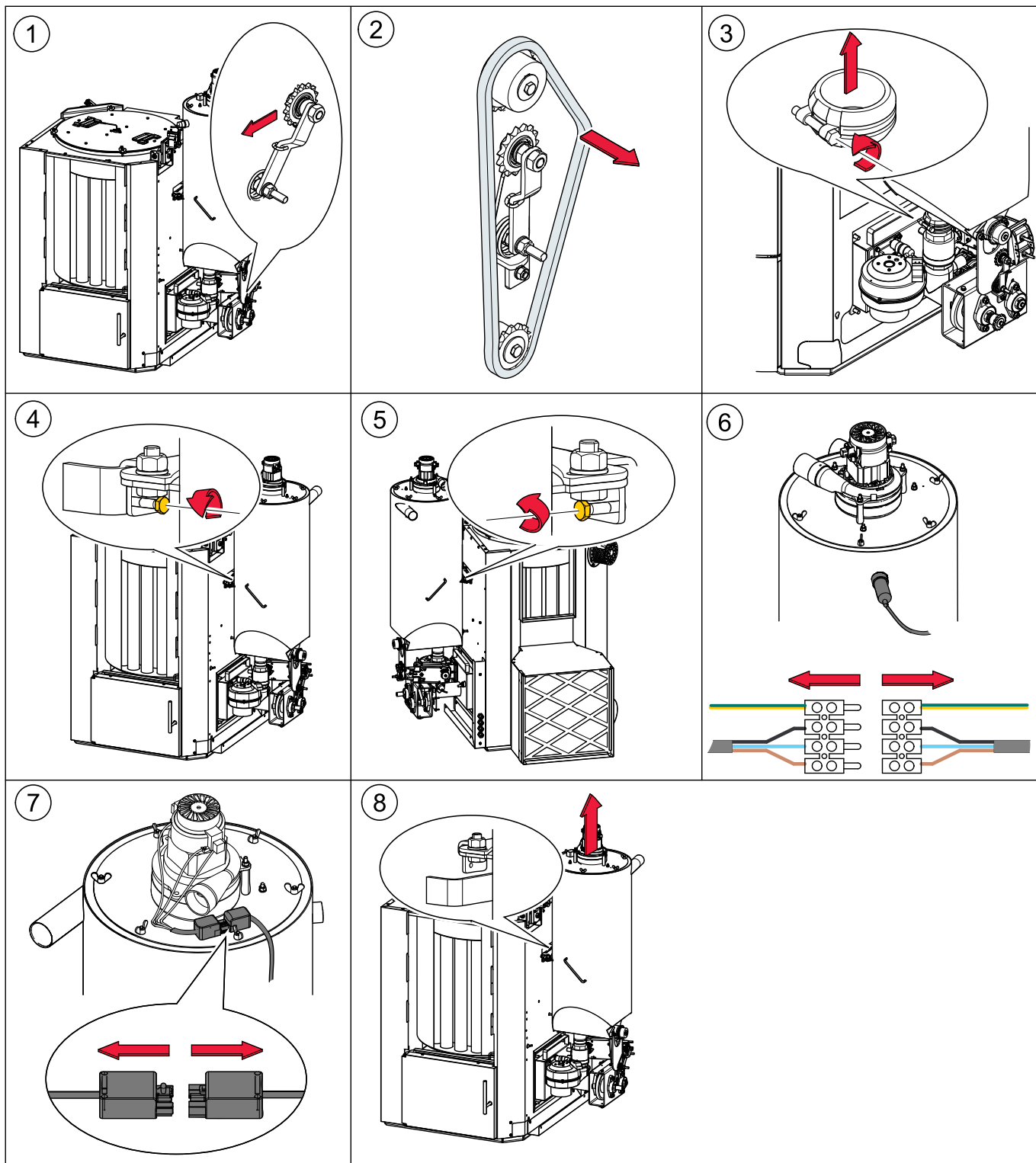
1. Dismantling the burner casing
2. Dismantling the hopper
3. Dismantling the burner
4. Dismantling the Furnace door
5. Dismantling the Furnace casing

### 7.5.1 Dismantling the burner casing

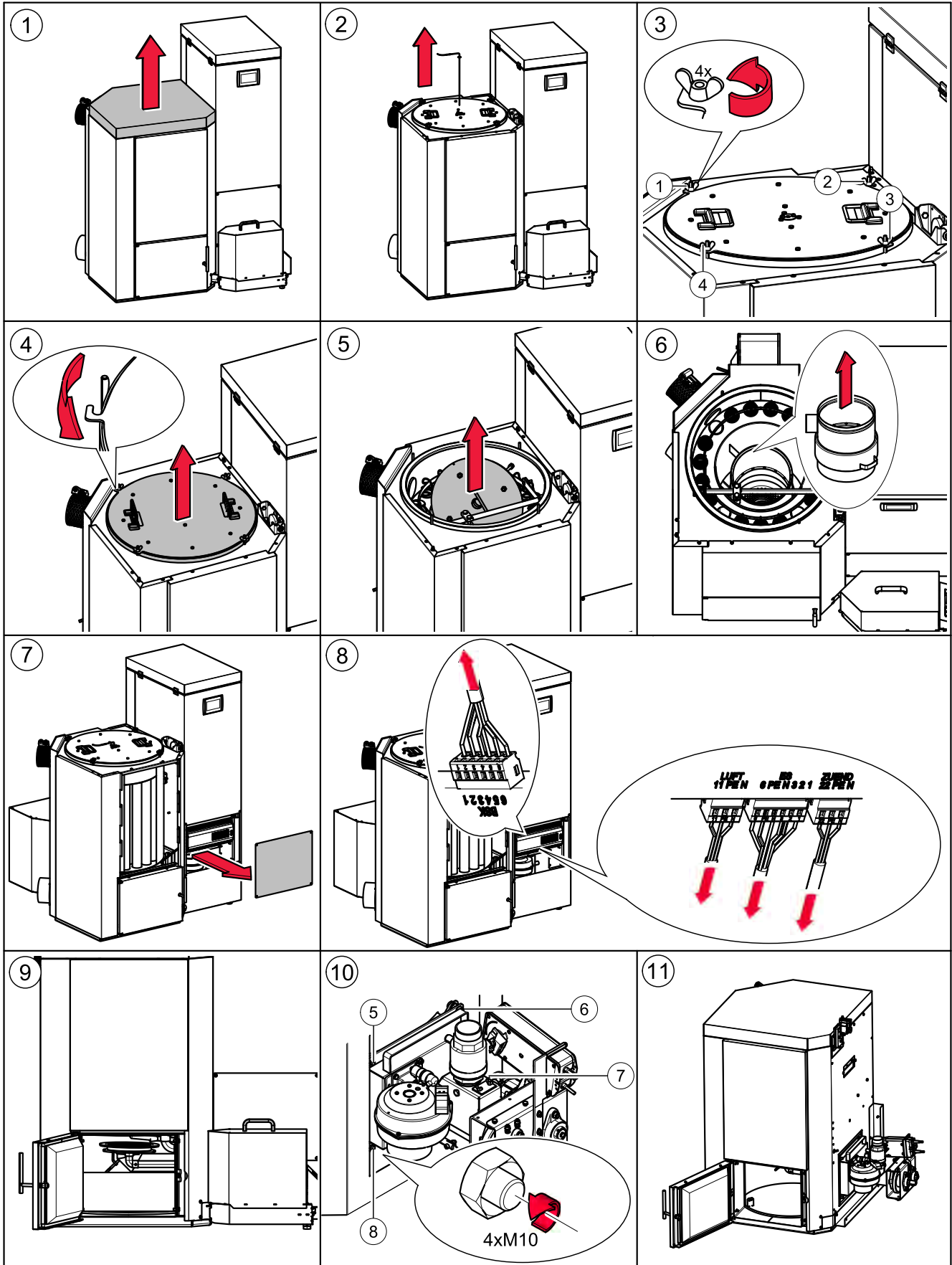




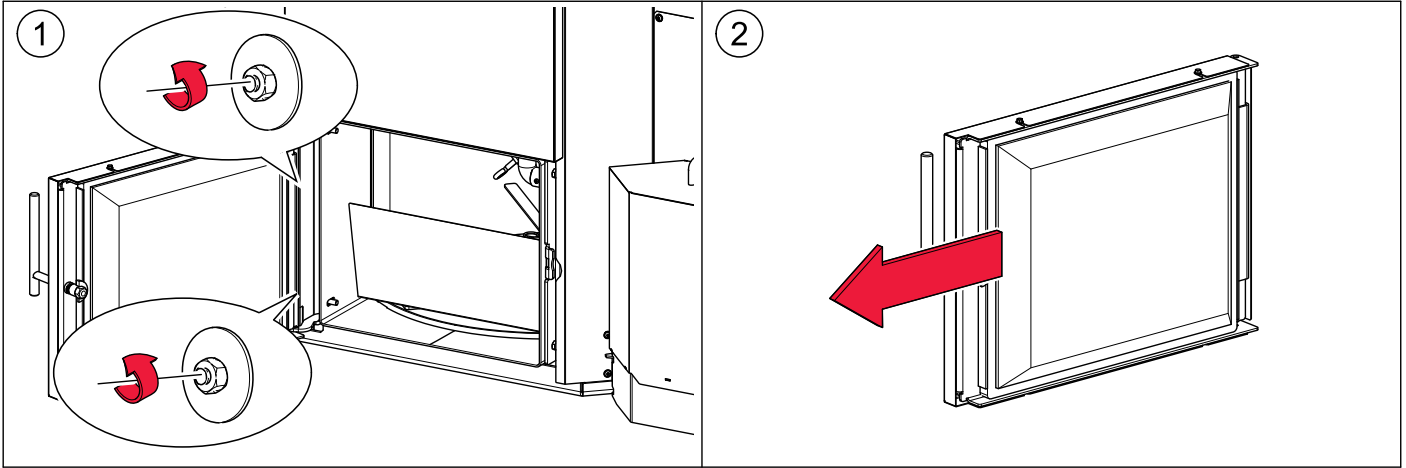
### 7.5.2 Dismantling the hopper



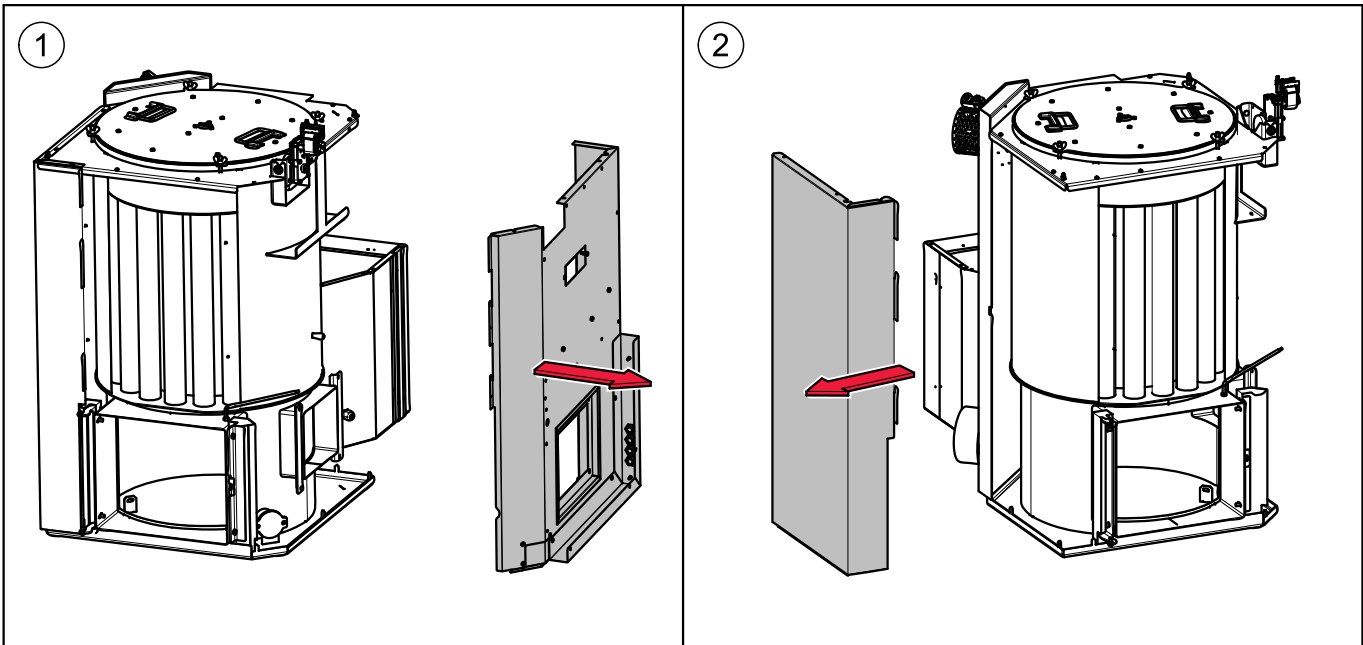
### 7.5.3 Dismantling the burner



### 7.5.4 Dismantling the Furnace door

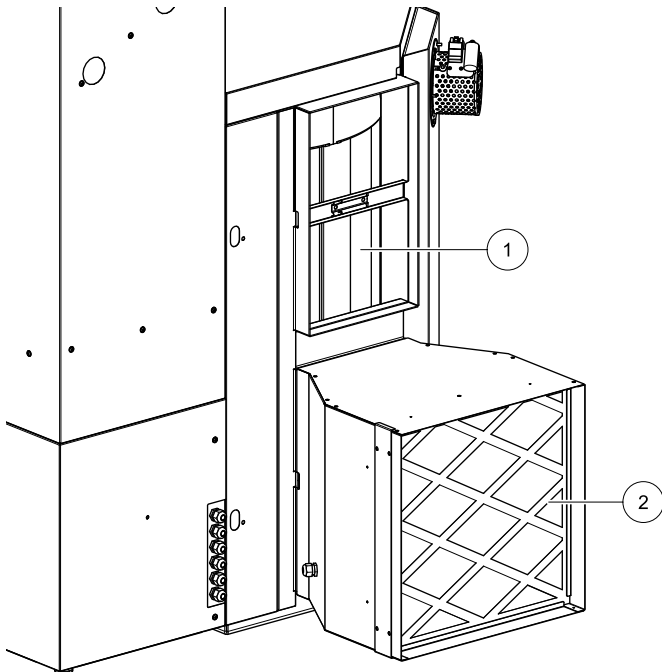


### 7.5.5 Dismantling the Furnace casing



## 7.6 Plenum / Warm air delivery and Return air

### 7.6.1 Plenum / Warm Air Delivery and Return Air connection locations



1	The warm air outlet is the upper opening at the rear of the furnace. The opening size is 12 x 20 inches.
2	The return air is connected to the blower assembly. Normally this is done after the blower assembly is connected to the furnace itself, at the lower opening at the rear of the furnace.

### 7.6.2 Minimum size of Warm Air Delivery Plenum

From the rear of the furnace, and for the first 43 inches of the warm air plenum, the minimum clearance to combustibles is 2 inches.

After 43 inches, as measured from the attachment point on the rear of the furnace, the warm air plenum no longer is required to have any clearance to combustibles.

#### NOTICE

THE MAIN WARM AIR PLENUM COMING FROM THE FURNACE SHALL BE NO SMALLER THAN 12 BY 20 INCHES.

#### NOTICE

ONLY INSTALL THIS FURNACE AS AN ADD-ON IF ALL DUCT WORK IS IN GOOD CONDITION AND MEETS ALL REQUIREMENTS OF BOTH FURNACES AND THE CHIMNEY IS IN GOOD OPERATING CONDITION.

#### NOTICE

DO NOT USE DUCT ELBOWS HAVING AN INSIDE RADIUS OF LESS THAN 6 INCHES.

**Note:**

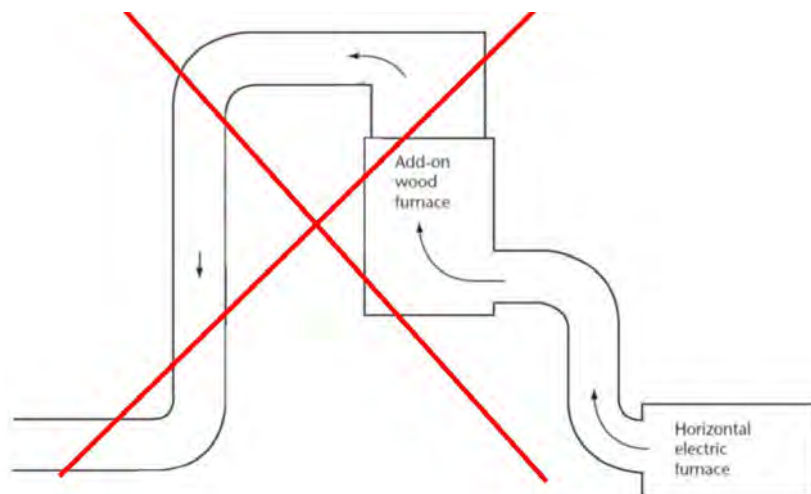
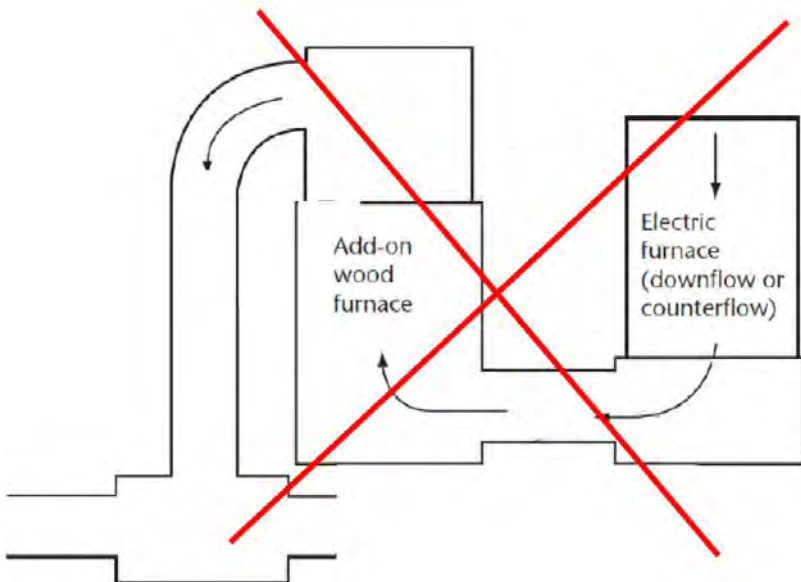
It is important for efficient and successful home heating that the air delivery piping is correctly sized for the home / building. Depending on the size and length of the air delivery pipes, the minimum and maximum fan speeds as well as the warm air temperature set-point or "control temp" will likely require adjustment beyond the default settings of the furnace.

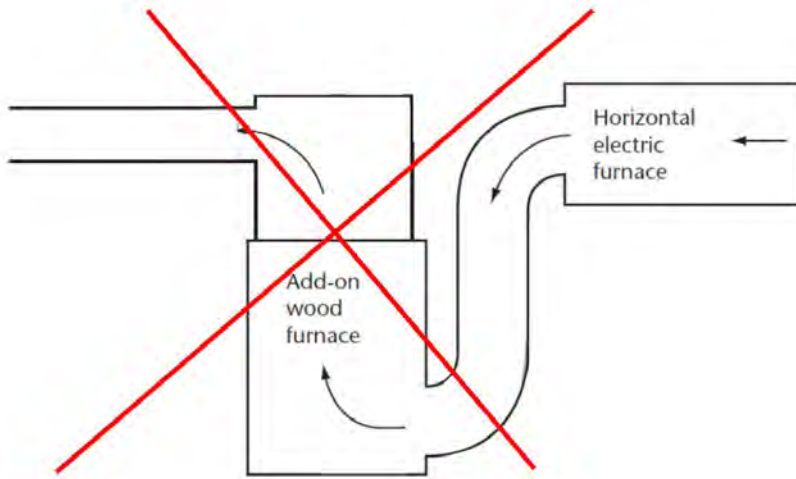
**7.6.3 Plenum / Warm Air Delivery and Return Air****NOTICE**

DO NOT CONNECT DUCT WORK SO THAT A REVERSE FLOW IS POSSIBLE.

**NOTICE**

UNDER NO CIRCUMSTANCES SHOULD THE WARM AIR OUTLET OF THE ADD-ON FURNACE BE CONNECTED TO THE COLD-AIR RETURN OF THE CENTRAL FURNACE AS OVERHEATING CAN RESULT.





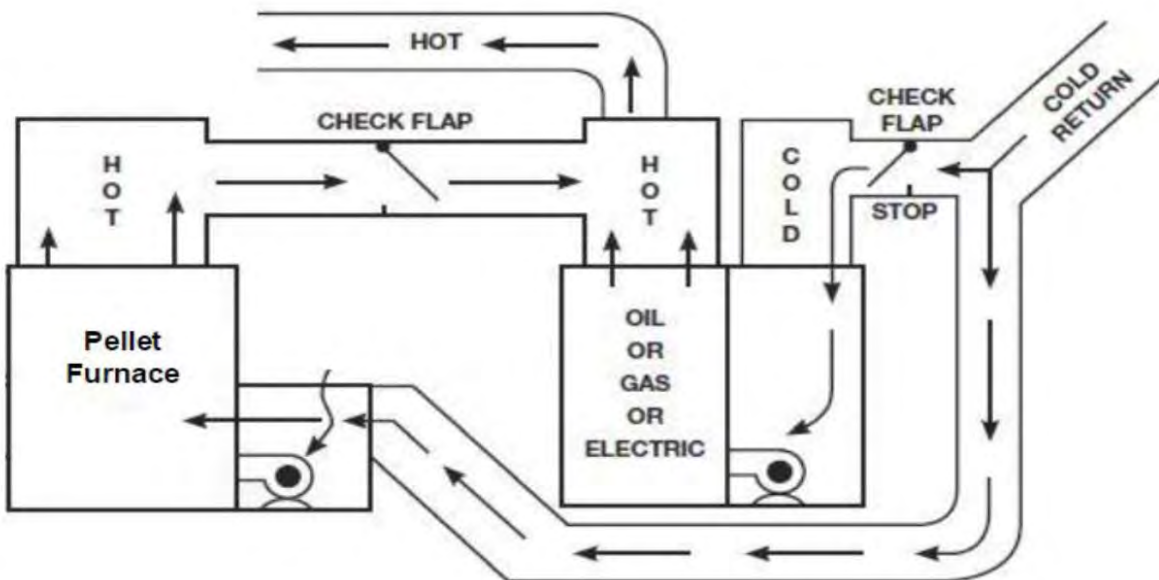
**Note:**

It is important that the Oil, Gas or Electric furnace be operated periodically to ensure that they will operate satisfactorily when needed.

**NOTICE**

CERTIFIED FOR INSTALLATION WITH THE FOLLOWING DUCTWORK CONFIGURATION ONLY AS IN FIGURE 7.6.3 - 1 WHEN INSTALLED AS AN ADD-ON OR SUPPLEMENTAL FURNACE.

Figure 7.6.3-1

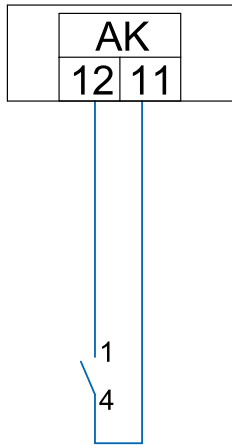


**Note:**

Check flaps in Figure 7.6.3-1 must have end switches to only allow operation of the appropriate furnace depending on position. See wiring example in section.

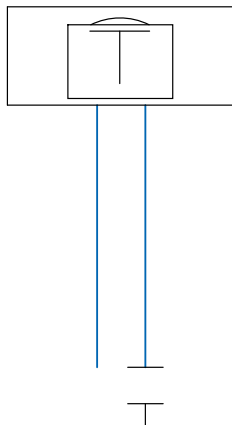
### 7.6.4 Interconnecting of furnaces to prevent simultaneous firing

To prevent pellet-fired furnace operation when air flaps are in the "central furnace" position, the end switch should close the AK input to the pellet-fired furnace. The AK connection point is at the FA / furnace controller.



Connections 1 and 4 would be to the air flap end switch as above. Closed contacts here prevent firing of the pellet-fired furnace.

Similarly, the start contact wiring (TT) of the oil, gas, electric furnace should be held open when the flaps are in the pellet-fired furnace operation position.



Wiring from thermostat to be controlled by the air flap end switch as above. Open contacts here prevent firing of the oil, gas, or electric furnace.

**Note:** Use different contacts for the pellet-fired furnace and the gas, oil, or electric furnace to avoid control circuit damage.

### 7.6.5 Construction Material for Plenums

The plenums installed to the furnaces shall be constructed of metal in accordance with NFPA 90B, 2-1.3.

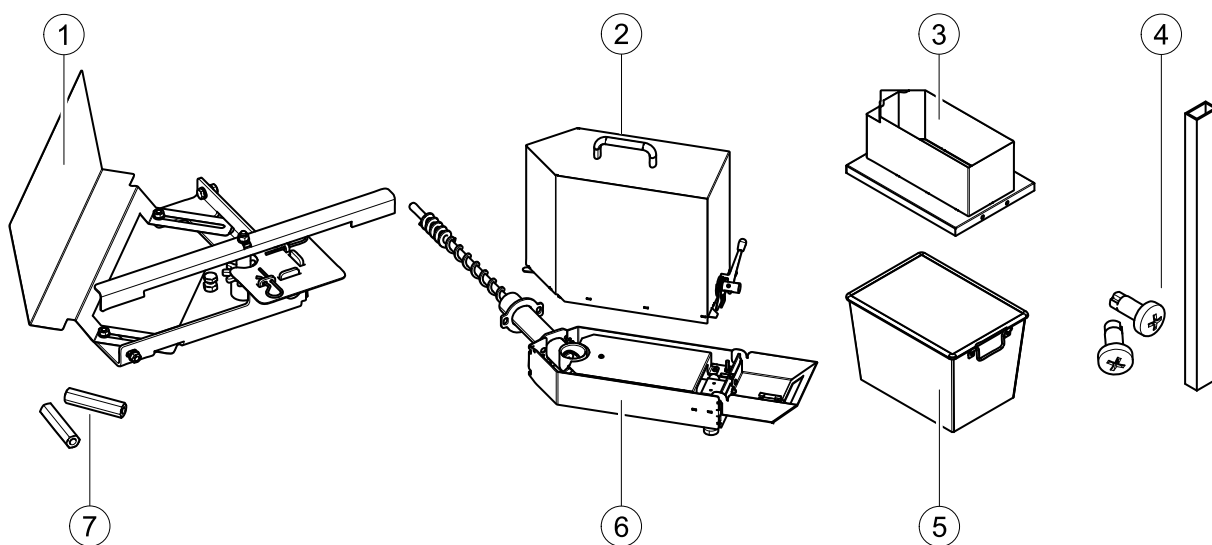
## 8 External de-ashing / automatic ash compaction system

We offer an automatic external de-ashing system.

1. Description of de-ashing system
2. How the de-ashing system works
3. Installing the de-ashing system
4. Emptying the de-ashing system

### 8.1 Description of de-ashing system

The de-ashing system compresses the ash and conveys it from the ash chamber into the ash box. The ash box enables the ash to be easily disposed off without creating dust.



1	Turnstile with agitator, door plate and mounting bolts	5	Ash container
2	Ash box with single-hand lever	6	Sub-assembly with extractor auger and cable
3	Mounting frame	7	Extended nuts to secure the sub-assembly
4	Cable duct with mounting bolts	8	1 pack of bio-bags

**Note:**

All components for the de-ashing system are packaged in a separate box which is shipped together with the Furnace. Open the box and check that all parts are available before starting work.



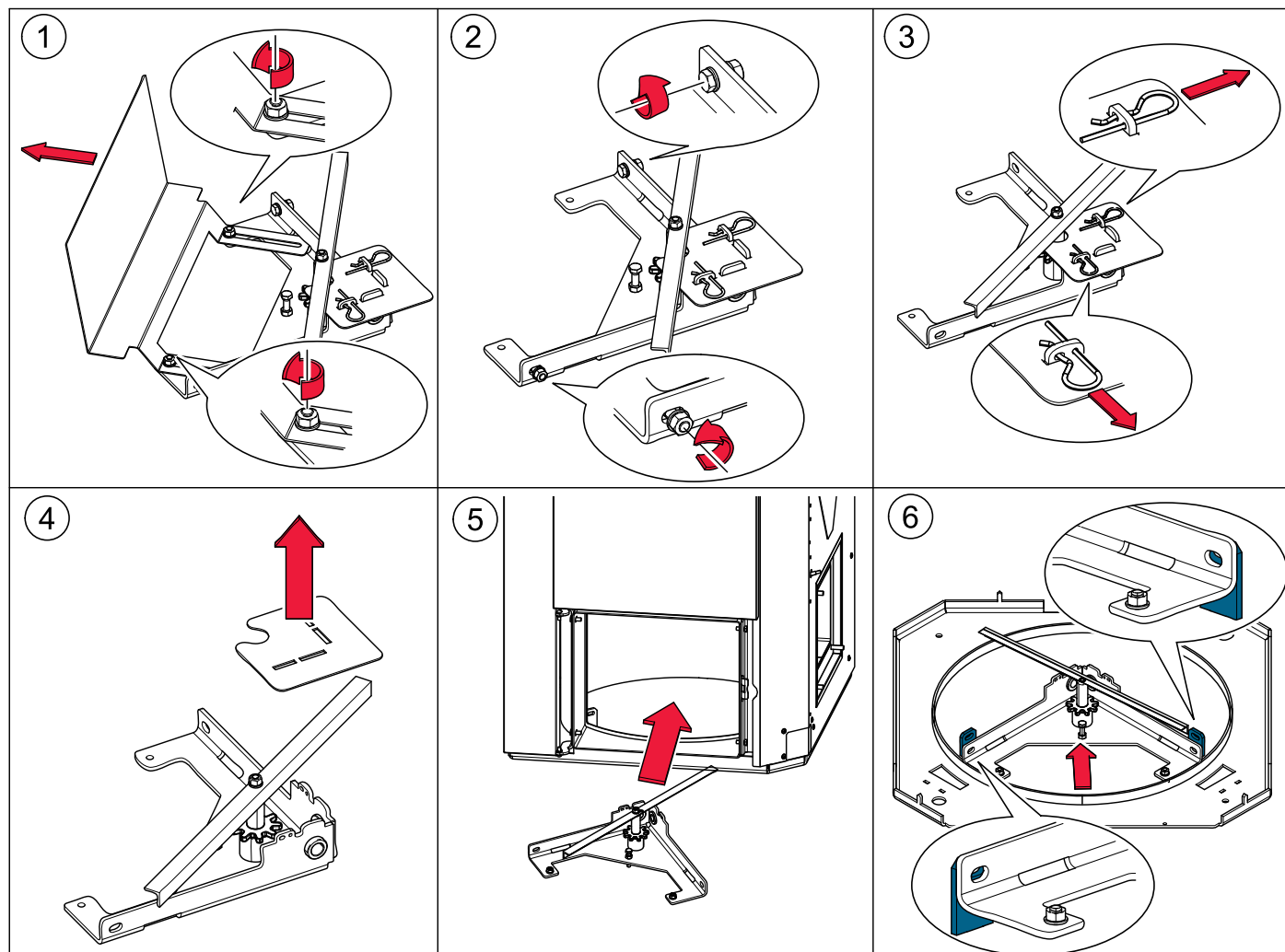
## 8.2 Installing the de-ashing system

We recommend installing the de-ashing system after the Furnace has been brought in, but before the Furnace casing is fitted. The de-ashing system has to be installed before the burner casing is assembled.

Installation of the de-ashing system is divided into the following steps:

1. Bringing in and installing the de-ashing system on the base plate
2. Installing the de-ashing auger, fitting the sub-assembly and mounting the door plate
3. Installing the burner side casing with cut-out and electrical connection
4. Assembling the pellet Furnace and activating the ash box

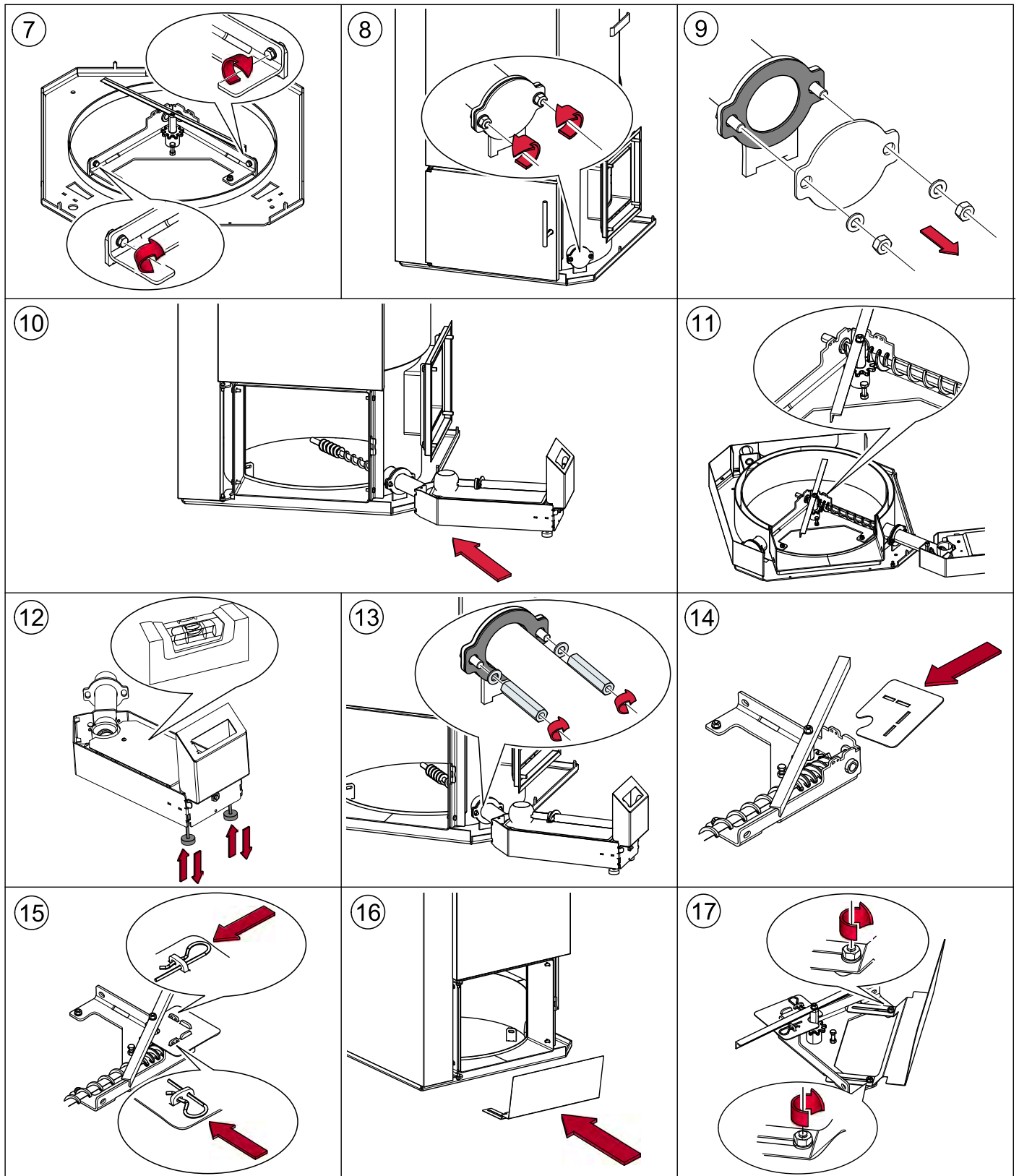
### 8.2.1 Bringing in and installing de-ashing system on the base plate



#### Note:

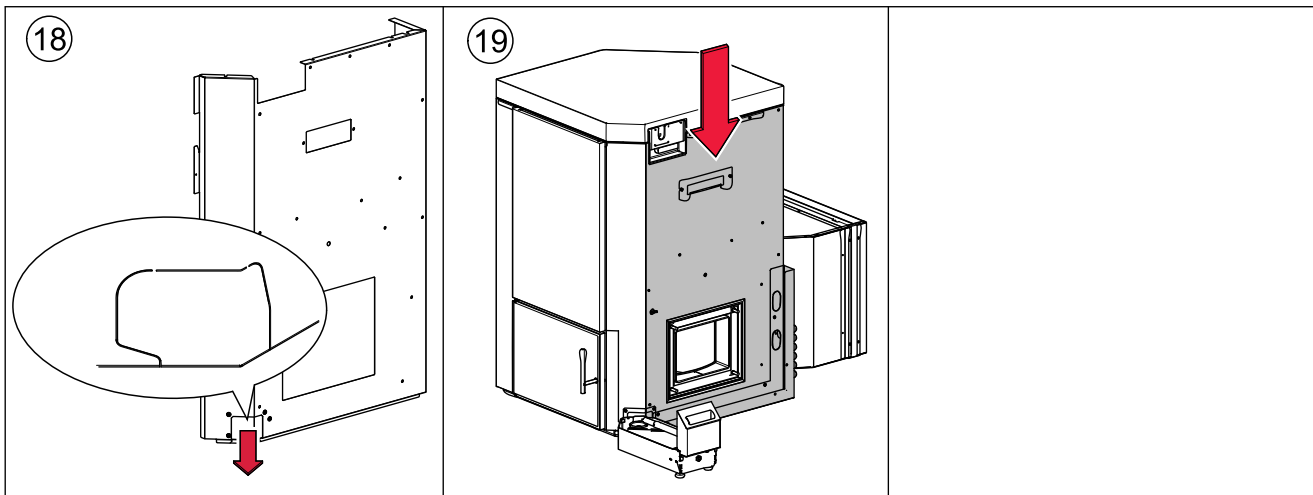
- 5: Replace the screw with the base in a horizontal position.

### 8.2.2 Installing the ash auger, fitting the sub-assembly and mounting the door plate

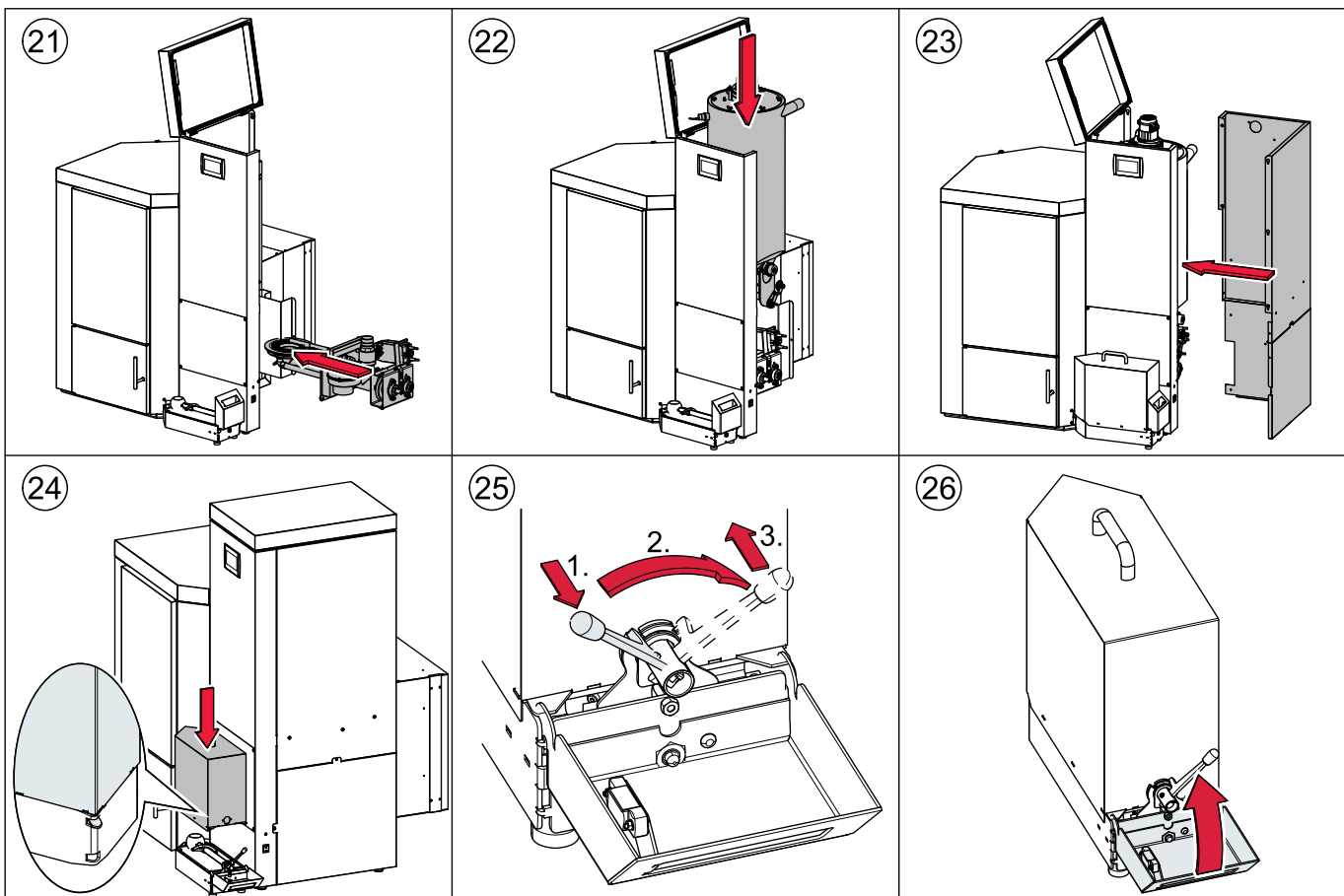


#### Note:

Do not tighten the screws firmly (picture 7). Tighten the screws firmly only after working step in picture 11. The ash auger engage with the gear must be so that the agitator moves freely.



### 8.2.3 Assembling the pellet Furnace and activating the ash box



#### Note:

Refer to the section on bringing the pellet Furnace into the Furnace room for detailed instructions on assembling the hopper, burner and casing components.

#### Activating the ash box

1. Switch the Furnace ON
2. In the menu Furnace, after entering the code, you can activate the function **Ashbox**.
3. Set up the number from **Off** to **On**
4. Ash box is now active

## 9 Connecting to the power supply

### 9.1 Plugs on the Furnace control unit

The designation of the plugs must correspond with the labeling of plug-in positions.

Designation of plug-in position		Voltage	Name of sensors, motors and pumps
X1A	3 2 GND 1	24 Volt	Operating display
X1B	3 2 GND 1	24 Volt	Not used
X2	5 4	24 Volt	Power supply display
R1	46 45	24 Volt	Not used
R2	44 43	24 Volt	Not used
AF	42 41	24 Volt	Not used
KF	8 9	24 Volt	Temperature sensor supply air / exhaust air
UP	2 3 4	24 Volt	Negative draft measuring
AE2	5 6 7	24 Volt	Level detection system (optional)
AE1	10 9 8	24 Volt	Not used
FRT	12 13	24 Volt	Combustion chamber temperature sensor
RGF	14 15	24 Volt	Flue gas temperature sensor (optional)
PWM	16 17	24 Volt	PWM for speed controlled high-efficiency pump
Analog IN	18 19	24 Volt	Not used
BR1	7 8	24 Volt	Burner / "cold start" contact
AK	11 12	24 Volt	Existing boiler (optional)
ESAV	32 33 34	24 Volt	Ash box RPM feedback
DE 1	37 36 35	24 Volt	Not used
DE 2	40 39 38	24 Volt	Not used
KAPZW	26 25 24	24 Volt	Capacitive sensor - hopper
KAPRA	5 4 3	24 Volt	Not used
BSK	6 5 4 3 2 1	24 Volt	Ball valve / Flame return gate
X21	PE L N	230 Volt	Power supply
VAK	56 PE 55	230 Volt	Vacuum turbine
ZUEND	N PE 22	230 Volt	Ignition
AV	52 PE 51	230 Volt	Motor ashbox
RES 2	54 PE 53	230 Volt	Not used
MA	48 PE 47	230 Volt	Not used
RM	15 PE N	230 Volt	Motor for Furnace flame tube cleaning device
SM	19 20	230 Volt	Relay fault signal (optional)
SZ	17 PE N	230 Volt	Flue gas fan
UW	13 PE N	230 Volt	Fan
STB	17 PE 19	230 Volt	Safety temperature / Over-temp sensor
NOT	41 43	230 Volt	Emergency stop heating
RA	N PE 14 15 16	230 Volt	Fuel transport system

RES1	50 PE 49	230 Volt	Not used
ZW	N PE 26 25 24	230 Volt	Not used
ES	1 2 3 N PE 6	230 Volt	Burner motor
LUFT	N PE 11	230 Volt	Burner fan

## NOTICE

For supply connections to the Furnace use 14 AWG or larger wires acceptable for at least 75° C.

## 9.2 Cable routing

Reroute cables after dismantling the casing or other system components.



### DANGER

#### Risk of electric shock

Switch off the system before performing work on the Furnace.

Note the following points to ensure the cables are routed securely:

Cables must not be routed:

- over moving parts
- over hot parts
- over sharp edges

Cables must be:

- routed in the cable ducts provided
- through cable leadthroughs
- tied together
- secured with cable ties at the points provided
- Power cables must be routed in the right-hand duct and sensor cables must be routed in the left-hand duct.



### DANGER

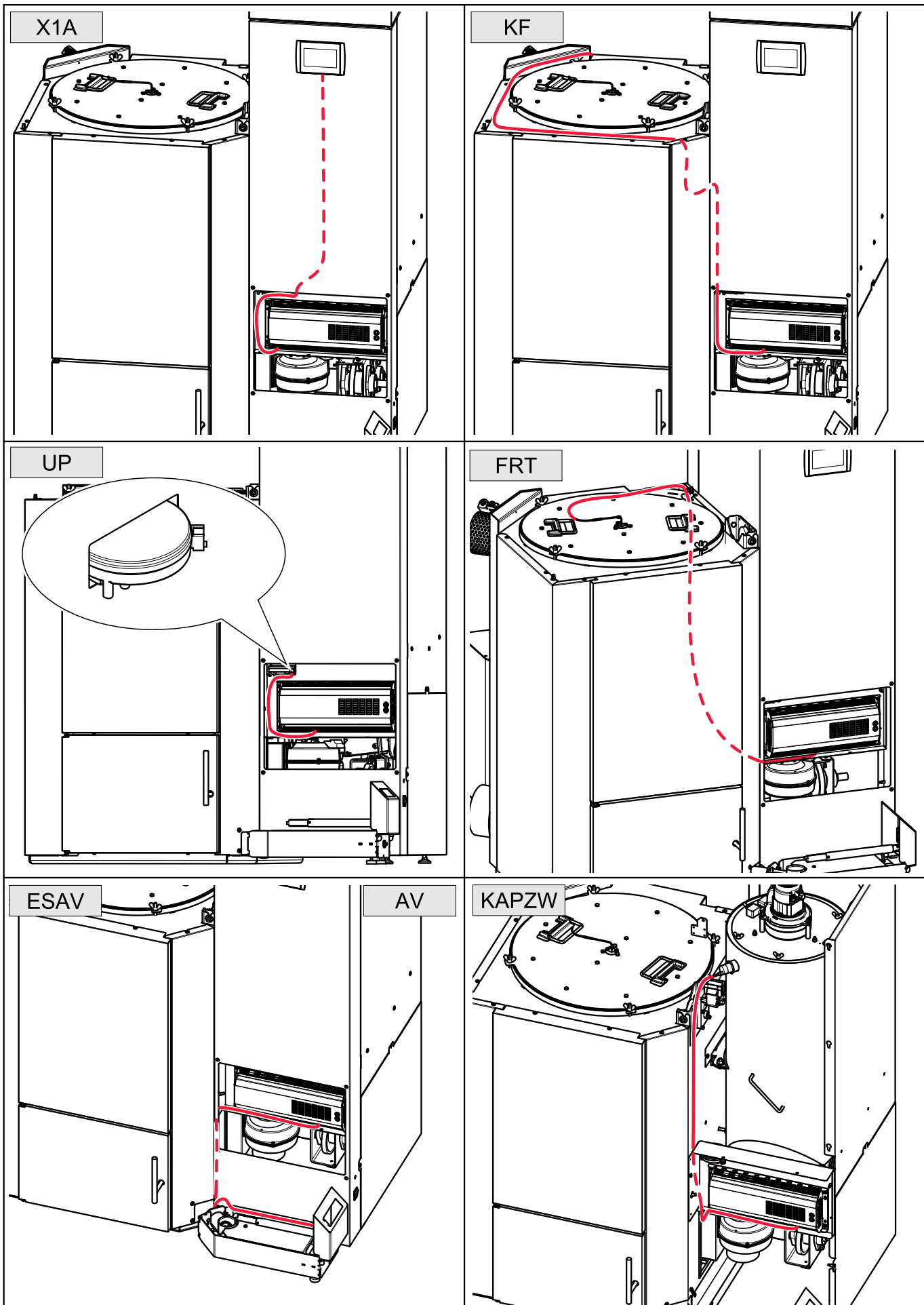
#### Risk of electric shock

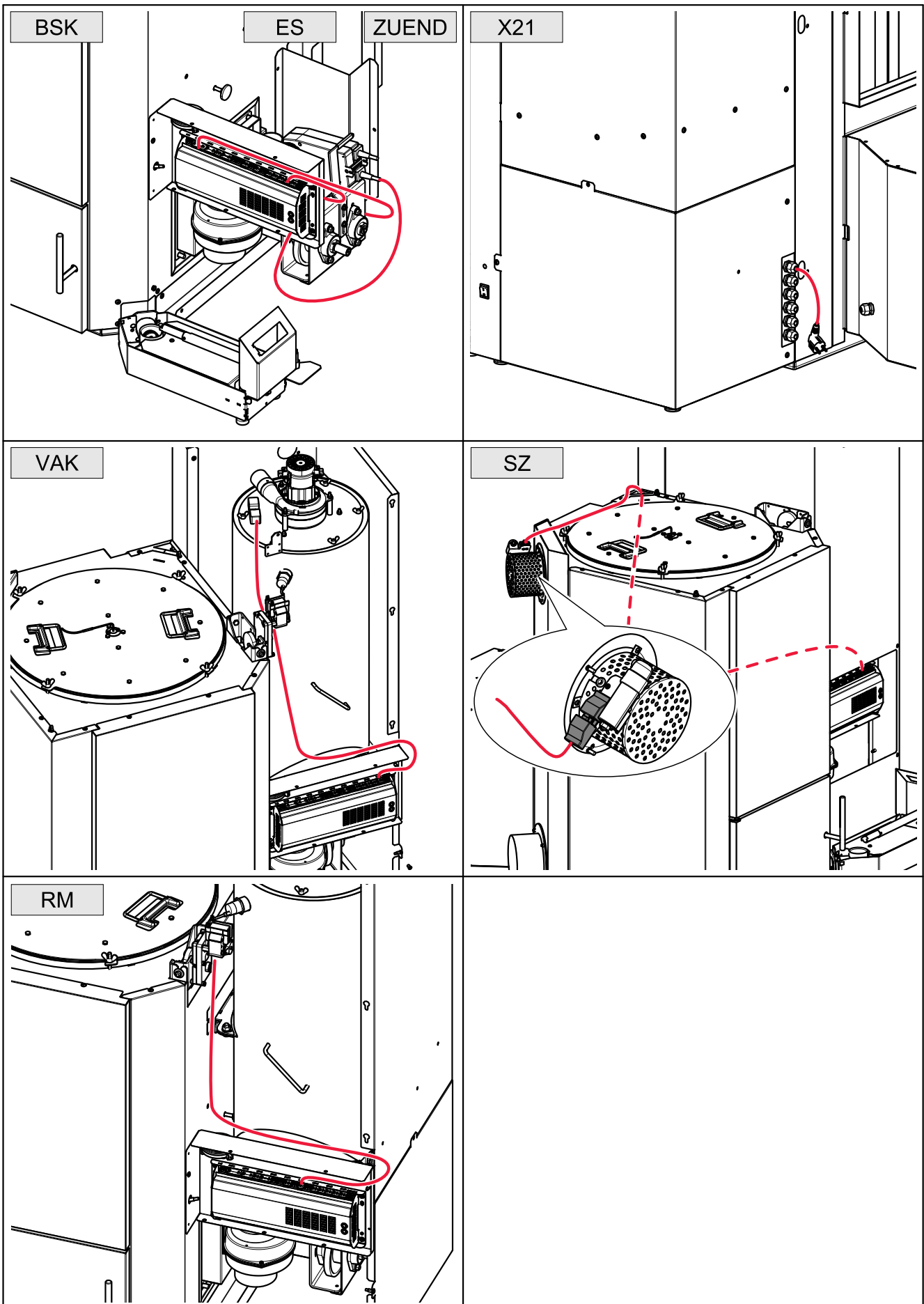
Check cables for damage..  
Replace any cables that are damaged.

### NOTICE

#### Damage to the Furnace controller

Before fitting the casing components, make sure that all cables are connected to the correct points on the controller! Failure to do so can lead to damage to the controller, and such damage is not covered by warranty!





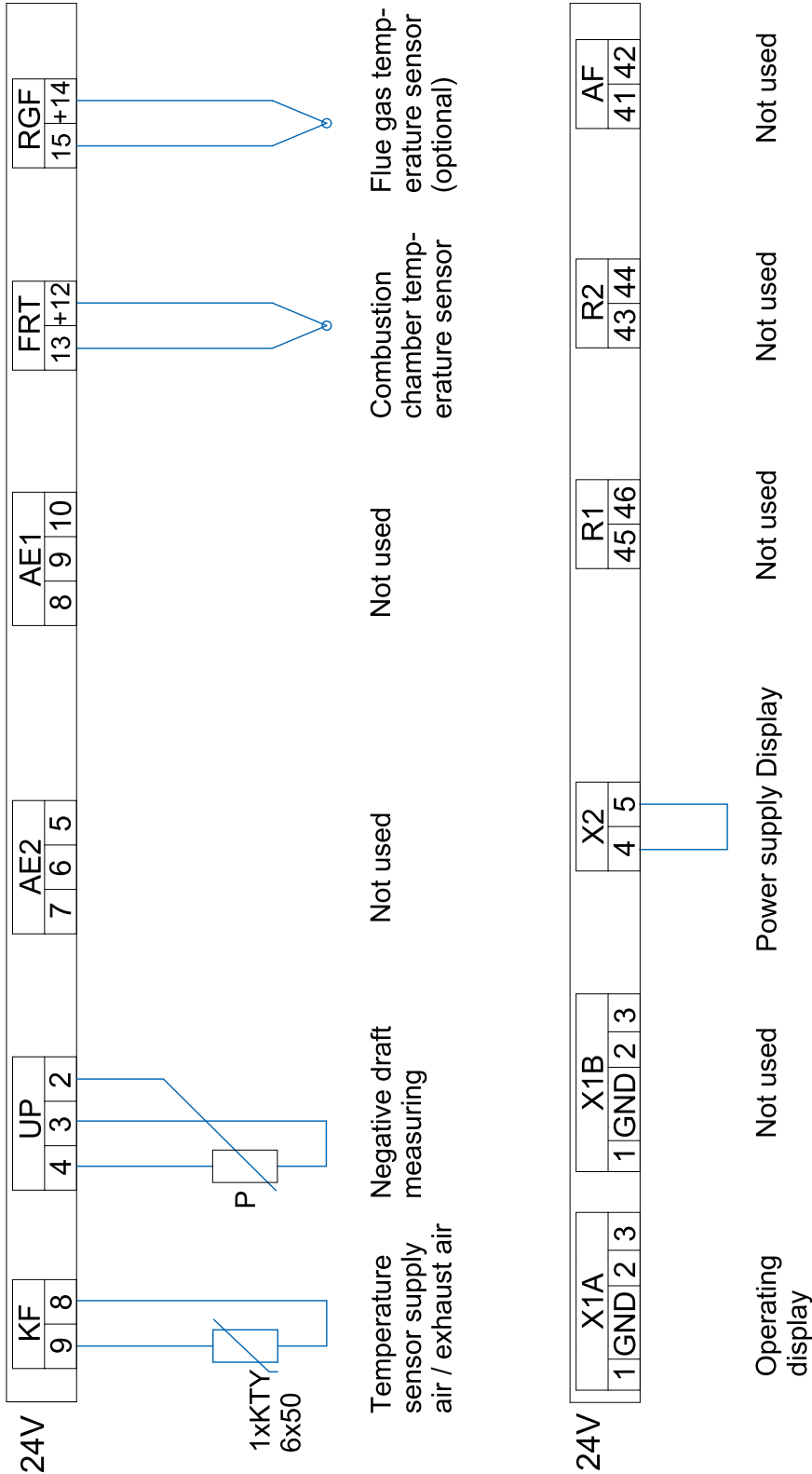


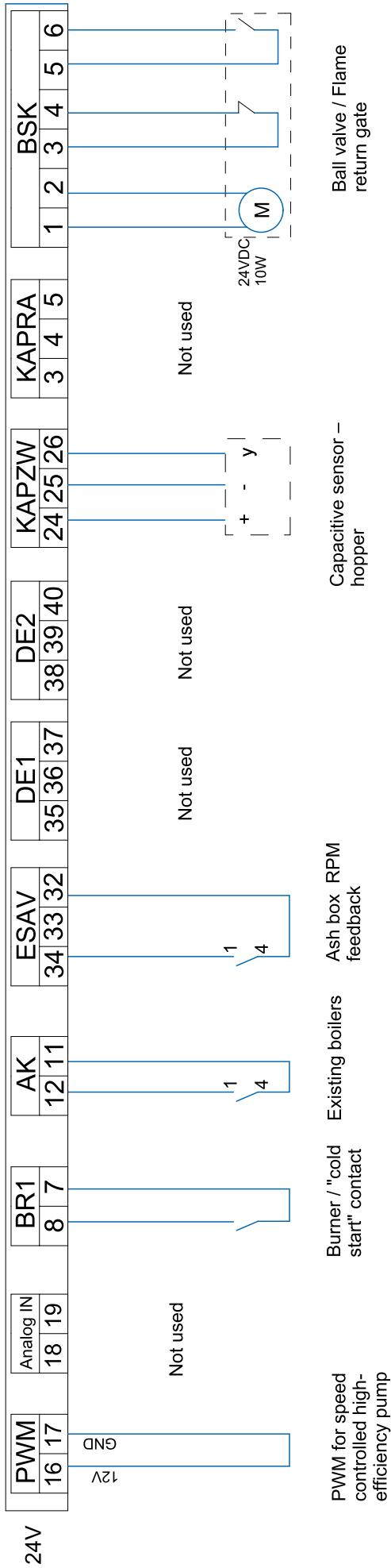
### 9.3 Wiring diagrams

The wiring diagrams for the Furnace control unit provide detailed technical information for electricians.

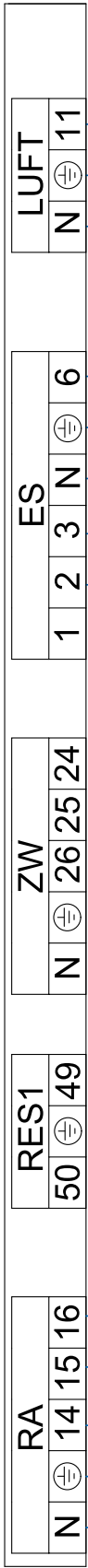

DANGER

**Electric shock**  
 Isolate the entire heating system from the power supply before starting work on the pellet Furnace.





115V-  
240V



230VAC  
max. 4A

230VAC  
50W  
max. 2A

230VAC  
85W  
max. 2A

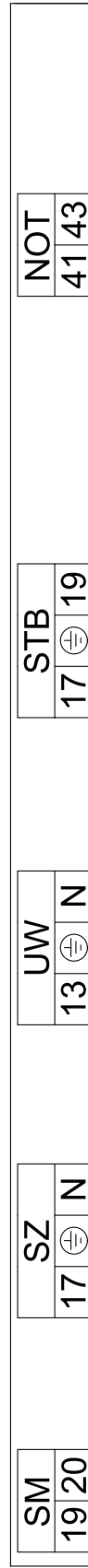
Fuel transport  
system

Not used

Not used

Burner motor-  
Auger system  
with vibration motor

Burner fan



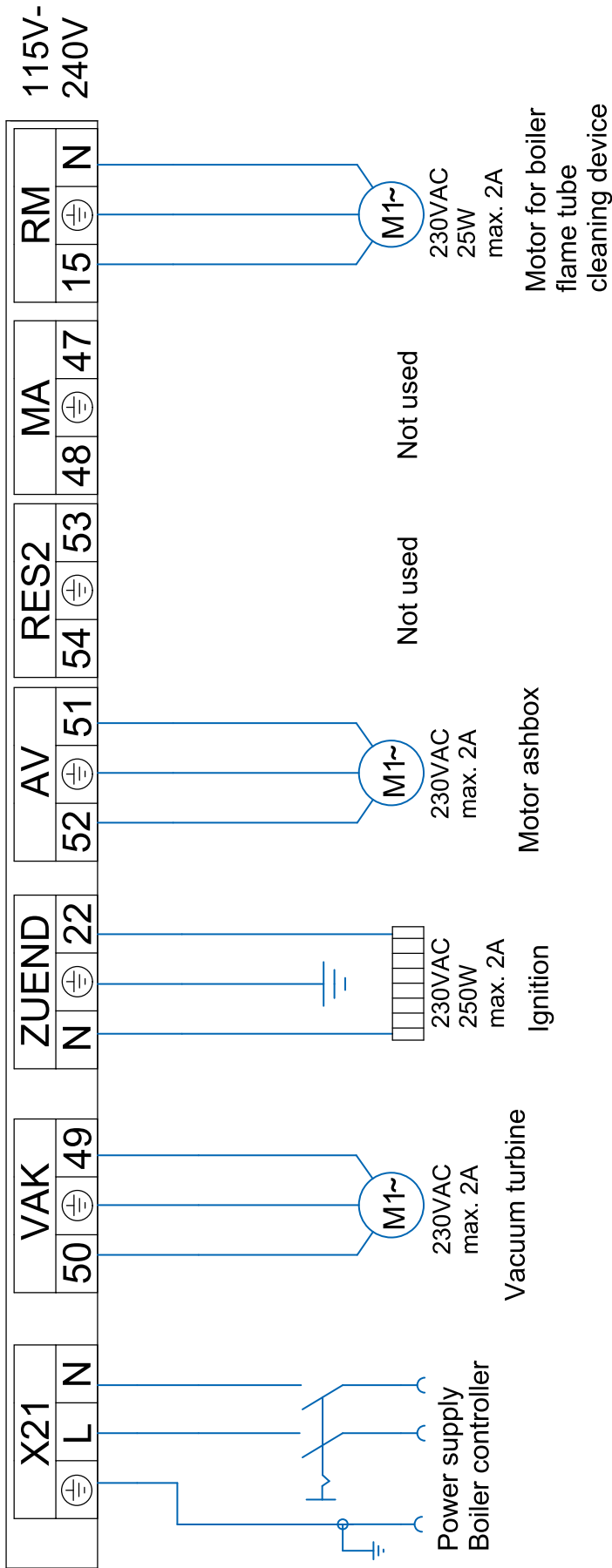
Relay fault signal

230VAC  
50W max. 2A  
Flue gas fan

230VAC  
max.2 A  
Fan

Safety temperature  
sensor 230VAC

Emergency stop heating

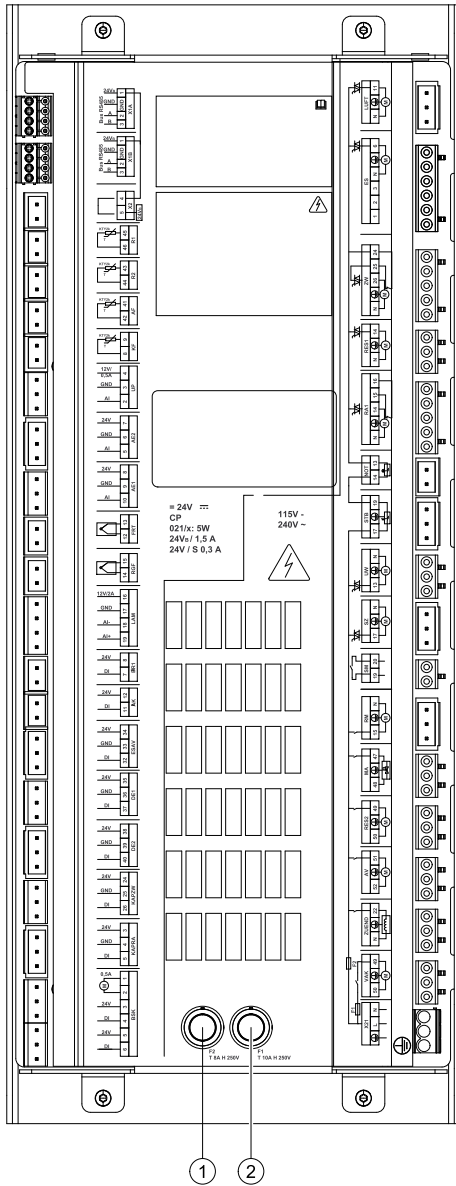


## 9.4 Fuses - Furnace controller

The control unit is protected against short circuits by fuses which are in the control panel (under the front Furnace panel). There are also fuses in the terminal box at the rear of the Furnace. At the rear panel, there are 4 fuses. Two 6.3 amp for outputs there, and two 10 amp also for the main controller.

NOTICE

**Damage of property**  
 Should it become necessary to replace a fuse, it is critically important to replace the fuse only with a fuse having the same exact ratings.



1	F1: Fuse T8A
2	F2: Fuse T10A

## 9.5 Operating the AutoPellet

The operation of the system is described in the **manual for the End User**.

# 10 Starting up for the first time

After bringing in the Furnace, connecting up the hydronics and power supply, the unit can be started up for the first time.

## NOTICE

### Air tight property of combustion chamber

To ensure correct combustion and overall operation, all fittings to the combustion chamber must be correctly assembled to be completely air-tight.

### Note:

The Furnace may only be commissioned (first start-up) by an authorized installer.

Before starting up the pellet Furnace, the following settings must be made in the sequence specified below:

1. Settings in the Furnace control unit
2. Output test - test all motors
3. Start the pellet Furnace

Use the checklist enclosed to document the start-up procedure.

## NOTICE


### Property damage

The allowable limits of temperature for the controller on the furnace are 40° F to 122° F. It is therefore necessary that the furnace room be no hotter than 90° F to avoid damage to the controller!

# 11 Malfunctions

## 11.1 Malfunctions - what to do

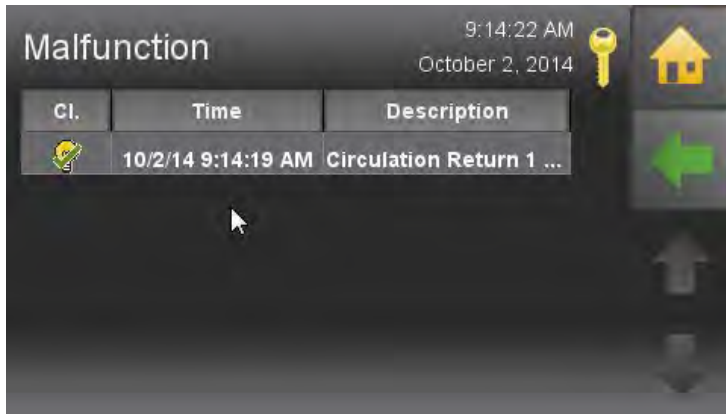
Follow the sequence described for handling malfunctions.

- The heating system switches off automatically if a malfunction occurs.
- The control unit display shows a malfunction alarm text.
- You have to rectify the cause of the malfunction.
- After rectifying the malfunction, you have to reset the fault text by pressing  before starting the heating system again.


## 11.2 Fault texts

The fault text displayed on the screen provides information on the type, time and status of the malfunction as well as help for troubleshooting.

The menu item **malfunction** saves errors as long as they are not solved.  
The chronological order of the errors helps to find the reason of the malfunction.



**There are 3 different status of Malfunction messages**

1. **C** - New fault: when the fault occurs
2. **G** - Rectified fault: when the fault has been rectified
3. **Q** - Reset fault: when the fault has been reset by pressing 

In the menu point **information**, all malfunctions are listed chronologically.



## 11.3 Malfunction report

This is a list of all malfunction reports on the display.

Code	Display	Input / Output		Affected element	Solution table
4005	BUS HCR 1	X1A or X1B		BUS-Network RS485	13.3
4006	BUS PE 1	X1A or X1B			
4007	BUS Remote 1	X1A or X1B			
4015	BUS Remote Touch 1	X1A or X1B			
4016	BUS Master	X1A or X1B			
4021	BUS Radio Remote 1	X1A or X1B			
5000	PE1 Reserve sensor1 BS	R1		Furnace Controller	13.1a
5001	PE1 Reserve sensor1 SC	R1		Furnace Controller	13.1b
5002	PE1 Reserve sensor2 BS	R2		Furnace Controller	13.1a
5003	PE1 Reserve sensor2 SC	R2		Furnace Controller	13.1b
5004	PE1 Outside sensor BS	AF		Furnace Controller	13.1a
5005	PE1 Outside sensor SC	AF		Furnace Controller	13.1b
5006	PE1 Furnace sensor BS	KF		Furnace Controller	13.1a
5007	PE1 Furnace sensor SC	KF		Furnace Controller	13.1b
5008	PE1 Fluegas sensor BS	RGF		Furnace Controller	13.4
5009	PE1 Fluegas sensor SC	RGF			
5010	PE1 Combustion sensor BS	FRT			
5011	PE1 Combustion sensor SC	FRT			
5012	PE1 Underpressure box BS	UP		Furnace Controller	13.5
5013	PE1 Underpressure box SC	UP			
5014	PE1 Analog input1 BS	AE1		Furnace Controller	13.6
5015	PE1 Analog input1 SC	AE1			
5016	PE1 Analog input2 BS	AE2			
5017	PE1 Analog input2 SC	AE2			
5018	PE1 Motor turbine	VAK		Furnace Controller	13.7
5019	PE1 Ignition	ZUEND		Furnace Controller	13.8
5020	PE1 Motor ashbox	AV		Furnace Controller	13.9
5021	PE1 Motor res 1	RES1		Furnace Controller	13.10
5022	PE1 Magnetic valve	MA		Furnace Controller	13.8
5023	PE1 Motor cleaning	RM			
5024	PE1 Flue gas fan	SZ		Furnace Controller	13.9
5025	PE1 Cirkulationspump	UW			
5026	PE1 Motor ext auger1	RA		Furnace Controller	13.11
5027	PE1 Motor ext auger2	ZW		Furnace Controller	13.9



Code	Display	Input / Output		Affected element	Solution table
5028	PE1 Motor between	RES1		Furnace Controller	13.12
5029	PE1 Motor Furnace auger	ES		Furnace Controller	13.9
5030	PE1 Combustion Fan	LUFT			
5032	PE1 Emergency stop	NOT		Furnace Controller	13.13
5033	PE1 Max temp sensor	STB			
5034	PE1 Ignition fault	generic		Furnace Controller	13.14
5036	PE1 Low flame temp				
5038	PE1 Firedamper open	BSK 1 2		Furnace Controller	13.15
5039	PE1 Firedamper closed	BSK 3 4			
5040	PE1 Firedamper end switch	BSK 1 2 3 4			
5041	PE1 Low underpressure	UP, SZ, LUFT		Furnace Controller	13.5
5042	PE1 Low underpressure	UP, SZ, LUFT			
5043	PE1 Vacuum system	KAPZW, RA		Furnace Controller	13.16
5044	PE1 Ashbox full	ESAV, AV		Furnace Controller	13.17
5045	PE1 Ball lock	DE1		Furnace Controller	13.18
5047	PE1 Burner Motor	ES		Furnace Controller	13.19
5048	PE1 Burner gas open-circuit	RGF		Furnace Controller	13.4
5049	PE1 Burner gas short-circuit				
5052	PE1 Container cover open	AK		Furnace Controller	13.20
5053	PE1 ash warning	ESAV, AV		Furnace Controller	13.17
5054	PE1 pellets warning	AE1		Furnace Controller	13.21

**13.2 Kollektor sensor (Fault 1010, 2010, 3010)**

Display:	<b>[1010] Kollektor BC</b>		
Description:	Collector sensor fracture, measuring circuit of collector sensor (X15) is open		
Cause and Remedy:	Sensor not connected	▶	Check and correct wiring
	Sensor defect	▶	Measure sensor (approx. 1,1kΩ at 77 °F), replace if required
	Sensor cable defect	▶	Replace sensor
Display:	<b>[2010] Kollektor SC</b>		
Description:	Measuring circuit of collector sensor (X15) is shorted out		
Cause and Remedy:	Sensor defect	▶	Measure sensor (approx. 1,1kΩ at 77 °F), replace if required
	Sensor cable defect	▶	Replace sensor
Display:	<b>[3010] Kollektor</b>		
Description:	Other fault at input X15		
Cause and Remedy:	Sensor defect	▶	Replace sensor
	Sensor cable defect	▶	Replace sensor
	Input on heating controller defect	▶	Replace input on heating controller

**13.3 Bus (Fault 4005, 4006, 4007, 4015, 4016)**

Display:	<b>[4005] BUS HCR</b>		
Description:	Time-Out of BUS-connection from touch operating device to heating controller		
Cause and Remedy:	Wrong cable connection	▶	Check cable connection
	No power supply available	▶	Connect heating controller to BUS
	Fuse in heating controller defect	▶	Replace fuse
Display:	<b>[4006] BUS PE</b>		
Description:	Time-Out of BUS-connection from touch operating device to Furnace controller		
Cause and Remedy:	Wrong cable connection	▶	Check cable connection
	No power supply available	▶	Connect heating controller to power supply (X21)
	Fuse in heating F2 defect	▶	Replace fuse F2
Display:	<b>[4007] BUS Remote</b>		
Description:	Time-Out of BUS-connection of remote control		
Cause and Remedy:	Wrong cable connection	▶	Check cable connection
	Remote controll defect	▶	Replace remote controll
Display:	<b>[4015] BUS Remote Touch</b>		
Description:	Time-Out of BUS-Connection from remote controll to Touch operating device		
Cause and Remedy:	Wrong cable connection	▶	Check cable connection
	Wrong softwareversion	▶	Check version of software
Display:	<b>[4016] BUS Master</b>		
Description:	Missing BUS connection to master-operating device		
Cause and Remedy:	Wrong cable connection	▶	Check cable connection

**13.4 Combustion chamber sensor (Fault 5010, 5011, 5048, 5049)**

Display:	<b>[5010] PE Combustion sensor BS</b>		
Description:	Combustion chamber sensor fracture, measuring circuit from combustion chamber sensor is open - Input FRT		
Cause and Remedy:	Sensor not connected	▶	Connect sensor at input
	Sensor defect	▶	Measure sensor (approx. 5 mV at 257 °F) replace if required
	Sensor cable defect	▶	Replace sensor
	Sensor temperature too high	▶	Sensor temperature above measuring range (2012 °F)
Display:	<b>[5011] PE Combustion sensor SC</b>		

Description:	Combustion chamber sensor short circuit, measuring circuit from combustion chamber sensor short circuit - Input FRT		
Cause and Remedy:	Sensor defect	▶	Measure sensor (approx. 5 mV at 257 °F) replace if required
	Sensor cable defect	▶	Replace sensor
	Sensor temperature too low	▶	Sensor temperature below measuring range (14 °F)
	Sensor polarity reversed	▶	Change sensor connection + and -

### 13.5 Underpressure box (Fault 5012, 5013, 5041, 5042)

Display:	<b>[5012] PE Underpressure box BS</b>		
Description:	Negative draft input open, measuring circuit from negative draft measurement open - Input UP		
Cause and Remedy:	Signal incorrect	▶	Check poarity and signal (0-10V)
	Signal cable defect	▶	Replace sensor
	No signal	▶	Replace underpressure box
	Combustion chamber leak	▶	Check total closure of Furnace door

Display:	<b>[5013] PE Underpressure box SC</b>		
Description:	Negative draft input short-circuit, measuring circuit from negative draft measurement is shorted out - Input UP		
Cause and Remedy:	Signal incorrect	▶	Check polarity and signal (0-10V)
	Signal cable defect	▶	Replace sensor
	Signal too high	▶	Signal above 10V
Display:	<b>[5041] [5042] PE Low underpressure</b>		
Description:	Negative draft pressure in Furnace is not achieved [5041] or is too high [5042] - Exit LUFT (SMART + Condens) / Output SZ (PE+PEK)		
Cause and Remedy:	Negative draft tube disconnected	▶	Connect up negative draft tube
	Negative draft does not change	▶	Check negative draft tube for leaks. Check flue gas tube for blockage.
	Negative draft pressure too low	▶	Close Furnace door, check tube to negative draft sensor, check whether Furnace flue gas outlet is clear, check whether condensation heat exchanger is clear. Make sure flue gas fan is running.
	Negative draft pressure too high	▶	Check induced draft blower

### 13.6 Analog input (Fault 5014, 5015, 5016, 5017)

Display:	<b>[5014] / [5016] PE Analog input 1/2 BS</b>		
Description:	Analog input 1/ 2 sensor fracture, measuring circuit of Analog input sensor open - Output AE1 / AE2		
Cause and Remedy:	Signal incorrect	▶	Check polarity and signal (0-10V)
	Signal cable defect	▶	Replace sensor
	Level detection system activated (valid for AE2)	▶	Check settings
Display:	<b>[5015] / [5017] PE Analog input 1 /2 SC</b>		
Description:	Analog input 1 / 2 sensor short circuit, measuring circuit of Analog input sensor is shorted out - Input AE1/AE2		
Cause and Remedy:	Signal incorrect	▶	Check polarity and signal (0-10V)
	Signal cable defect	▶	Replace sensor
	Signal too high	▶	Signal above 10V

**13.7 Motor turbine (Fault 5018)**

Display:	<b>[5018] PE Motor Turbine</b>		
Description:	Vaccuum turbine not running (Exit VAK)		
Cause and Remedy:	Motor unplugged	▶	Plug in motor, check cable connections
	Motor defect	▶	Replace motor
	Fuse F1, suction circuit board defective	▶	Replace fuse

**13.8 Output 230V (Fault 5019, 5022, 5023)**

Display:	<b>[5019] PE Ignition [5022] PE Magnetic valve [5023] PE Motor cleaning</b>		
Description:	No function of output ZUEND (Ignition)/MA (Magnetic valve)/ RM (Motor cleaning)		
Cause and Remedy:	Output unplugged	▶	Connect plug, check cable wiring
	Current value above the maximal Limit	▶	Check limits
	Current value under the minimal Limit	▶	Check limits

**13.9 Output 230V-2 (Fault 5020, 5024, 5025, 5027, 5029, 5030)**

Display:	<b>[5020] PE Motor ashbox (Output AV) [5024] PE Flue gas fan (Output SZ) [5025] PE Cirkulationspump (Output UW) [5027] PE Motor ext auger2 (Output RES2) [5029] PE Motor Furnace auger (Output ES) [5030] PE Combustion Fan (Output LUFT)</b>		
Description:	No function of the respective motor/pump/fan		
Cause and Remedy:	Motor/pump/fan unplugged	▶	Connect plug, check cable wiring
	Motor/pump/fan defect	▶	Replace motor/pump/fan

**13.10 Zwischenbehälter leer - Motor res 1 (Fault 5021)**

Display:	<b>[5021] PE Hopper empty / Motor RES1 (for 36-56 kW, Pellematic Condens or PEB)</b>		
Description:	No function of PE motor res 1		
Cause and Remedy:	Motor unplugged	▶	Plug in motor, check cable connections
	Motor defect	▶	Replace motor
	No pellets available	▶	Refill storage-Room / supply tank

**13.11 Motor extraction auger 1 - RA (Fault 5026)**

Display:	<b>[5026] Motor ext auger1</b>		
Description:	Storage room auger 1 motor defect - Output RA		
Cause and Remedy:	Motor unplugged	▶	Plug in motor, check cable connections
	motor is jammed	▶	Remove pellets and dust from auger and make sure auger rotates freely
	Motor defect	▶	Replace motor
	Thermic contact triggered	▶	Let motor cool down
	Motor not running	▶	Check thermic contact

**13.12 Hopper motor (Fault 5028)**

Display:	<b>[5028] Hopper motor</b>		
Description:	Hopper suction fan fault. Output ZW.		
Cause and Remedy:	Motor unplugged	▶	Plug in motor, check cable connections
	Motor defect	▶	Replace motor

**13.13 Emergency OFF/ Safety temperature (Fault 5032, 5033)**

Display:	<b>[5032] Emergency OFF - NOT AUS</b>		
Description:	Emergency OFF has been actuated - Input NOT-AUS		
Cause and Remedy:	Emergency OFF unplugged	▶	Connect up Emergency OFF and check cable connections
	Emergency OFF button has been pressed	▶	Reset Emergency OFF switch
	Emergency OFF defect	▶	Replace Emergency OFF switch
Display:	<b>[5033] Safety temperature - STB</b>		
Description:	Safety temperature limiter has tripped - Input STB		
Cause and Remedy:	Safety temperature limiter unplugged	▶	Connect up safety temperature limiter and check cable connections
	Safety temperature limiter has tripped	▶	Let Furnace cool down and reset safety temperature limiter
	Safety temperature limiter defect	▶	Replace safety temperature limiter
	A 230V Output is defect	▶	Check 230V Outputs

**13.14 Temperature Combustion chamber sensor/Flue gas sensor (Fault 5034, 5036)**

Display:	<b>[5034] PE Ignition fault / Pellets available?</b>		
Description:	Minimum temperature Combustion chamber sensor/Flue gas sensor not reached during the ignition phase		
Cause and Remedy:	No pellets available	▶	Fill up with pellets
	Ignition electrode defect	▶	Check ignition electrode (approx. 200Ω) replace if required
	Ignition nozzle blocked	▶	Clean burner plate and ignition tube

	Not enough draught	▶	Check ventilation flap, funktion radial fan, draught free
	Flue gas sensor or flamm-roomtemperature-sensor soiled	▶	Check Flue gas sensor or flammroom-temperature-sensor
Display:	<b>[5036] PE Flame supervision fault</b>		
Description:	Flame supervision fault, minimum flue gas temperature not reached during heating up at full power - Input FRT		
Cause and Remedy:	No pellets available	▶	Fill up with pellets

### 13.15 Flame return gate BSK (5038, 5039, 5040)

Display:	<b>[5038] PE Flame return gate open</b>		
Description:	Flame return gate open fault (BSK - 1 2)		
Cause and Remedy:	Flame return gate unplugged	▶	Connect up flame return gate and check cable connections
	Flame return gate does not reach OPEN limit switch	▶	Check ball valve to see if it is jammed
	No signal although open	▶	Check cables and flame return gate
Display:	<b>[5039] PE Flame return gate closed</b>		
Description:	Flame return gate open fault		
Cause and Remedy:	Flame return gate unplugged	▶	Connect up flame return gate and check cable connections
	Flame return gate does not reach CLOSE limit switch	▶	Check whether ball valve is jammed, check ball valve throughway to see if foreign objects are preventing it from closing
	No signal although closed	▶	Check cables and flame return gate
Display:	<b>[5040] PE Flame return gate limit switch</b>		
Description:	Both flame return gate limit switches (BSK 1-2 and BSK 3-4) are closed at the same time		
Cause and Remedy:	Both limit switches activated	▶	Check flame return gate, check cables, check connectors

### 13.16 Suction system (Fault 5043)

Display:	<b>Suction system</b>		
Description:	Hopper cannot be filled up even after 3 suction cycles		
Cause and Remedy:	Storage room empty	▶	Fill up with pellets
	Extraction system is blocked	▶	Clear extraction system
	Extraction system not conveying pellets	▶	Pellet bridge - destroy bridge and make sure material flows properly



	Suction fan unplugged	▶	Connect up suction fan
	Storage room auger motor unplugged	▶	Connect up storage room motor

### 13.17 Ashbox full (Fault 5044) - Ash Warning (Fault 5053)

Display:	<b>[5044] PE Ashbox full</b>		
Description:	Moter doesn't reach the normal speed after 3 attempts.		
Display:	<b>[5053] PE Ash Warning</b>		
Description:	Ash-box nearly full		
Cause and Remedy:	Ash-box full	▶	Clear ash-box
	Ash-box not completely closed	▶	Close ash-box
	End-switch defect	▶	Replace end-switch

### 13.18 Ball lock (Smart and Condens only - Fault 5045)

Display:	<b>[5045] PE Ball lock</b> - Smart and Condens only		
Description:	No pellets detected from capacitive sensor (KAP RA)		
Cause and Remedy:	Pellet reserves depleted	▶	Refill storage-Room / supply tank
	Capacitive sensor RA defect	▶	Replace Capacitive sensor RA

### 13.21 Pellets Warning (Fault 5054)

Display:	<b>[5054] PE 1 Pellets Warning</b>		
Description:	Measured pellets capacity (AE2) is below the threshold		
Cause and Remedy:	Pellets nearly empty or empty	▶	Fill up with pellets
	Sensor unpugged (AE2)	▶	Connect plug
	Parameter set incorrectly	▶	Check settings in menu Level detection system (protected access)

# 12 Appendix

## 12.1 Checklist for checking the heating system

The checklist is intended to help authorised specialists perform and document a comprehensive check on the heating system.

<b>Name and adress of the customer</b>		<b>Heating device</b>	
Name:		Type of Furnace:	
Street:		Rated power:	
Place:		Year of build:	
<b>Name and adress of installer</b>		Manufacturer`s serial number:	
Name:		Type of accumulator:	
Street:		Solar device:	
Place:			

### NOTICE

#### Damage to property

Use the checklist to check the heating system before starting up for the first time.

CHECKLIST		Yes	Comment
<b>Textile tank</b>			
Textile tank	Are the tie members installed?		
	Are all legs straightened vertical?		
Delivery unit	Is the slot for the emergency gate valve closed with an adhesive tape?		
Filling coupling	Are the filling couplings correctly installed?		
	Are the plugs at the filling couplings?		
	Are the safety labels placed? (Caution - Switch off the heating system before entering)		
	Are the couplings correctly grounded?		
Ventilation	Is the storage room / building properly ventilated with minimum 27 square inches to the outside?		
Caution label	Is the label "Wood pellets storage room" placed on the door to the storage room?		
Vibration plate	Check the electrical connection of the vibration motor and the capacitive sensor		
<b>Pellet Furnace</b>			
Burner plate	Is the screw fixing the burner plate, tightened?		
Flame tube	Is the flame tube placed correctly?		
Combustion chamber cover	Are the adjusting screws for the increasing of the flue gas temperature adjusted correctly?		
Flue gas connection	Is a chimney draft regulator, barometric damper implemented?		

Make-up air / ventilation	Does the Furnace room have required make-up air?		
Nameplate	Is the nameplate placed on the Furnace?		
<b>Electric installation and regulation</b>			
Power supply	Check the electrical connection? (terminal box)		
	Check the ratings of the fuses.		
Settings-Furnace control unit	Are the settings of the Furnace control unit according to the installation manual?		
Temperature sensor supply air / exhaust air	Securing location and connection		
<b>Safety systems</b>			
Fire protection - ball valve	Check the function?		
Safety temp. sensor	Check the installation and explain the function. Securing location and connection		
Negativ draft control	Check the function.		
Emergency stop switch	Is there an emergency stop switch?		
Fire extinguisher	Is there a fire extinguisher?		
<b>Instruction</b>			
Heating-up	Explanation of functions, malfunctions and maintenance to the customer.		
Operating manual	Explanation of the operating and maintenance regulations to the customer.		
Maintenance contract	Notice to the legal regulations;		

**Date:** \_\_\_\_\_

**Signature authorized installer:**

**Signature customer:**

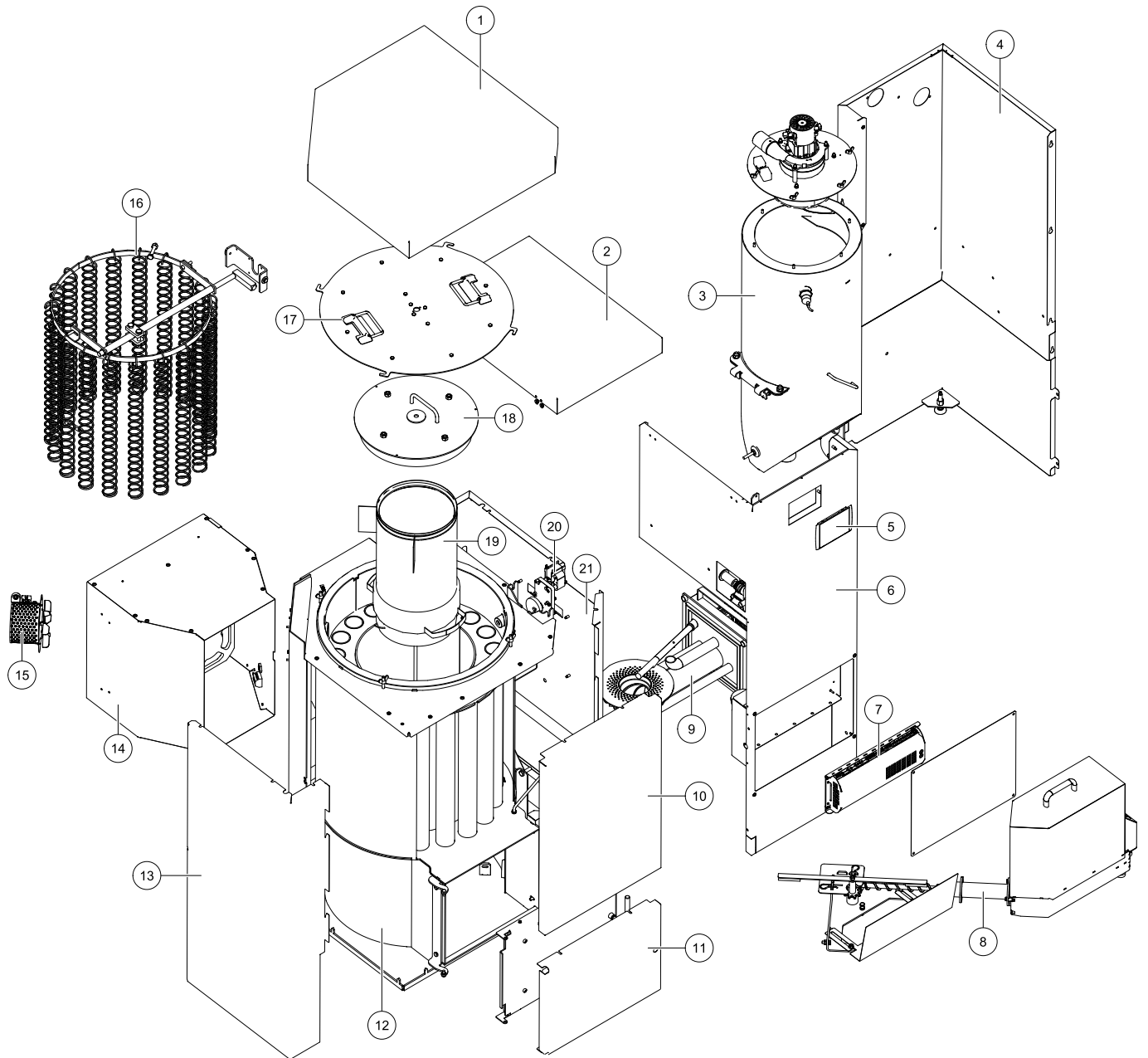
\_\_\_\_\_

The customer confirms that the installer has shown how to operate the Furnace, empty the ash box and how to tell if the storage room or FlexILO is requiring more pellets as well as the need to empty the storage unit yearly.

## 12.2 Parts list

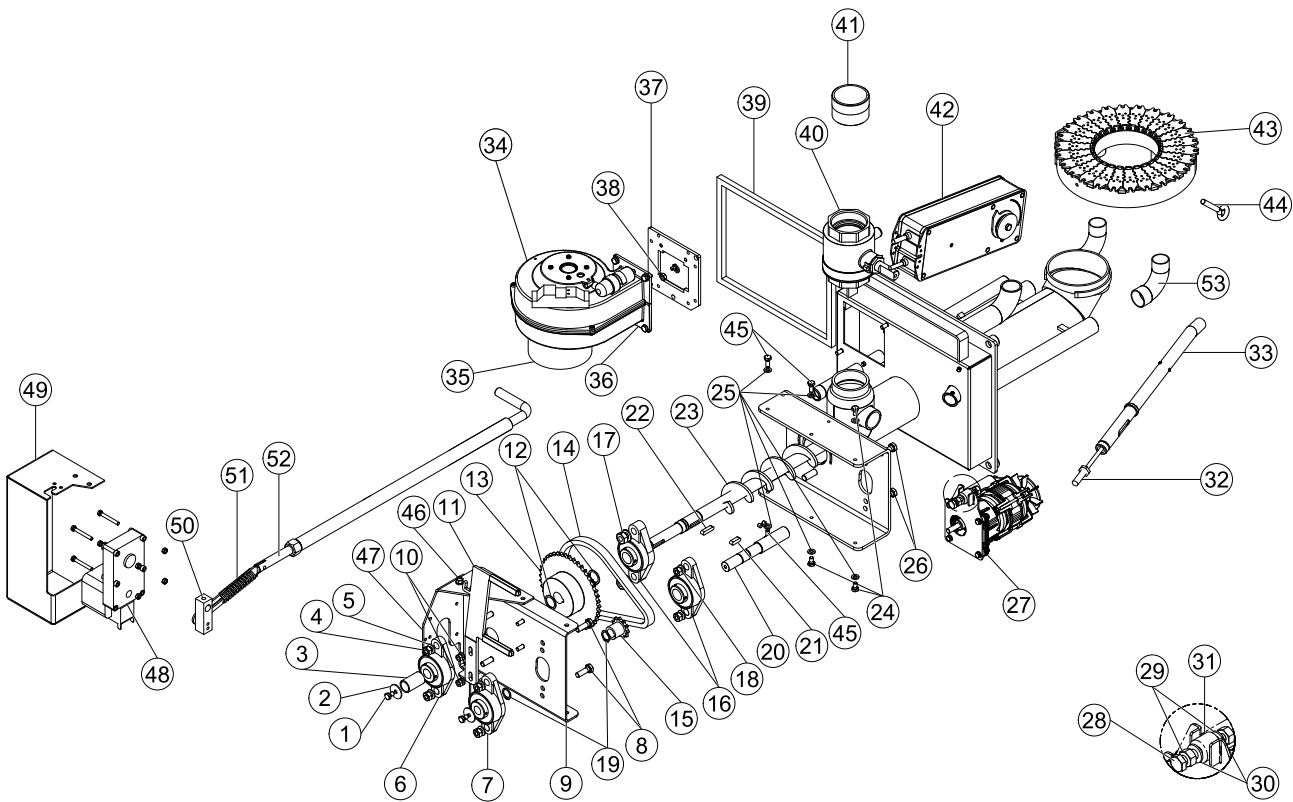
### 12.2.1 Furnace 10-32

1	109760	9	1039449	17	101669
2	110280	10	110233	18	101665
3	103235	11	110688	19	103098
4	109785	12	109708	20	107217
5	107272	13	109775	21	109778
6	109748	14	110706		
7	106684	15	105833		
8	103930	16	110682		

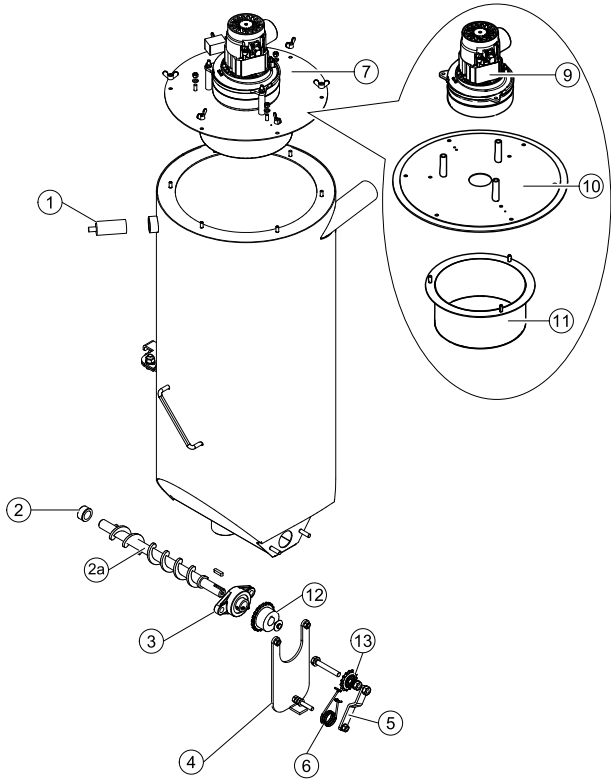


**B0030 / B0030 BRE**

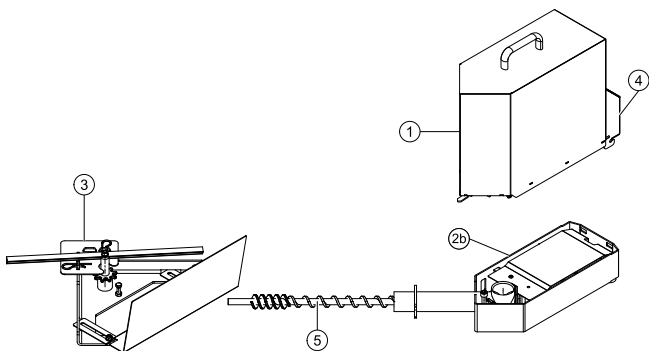
1	121041	19	121196	37	B148
2	121058	20	B172	38	121082
3	B150	21	121197	39	B152
4	121039	22	121023	40	B144
5	121038	23	B131	41	B132
6	121011	24	121041	42	E1413E
7	121195	25	121037	43	B226E
8	121051	26	121079	44	121284
9	B179	27	E1030 / E1002-1	45	121034 / 121082
10	121082 / 121037	28	121166	46	121034 / 121037 / 121082
11	B129P	29	121039	47	B181
12	121075	30	121038	48	E1204 / E 1304
13	121193	31	B113	49	B182
14	121194	32	E1004	50	B183
15	121192	33	B105	51	B184
16	121010	34	E1005	52	B197
17	121083 / 121029	35	B202	53	B202
18	121039 / 121038	36	121041		



041886 - Hopper					
1	E1138	5	O41071	11	O41868
2	121114	6	121122	12	121250
2a	SZB	7	E1368	13	121253
3	121010	9	E1205		
4	O41070	10	O41869		



**PEASCHRE** Ashbox



1	PE442	2b	PE439	4	PE453
2a	PE440	3	PE373	5	PE462

## 12.3 Technical data

<b>Furnace - Type</b>									
Furnace-rated power	BTU/hr								
	kW								
Furnace-partial load	BTU/hr								
	kW								
<b>Measurements</b>									
Width - total (B)	Inch								
	mm								
Width - Furnace (C)	Inch								
	mm								
Height - Furnace (H)	Inch								
	mm								
Height - vacuum system execution (D)	Inch								
	mm								
Height - filling unit (F)	Inch								
	mm								
Depth - Furnace (T)	Inch								
	mm								
Depth - burner casing (V)	Inch								
	mm								
Flow/return - dimensions	Inch								
Flow/return - height of connection (A)	Inch								
	mm								
Flue size - diameter	Inch								
	mm								
Flue - height of connection (E)	Inch								
	mm								
Overall Weight	Lb								
	kg								
Furnace Body Weight	Lb								
	kg								
Efficiency rated power	%								
Efficiency partial power	%								
<b>Flue gas area</b>									
Fire vault temperature	°F								
	°C								
Fire vault pressure	Inch WC								
	mbar								

<b>Furnace - Type</b>									
Flue gas temperature rated power (Flue gas temperature can be adjusted)	°F								
	°C								
Flue gas temperature partial load (Flue gas temperature can be adjusted)	°F								
	°C								
Flue gas inertia current rated power	Lb/hr								
	kg/h								
Flue gas inertia current partial load	Lb/hr								
	kg/h								
Flue gas volume rated power	Cft/hr								
	m <sup>3</sup> /h								
Flue gas volume partial load at flue gas temperature	Cft/hr								
	m <sup>3</sup> /h								
Chimney diameter	according to chimney calculation								
Chimney construction	steel or ceramic lined, withstand humidity								
Electrical connection	<b>USA and Canada</b>	208 to 240 VAC, single phase, 60 Hz, 15 amp dedicated circuit.							
<b>Fuel</b>	<b>USA</b>	According to PFI Premium Standards or EnPlus -A1 pellets							
	<b>Europe</b>	According to EN14961-2 Standards (A1 Class)							
Colorific value	<b>BTU/lbs</b>								
	<b>MJ/kg</b>								
Bulk density	<b>Lb/cft</b>								
	<b>kg/m<sup>3</sup></b>								
Water content	<b>Mass%</b>								
Ash content	<b>Mass%</b>								
Lenght	<b>Inch</b>								
	<b>mm</b>								
Diameter	<b>Inch</b>								
	<b>mm</b>								
Fine material	<b>Mass%</b>								
	<b>Mass%</b>								
Ash melting point	°F								
	°C								
Contents	<b>USA</b>	untreated wood							
	<b>Europe</b>	stemwood or chemically untreated wood							



<b>Furnace - Type</b>									
<b>Components</b>									
Internal ash pan volume	<b>Gal</b>								
	<b>lb</b>								
External ash box volume	<b>Gal</b>								
	<b>lb</b>								
Main Drive	<b>W</b>					40			
Drive Motor	<b>W</b>					250/370			
Suction Turbine	<b>W</b>					1200			
Combustion Air Blower	<b>W</b>					83			
Suction Fan Blower	<b>W</b>					32			
Electrical Ignition	<b>W</b>					250			
Cleaning Motor	<b>W</b>					40			
Motor External Ash Box	<b>W</b>					40			
Fire protection motor	<b>W</b>					5			

The data are values of the test measurement and can vary from locally measured values

OMNI-Test Laboratories, Inc.



Address: 13327 NE Airport Way; Portland, OR 97230; Tel.: +1-503-643-3788

**Note:**

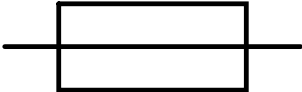
Test reports are available


## 12.4 Pellet Furnace cautionary markings



### Labeling 60x30

 <p>BEFORE OPENING TURN OFF THE MAIN SWITCH</p>	<p>TO START THE SYSTEM PRESS THE GREEN ON/OFF BUTTON</p>	<p>THE CONTAINER CAN BE TAKEN DOWN ONLY BY LOOSENING THE YELLOW LOCKING SCREW</p> 
<p><b>CAUTION</b></p> <p>DO NOT ALTER THIS EQUIPMENT IN ANY WAY LOSS OF WARRANTY</p>	<p><b>CAUTION</b></p> <p>POWER SOURCE NOT CONTROLLED BY SUCTION TURBINES MAIN DISCONNECT</p>	<p><b>CAUTION</b></p> <p>DO NOT REMOVE THE SNAP RING! LOSS OF WARRANTY</p>
<p><b>CAUTION</b></p> <p>FOR USE WITH WOOD PELLET FUEL ONLY LOSS OF WARRANTY</p>	<p><b>CAUTION</b></p> <p>VACUUM SUCTION SYSTEMS: REMOVE THE PROTECTIVE CAP FROM THE BALL VALVE</p>	<p>COPPER CONDUCTORS ONLY!</p>






### Labeling 99x34

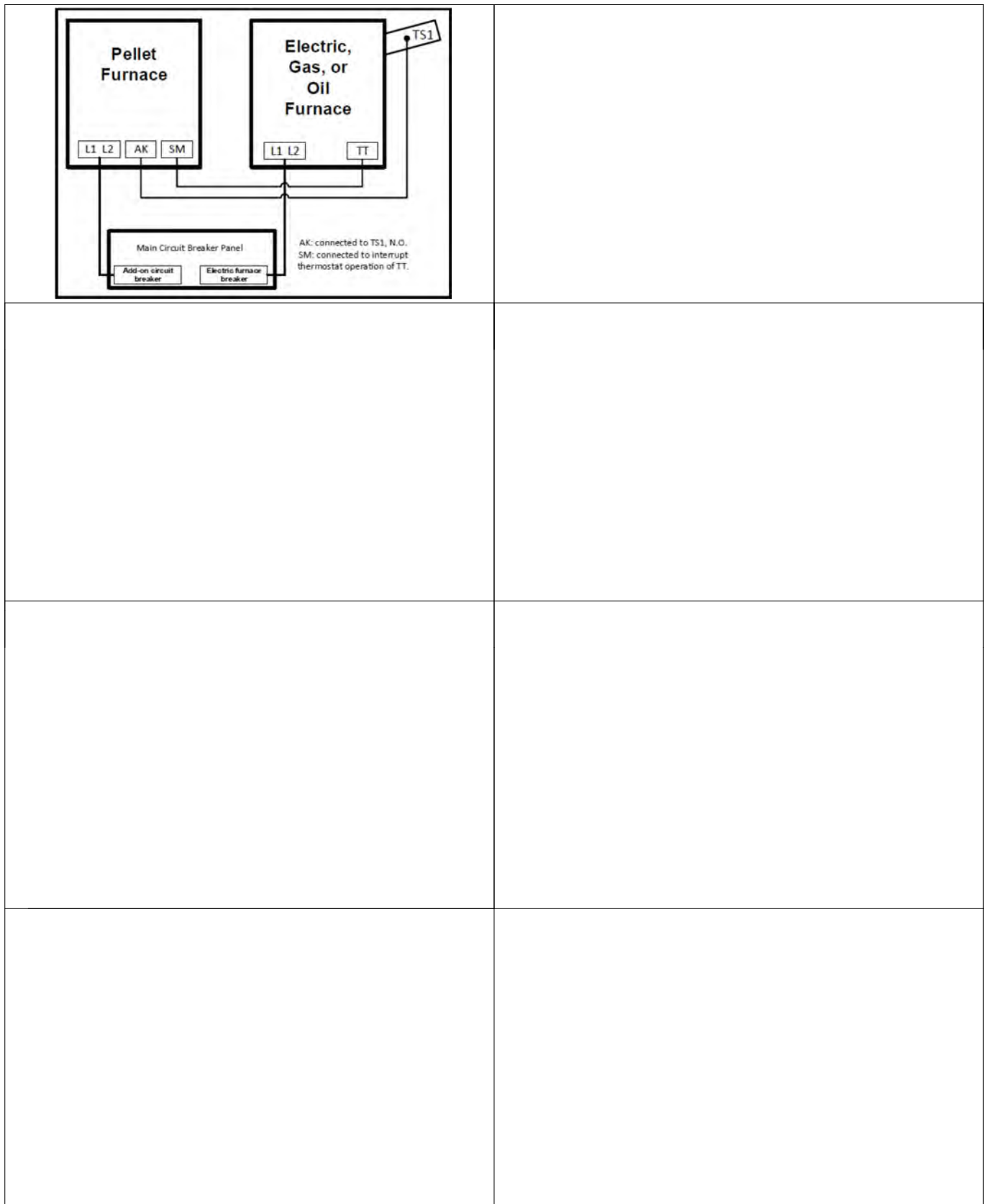
<p><b>DANGER</b></p> <p>TO AVOID INJURY FROM MOVING PARTS, SHUT OFF THE MAIN CONTROLLER BEFORE REMOVING THIS COVER</p>	<p><b>CONTACT LOCAL BUILDING OR FIRE OFFICIALS ABOUT RESTRICTIONS AND INSTALLATION INSPECTION IN YOUR AREA</b></p>
<p><b>DANGER</b></p> <p><b>FOR SAFETY KEEP FIRING AND ASHPIT DOORS TIGHTLY CLOSED.</b></p>	<p><b>CAUTION</b></p> <p>DO NOT CONNECT THIS UNIT TO A CHIMNEY FUEL SERVING ANOTHER APPLIANCE. <b>SEE LOCAL RESTRICTIONS!</b></p>
<p><b>CAUTION</b></p> <p>INSTALL AND USE ONLY IN ACCORDANCE WITH INSTALLATION- AND OPERATING INSTRUCTIONS! REFER TO OWNERS MANUAL</p>	<p><b>FUSE</b></p>  <p><b>T 8A</b></p>
<p><b>DANGER</b></p> <p><b>MOVING PARTS CAUSE INJURY! DO NOT OPERATE WITH REMOVED COVERING!</b></p>	<p><b>BLOWER FILTER TYPE</b></p> <p><b>25 kW:</b> AERO20x20x1 - CLASS EN7799:2012</p> <p><b>32 kW:</b> AERO24x24x1 - CLASS EN7799:2012</p>

<p style="text-align: center;"><b>NOTICE</b></p> <p>MAY BE CONNECTED TO DUCTWORK THAT IS STILL CONNECTED TO ANOTHER FURNACE</p>	<p style="text-align: center;"><b>NOTICE</b></p> <p>THERE SHALL BE NO OPENINGS MADE IN THE FURNACE CASING OTHER THAN THOSE MADE DURING MANUFACTURING</p>
<p style="text-align: center;"><b>NOTICE</b></p> <p>DO NOT CONNECT DUCTWORK SO THAT A REVERSE FLOW IS POSSIBLE</p>	<p style="text-align: center;"><b>NOTICE</b></p> <p>OPERATE THE OIL –FIRED UNIT PERIODICALLY TO ENSURE THAT IT WILL OPERATE SATISFACTORILY WHEN NEEDED</p>
<p style="text-align: center;"><b>NOTICE</b></p> <p>DO NOT RELOCATE OR BYPASS ANY OF THE SAFETY CONTROLS IN THE ORIGINAL FURNACE INSTALLATION</p>	<p style="text-align: center;"> <b>CAUTION</b></p> <p>MAINTAIN COMBUSTION-AIR SUPPLY TO BOTH FURNACES. AIR STARVATION IS DANGEROUS</p>
<p style="text-align: center;"><b>NOTICE</b></p> <p>REFER TO MANUFACTURER’S INSTRUCTIONS</p>	<p style="text-align: center;"><b>NOTICE</b></p> <p>THE MAIN WARM AIR PLENUM COMING FROM THE FURNACE SHALL BE NO SMALLER THAN 12 BY 20 INCHES</p>

<p>Identity of Installer _____                  Installer's address _____                  Date of Installation _____</p> <p>It is the recommendation of the manufacturer that this system be inspected yearly by a qualified person</p>	<p style="text-align: center;"> <b>CAUTION</b></p> <p style="text-align: center;">DISCONNECT POWER FROM BOTH ELECTRIC FURNACE AND PELLET FURNACE BEFORE SERVICING</p>
<p style="text-align: center;"> <b>CAUTION</b></p> <p>THIS EQUIPMENT MAY ONLY BE INSTALLED AND TESTED BY QUALIFIED PERSONNEL</p>	<p style="text-align: center;"><b>NOTICE</b></p> <p>THE FLUE PIPE MUST BE A MINIMUM OF 12 INCHES FROM THE ELECTRIC FURNACE CASING AND POWER SUPPLY AND ANY OTHER ELECTRICAL WIRING</p>
<p style="text-align: center;"><b>NOTICE</b></p> <p>THIS FURNACE CERTIFIED IN SEPTEMBER OF THE YEAR 2015</p>	<p style="text-align: center;"><b>NOTICE</b></p> <p>DO NOT CONNECT THIS FURNACE TO A CHIMNEY SERVING A GAS APPLIANCE</p>
<p style="text-align: center;"><b>NOTICE</b></p> <p>A FRESH AIR OPENING OF AT LEAST 32 SQUARE INCHES SHALL BE PROVIDED</p>	<p>Identity of gas fitter performing before inspection of gas furnace _____                  Address _____ Date _____                  Identity of gas fitter performing after inspection of gas furnace _____                  Address _____ Date _____</p>

Labeling 105x74

<p><b>IN THE CASE OF A “RUN-AWAY” FIRE:</b></p> <ul style="list-style-type: none"> <li>• NEVER PUT YOUR SELF AT RISK OF FATAL INJURY. YOUR SAFETY MUST ALWAYS TAKE HIGHEST PRIORITY!</li> <li>• SWITCH OFF THE HEATING SYSTEM</li> <li>• EXIT THE BUILDING AND CALL YOUR SERVICE CONTRACTOR AND LOCAL FIRE DEPARTMENT</li> </ul>	<div style="background-color: yellow; padding: 5px; text-align: center;">  <b>CAUTION</b> </div> <p style="text-align: center;"><b>HOT SURFACES</b></p> <ul style="list-style-type: none"> <li>• DO NOT TOUCH DURING OPERATION!</li> <li>• KEEP CHILDREN AWAY</li> <li>• KEEP CLOTHING AND COMBUSTIBLE MATERIALS AWAY FROM MARKED CLEARANCES.</li> <li>• MAXIMUM DRAFT MARKED ON NAMEPLATE</li> </ul>
<div style="background-color: red; color: white; padding: 5px; text-align: center;">  <b>DANGER</b> </div> <p style="text-align: center;">HOT SURFACES AND MOVING PARTS MAY CAUSE INJURY!</p> <p style="text-align: center;">RISK OF FIRE OR EXPLOSION – DO NOT BURN GARBAGE, GASOLINE, DRAIN OIL OR OTHER FLAMMABLE LIQUIDS</p>	<div style="background-color: orange; padding: 5px; text-align: center;">  <b>WARNING</b> </div> <p style="text-align: center;">RISK OF FIRE!</p> <ul style="list-style-type: none"> <li>• DO NOT OPERATE WHILE FLUE DRAFT EXCEEDS -.11 INCHES WC!</li> <li>• DO NOT OPERATE WITH DOORS OPEN!</li> <li>• DO NOT STORE FUEL OR OTHER COMBUSTIBLE MATERIAL WITHIN MARKED INSTALLATION CLEARANCES!</li> <li>• INSPECT AND CLEAN FLUE AND CHIMNEY REGULARLY!</li> <li>• DO NOT USE CHEMICALS OR FLUIDS TO START THE FIRE</li> <li>• DO NOT BURN GARBAGE, GASOLINE, NAPHTHA, ENGINE OIL, OR OTHER INAPPROPRIATE MATERIALS.</li> </ul>
<div style="background-color: yellow; padding: 5px; text-align: center;">  <b>CAUTION</b> </div> <p>THE HEAT EXCHANGER, FLUE PIPE AND CHIMNEY MUST BE CLEANED REGURARLY TO REMOVE ACCUMULATED CREOSOTE AND ASH, ENSURE THAT THE HEAT EXCHANGER, FLUE PIPE, AND CHIMNEY ARE CLEANED AT THE END OF THE HEATING SEASON TO MINIMIZE CORROSION DURING THE SUMMER MONTHS, THE APPLIANCE FLUE PIPE AND CHIMNEY MUST BE IN GOOD CONDITION. THESE INSTRUCTIONS ALSO APPLY TO A DRAFT INDUCER IF USED.</p>	<div style="background-color: yellow; padding: 5px; text-align: center;">  <b>CAUTION</b> </div> <p>UNSAFE TO ADJUST FLUE DRAFT HIGHER THAN .11 INCHES WATER COLUMN</p> <ul style="list-style-type: none"> <li>• MIN DRAFT @ LOW FIRE -.02 INCHES WC</li> <li>• MIN DRAFT @ HIGH FIRE -.04 INCHES WC</li> <li>• MAX DRAFT -.11 INCHES WC</li> </ul>
<p style="text-align: center;">LOSS OF ELECTRICAL POWER</p> <p style="text-align: center;"><b>NO DANGER</b> PELLET FURNACE COOLS DOWN AUTOMATICALLY</p>	<div style="background-color: blue; color: white; padding: 5px; text-align: center;"> <b>NOTICE</b> </div> <p><b>Appliance clearances:</b>  <b>Top @ tallest point: 1” Front: 20”</b>  <b>Rear: 12” Right side: 10”</b>  <b>Left side: 12”</b>  <b>Plenum clearance for the first 43” shall be no less than 2 inches. After 43” away from the furnace, there is no required clearance.</b></p>
<p style="text-align: center;"><b>INSPECT AND CLEAN EXHAUST VENTING SYSTEM FREQUENTLY</b></p>	



## General Information

As required by the United States Environmental Protection Agency the following information is given for the: AutoPellet Air 28 wood pellet fired central heating Warm Air Furnace. Manufactured by Maine Energy Systems, of 8 Airport Road, Bethel, Maine, 04217

- The AutoPellet Air 28 has a thermal output levels from 4 kW or 17,000 btu/h to 95,000 btu/h and complies with EPA 2020 requirements.
- This wood heater has a manufacturer-set minimum low burn rate that must not be altered. It is against federal regulations to alter this setting or otherwise operate this wood heater in a manner inconsistent with operating instructions in this manual.
- Complete installation information is found in the Installation Manual.
- Although operational information is elsewhere in this manual, there are specific concerns for correct operation that can directly affect the emissions profile of this equipment. It is therefore necessary that we mention these important points.
- Fuel loading and selection. Your AutoPellet Air 28 is equipped with completely automatic fuel loading. Thus, other than selecting the correct fuel, there are no loading instructions as such. Fuel selection is straight forward.

Only PFI Premium 100% wood pellets should be used in your boiler.

- Among the materials that are specifically prohibited to be burned in your AutoPellet Air 28 are: trash, plastics, gasoline, rubber, naphtha, household garbage, material treated with petroleum products such as particleboard, railroad ties, and pressure treated wood.

Burning these materials may result in release of toxic fumes or render the boiler ineffective and cause smoke.

- Your AutoPellet Air 28 is completely automatic ignition as well as the loading as before mentioned.

There are therefore no starting procedures to be followed. The boiler correctly starts itself when required by building load.

- There are no user adjustments required for the air controls on your AutoPellet Air 28.
- It is important to have your AutoPellet Air 28 serviced by a trained professional who is aware of the importance to ensure that there are no inlet air restrictions in or around your boiler's combustion blower. And that the air passages within your boiler are free of debris, (creosote, ash, etc.) The flue pipe and chimney are also clean and free of debris / restrictions. And that the combustion chamber door seal is airtight when the door is closed and secured.
- Ash removal is also completely automatic on your AutoPellet Air 28. Ashes should be placed in a metal container with a tight-fitting lid.

The closed container of ashes should be placed on a noncombustible floor or on the ground, away from all combustible materials, pending final disposal. The ashes should be retained in the closed container until all cinders have thoroughly cooled.

When cooled ashes can be disposed of on your lawn, garden or local transfer station.

Your AutoPellet Air 28 is not a catalytic type burner.

- A person or persons responsible for the operation of a warm air furnace must comply with all applicable laws or other requirements, such as State laws or regulations as well as local ordinances.
- A person or persons operating a warm air furnace should be aware that they are responsible for operation in such a manner that does not create a public or private nuisance condition. The Manufacturer's distance and stack height recommendations and the requirements in any applicable laws or other requirements may not always be adequate to prevent nuisance conditions due to terrain or other factors.
- Your AutoPellet Air 28 should be installed with a minimum stack height of 16 feet. Providing correct draft as given in the Installation manual.
- Draft is the force which moves air from the appliance up through the chimney. The amount of draft in your chimney depends on the length of the chimney, local geography, nearby obstructions and other factors. Too much draft may cause excessive temperatures in the appliance and may damage the catalytic combustor. Inadequate draft may cause backpuffing into the room and 'plugging' of the chimney. Inadequate draft will cause the appliance to leak smoke into the room through appliance and chimney connector joints and an uncontrollable burn or excessive temperature indicates excessive draft.
- The efficiency of your AutoPellet Air 28 running at full power is >86%.
- This is the result of a laboratory test and was measured using the HHV of the fuel used.
- You should never operate a combustion appliance of any type in your home without there being a properly installed smoke and CO detector.

Your local fire department usually has good advice on placement of these detectors and how many your home may need for complete coverage.





**MESys**  
 Maine Energy Systems, LLC  
 8 Airport Road, Bethel, Maine 04217  
 Voice: 207.824.6749 Fax: 207.824.4816

Report No. 0444PH005S

<b>Type:</b> AutoPellet Air 28		<b>S/N:</b> XUF00100	<b>CATALOG No.:</b> PFS28
<b>Date of manuf.:</b> 07/2015		<b>Rated heat power:</b> 95540 BTU/hr	
<b>Tested to:</b> UL 391-2010. CSA B366.1-2011			
<b>Manufactured By:</b> MESys LLC, Bethel, Maine		<b>FUEL:</b> Wood Pellets	
U.S. ENVIRONMENTAL PROTECTION AGENCY certified to comply with the 2020 particulate emissions standard using wood pellets.			
This appliance needs periodic inspection and repair for proper operation. Consult owner's manual for further information. It is against federal regulations to operate this appliance in a manner inconsistent with operating instructions in the owners manual.			
<b>Particulate Emissions,</b> 0.06 lb./million btu - 1.32 grams/hr. <b>CO Emissions,</b> 0.029 grams/min. Annual Efficiency, (HHV) 88.35%			
<b>FUEL:</b> PREMIUM WOOD PELLETS		<b>Max Operating Temp:</b> 194 °F	
Furnace tested to .2 inches WC external static pressure			
<b>Chimney</b>	Approved factory built stainless steel or tile-lined masonry		
<b>MAX DRAFT:</b> 0.11 inches WC <b>MIN DRAFT:</b> 0.04 inches WC			
<b>Diameter:</b> 6 INCH		<b>Electrical Rating:</b> 220 V, 60 Hz, 12 A, 2300 W	
<b>FLOORING:</b> COMBUSTIBLE FLOORS CAN BE USED WITH A NON-COMBUSTIBLE SHIELD. MINIMUM CLEARANCES ARE 18IN/457MM IN THE FRONT AND 8IN / 203MM ON EACH SIDE.			
<b>PARTS</b>	<b>Fan Flue Gas:</b> E1001A	<b>Controller Display:</b> E1330	
<b>Motor Ash Box:</b> E1302		<b>Motor Flame Return Protection:</b> E1413A	
<b>Motor Cleaning Device:</b> E1054		<b>Motor Hopper:</b> -----	
<b>Motor Burner Plate Cleaning:</b> -----		<b>Suction Turbine:</b> E1192	
<b>Motor Burner Screw:</b> E1002			
<b>Controller Board:</b> E1412			
<b>Fan Burner:</b> E1005S			





## Author & Manufacturer

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Subject to modifications

Please read carefully prior  
to installing and servicing.

SAVE THESE INSTRUCTIONS

# Operating Manual

Pellet heating with auger  
delivery or vacuum suction  
system for the end-user  
**AutoPellet Air Furnace  
28**

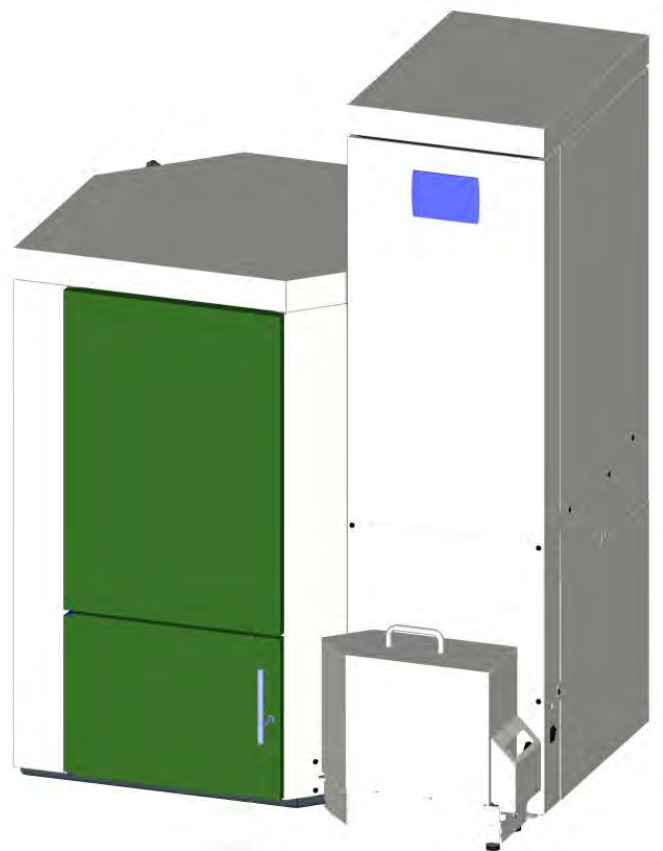
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MESys V1.1

AutoPellet Air TOUCH

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USA



Title: Operating Manual AutoPellet Air Furnace 28 PE  
Article number: 604 USA\_FA 1.0  
  
Version valid from: **02/2025**  
Approved: **MESYS**

## Author & Manufacturer

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Pour la version française de ce manuel, veuillez visiter notre site Web à  
[Maineenergysystems.com](http://Maineenergysystems.com).

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Note that warranty and replacement part information is included at the end of this manual. For warranty questions, refresher training, or replacement part inquiries (for all replacement parts including those pertaining to emissions control such as gaskets or other), please send an email to [info@maineenergysystems.com](mailto:info@maineenergysystems.com) including the system's address in the subject line. MESys provides replacement parts for installation by certified technicians.



# 1 Dear Customer

**Maine Energy Systems** specializes in wood pellet heating, our company enjoys an exclusive license from ÖkoFEN to manufacture AutoPellet Air here in the USA. We represent expertise, innovation and quality. We are delighted that you have decided to purchase our product.

- This instruction manual is intended to help you operate the product safely, properly and economically.
- Please read this instruction manual completely and take note of the safety warnings.
- Keep all documentation supplied with this unit in a safe place for future reference.  
Please pass on the documentation to the new user if you decide to part with the unit at a later date.
- Installation and first start up must be carried out by an installer certified by Maine Energy Systems.
- Please contact your authorised dealer if you have any questions.



We place great importance on the development of new products. Our R&D department continues to question accepted solutions and works continually on new improvements. That is how we maintain our technological lead. We have already received several awards for our products in Austria and abroad. Our products fulfill European and USA requirements regarding quality, efficiency and emissions.



## 1.1 Special Statement

This unit is designed and tested to shut off at 30% of the tested maximum Category 4 tested heat rate as required by both Wood Heater Rule at 40 CFR §60.5476(e) and the Alternative Test Method (ATM)-134. No combustion settings are to be modified.

This wood heater needs periodic inspection and repair for proper operation. It is against federal regulations to operate this wood heater in a manner inconsistent with operating instructions in this manual.

This heating appliance is US EPA 2020 NSPS Compliant.

## **2 Use only for the purpose intended**

The pellet furnace is designed heat air to provide heat for buildings. It is not permissible to use the furnace for any other purpose.

The pellet furnace fulfills the requirements of UL 391-2010 and CSA B366.1–2011.

This boiler is intended to be fueled by Pellet Fuels Institute (PFI) Certified Wood Pellets.

### 3 Types of safety warning sign

The warning signs use the following symbols and text.

#### Types of safety warning sign

1. Risk of injury
2. Consequences of risk
3. Avoiding risk



#### 1. Risk of injury:

Danger - indicates a situation that could lead to death or life-threatening injury.



Warning - indicates a situation that could lead life-threatening or serious injury.



Caution - indicates a situation that could lead to injury.



Note - indicates a situation that could lead to property damage.



#### 2. Consequences of risk

Effects and consequences resulting from incorrect operation.

#### 3. Avoiding risk

Observing safety instructions ensures that the heating system is operated safely.


## 4 Warnings and safety instructions


Observing safety instructions ensures that the heating system is operated safely.


### 4.1 Basic safety instructions

- Never get yourself into danger; give your own safety the utmost priority.
- Keep children away from the Furnace room and storage room.
- Observe all safety warnings on the Furnace and in this user manual.
- Observe all instructions relating to maintenance, servicing and cleaning.
- Never make any changes to the heating system or flue gas system.
- Never close or remove safety valves.

### 4.2 Warning signs

	<b>DANGER</b>
<p><b>Risk of poisoning</b>            Make sure that the pellet Furnace is supplied with sufficient combustion air.            The openings in the combustion air inlet must never be partially or completely closed.            Ventilation systems, central vacuum cleaning systems, extractor fans, air conditioning systems, flue gas blowers, dryers, fuel storage ventilation fans or similar equipment must never be allowed to draw air from the Furnace room and cause a drop in pressure.            The Furnace must be connected tight to the chimney using a flue gas tube.            Clean the chimney and the flue gas tube at regular intervals.            The Furnace room and pellet storage room must be sufficiently supplied with air and ventilated.            Before entering the storage room it must be ventilated with sufficient air and the heating system switched off</p>	

	<b>DANGER</b>
<p><b>Risk of electric shock</b>            Always disconnect / de-energize the power supply before working on the Furnace.</p>	

	<b>DANGER</b>
<p><b>Risk of explosion</b>            DO NOT BURN GARBAGE, GASOLINE, NAPHTHA, ENGINE OIL, OR OTHER INAPPROPRIATE MATERIALS.            DO NOT USE CHEMICALS OR FLUIDS TO START THE FIRE.            Switch off the heating system before filling the storage room.</p>	



## DANGER

### Risk of fire

Do not store any flammable materials in the Furnace room.  
Do not hang out any washing in the Furnace room.  
Do not operate with fuel loading or ash removal doors open.



## WARNING

### Risk of burns

Do not touch the flue gas connector or flue gas pipe.  
Do not reach into the ash chamber.  
Use gloves to empty ash box if Furnace not equipped with automatic ash compression  
Do not clean the Furnace until it has been allowed to cool down.



## CAUTION

### HOT SURFACES

Keep children away.  
Do not touch during operation.  
Do not operate if maximum draft as listed on Furnace nameplate is exceeded.  
Doing so can allow non-controlled combustion.



## CAUTION

**Risk of cut injuries due to sharp edges.**  
Use gloves for performing all work on the Furnace.

## NOTICE

### Damage to property

The pellet Furnace is suitable only for pellets which comply with PFI premium or EnPlus -A1 pellets specifications. The use of any other fuel voids your warranty and can cause damage to the pellet Furnace and chimney.

## NOTICE

### Damage to property

Do not use the heating system if it, or any of its components, come into contact with water.  
If water damage occurs, check the heating system and replace damaged parts.



## WARNING

All cover plates, enclosures, and guards must be maintained in place at all times, except during maintenance and servicing.

## 4.3 What to do in an emergency



### DANGER

**Risk to life**

Never get yourself into danger; give your own safety the utmost priority.

**What to do in the event of a fire**

- Switch off the heating system.
- Call your local fire department and or 911.
- Use approved fire extinguishers (fire protection class ABC).

**What to do if you smell smoke**

- Switch off the heating system.
- Close the doors leading to living areas.
- Ventilate the central heating room.

**Important: Federal, State/Provincial, and Local Regulations, Laws, and Codes must be followed; use of smoke detectors and carbon monoxide monitors are recommended in accordance with applicable statutes.**

**INSTALL CO SMOKE DETECTORS IN THE LIVING AREA AND BEDROOMS OF YOUR HOME. TEST THEM REGULARLY AND INSTALL FRESH BATTERIES TWICE ANNUALLY.**

**WHEN INSTALLED IN THE SAME ROOM AS THE STOVE, A SMOKE OR CARBON MONOXIDE DETECTOR SHOULD BE LOCATED AS FAR FROM THE STOVE AS POSSIBLE TO PREVENT THE ALARM SOUNDING WHEN ADDING FUEL.**

## 5 Prerequisites for installing a pellet Furnace

You must fulfil the following conditions before operating a fully automatic pellet Furnace.

### 5.1 Guidelines and standards for installing a pellet Furnace

Overview of standards and guidelines applying to the installation of a pellet Furnace.

Check whether you need to obtain planning permission or approval from the authorities for installing a new heating system or changing your existing system. Installation must meet all requirements for pellet fired heating systems in your specific location.

All equipment shall be installed in accordance with the instructions of the manufacturer and in a manner acceptable to the authority having jurisdiction by experienced personnel. When required by the authority having jurisdiction, such personnel shall be licensed to perform this service.


In Canada, the installation of the solid fuel furnace shall comply with the applicable requirements of CSA B365, and if changes are made to the installation of the oil furnace, these shall comply with CSA B139.

If changes are made to an electric furnace during the installation, the changes shall comply with the Canadian Electric Code. Part 1.

### 5.2 Furnace room circulating air

The pellet Furnace is installed in the Furnace room.

#### 1. Safety instructions for the Furnace room

	<b>DANGER</b>
<p><b>Risk of fire</b>            Do not store flammable materials or liquids in the vicinity of the pellet Furnace.            Do not permit unauthorised persons to enter the Furnace room - Keep children away.            Do not operate with fuel loading or ash removal doors open.</p>	

#### 2. Air supply and ventilation of Furnace room

The Furnace room must be fitted with air supply and ventilation openings (at least 31 inch<sup>2</sup>/200cm<sup>2</sup>). In any case you must comply with the state and local regulations

#### 3. Damage due to frost and humid air

The Furnace room must be frost-proof to ensure trouble-free operation of the heating system. The temperature of the Furnace room must not fall below 37°F and must not exceed 90°F. The air humidity in the Furnace room must not exceed 70%.

#### 4. Danger for animals

Make sure that household pets and other small animals cannot enter the Furnace room. Fit mesh over any openings.


#### 5. Flooding

If there is a risk of flooding, switch off the pellet Furnace and disconnect from the power supply before water enters the Furnace room. You must have all components that come into contact with water replaced, before you start up the pellet Furnace again.

## 5.3 Furnace room supply air

The pellet Furnace is installed in the Furnace room.

### 1. Safety instructions for the Furnace room

	DANGER
<p><b>Risk of fire</b>            Do not store flammable materials or liquids in the vicinity of the pellet Furnace.            Do not permit unauthorised persons to enter the Furnace room - Keep children away.            Do not operate with fuel loading or ash removal doors open.</p>	

### 2. Air supply and ventilation of Furnace room

The Furnace room must be fitted with air supply and ventilation openings (at least 31 inch<sup>2</sup>/200cm<sup>2</sup>). In any case you must comply with the state and local regulations

### 3. Combustion air supply

The pellet Furnace needs a supply of combustion air. The supply of combustion air can:

- a. take place using one or more air supply and ventilation openings in total min. 31 inch<sup>2</sup>.
- b. The air must not be used directly from the outside without preheating (background: This could lead to a condensation of the boiler).

Never operate the pellet Furnace if the air intake openings are partially or completely closed.

Contaminated combustion air can cause damage to the pellet Furnace. Never store or use cleaning detergents containing chlorine, nitrobenzene or halogen in the room where the heating system is installed, if combustion air is drawn directly from the room. It is recommended that no washing or drying of laundry is done in the Furnace room or where the Furnace may draw air from.

Do not hang out washing in the Furnace room.

Prevent dust from collecting at the combustion air intake to the pellet Furnace.

### 4. Damage due to frost and humid air

The Furnace room must be frost-proof to ensure trouble-free operation of the heating system. The temperature of the Furnace room must not fall below 37°F and must not exceed 90°F. The air humidity in the Furnace room must not exceed 70%.

### 5. Danger for animals

Make sure that household pets and other small animals cannot enter the Furnace room. Fit mesh over any openings.

### 6. Flooding

If there is a risk of flooding, switch off the pellet Furnace and disconnect from the power supply before water enters the Furnace room. You must have all components that come into contact with water replaced, before you start up the pellet Furnace again.



## 5.4 Flue gas system

The flue gas system consists of a chimney and a flue gas tube. The flue gas tube connects the pellet heating system to the chimney. The chimney leads the flue gas from the pellet heating system out into the open.

### 1. Design of the chimney

The dimensions and design of the chimney is very important. The chimney must be able to ensure sufficient draft to safely draw away the flue gas regardless of the status of the Furnace. Low flue gas temperatures can cause sooting and moisture damage on chimneys that are not insulated. For this reason **moisture-resistant chimneys** (stainless steel or ceramic) should be used. An existing chimney that is not damp-resistant needs to be renovated before use. Follow guidelines below:

Furnace size		Furnace
Flue gas tube diameter (at Furnace)	inch/mm	6.3/160
Flue gas temp. / rated power	°F	
Flue gas temp. / partial load	°F	
Min. draft - full load/part load	in/wc	- 0.04 / - 0.02

Chimney size	Min. Height
6in x 6in	17ft
7in x 7in	16ft
8in x 8in	16ft
6in round	19ft
7in round	17ft

**NOTICE**

Person(s) operating a pellet fired furnace is/are responsible for operation in a manner that does not create a public or private nuisance condition. The manufacturer's distance and stack height recommendations and the requirements in any applicable laws or other requirements may not always be adequate to prevent nuisance conditions due to terrain or other factors.

Recommended and UL-103HT approved chimney materials are:

- a. Selkirk sure temp
- b. Supervent (JSC)
- c. Security chimneys (secure temp ASHT)

Use flue gas pipe from chimney to Furnace as required by your local code.

**CAUTION**

**Unregulated combustion**  
Please observe that combustion air openings and flue pipes are not reduced in size or closed. Make end user aware of these guidelines and their potential danger. Clean the chimney and the flue gas tube at regular intervals. Check if the draft inducer is clean and in a good condition.

## 2. Flue gas temperature

The flue gas temperatures are approximately the same for all AutoPellet Air covered in this manual.

The dewpoint of flue gas with wood pellets (max. 10% water content) is approx. 120°F.

It is possible to increase the flue gas temperature to prevent condensation inside the chimney and avoid damage due to damp. Only authorised installers may increase the flue gas temperature.

### Note:

The increase in flue gas temperature results in reduced efficiency and thus increases fuel consumption.

## 3. Negative pressure of the chimney

The Furnace must be connected to a chimney or a vertical venting system that is capable of handling and producing a negative breaching pressure of  $-0.4$  "WC. Use a draft gauge to verify the indicated draft value, adjust barometric damper as required. Drill a small hole in the connection pipe at about 2in/ 50mm from the Furnace flue outlet and use this hole as your measuring point.

### Chimney draft

The suction effect of the chimney draft must extend all the way to the Furnace flue pipe connection. The maximum flow rate that can be drawn through the chimney limits the maximum performance of the chimney connection. The Furnace performance must be reduced if the chimney does not possess the necessary cross-section. This may only be performed by authorised personnel.

## 4. Power venter

AutoPellet Air are approved by the manufacturer for installation with the Field Controls SWGAF power venter which is approved for wood pellet burning appliances. Furnaces installed with SWGAF power venters must follow all manufacturer's installations and must comply with all applicable codes from agencies having authority over the installation.



## 5. Cleaning

Clean the flue gas tube and chimney regularly. Solid fuel burning appliances need to be cleaned frequently because soot, creosote, and ash may accumulate. The hotter the fire, the less creosote is deposited. Cleaning intervals can vary in warm periods due to this and become more frequent.



## DANGER

### Risk of chimney fire

Creosote-formation and need for removal: Low flue gas temperature can cause creosote. Creosote can condense in a relatively cool chimney. As a result, creosote residue accumulates on the flue lining. If ignited, this creosote will create an extremely hot fire. The chimney and the chimney connector should be inspected at least twice monthly during the heating season to determine if a creosote buildup has occurred. If creosote has accumulated it should be removed to reduce the risk of a chimney fire.

## NOTICE

### Oxidation of chimney

Do not use metal brushes to clean chimneys made of stainless steel.  
Your state and local regulations must be observed.

## 5.5 Safety systems

The following safety measures are the prerequisite for safe operation of your system.

### Emergency stop switch

Every heating system must be able to be switched off with an Emergency Stop switch. The Emergency Stop switch must be outside of the Furnace room.



### Safety temperature sensor

The pellet Furnace is equipped with a safety temperature sensor. This is located on the pellet Furnace. If the Furnace temperature exceeds 230°F then the heating system switches off.



## 5.6 Installation with an existing Furnace

AutoPellet Air Furnaces are not to be connected to a chimney flue serving another appliance. However, when all State and local codes allow for the sharing of chimney flues, the AutoPellet Air Furnaces and another appliance burning pellets or a different fuel can be operated simultaneously while connected to a single existing chimney or flue gas system providing the following conditions are met:

- All state and local codes permit the specific installation
- All appliances are installed in accordance with the manufacturer's installation specifications or if lacking manufacturers specifications, the appliance in question is installed in a manner commonly recognized as safe and correct for the application and circumstances
- The chimney or flue gas system must be able to handle the combustion products of either appliance and both appliances when operated simultaneously

### NOTICE

#### Avoid clearance issues that can make servicing difficult:

Be sure to follow suggested clearances when installing the AutoPellet Air Furnaces with an existing Furnace to be sure that service and cleaning can be performed adequately.



### CAUTION

#### Avoid code violations:

When connecting to or with an existing Furnace, contact the authority having jurisdiction to be sure the type of installation planned is allowed.

Document the type of Furnace that the AutoPellet Air Furnace is connected to or with.

Pellet Furnace: Make and Model number:

\_\_\_\_\_

Existing Furnace: Make and Model number:

\_\_\_\_\_



### DANGER

#### Possible escape of flue gas:

Do not connect this unit to a chimney flue serving another appliance unless multiple appliances into a single flue is authorized by all authorities having jurisdiction.

## 6 Fuel

Wood pellets are natural wood (dried sawdust or waste from machining) that has been formed into pellets under high pressure. They have a very low moisture content and very high calorific value. The manufacture of wood pellets is regulated by European standard EN ISO 17225-2.

### 6.1 Specification for high quality pellets as PFI (Pellet Fuel Institut)

Calorific value	min. 7200 BTU/lbs
Bulk density	min. 40 Lb/cft
Water content	max. 10%
Ash content	max. 1.0%
Ash melting point	at least 2192°F
Length	max. 1.5 inch / 40 mm
Diameter	1/4" - 5/16" / 6 - 8mm
Fine material	max. 0.5 %
Contents	100% untreated natural wood

### NOTICE

The pellet Furnace is suitable only for pellets of natural wood that comply with PFI premium specifications. Using non-pelletised fuels or pellets that are not manufactured from natural wood will lead to the warranty becoming void and will cause damage to the pellet Furnace and the chimney.



### WARNING

Never use pellets that contain treated wood, colored paper products, cardboard, solvents, plastic, trash or garbage  
 Never burn trash, plastics, gasoline, solvents, naphtha, household garbage, material treated with petroleum products such as particleboard, railroad ties and pressure treated wood, leaves, paper products, cardboard.

## 6.2 Storing the pellets

1. Pellets are to be stored in a place where they are kept dry all year.
2. Install a back-ventilated partition to prevent pellets from contacting damp walls, or use a fabric tank.
3. Refer to our planning hints for pellet storage rooms and warning signs.
4. Legislation in your country must be observed regarding building specifications for storage rooms.
5. ÖkoFEN also offers FleXILO fabric tanks for storing pellets.

## 6.3 Measures for the ventilation of storage rooms

To avoid any kind of danger through possible degassing of the pellets, make sure you obey the following guidelines:

- The storage room has to be insulated towards the living area.
- The storage room has to be ventilated to the outdoors.

For further information please consult your expert adviser.

## 7 The pellet Furnace

The pellet Furnace is equipped with an automatic cleaning system and an ash box with ash compression system. The installed programmable logic controller system enables fully automatic operation and highest efficiency. We offer an optional automatic de-ashing system for the highest level of cleanliness and comfort.

### AutoPellet Air types and power ratings

We offer the Pellet Furnace with the following power ratings:

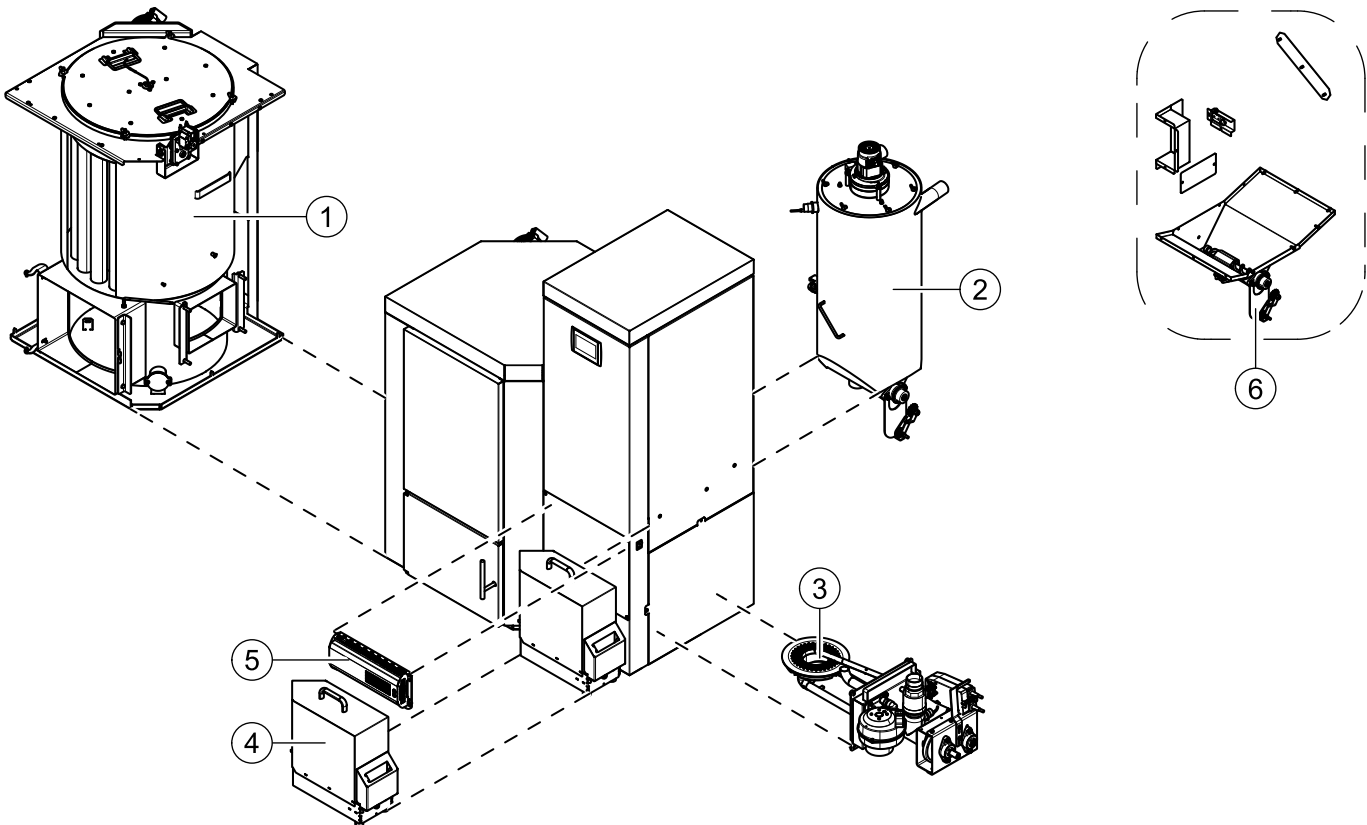
Suction-feed systems: 95,000 BTU/hr

All sizes / outputs of the AutoPellet Air Furnace are available with external automatic ash compression system.

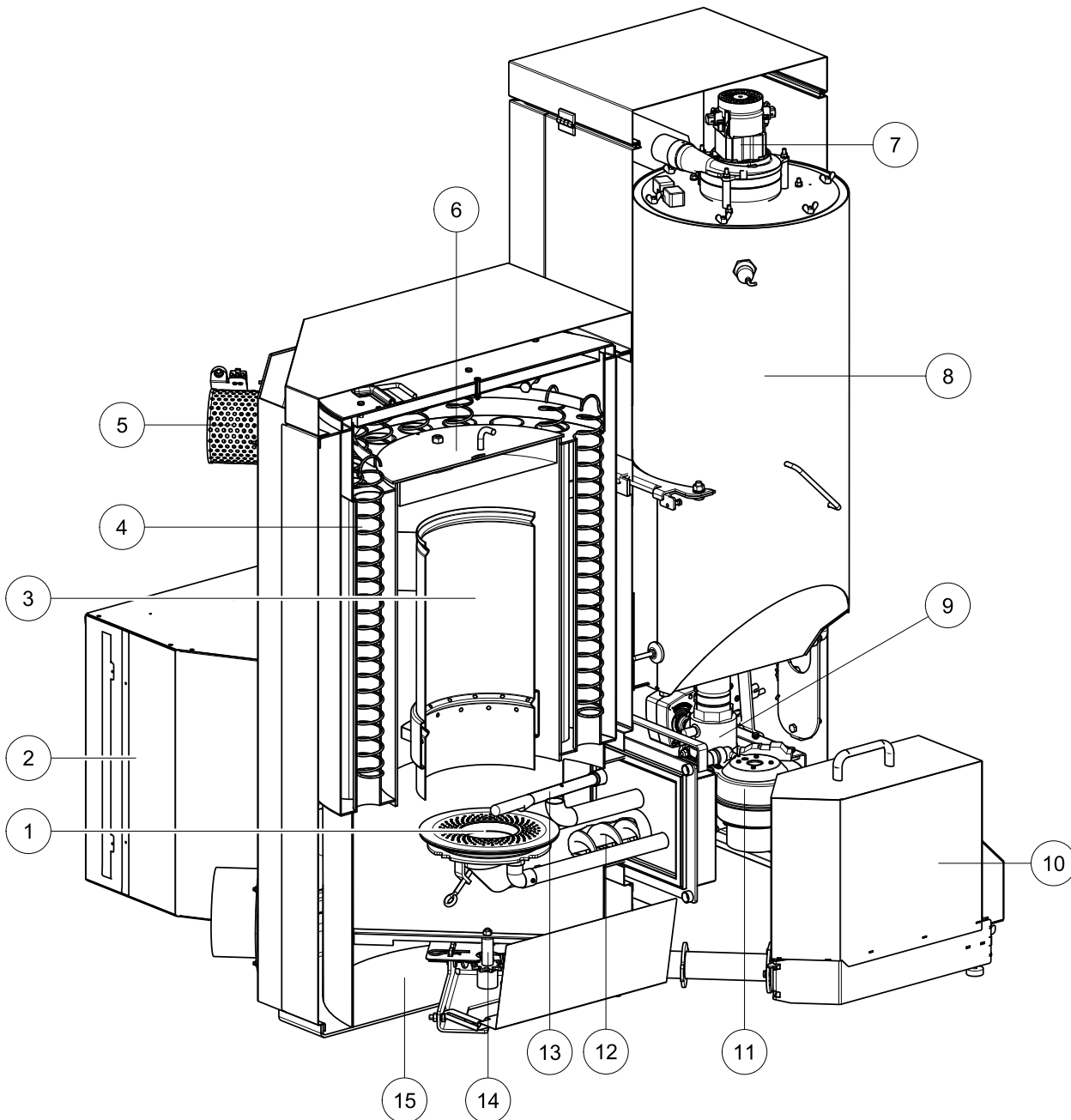
#### Note:

Refer to the data plate for the power rating of your AutoPellet Air. The data plate is located on the rear side of the AutoPellet Air. Here you will find the type designation, manufacturer's serial number and year of build.

### Key components of the AutoPellet Air



1	Furnace (heat exchanger)
2	Vac Hopper / Day tank
3	Burner
4	External automatic ash compression system
5	Furnace controller
6	Additional parts hand filling



1	Burner plate	9	Fire protection - ball valve
2	Fan	10	External ash box (optional)
3	Flame tube	11	Burner fan
4	Heat exchanger	12	Burner auger
5	Flue gas fan	13	Electronic ignition
6	Combustion chamber cover	14	De-ashing system (optional)
7	Suction turbine	15	Ash chamber / Fire chamber
8	Vac hopper / Day tank		

## 7.1 Pellet suction system

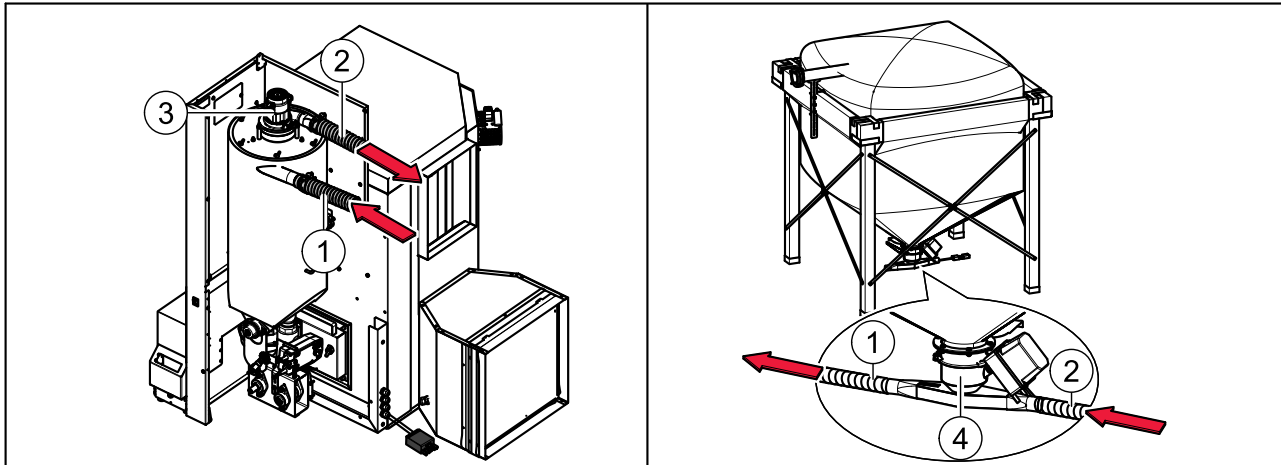
The pellet suction system consists of a pellet line, an air line and a suction turbine. The suction turbine in the hopper conveys pellets in the pellet line from the storage room or textile tank to the hopper.

### Key components of pellet suction system

1	Pellet hose	Hose from textile tank to the hopper.
2	Air hose	Hosee from the suction turbine to the textile tank.
3	Suction turbine	Located above the hopper underneath the AutoPellet Air burner casing.
4	Suction switch	Located underneath the textile tank.

Pellet Furnace

FleXILO textile tank



### 7.1.1 Assembly of the vacuum system

The pellet hose and the air hose are flexible spiral hoses made out of plastic. A copper braid avoids the static loading of the spiral hose.

#### To avoid damage to the spiral hose, you must observe the following assembly guidelines:

- Bending radius** The hose should be led as briefly as possible and with a few curves as necessarily. Bending radius may never be smaller than **12 inch**.
- Upward gradients** Max difference in height = **19 feet**  
**Note:** A difference in height of up to 10 feet can be overcome at one time. Larger differences in height must be interrupted with a 4 foot horizontal run of the pellet hose.
- Impact protection** The spiral hose can be mounted up to 19 feet exactly straight. In such cases however, it is very important to create a slight "S" in the pellet piping before a sharp curve to slow down the pellets to prevent hose damage.
- Installation in the soil and openings:** When installing pellet lines underground remember! The pellet lines are not designed for direct burial and require protection from being crushed or chewed by varmints. Protective piping should be minimum 4 inch and sealed at each end. There should be no bends greater than 15 degrees in the underground sections of the pellet hose.
- Tightness** To avoid problems with your pellet lines, it is important to have all hose connections secured completely air tight with hose clamps.
- Static neutralization** The hoses are provided with a copper braid, those the hose keeps antistatic. In order to ensure the function of the anti-statics, those copper braid must be attached at each end to the existing grounding become.
- Fire protection** At a wall break-through to the heating room must be installed a fire protection seal in the pellet- and the air hose.



**Crossing**

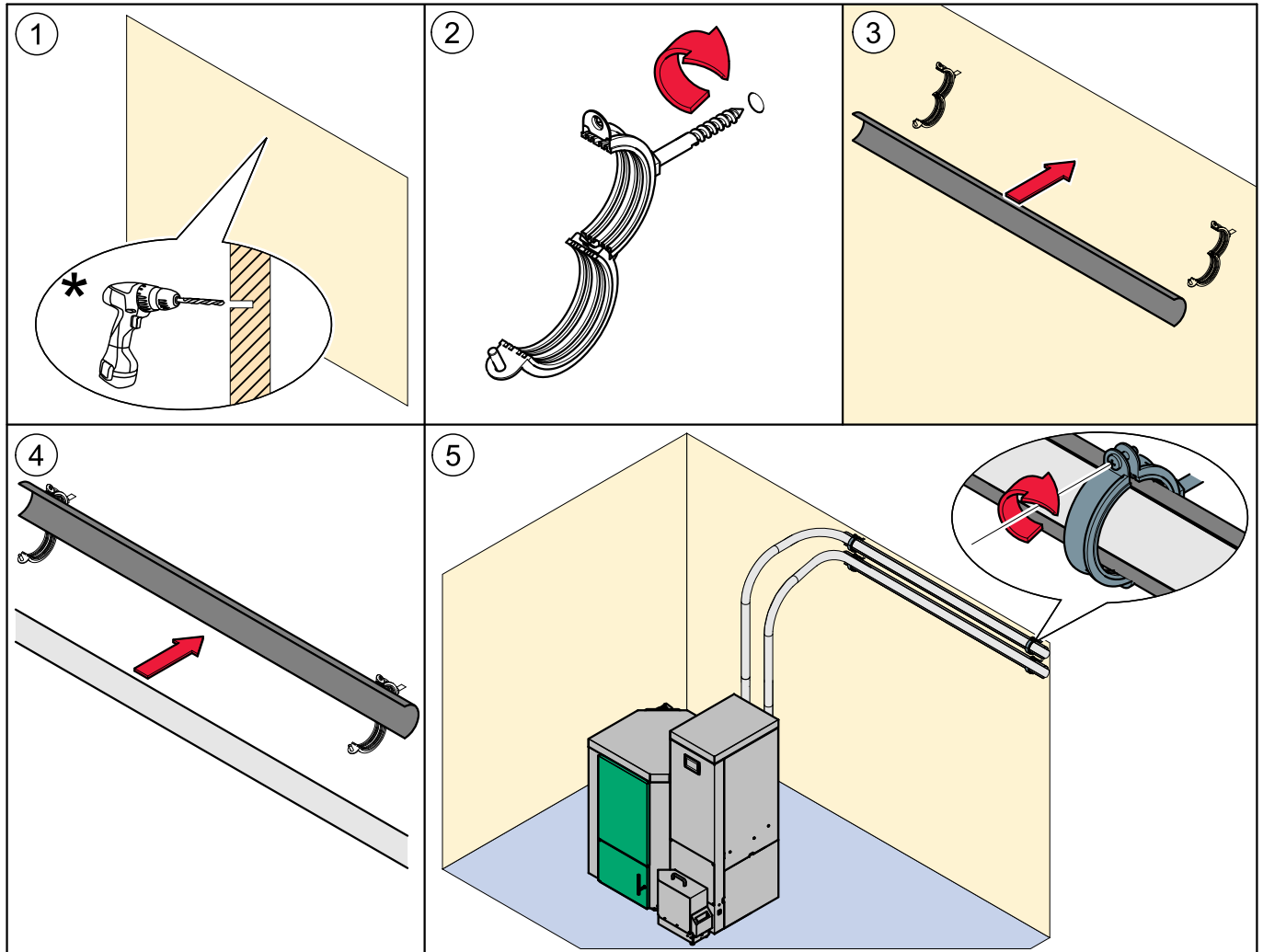
The pellet hose and the air hose should cross each other as few times as possible.

**Length of the spiral hose**

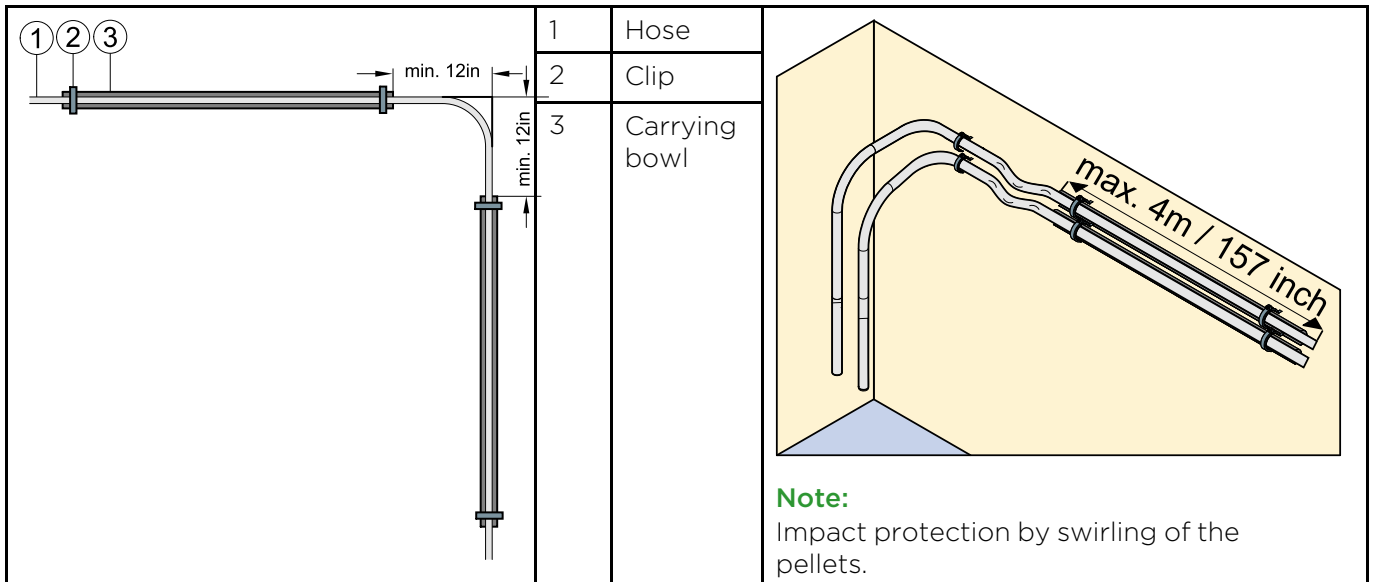
The maximum total length of the spiral hose is 130 feet.  
The maximum for pellet hose and air hose are each 60 feet.

**Assembly**

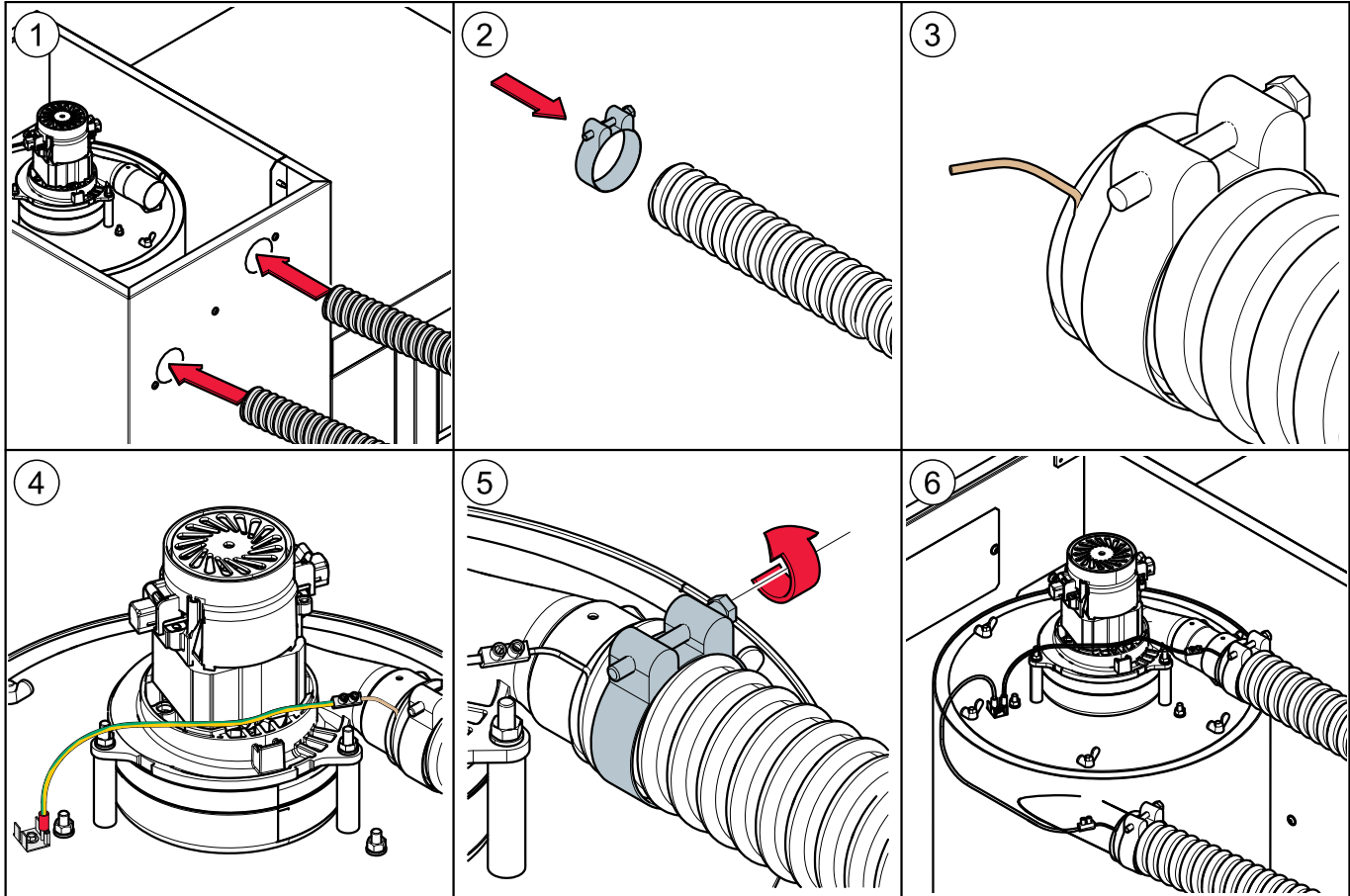
Use securing clips and carrying bowls.



\*Pay attention to the defined distances!



### Connection of the pellet and air hose to the suction turbine



## 7.2 Storage systems

For storing pellets we offer a FlexILO textile tank. FlexILO textile tanks can be located inside the Furnace room, storage room or protected from wet and sun outside.

### NOTICE

#### Damage to property and loss of warranty

The use of an AutoPellet Air Furnace with a storage or conveyor system from another manufacturer is not permissible and will result in voiding your warranty along with undependable operation.

#### 7.2.1 Flexilo textile tank

Maine Energy Systems offers various sizes and types of fabric tanks. The fabric tank supplied may vary from the example shown above.

Please refer to the installation instructions supplied for the fabric tank. Note also the instructions on setting up and filling.

## 8 Operating the Furnace

The pellet heating system is an automatic heating system. All pellet feed system and combustion system sequences are regulated automatically using an electronic Furnace controller.

### 8.1 Operating the heating system

#### NOTICE

**Damage caused do to incorrect operation or incorrect settings.**

Only trained operators may use the heating system. Make sure no unauthorised persons enter the central heating room. Keep children away from the central heating room and storage room.



#### DANGER

**Fire risk**

Keep the ash removal door closed while the Furnace is in operation.

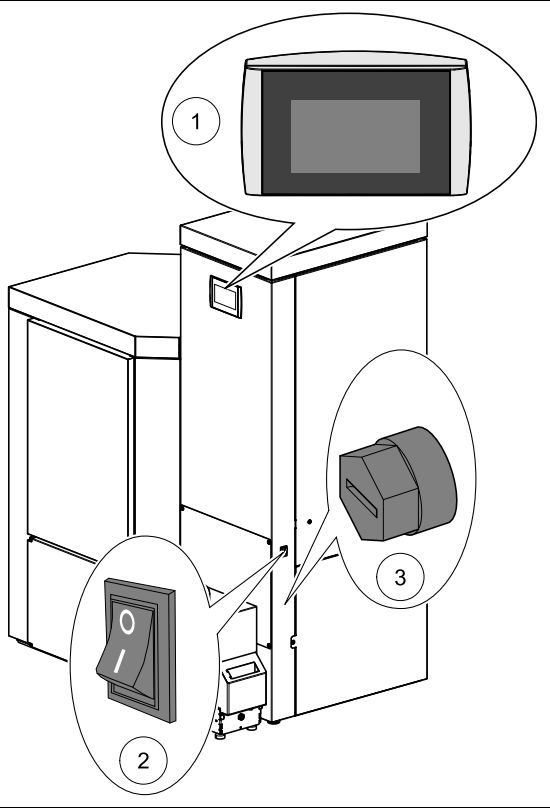
#### NOTICE

**Standby mode Furnace controller**

Don't set the main switch of the Furnace controller outside of the heating period to Off, because no buffer battery is used.

## 8.2 Description of the control panel

The control panel is located underneath the flap above the door of the Furnace.

	1	User control unit	Operates the Furnace controller.
2	Main switch	Switches off the heating system (both poles) including the power supply to the control panel.	
3	Safety temperature sensor	Switches the heating system off, if the Furnace temperature exceeds 203 °F.	

## 8.3 Setting language, date and time at Pelletronic Touch

**Setting the language** (The factory setting for the language is German)



### Setting the date



### Setting the time



## 8.4 Emptying the ash pan

**CAUTION**

Risk of burns  
Do not touch the Furnace vessel. Use gloves.

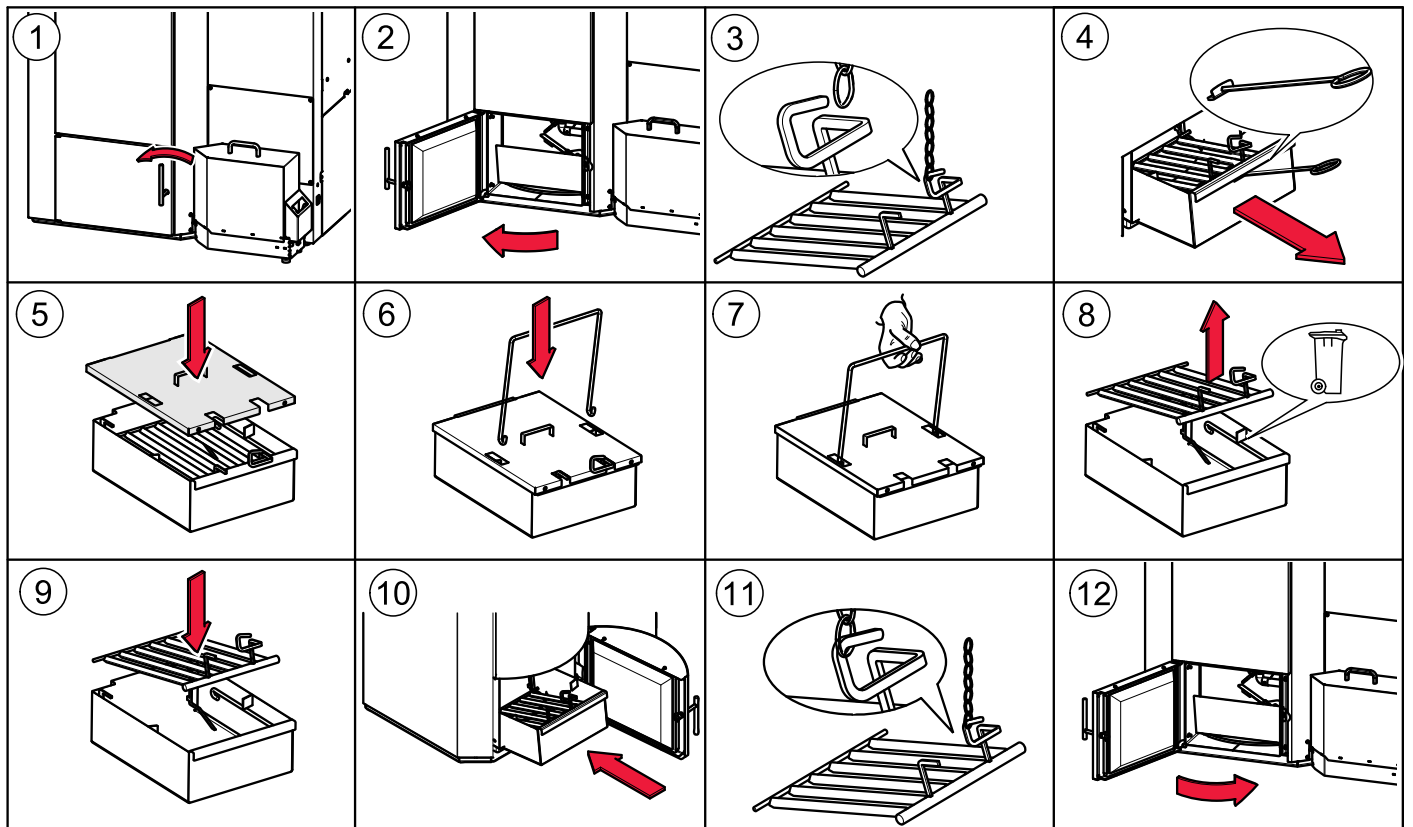
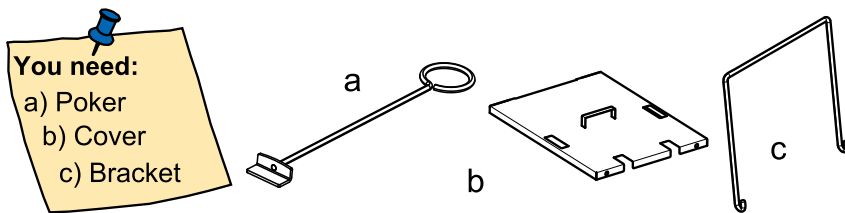
**DANGER**

Risk of fire  
Bring out the ash pan immediatly.  
Do not dispose ash until it has completely cooled down.  
Empty ash only into a not flammable steel container.  
Do not use ash container to store waste or other material.  
Do not empty ash onto flammable floors or materials.

### Emptying the ash pan

**Note:**

Check the level of the ash pan and empty it at regularly intervals (at least every 2 weeks). No warning is displayed indicating that ash pan needs to be emptied when it is full (unlike external ash box)



\* No riddle grate for systems with burner plate cleaning system.

## 8.5 Emptying the ash box

**Only on Furnaces with external ash box.** We also offer an optional automatic external ash box. This compresses the ash and reduces the frequency at which it needs to be emptied. It enables the ash to be disposed off without creating dust. Installation is performed by the service technician when the pellet Furnace is installed. An external ash box can also be retrofitted.

### NOTICE

#### Damage to property

Empty the ash box before a longer off-time of the Furnace. Otherwise the auger and the opening mechanism can be blocked through firmly bonded ash.



### DANGER

#### Risk of fire

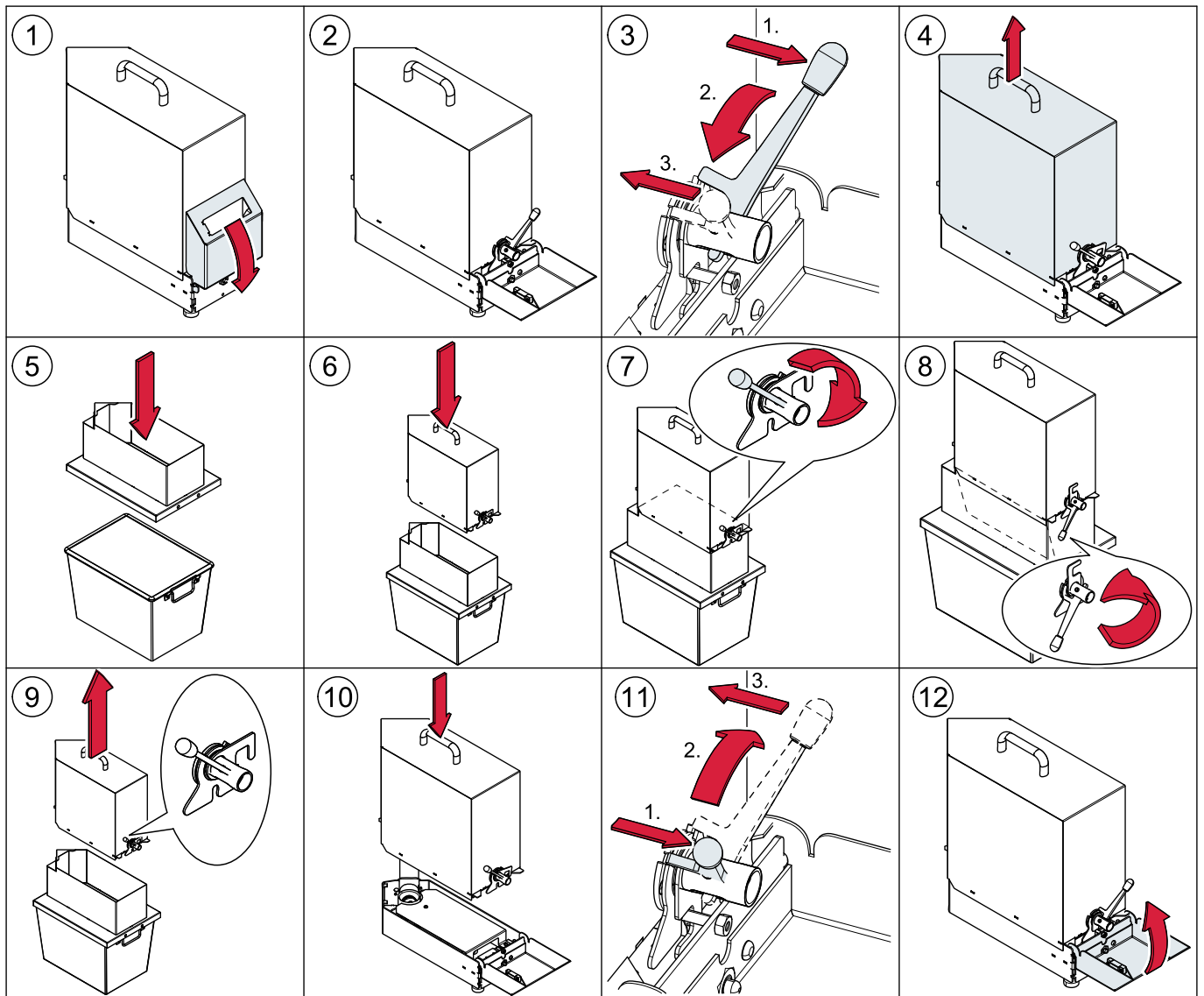
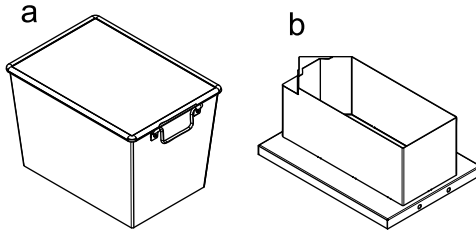
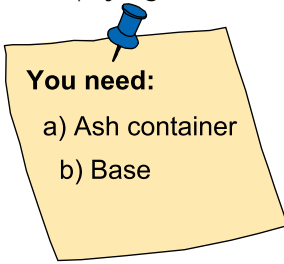
Bring out the ash box immediately.  
Do not dispose ash until it has completely cooled down.  
Empty ash only into a not flammable steel container.  
Do not use the ash container to store waste or other material.  
Do not empty ash onto flammable floors or materials.



**Emptying the ash box**

**Note:**

When the ashbox is full then **Ash!!!** appears on the display with the alarm text **Ash box full**. After emptying and restarting the ash box the alarm text disappears automatically.

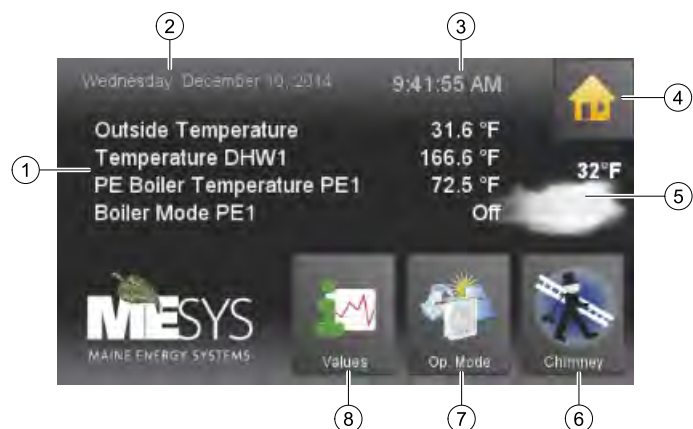


## 9 Operating Device with Touch screen

The Touch operating device is mounted on the control board of Furnace. The 4.7" color display is surrounded by a foil design with logo. With finger pressure you make settings on the Touch operating device.

### 9.1 Opening window

The touch panel is dark during in standby mode. As soon as you touch the surface of the touch, light turns on and displays the opening window.



- 1 Measuring values (adjustable)
  - 2 Date
  - 3 Hour
  - 4 The icon house takes to the main menu
  - 5 Weather
- Note:**  
If there is a malfunction, the corresponding fault message is displayed at this point instead of the weather icon
- 6 Favorite 1 (adjustable)
  - 7 Favorite 2 (adjustable)
  - 8 Favorite 3 (adjustable)

## 9.2 User controls and their function

### 1. Navigation-icons

Icon-view

If you touch an icon, the icon turns green. The green shows that you are currently on this icon. You get to the enabled menu item .

The yellow house enters you directly to the main menu.



The horizontal arrow leads you one step back.



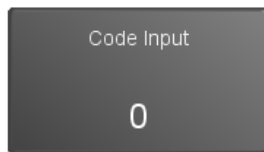
With the blue down arrow you get to additional lines of information on this item. (Down - scroll down).



With the blue up arrow you get to additional lines of information on this item. (Top of page - scroll up)

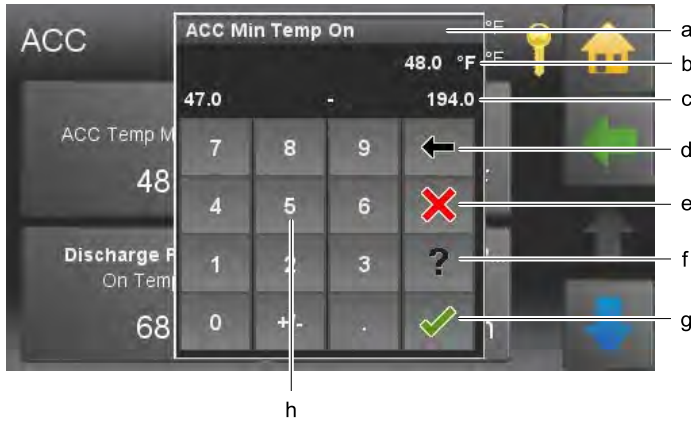


You get to the respective menu item.



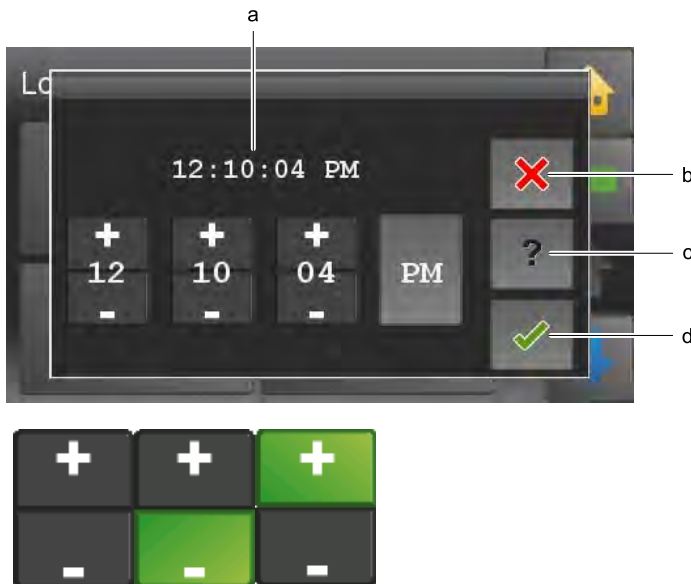
You get to the settings of the parameter. You come either to a numeric keypad, a time / date block or the text selection.

2. Numeric keyboard



- a. Name of parameter
- b. Value of parameter with unit
- c. Min/max value - Values outside this range are not accepted.
- d. Delete input of numbers - per contact you delete one place.
- e. Cancel - You return to the menu item. Input of a new value was not accepted. The original value is.
- f. Help function - inactive
- g. Confirm
- h. Numeric keyboard - used to enter values within the min - max range.

3. Time and date block



- a. Adjustable time or date
- b. Cancel
- c. Help function - inactive
- d. Confirm

With the Plus Minus block you change numbers.

4. Text selection



- a. Name of parameter
- b. Status texts  
The number of status texts depends of the parameter.

Choose a status text. The setup menu closes automatically and the chosen status text is displayed in the menu.

**Note:**

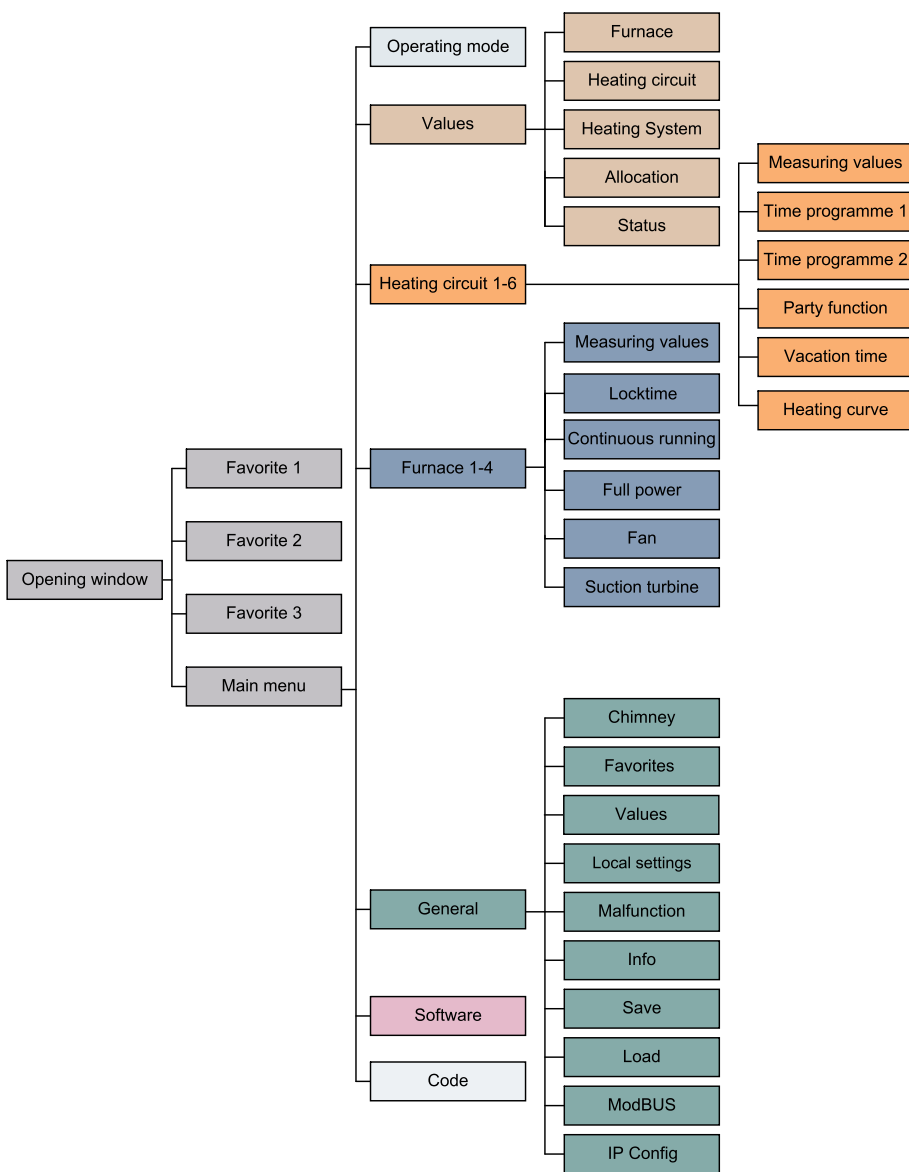
Although a scroll down menu is open, the navigation icons, menu items and parameters behind are active and by touching them it takes you directly there .

## 9.3 Main Menu

In the Main menu you see all submenus. By finger pressure on an icon you reach the respective submenu.



### Menu navigation of Pelletronic Touch

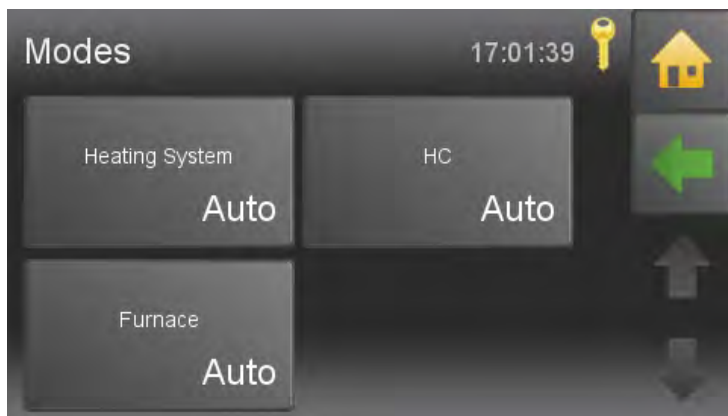


# 10 Mode

In the menu item Mode you can see the mode of your heating system and the mode of the heating circuits.



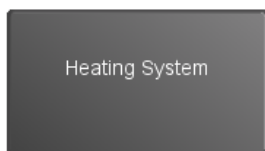
The menu item **Mode** is in the Main menu.



Overview of the operating modes

- Heating Plant
- Heating system 1-6 .
- Furnace

Choose the operating modes and make settings.



**Off**

The adjusted operating mode of the heating circuits is inactive.

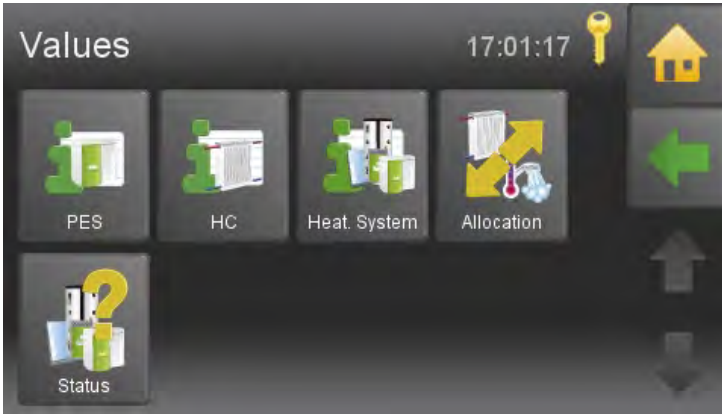
The operating mode heating circuits and Furnace are described in the respective chapters.

# 11 Measuring Values

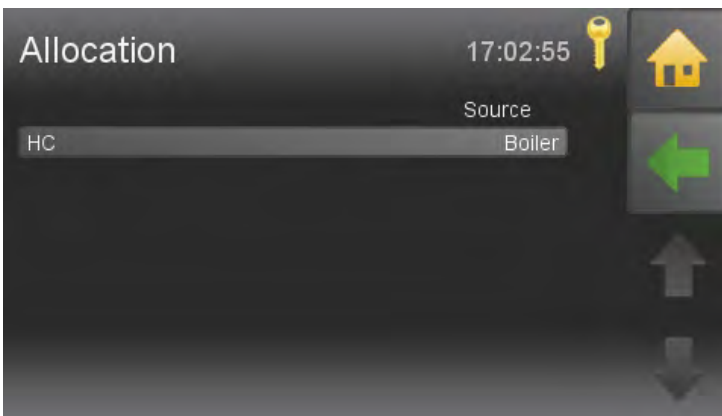
In the menu item of Measuring Values you see all actual and set values of your heating system.



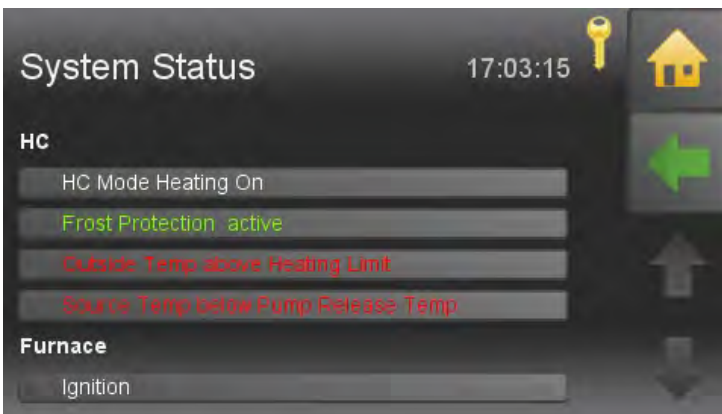
The menu item **Measuring Values** is in the Main menu.



- Furnace
- Heating circuit
- Heating Plant
- Allocation
- Status




In the menu item **Allocation** you see which heating circuits are allocated to the Furnace or to the accumulators.

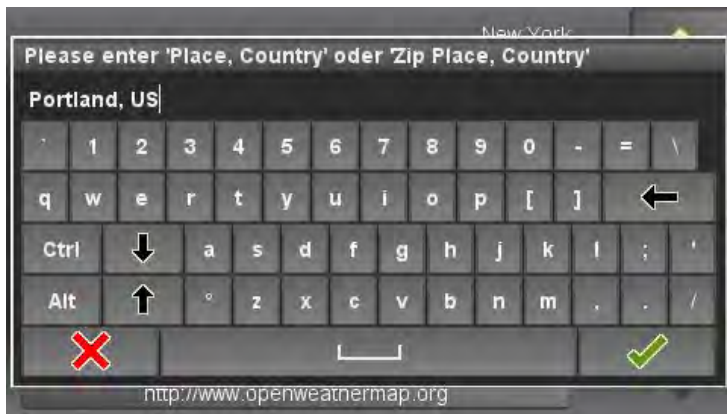


In the menu item **Status** you always have an overview about the whole heating system.

# 12 Weather



Choose **Settings** (  ), to enter your location.



Enter location and country. If the specified location is not found, enter a larger, nearby place.

Search with the following details:

- Postal code, location, country
- Postal code, country
- Location, country



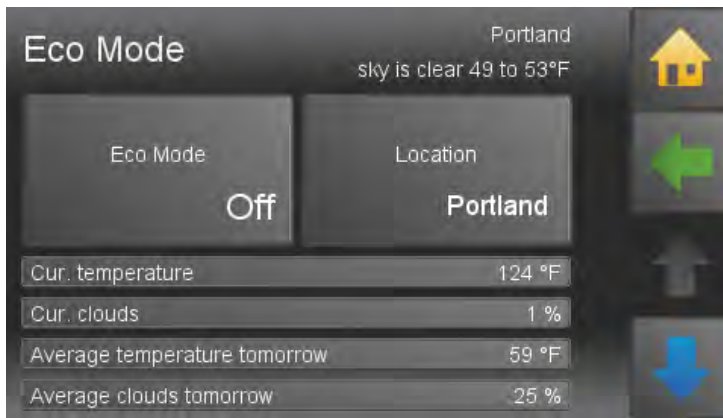
Afterwards, weather data for the next 3 days are downloaded. An icon for the current weather is displayed on the opening window.

**Note:**

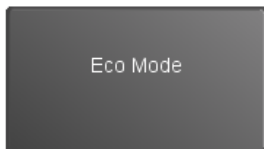
This feature requires an internet connection.



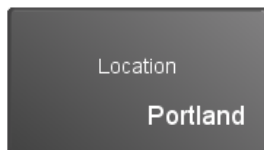
# 13 Eco Mode



With the Eco Mode, the influence of weather forecasts can be defined.



- Off:** Eco mode inactive.
- Comfort:** Set temperature minus 0.9 °F
- Minimum:** Set temperature minus 1.8 °F
- Ecologically:** Set temperature minus 2.7 °F



Enter location and country. If the specified location is not found, enter a larger, nearby place.

Search with the following details:

- Postal code, location, country
- Postal code, country
- Location, country

Afterwards, weather data for the next 3 days are downloaded. An icon for the current weather is displayed on the opening window.

**Note:**

This feature requires an internet connection.

**Cur. temperature**

Current temperature according to forecast.

**Cur. clouds**

Current clouds in % according to forecast.

**Average temperature today / tomorrow**

Calculated temperature for the forecast period

**Average clouds today / tomorrow**

Calculated clouds for the forecast period

**Sunrise / sunset**

Time at sunrise or sunset

**Starttime/ Endtime**

In this time frame, the Eco Mode affects the heating settings.

**Last update**

Time of last update of the forecast.

# 14 Heating Circuit

**Heating Circuit** encloses all for heating relevant parameters and settings. It can occur up to 6 menu items **Heating Circuit**.

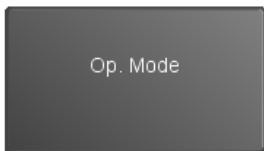


**Heating Circuit** is in the Main menu



Heating circuits settings has following menu items:

- Mode
- Room Temp Heating
- Room Temp Set back
- Time Allocation
- Values
- Time 1
- Time 2
- Party
- Vacation
- Heatingcurve



**Off** Only the frost protection function is active.

**Auto** The Furnace starts in the heating times according to the Set room temperature.

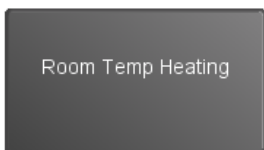
**Heating** The Furnace heats constantly according to the Set room temperature.

**Set back** The Furnace heats constantly according to the Set back room temperature.

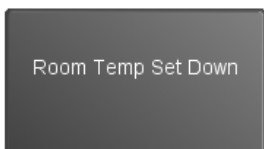
The operating mode of the heating circuits can only be changed if the plant operating mode is set to AUTO.

The adjusted heating limits and maximum flow temperatures are used in all operating modes.

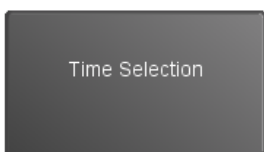
Choose your room temperature (Temperature within the heating times).



Choose Room Temp Set back (= Minimum temperature beyond the heating times).



Activate **Time 1** (= Time programme 1) and **Time 2**.



## 14.1 Measuring values Heating circuit



Measuring values HC is in the Main menu.

Values		9:58:36 AM	
HC			
	Act	Set	
Outside Temperature	-0.3 °C		
Boiler Temperature	24.7 °C	8.0 °C	
Burner Contact	Off		
Existing Boiler	60.5 °C		
Switching Valve	On		
HC1 Flow Temperature	14.3 °C	28.9 °C	
HC1 Pump	On		

You see all to the Heating circuit corresponding measuring values:

- Actual value
- Set value
- Inputs (sensors)
- Outputs (pumps, mixer and motors)

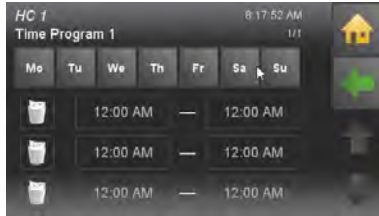
<b>Outside Temperature</b>	actual Outside Temperature
<b>Furnace Temp</b>	actual Furnace Temperature
<b>Existing Furnace</b>	actual Temperature of available Furnaces
<b>Booster</b>	Status (Booster On/Off)
<b>Flow Temp</b>	display of the flow temperature
<b>Room Temp</b>	display of the room temperature
<b>Pump</b>	Status (Pump On/Off)
<b>Mixer</b>	Status (Mixer On/Off)

## 14.2 Time programme Heating circuit

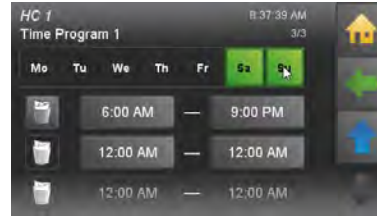
In the heating circuit time programme you fix the heating times.



**Time 1 (=Time programme 1)** and **Time 2** are in the menu Heating circuit.

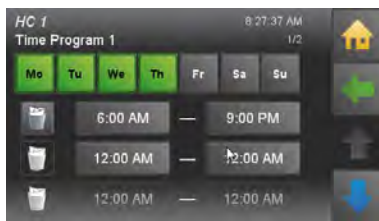


**1** Select Time programme 1

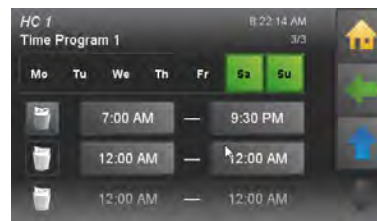


**6** Mo-Fr were assigned heating times

With you get to the remaining days Sa-Su.



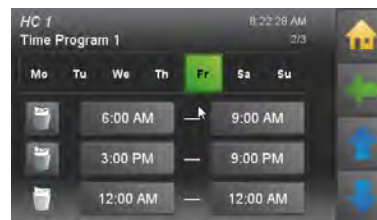
**2** Select the heating days. The activated days are deposited in green.



**7** Sa-Su were assigned to heating times.



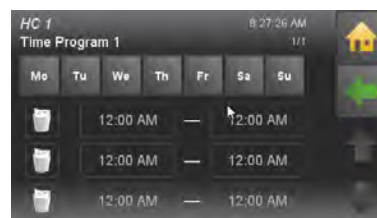
**3** Enter the heating times for these heating days (Mo-Th).



**8** With and you switch between the heating blocks. You can deactivate heating days in the heating block and activate in another.



**4** The heating times for Mo-Th are assigned. With you assign to days heating times further.



**9** With you set all the heating times in the line and below to 0.



**5** Friday was activated. Heating times were assigned.



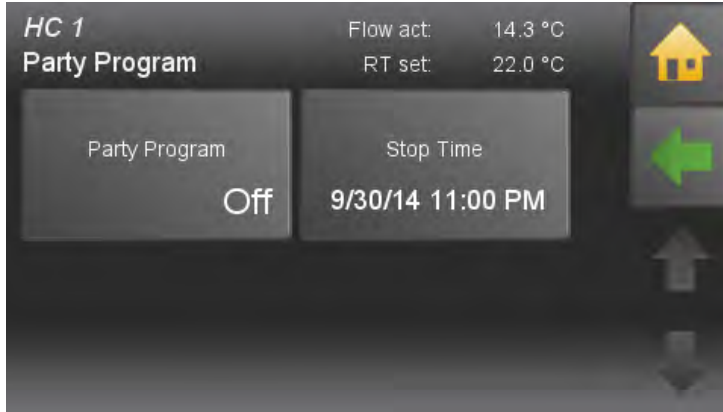
**10** Go back with . Choose Time 2. For every heating circuit there are 2 time programmes. You can programme 2 time programmes. In the menu item **Time Allocation** you can activate time 1 or time 2.

## 14.3 Party

The party function extends the heating time once, without changing the heating times.



**Party** is in the Main menu.



The party function is basically inactive. Enter the time until the room temperature heating should be heated. Activate the Party function. The heating time is extended up to the indicated time. Then the party function deactivates itself automatically.

## 14.4 Vacation

The holiday programme cancels the heating times and heats for the entered period on the set temperature level.



**Vacation** is in the Main menu.



Enter the room temperature on which in your absence the building should be heated. Enter the departure (start time) and return (finish date) and activate the vacation programme.

**Note:**

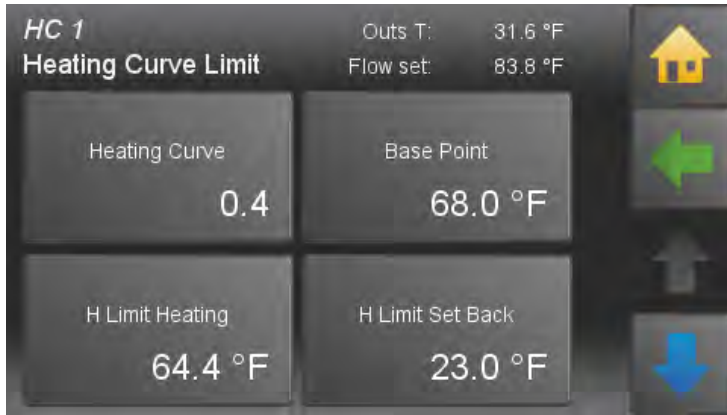
To return in an already tempered building, you must enter the day before the return as the finish date.

## 14.5 Heating curve and Heating limits

By starting up the first time, the authorised technical adviser adjusts the heating curve, the base point and the heating limits on the building situation and the hydraulics. If the Set room temperature is not reached or exceeded, adjust the heat curve with the flow temperatures according to outside temperatures.



Heating curve is in the menu **Heating circuit**.



### Heating curve 0.0 - 4,0

The heating curve describes the combination between outdoor temperature and the associated flow temperature for a heating circuit.

### Base point adjustable from 68 - 113°F

With the change the of base point, you provide a parallel shift of the heating curve.

### H limit heating

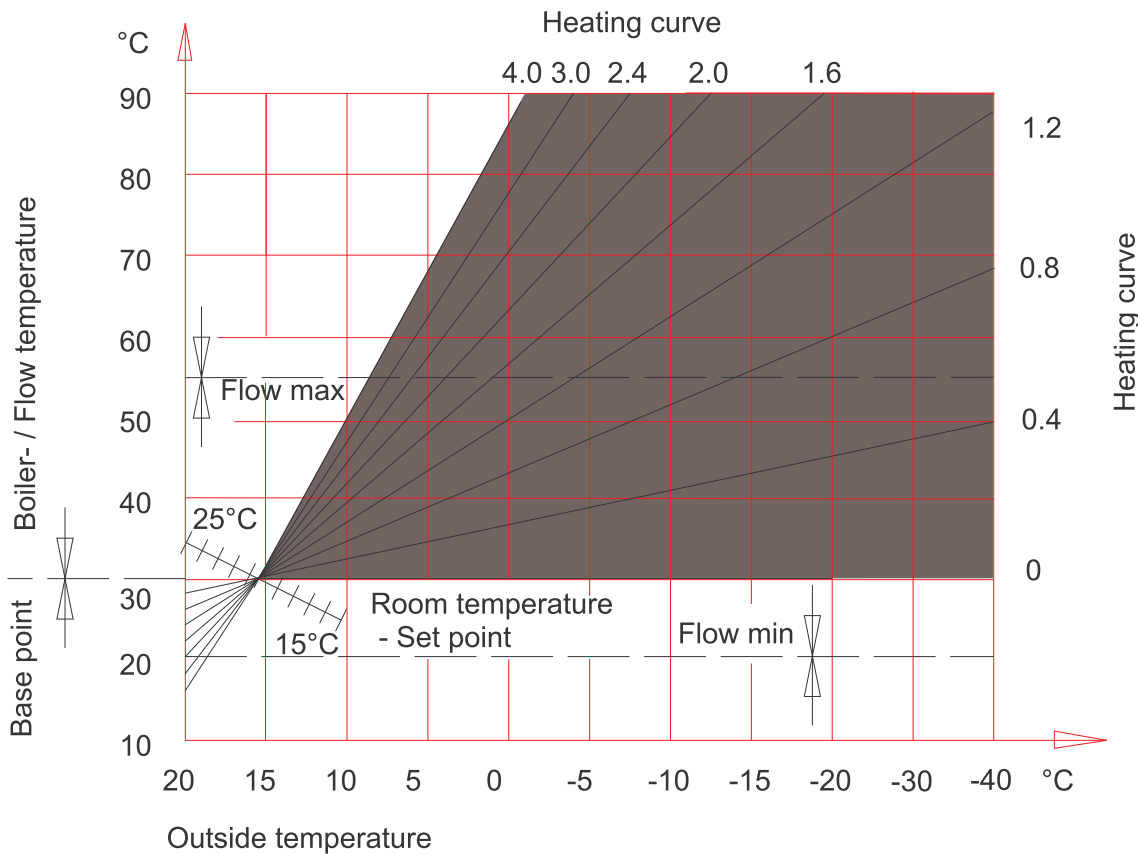
If the average outside temperature is higher than the set temperature, the heating circuit switches off in the heating mode.

### H limit set temperature

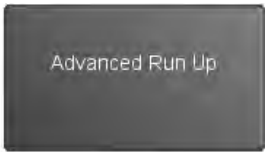
If the average outside temperature is higher than the set temperature, the heating circuit switches off in the Set back mode.

### Adjustment of heating curve and the base point to the building

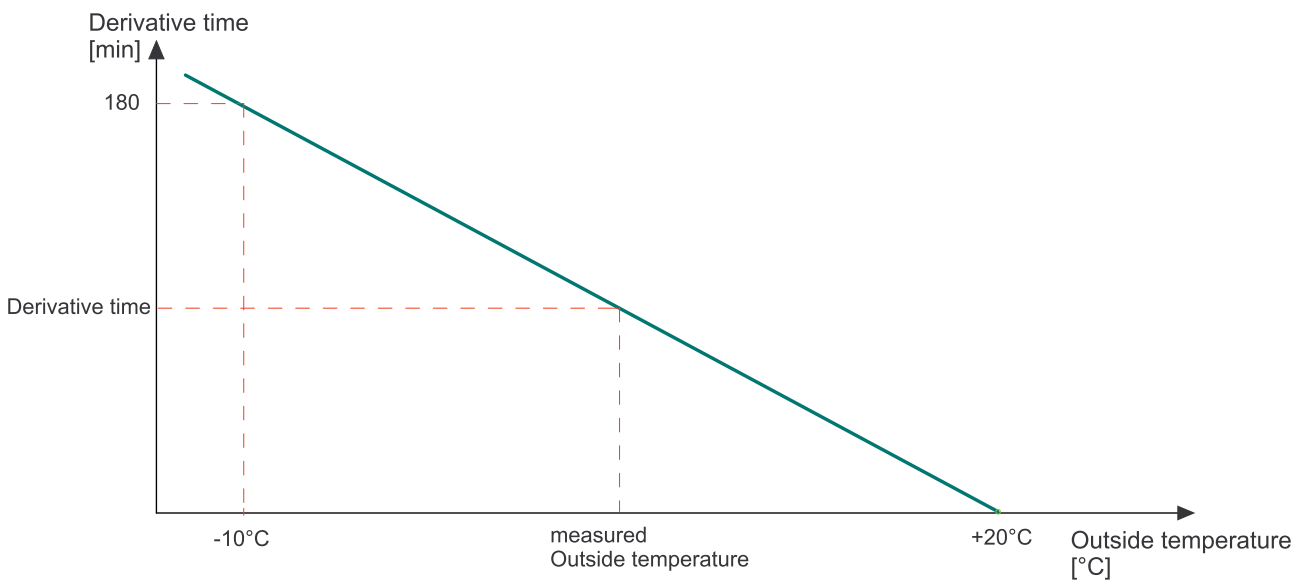
Because of the building's thermal inertia, it is recommended to perform no more than one adjustment step per day.



Daytime outside temp	Room temperature	
	too warm	too cold
+5 to +15°C	Decrease heating curving value by 0,2	Increase heating curving value by 0.2
	Decrease base point value by 5°	Increase base point value by 5°
-20 to +5°C	Decrease heating curve value by 0.2	Increase heating curve value by 0.2



The advanced run up indicates how long the system has to heat before the start of the heating time, to reach the adjusted **roomtemp heating**.



**Room thermostat influence**

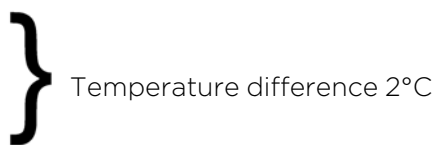
If the measured room temperature deviates from the set room temperature, the heating controller corrects the flow temperature with the Room thermostat influence. The Room thermostat influence indicates how much the flow temperature is raised or lowered so that the Set room temperature is reached.

**Example:**

Room temperature desired value = 20°C

Room temperature actual value = 18°C

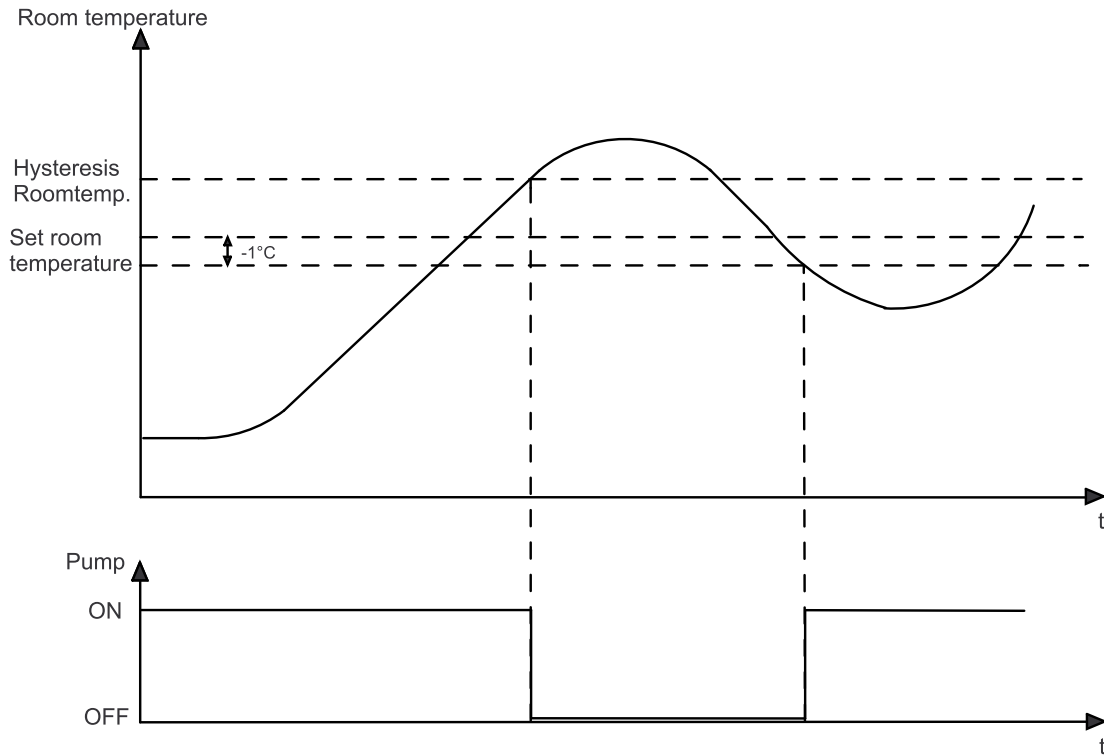
Room sensor influence = 3



<b>Room sensor influence</b>	*	<b>Temperature difference</b>	=	<b>Advanced run up rise/reduction</b>
<b>3</b>	*	<b>2</b>	=	<b>6°C</b>

### Room temperature hysteresis

The Room temperature hysteresis prevents the cycling (On Off On Off...) of the heating circuit pump: If the Set room temperature + room temperature hysteresis is reached, the associated pump stops. If the Set room temperature is  $-1^{\circ}\text{C}$ , the pump switches on again.





# 15 Furnace

Furnace includes all the relevant parameters and settings for the control of the pellet Furnace. There are up to 4 Furnaces possible.



**Furnace** is in the Main menu.



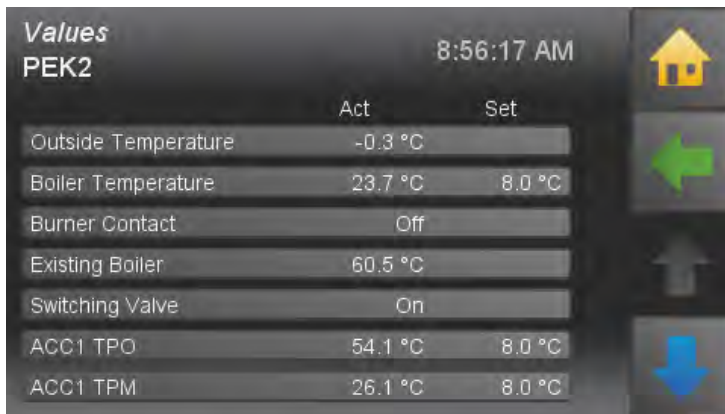
Furnace has following items:

- Operation Mode
- Measuring values
- Locktime
- Continuous running
- Full power
- Filling level
- Fan
- Suction turbine

## 15.1 Measuring values



**Measuring values** is in the menu Furnace.



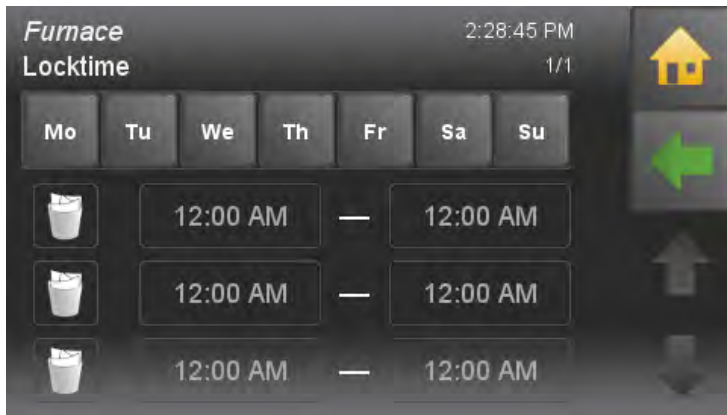
It displays all measuring values of Furnace:

- Actual values
- Set values
- Inputs (sensors)
- Outputs (pumps, mixer and motors)

## 15.2 Locktime



**Locktime** is in the menu Furnace.



## 15.3 Continuous running



**Continuous running** is in the menu Furnace.



First of all, the spring-driven motor opens the fire protection system at the burner- the process takes about 2 minutes.

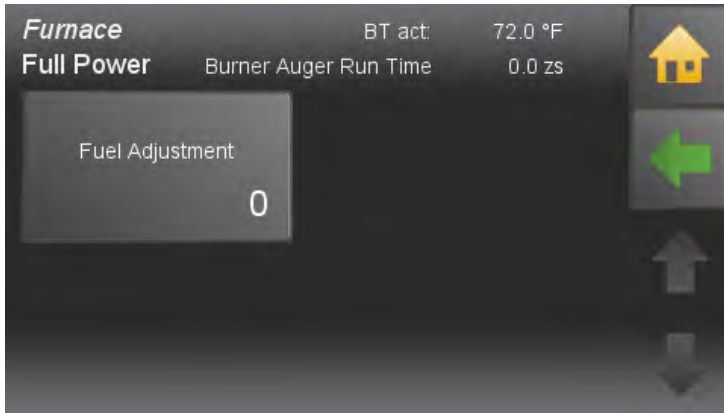
After that the burner motor runs in permanent operation and transports pellets to the burner plate.

If you confirm the query, you activate the function **continuous running**.

## 15.4 Full Power



**Full Power** is in the menu Furnace.



In the menu item Full Power can you adjust the fuel feed.

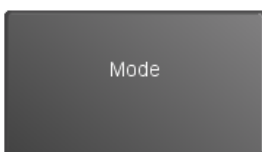
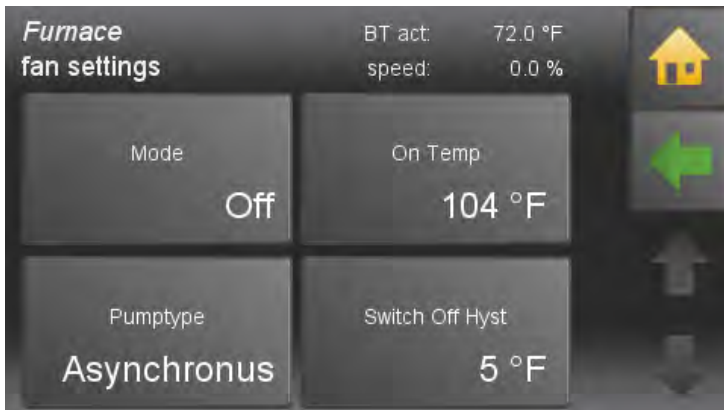
### Fuel Adjustment:

The burner auger run time is calculated automatically by the PLC depending on the rated power and the Furnace setpoint temperature. The burner motor is controlled accordingly. You can reduce or increase the value calculated by the PLC 10 steps up or down.

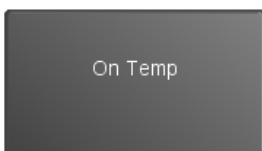
## 15.5 Fan



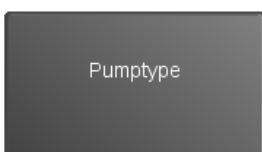
**Fan** is in the menu Furnace.



- Off:** Function fan inactive.
- Auto:** The function of the fan or blower is automatic.
- On:** Function fan active.



When reaching the **On Temp**, the output UW is activated respectively the fan is switched on. The On Temp is the Furnace temperature minimum.



The menu **Pumptype** contains the following entries:

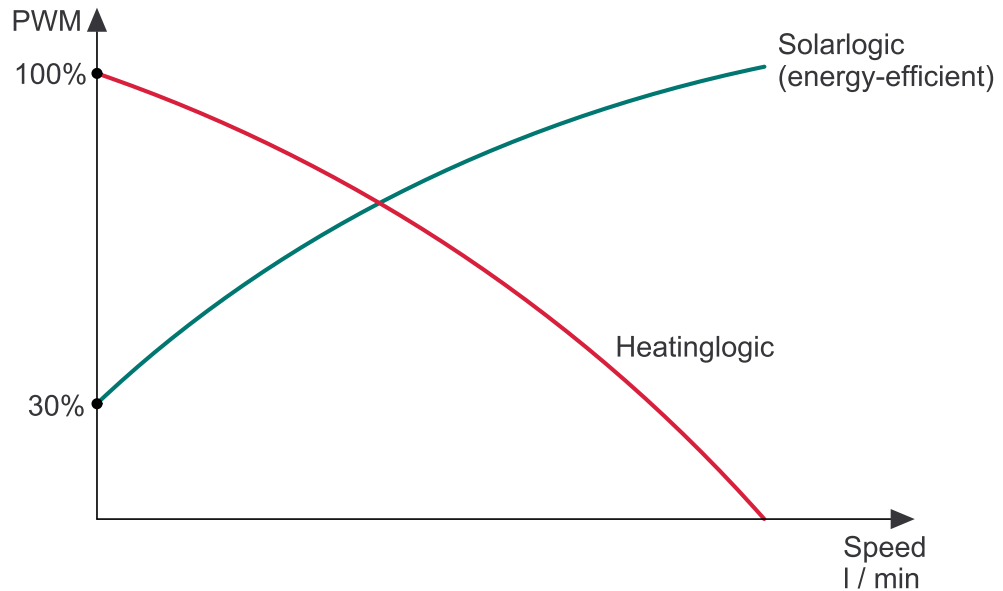
- Asynchronous:** Asynchronous pump - direct output 230VAC on/off
- Async.Regulated:** Asynchronous pump - pulsed output 230VAC
- Heating Efficient:** PWM1 - PWM signal inverted
- Solar Efficient:** PWM2 - PWM direct signal

**Note:**

When using an A-class pump as a **accumulator pump**, the pump can not be regulated from solar circuit 2.

**NOTICE**

Material damage by choosing the wrong pump type.



Switch Off Hyst

The pump switches off after falling below the **On Temp** from minus **Switch Off Hyst**.

Control Range

Is the **Control Range** of output UW at cycling mode. The speed controller starts at the Furnace temperature minimum with a speed of 30% and increases to the Furnace temperature minimum + **Control Range** up to 100% speed.

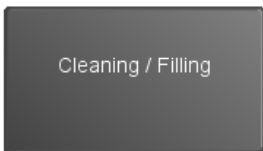
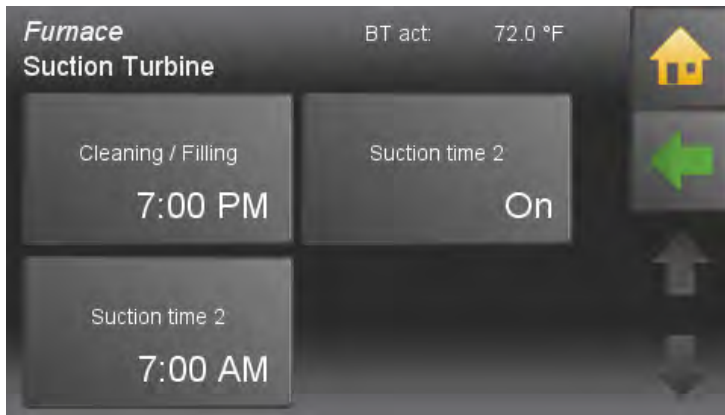
# 15.6 Suction turbine



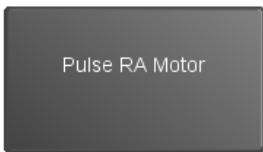
**Suction turbine** is in the menu Furnace.

**Note:**

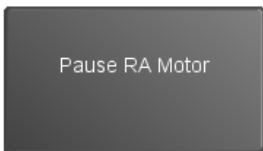
The menu item **Suction turbine** is only visible in suction systems.



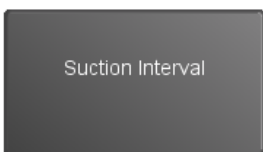
Set a Time (full hours), at which the hopper gets refilled, regardless how full it is at this time.  
At this time, the fire tubes are also cleaned. This time matches the time set in the Cleaning/Filling menu and can be set at either menu.



Frequency for storage room suction systems in pulse mode, only for vacuum systems.



Pause time for storage room extractor motor - suction system in pulse mode. If pause time = 0 then no pulse mode.



Run time of burner auger until next Suction Interval.  
The hopper is filled at this time regardless whether it is empty or not.

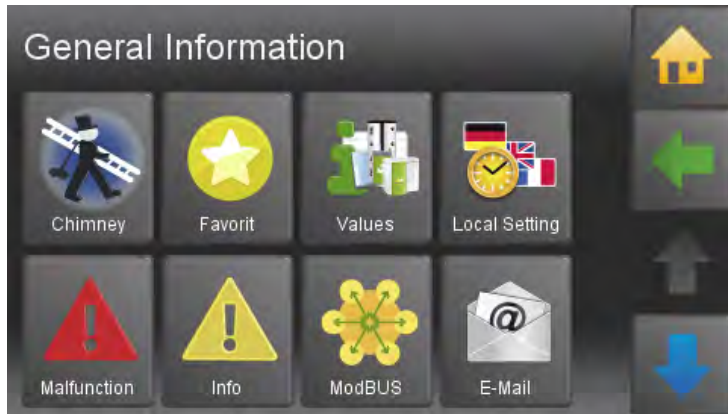
- 175 min = 12 - 20 kW
- 225 min = 25 - 32 kW
- 90 min = 36 - 56 kW

# 16 General

General includes the complete heating control related settings and individual operating options for the customer.



**General** is in the Main menu.



The menu **General** includes:

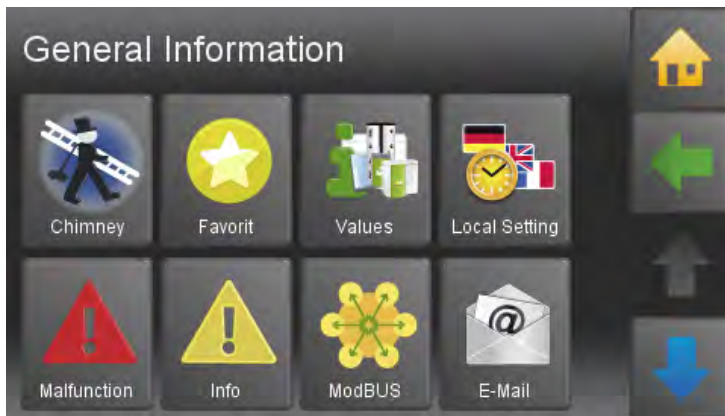
- Chimney
- Favorit
- Values
- Local setting
- Malfunction
- Info
- ModBUS
- E-Mail
- IP Config

## 16.1 Chimney

The function chimney is only for chimney draughts and authorized service technicians. It is used for the measurement of exhaust gas.



The menu item **Chimney** is situated in the menu General.



Please choose the function **Chimney**.

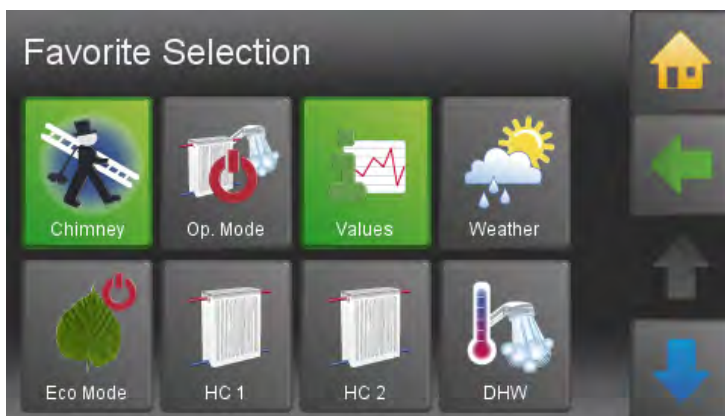


- The Furnace temperature is set to 140 °F for a total runtime of 30 minutes.
- You also can see actual Furnace temperature and the rest of the time limit.
- After the expiry of the time limit the function chimney ends.time of expiry the operation Chimney sweeper ends.
- The button Cancel ends the function Chimney.

## 16.2 Favorite



**Favorite** is in the menu General.



With this function you can display most commonly used menus in the start menu. This enables you a direct access. Select the menu item that should be displayed as a favorite 1 in the Start menu.

The selected item is green and the icon is displayed in the Start menu and is active.

## 16.3 Local Settings

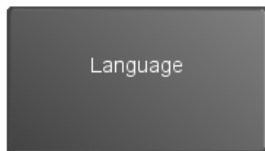


**Local Settings** is in the menu General.

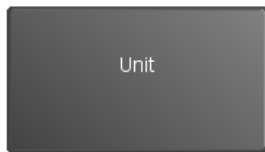


Local Settings has following menu items:

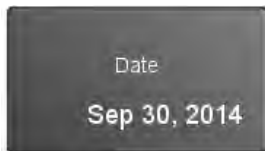
- Language
- Unit
- Date
- Time



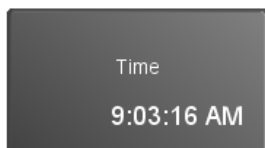
Choose between the languages German, English UK, English U.S. French, Spanish, Italian, Dutch, Danish and Russian.



You can choose between isometric and imperialist number system.



Set the current date.



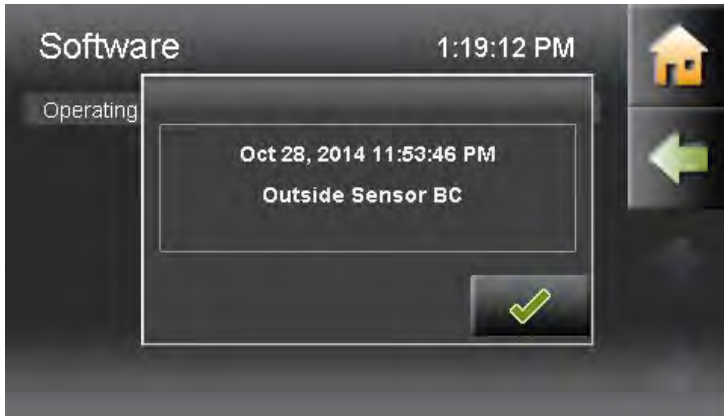
Set the current time.



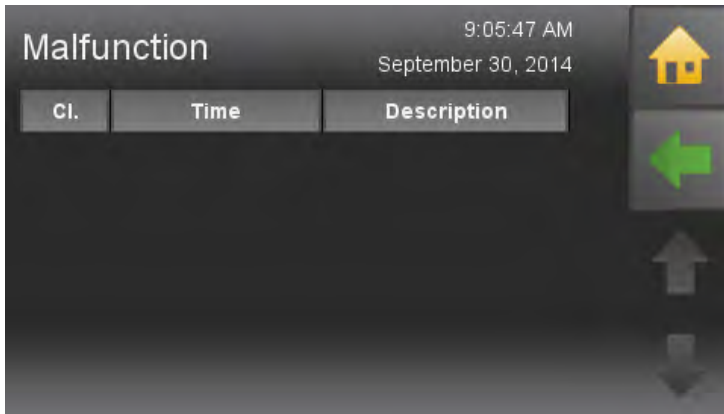
## 16.4 Malfunction



**Malfunction** is in the menu General.



Fault messages can be overlaid on all menu items and appear immediately if a fault occurs. Every fault message appears with the date, time and name on the display. It remains until it is acknowledged.



The menu remains the fault incident reports, as long as they are corrected up.

## 16.5 Information



**Information** is in the menu General.

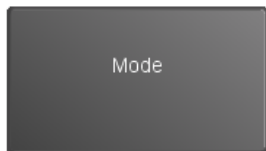
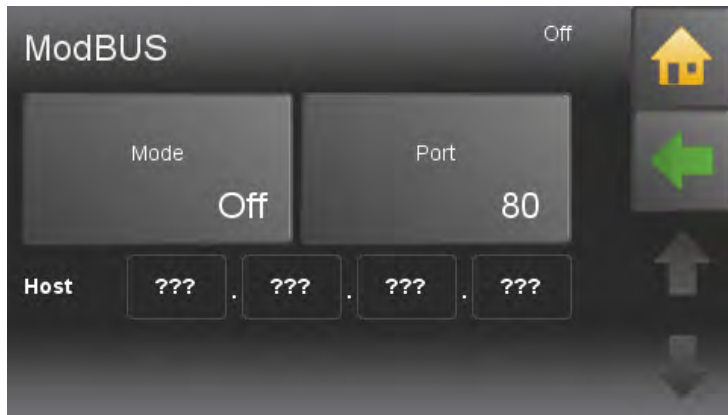


In the menu item information are all faults listed chronologically.

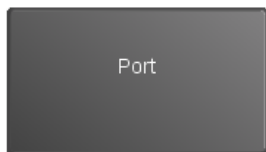
The fault texts have 3 status

- C.....COME — when the fault occurs
- Q.....QUIT — when the fault has been rectified
- G.....GONE — when the fault has been reset by pressing ENTER

## 16.6 ModBUS

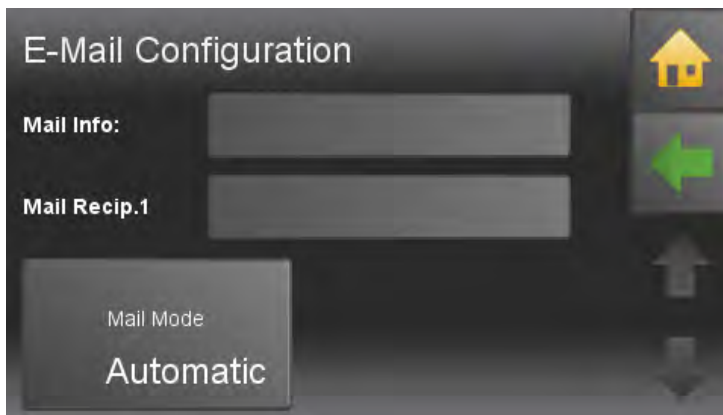


**Off**  
**TCP Server**



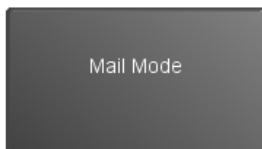
Defaultport for ModBUS is 502.

## 16.7 E-Mail

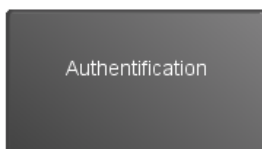
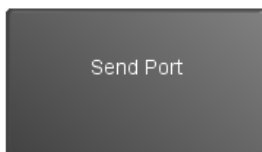


Delivery of disturbance-emails is done through an Maine Energy system server.

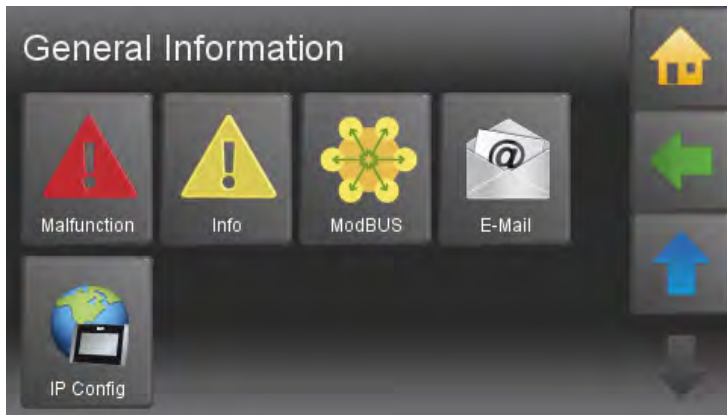
Only the recipient address needs to be configured.



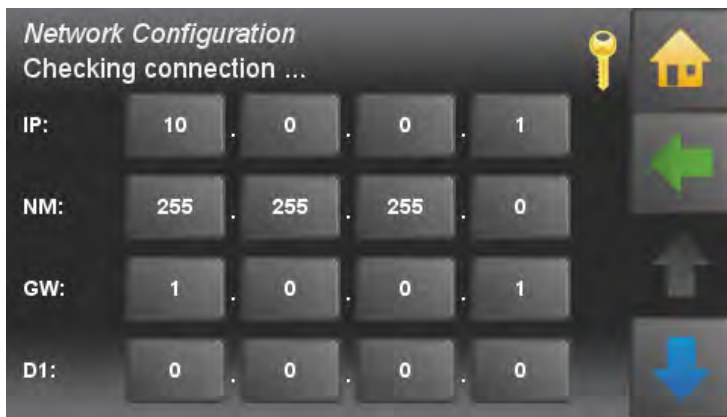
To ensure maximal flexibility, E-mail settings can set individually.



## 16.8 IP Config



Please choose the submenu item **IP Config** in the menu General.



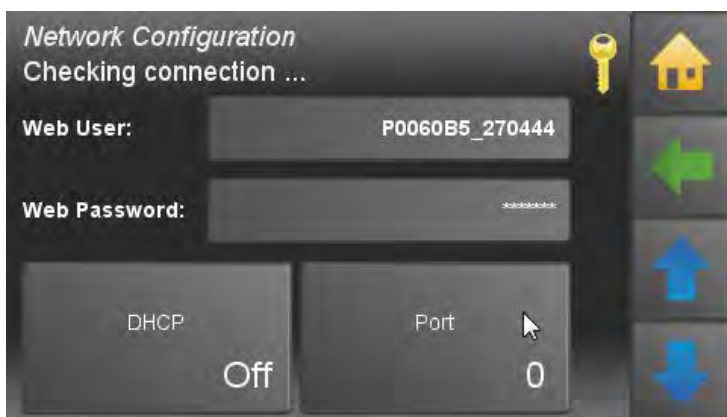
Insert the **IP (Address)**, **NM (Netmask)** and **GW (Gateway)**, D1 (in most cases similar to GW) and **D2 (optional)**.

**IP:** IP address in the local network

**NM:** Networkmask is required in the local network.

**GW:** The gateway enables the touch operating device the access to the internet.

**D1, D2:** Server, which provide routing information



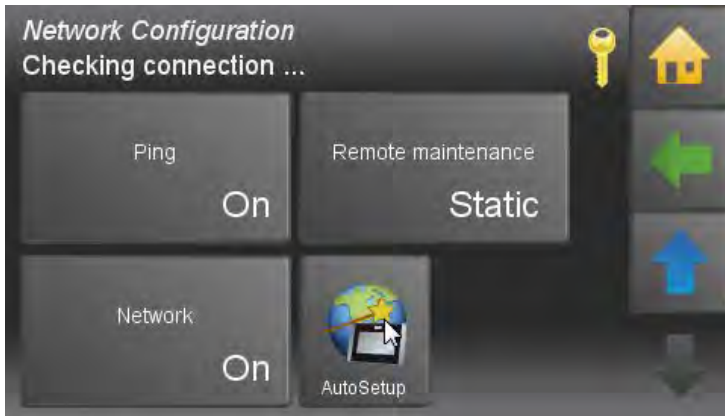
Set **DHCP On** or **Off** depending on your network.

Enter the **Port** (Default **80**).

**Web:** IP address in local network

**Web User:** Networkmask is required in local network

**Web Password:** The gateway enables the touch operating device the access to the internet.



Activate optionally the **Ping** function.

NOTICE

To prevent the modem from switching into standby mode, a ping command is executed every 10 minutes.

**You get the data from your network technician.**

Configuration

This menu item is only active when a compatible USB wireless adapter is connected. (not every wireless stick works with the Touch operating device)  
By default, this item is hidden and located in LAN mode.  
If the wireless mode is enabled, a password box appears.

DHCP

Dynamic address assignment on the local network (should be disabled if possible).

WiFi

If a WLAN stick is recognized and supported, an Additional LAN & WLAN button appears.

Password

Password of router.

Port  
0

Address extension with which the touch remote control is accessible.  
In principle, you can make your own choice, certain ports are associated with special services, e.g. 25 Mail, 80 Web and so on.

Ping

The ping prevents the internet connection from being closed by the router. Therefore a query to the Maine Energy Systems server is started at certain time intervals.  
So the router detects that the connection is still active.

Remote maintenance

**Automatic** This will attempt to automatically set up the router using the UPNP protocol port forwarding.  
If this service is disabled on the router or doesn't work properly, it is canceled accompanied by an appropriate error message.  
As this function is time-consuming (may take a few minutes), it is running in the background. Whatever the UPNP  
If available, the Touch operating device registers on the Maine Energy Systems remote control server with its current external IP Address.  
In case of change of address by the external provider, this is detected and sent to the server Maine Energy Systems.

**Manual** In this mode, the port forwarding must be set manually. (for lack of UPNP)

The port of the touch panel must correspond to the external shared port.

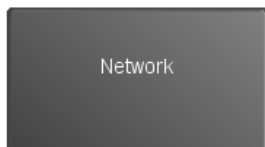
The touch then registers with the external IP address and port on Ök-oFEN remote maintenance server.

In case of change of address by the external provider, this is detected and sent to the Maine Energy Systems server.

### Static

In this mode, no connection data is transferred to the Maine Energy Systems server and the online service of Maine Energy Systems can not be used.

But the remote controll of the Touch operating device remains active and can be uses as before via port forwarding, DynDns, fixed external IP, LAN and so on.



All functions for the network/internet can be disabled here.

### Remote maintenance access



This function determines the network settings automatically.

For this the DHCP mode is activated and the required settings are set automatically.

Afterwards DHCP is deactivated.

Because of this, the IP address of the control unit can change.

The settings are set as follows:

- DHCP Off
- Ping On
- Port 8080
- Remote maintenance: Automatic

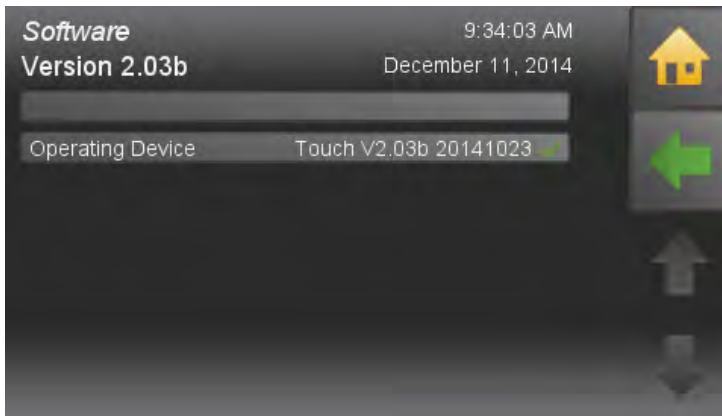


Back to the menu **General**.

# 17 Software



**Software** is in the Main menu.



**Software** shows you the name of the current software.

# 18 Maintenance and servicing

Regular checks of the pellet heating system are a prerequisite for reliable, efficient and environment-friendly operation.

## NOTICE

This wood heating appliance needs periodic inspection and repair for proper operation. It is against federal law to operate this wood heating appliance in a manner inconsistent with operating instructions in the manual.

## 18.1 Cleaning the Furnace every year

## NOTICE

The pellet Furnace is equipped with an automatic cleaning system that cleans the heat exchanger every day. In addition, you need to clean the Furnace manually once a year before the start of the heating season.

## NOTICE

Cleaning of the pellet Furnace has to be performed from a authorized service technician at least every third year.



## WARNING

### Risk of burns

Do not clean the Furnace until it has been allowed to cool down.  
Switch off the heating system at least 6 hours before opening the Furnace.  
Switch off the main switch before starting any maintenance work on the system.



## CAUTION

Risk of cut injuries due to sharp edges  
Use gloves.



## CAUTION

INSPECT FLUE PIPES, FLUE PIPE JOINTS, AND FLUE PIPE SEALS REGULARLY TO ENSURE THAT SMOKE AND FLUE GASSES ARE NOT DRAWN INTO, AND CIRCULATED BY, THE AIR CIRCULATION SYSTEM



## CAUTION

CLEANOUT OF THE HEAT EXCHANGER, FLUE PIPE, CHIMNEY, AND DRAFT INDUCER, IF USED, IS ESPECIALLY IMPORTANT AT THE END OF THE HEATING SEASON TO MINIMIZE CORROSION DURING THE SUMMER MONTHS, CAUSED BY ACCUMULATED ASH

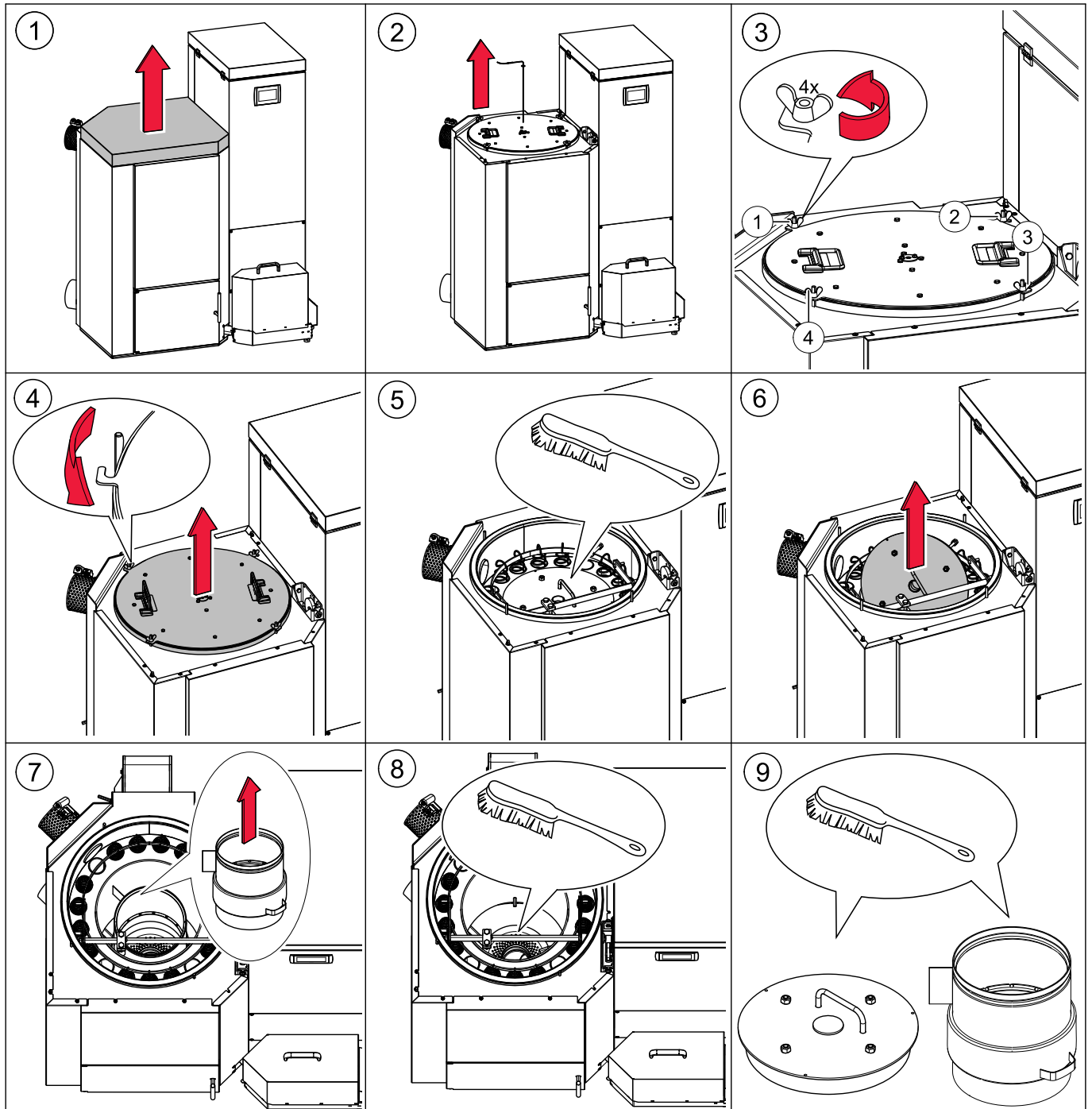
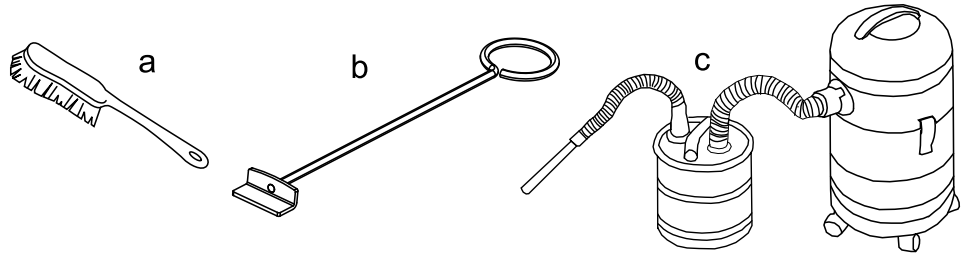


**Note:**

Check first of all, if all seals are in a good condition and the doors closes tightly.

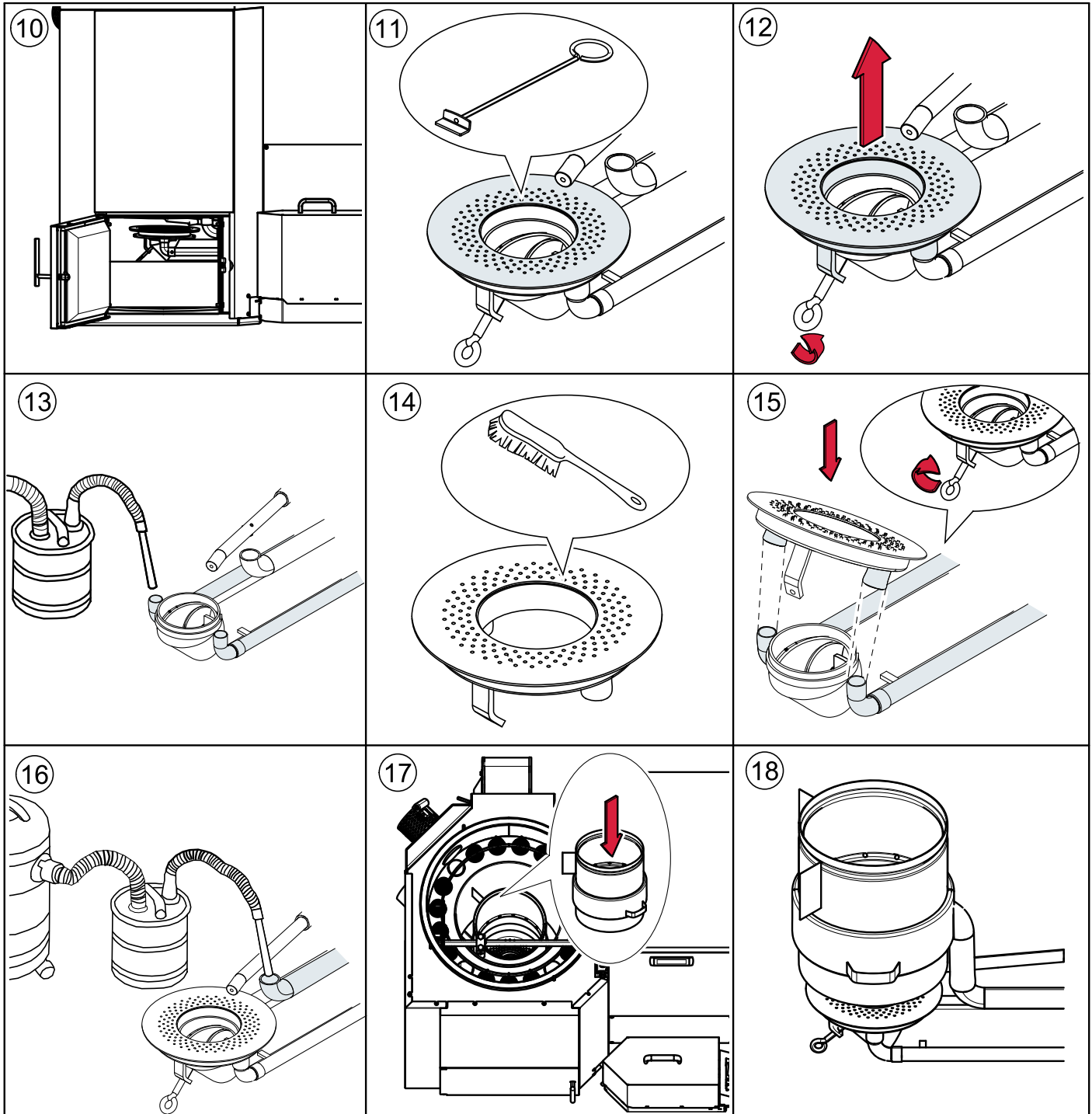
**Procedure for cleaning the Furnace**

**You need:**  
 a) Brush  
 b) Poker  
 c) Vacuum cleaner with ash filter



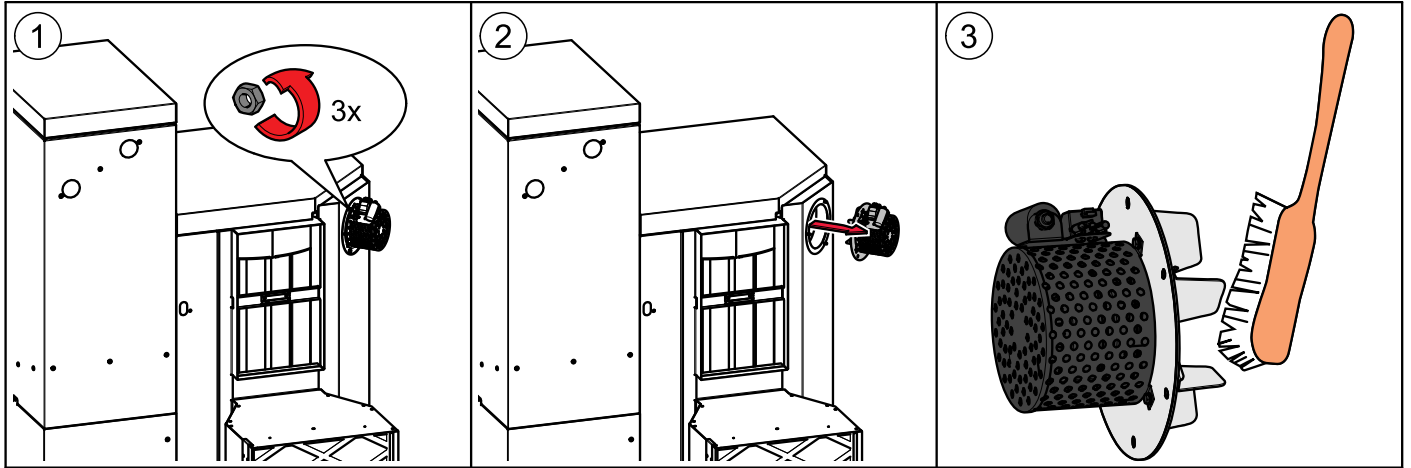
## NOTICE

Reduction in Furnace performance and damage to pellet Furnace due to blockages in the air inlet  
Clean the air intakes, the burner plate and the flame tube.



### Note:

The individual parts of the multi segmented brazier may not be in raised position!

**Cleaning the Induced draft blower:****18.2 Maintenance intervals**

We recommend taking out a maintenance contract with your service technician.

**18.3 Repairs**

Only authorised specialists may carry out repair work on this system. Use original spare parts only. Not using original spare parts will cause the warranty to become void.

**18.4 Checking the Furnace room and storage room**

Checking the pellet heating system regularly prevents malfunctions and unexpected failure of the heating system.

**Furnace room**

Make sure that no flammable materials are stored in the Furnace room.

Make sure that no washing is hanging in the Furnace room.

Check the display on the control panel for malfunction messages.

Check the flue gas tube and chimney. Clean it regularly.

Maintenance clearances as given in Installation Manual must be observed at all times.

Do not store fuel or any other materials within these clearances.

**Storage room****DANGER****Risk of suffocation**

Ventilate the pellet storage room sufficiently before entering.  
Switch off the heating system before entering.

Check the level of pellets in the textile tank and order more pellets in good time.

## RESIDENTIAL LIMITED WARRANTY

**What this Warranty Covers & Who it Applies to:** The limited warranty provided by **Maine Energy Systems LLC** (“MESys”) applies only to MESys brand boilers, furnaces, wood pellet burners and accessories (“Product”) sold to you, the first user and purchaser provided that the Product was purchased: (1) for your normal, household (non-commercial) use, and has only been used for normal household purposes; (2) new at retail (not a display, “as is”, or previously returned model) and not for resale, or commercial use; and (3) within the United States. Products installed in a building other than a one or two family residential dwelling are not covered, under this Warranty unless individual Boilers are installed for each dwelling unit. Please return your registration card; while not necessary to establish warranty coverage, it allows MESys to be able to notify you in the unlikely event of a safety issue.

**How Long this Limited Warranty Lasts:** This Limited Warranty has three time frames, depending on the particular Product component involved.

(1) MESys warrants that the burner, ignition, electric and electronic parts, flame tube and burner plate, chains, bearings, chain pinions, and all other moving components of the Product are free from defects in materials and workmanship for a period of *two (2) years from the date of initial operation or 6,000 operating hours, whichever comes first*, provided they are installed and properly maintained by a qualified heating contractor and the other conditions of this warranty are met, and

(2) *In addition*, all other parts including the boiler vessel, or heat exchanger in furnaces, are warranted to be free from defects in materials and workmanship for a period of *five (5) years from the date of initial operation or 15,000 operating hours, whichever comes first* provided it is installed and properly maintained by a qualified heating contractor and the other conditions of this warranty are met; and

(3) *In addition* thereafter, MESys warrants that the boiler vessel is free from defects in materials and workmanship on a prorated basis follows, provided it is installed and properly maintained by a qualified heating contractor and the other conditions of this warranty are met:

*For the next five (5) years (years 6 through 10) or a maximum of 30,000 operating hours, whichever comes first*, the boiler vessel is warranted for 75% of the then retail parts cost; and thereafter

*For the next ten (10) years (years 11 through 20) or a maximum of 60,000 operating hours, whichever comes first*, the boiler vessel is warranted for 50% of the then retail parts cost.

*For the next ten (10) years (years 21 through 30) or a maximum of 90,000 operating hours, whichever comes first*, the boiler vessel is warranted for 25% of the then retail parts cost, which may be used to replace the boiler vessel, or used as a credit toward a new boiler system, at MESys’ discretion.

Labor is not covered under this limited warranty. During the pro-rated warranty period, the customer is responsible for payment of the remaining portion of the then retail cost.

The warranty period begins to run upon the date of initial operation, and shall not be extended for any reason whatsoever. This limited warranty does not cover labor and shipping costs, non-MESYS components, serviceable items or normal maintenance, nor the other items and events excluded below.

**Terms of Limited Warranty:** MESys will provide replacement parts for any component that proves to be defective in materials or workmanship (excludes labor charges) within the periods set forth above, or replace it with the most comparable model available from MESys at the time of the replacement, provided that the purchaser pays for the other portion of the prorated charge set forth above if applicable. The proportionate charge is based on the current list price of the boiler vessel involved in the warranty claim (or the nearest comparable MESys model). The foregoing timelines begin to run upon the date of initial operation, and shall not be stalled, tolled, extended, or suspended, for any reason whatsoever.

**Repair/Replace as Your Exclusive Remedy:** During this limited warranty period, MESys or one of its authorized service providers will provide replacement parts for your Product or replace it with the most comparable model then available from MESys at the time of the replacement (subject to certain limitations stated herein,) if your Product proves to have been manufactured with a defect in materials or workmanship. All removed parts and components shall become the property of MESys at its sole option. All replaced and/or repaired parts shall assume the status of the original part for purposes of this

warranty and this warranty shall not be extended by the replacement of such parts. MESys's sole obligation hereunder is to provide replacements for defective Product to a MESys-authorized service provider during normal business hours. For safety and property damage concerns, MESys highly recommends that you do not attempt to repair the Product yourself, or use an un-authorized servicer; MESys will have no responsibility or liability for repairs or work performed by a non-authorized servicer. If you choose to have someone other than an authorized service provider work on your Product, THIS WARRANTY WILL AUTOMATICALLY BECOME NULL AND VOID. Authorized service providers are those persons or companies that have been specially trained for customer service and technical ability (note that they are independent entities and are *not* agents, partners, affiliates or representatives of MESys).

**Warranty Exclusions:** The warranty coverage described herein excludes all defects or damage that are not the direct fault of MESys, including without limitation, any one or more of the following: (a) use of the Product in anything other than its normal, customary and intended manner (including without limitation, any form of commercial use or use that is not for personal, family or household purposes); (b) any party's willful misconduct, negligence, misuse, abuse, accidents, improper operation, failure to maintain, improper or negligent installation, tampering, failure to follow operating instructions, mishandling, unauthorized service (including self-performed "fixing" or exploration of the appliance's internal workings); (c) adjustment, alteration or modification of any kind; (d) a failure to comply with applicable state, local, city, or county electrical, plumbing and/or building codes, regulations and laws, including failure to install the product in strict conformity with local fire and building codes and regulations; (e) ordinary wear and tear; (f) any external, elemental and/or environmental forces and factors, including without limitation, lightning strikes, voltage spikes, flues that do not meet specified standards, fire, floods, rain, windstorm, floods, fires, mud slides, freezing, excessive moisture or extended exposure to humidity, power surges, building structural failures and acts of God; (g) any damage or failure resulting from contaminated air, including but not limited to sheetrock particles or other dirt or dust, introduced into the Boiler; (h) damage or failure resulting from hard water scale build-up on the heat exchanger waterways; (i) use with insufficient water or operation with water or fuel additives that cause deposits or corrosion; and (j) use with oxygen permeable tubing or other components. In no event shall MESys have any liability or responsibility whatsoever for damage to surrounding property and other structures or objects around the Product. Also excluded from this warranty are scratches, nicks, minor dents, and cosmetic damages on external surfaces and exposed parts; Products on which the serial numbers have been altered, defaced, or removed; service visits to teach you how to use the Product, or visits where there is nothing wrong with the Product; correction of installation problems (you are solely responsible for any structure and setting for the Product, including all chimneys, flues, electrical, plumbing or other connecting facilities, for proper foundation/flooring, and for any alterations); and resetting of breakers or fuses.

**TO THE EXTENT ALLOWED BY LAW, THIS WARRANTY SETS OUT YOUR EXCLUSIVE REMEDIES WITH RESPECT TO PRODUCT, WHETHER THE CLAIM ARISES IN CONTRACT OR TORT (INCLUDING STRICT LIABILITY, OR NEGLIGENCE) OR OTHERWISE. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, WHETHER EXPRESS OR IMPLIED. ANY WARRANTY IMPLIED BY LAW, WHETHER FOR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE, SHALL BE EFFECTIVE ONLY FOR THE PERIOD THAT THIS EXPRESS LIMITED WARRANTY IS EFFECTIVE OR THE IMPLIED WARRANTY PERIOD, WHICHEVER IS LESS. IN NO EVENT WILL MESYS BE LIABLE FOR CONSEQUENTIAL, SPECIAL, INCIDENTAL, INDIRECT, "BUSINESS LOSS", AND/OR PUNITIVE DAMAGES, LOSSES, OR EXPENSES, INCLUDING WITHOUT LIMITATION TIME AWAY FROM WORK, HOTELS AND/OR RESTAURANT MEALS, EXPENSES IN EXCESS OF DIRECT DAMAGES DEFINITELY CAUSED EXCLUSIVELY BY MESYS, OR OTHERWISE ARISING. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, AND SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS, WHICH VARY FROM STATE TO STATE.**

The customer is responsible for the costs of:

- Components which have been replaced but found not to have been defective;
- Faulty installation;
- Normal maintenance; and
- Equipment used contrary to the installation manual.

The required information that must be furnished to MESYS for a claim under this Limited Warranty includes:

- Model number and serial number of the Product;
- Date the Product was installed and placed in operation, the location, the name of the installer;
- Date the Product component failure was reported; and

- Description of condition that prompted the report.

No attempt to alter, modify or amend this warranty shall be effective unless authorized in writing by an officer of MESYS.

**To Obtain Warranty Service, Please Contact**

**Maine Energy Systems, LLC (“MESys”)**

8 Airport Road, P.O. Box 547, Bethel, Maine 04217

Tel: 207.824. 6749 Fax: 207.824.4816

[info@maineenergysystems.com](mailto:info@maineenergysystems.com)

Limited Warranty Boiler Resid 1-31-2013 REV  
6/13/2013 3:46 PM

## General Information

As required by the United States Environmental Protection Agency the following information is given for the: AutoPellet Air 28 wood pellet fired central heating Warm Air Furnace. Manufactured by Maine Energy Systems, of 8 Airport Road, Bethel, Maine, 04217

- The AutoPellet Air 28 has a thermal output levels from 4 kW or 17,000 btu/h to 95,000 btu/h and complies with EPA 2020 requirements.
- This wood heater has a manufacturer-set minimum low burn rate that must not be altered. It is against federal regulations to alter this setting or otherwise operate this wood heater in a manner inconsistent with operating instructions in this manual.
- Complete installation information is found in the Installation Manual.
- Although operational information is elsewhere in this manual, there are specific concerns for correct operation that can directly affect the emissions profile of this equipment. It is therefore necessary that we mention these important points.
- Fuel loading and selection. Your AutoPellet Air 28 is equipped with completely automatic fuel loading. Thus, other than selecting the correct fuel, there are no loading instructions as such. Fuel selection is straight forward.

Only PFI Premium 100% wood pellets should be used in your boiler.

- Among the materials that are specifically prohibited to be burned in your AutoPellet Air 28 are: trash, plastics, gasoline, rubber, naphtha, household garbage, material treated with petroleum products such as particleboard, railroad ties, and pressure treated wood.

Burning these materials may result in release of toxic fumes or render the boiler ineffective and cause smoke.

- Your AutoPellet Air 28 is completely automatic ignition as well as the loading as before mentioned.

There are therefore no starting procedures to be followed. The boiler correctly starts itself when required by building load.

- There are no user adjustments required for the air controls on your AutoPellet Air 28.
- It is important to have your AutoPellet Air 28 serviced by a trained professional who is aware of the importance to ensure that there are no inlet air restrictions in or around your boiler's combustion blower. And that the air passages within your boiler are free of debris, (creosote, ash, etc.) The flue pipe and chimney are also clean and free of debris / restrictions. And that the combustion chamber door seal is airtight when the door is closed and secured.
- Ash removal is also completely automatic on your AutoPellet Air 28. Ashes should be placed in a metal container with a tight-fitting lid.



The closed container of ashes should be placed on a noncombustible floor or on the ground, away from all combustible materials, pending final disposal. The ashes should be retained in the closed container until all cinders have thoroughly cooled.

When cooled ashes can be disposed of on your lawn, garden or local transfer station.

Your AutoPellet Air 28 is not a catalytic type burner.

- A person or persons responsible for the operation of a warm air furnace must comply with all applicable laws or other requirements, such as State laws or regulations as well as local ordinances.
- A person or persons operating a warm air furnace should be aware that they are responsible for operation in such a manner that does not create a public or private nuisance condition. The Manufacturer's distance and stack height recommendations and the requirements in any applicable laws or other requirements may not always be adequate to prevent nuisance conditions due to terrain or other factors.
- Your AutoPellet Air 28 should be installed with a minimum stack height of 16 feet. Providing correct draft as given in the Installation manual.
- Draft is the force which moves air from the appliance up through the chimney. The amount of draft in your chimney depends on the length of the chimney, local geography, nearby obstructions and other factors. Too much draft may cause excessive temperatures in the appliance and may damage the catalytic combustor. Inadequate draft may cause backpuffing into the room and 'plugging' of the chimney. Inadequate draft will cause the appliance to leak smoke into the room through appliance and chimney connector joints and an uncontrollable burn or excessive temperature indicates excessive draft.
- The efficiency of your AutoPellet Air 28 running at full power is >86%.
- This is the result of a laboratory test and was measured using the HHV of the fuel used.
- You should never operate a combustion appliance of any type in your home without there being a properly installed smoke and CO detector.

Your local fire department usually has good advice on placement of these detectors and how many your home may need for complete coverage.



**MESys**  
 Maine Energy Systems, LLC  
 8 Airport Road, Bethel, Maine 04217  
 Voice: 207.824.6749 Fax: 207.824.4816

Report No. 0444PH005S

<b>Type:</b> AutoPellet Air 28		<b>S/N:</b> XUF00100	<b>CATALOG No.:</b> PFS28
<b>Date of manuf.:</b> 07/2015		<b>Rated heat power:</b> 95540 BTU/hr	
<b>Tested to:</b> UL 391-2010. CSA B366.1-2011			
<b>Manufactured By:</b> MESys LLC, Bethel, Maine		<b>FUEL:</b> Wood Pellets	
U.S. ENVIRONMENTAL PROTECTION AGENCY certified to comply with the 2020 particulate emissions standard using wood pellets.			
This appliance needs periodic inspection and repair for proper operation. Consult owner's manual for further information. It is against federal regulations to operate this appliance in a manner inconsistent with operating instructions in the owners manual.			
<b>Particulate Emissions,</b> 0.06 lb./million btu - 1.32 grams/hr. <b>CO Emissions,</b> 0.029 grams/min. Annual Efficiency, (HHV) 88.35%			
<b>FUEL:</b> PREMIUM WOOD PELLETS		<b>Max Operating Temp:</b> 194 °F	
Furnace tested to .2 inches WC external static pressure			
<b>Chimney</b>	Approved factory built stainless steel or tile-lined masonry		
<b>MAX DRAFT:</b> 0.11 inches WC <b>MIN DRAFT:</b> 0.04 inches WC			
<b>Diameter:</b> 6 INCH		<b>Electrical Rating:</b> 220 V, 60 Hz, 12 A, 2300 W	
<b>FLOORING:</b> COMBUSTIBLE FLOORS CAN BE USED WITH A NON-COMBUSTIBLE SHIELD. MINIMUM CLEARANCES ARE 18IN/457MM IN THE FRONT AND 8IN / 203MM ON EACH SIDE.			
<b>PARTS</b>	<b>Fan Flue Gas:</b> E1001A	<b>Controller Display:</b> E1330	
<b>Motor Ash Box:</b> E1302		<b>Motor Flame Return Protection:</b> E1413A	
<b>Motor Cleaning Device:</b> E1054		<b>Motor Hopper:</b> -----	
<b>Motor Burner Plate Cleaning:</b> -----		<b>Suction Turbine:</b> E1192	
<b>Motor Burner Screw:</b> E1002			
<b>Controller Board:</b> E1412			
<b>Fan Burner:</b> E1005S			

## Author & Manufacturer

MAINE ENERGY SYSTEMS LLC  
8 Airport Road – P.O. Box 547 Bethel  
Maine 04217

E-Mail: [info@maineenergysystems.com](mailto:info@maineenergysystems.com)  
[www.maineenergysystems.com](http://www.maineenergysystems.com)

© MAINE ENERGY SYSTEMS LLC  
Subject to modifications

*Model: AutoPellet Air  
Maine Energy Systems LLC  
8 Airport Road  
Bethel, ME 04217*

# **Appendix 1**

## **Communications**

## Ken Morgan

---

**From:** B.J. Otten <ben@maineenergysystems.com>  
**Sent:** Wednesday, November 4, 2020 9:04 AM  
**To:** Alex Tiegs; Ken Morgan  
**Subject:** Fwd: MESys AutoPellet Air 28kW Forced Air Pellet Heater Step 2 Certification Requirements

----- Forwarded message -----

**From:** Sanchez, Rafael <[Sanchez.Rafael@epa.gov](mailto:Sanchez.Rafael@epa.gov)>  
**Date:** Thursday, August 20, 2020  
**Subject:** MESys AutoPellet Air 28kW Forced Air Pellet Heater Step 2 Certification Requirements  
**To:** Les Otten <[les@maineenergysystems.com](mailto:les@maineenergysystems.com)>  
**Cc:** BJ Otten <[ben@maineenergysystems.com](mailto:ben@maineenergysystems.com)>, Dan Wheeler <[dan@maineenergysystems.com](mailto:dan@maineenergysystems.com)>, "Scinta, Robert" <[scinta.robert@epa.gov](mailto:scinta.robert@epa.gov)>, "Yellin, Patrick" <[Yellin.Patrick@epa.gov](mailto:Yellin.Patrick@epa.gov)>, "Johnson, Steffan" <[johnson.steffan@epa.gov](mailto:johnson.steffan@epa.gov)>, "Toney, Mike" <[Toney.Mike@epa.gov](mailto:Toney.Mike@epa.gov)>, "Lischinsky, Robert" <[Lischinsky.Robert@epa.gov](mailto:Lischinsky.Robert@epa.gov)>

Les,

As a follow-up to our conference call this morning, the following is EPA's understanding of the agreement reached for supporting a possible certification of the MESys AutoPellet Air 28kW Forced Air Pellet Heater. As discussed, EPA requires MESys submit the documentation listed below confirming that the above-referenced model's low burn rate test, as completed on September 3, 2015, meets the requirements of both the Wood Heater Rule at 40 CFR §60.5476(e) and the Alternative Test Method (ATM)-134. Specifically, the unit operation during the low burn testing must be the lowest achievable by the unit when operated by the homeowner and the lowest heat rate marketed or advertised. See 40 CFR § 60.5476.

MESys must submit the following documentation:

1. Owner's manual with a statement to the effect that the unit will shut off at 30% of the tested maximum (Category 4 test heat rate) and installation instructions not to modify any settings.
2. Third-party certification from an EPA approved 3<sup>rd</sup> party certifier that the unit mechanically (or software-driven) effectively shuts off/on at that level.
3. A signed statement from MESys confirming that you understand and agree to this requirement and baseline level of operation.

This response has been coordinated with the Office of Air Quality Planning and Standards. If you have any questions, please let me know.

Rafael Sanchez, Ph.D.

Wood Heater Program Lead

Air Branch

Monitoring, Assistance, and Media Programs Division

Office of Compliance

U.S. Environmental Protection Agency (EPA)

Room 7149-D

[1200 Pennsylvania Ave., NW](#)

MS:2227A

Washington, DC 20460

202-564-7028

202-564-0050 fax

Teleworking on Mondays and Fridays (571-236-1927)

**[Are you looking for a wood heater? Please try our new fully searchable EPA Certified Wood Heater Database \(https://www.epa.gov/compliance/epa-certified-wood-heater-database\).](https://www.epa.gov/compliance/epa-certified-wood-heater-database)**

---

**From:** Dan Wheeler <[dan@maineenergysystems.com](mailto:dan@maineenergysystems.com)>  
**Sent:** Monday, August 17, 2020 1:35 PM  
**To:** Sanchez, Rafael <[Sanchez.Rafael@epa.gov](mailto:Sanchez.Rafael@epa.gov)>  
**Cc:** Les Otten <[les@maineenergysystems.com](mailto:les@maineenergysystems.com)>; BJ Otten <[ben@maineenergysystems.com](mailto:ben@maineenergysystems.com)>  
**Subject:** Meeting of 8-6-2020

Good afternoon Dr. Sanchez. We are wondering if there is any outcome from your discussions mentioned during our conversation of 8-6-2020.

Thank you, best regards,

Dan Wheeler  
Senior Engineer  
Maine Energy Systems  
[8 Airport Road](#)  
Bethel, Maine 04217  
Office Phone 207-824-6749  
[dan@maineenergysystems.com](mailto:dan@maineenergysystems.com)

--  
B.J. Otten  
President / Chief Operating Officer  
Maine Energy Systems  
Ph: (207)-824-6714

*Model: AutoPellet Air  
Maine Energy Systems LLC  
8 Airport Road  
Bethel, ME 04217*

## **Appendix 2**

**Pellet Fuel Analysis**

**Twin Ports Testing  
report USR-W220-0782-01**





Twin Ports Testing, Inc.  
 1301 North 3rd Street  
 Superior, WI 54880  
 p: 715-392-7114  
 p: 800-373-2562  
 f: 715-392-7163  
 www.twinportstesting.com

**Report No:** USR:W220-0782-01  
**Issue No:** 1

# Analytical Test Report

**Client:** MAINE ENERGY SYSTEMS  
 8 Airport Road  
 Bethel, ME 04217  
**Attention:** Dan Wheeler  
**PO No:**

Signed: *Katy Jahr*  
 Katy Jahr  
 Chemistry Lab Supervisor  
 Date of Issue: 11/20/2020  
THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL

**Sample Details**  
**Sample Log No:** W220-0782-01      **Sample Date:**  
**Sample Designation:** Furnace Fuel      **Sample Time:**  
**Sample Recognized As:** Biomass      **Arrival Date:** 11/20/2020

Test Results			
	METHOD	UNITS	MOISTURE FREE AS RECEIVED
Moisture Total	ASTM E871	wt. %	5.78
Ash	ASTM D1102	wt. %	
Volatile Matter	ASTM D3175	wt. %	
Fixed Carbon by Difference	ASTM D3172	wt. %	
Sulfur	ASTM D4239	wt. %	0.008
SO <sub>2</sub>	Calculated	lb/mmbtu	0.019
Net Cal. Value at Const. Pressure	ISO 1928	GJ/tonne	
Gross Cal. Value at Const. Vol.	ASTM E711	Btu/lb	8739      8254
Carbon	ASTM D5373	wt. %	
Hydrogen*	ASTM D5373	wt. %	
Nitrogen	ASTM D5373	wt. %	
Oxygen*	ASTM D3176	wt. %	
<small>*Note: As received values do not include hydrogen and oxygen in the total moisture.</small>			
Chlorine	ASTM D6721	mg/kg	
Fluorine	ASTM D3761	mg/kg	
Mercury	ASTM D6722	mg/kg	
Bulk Density	ASTM E873	lbs/ft <sup>3</sup>	
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:**



Accreditation #60243

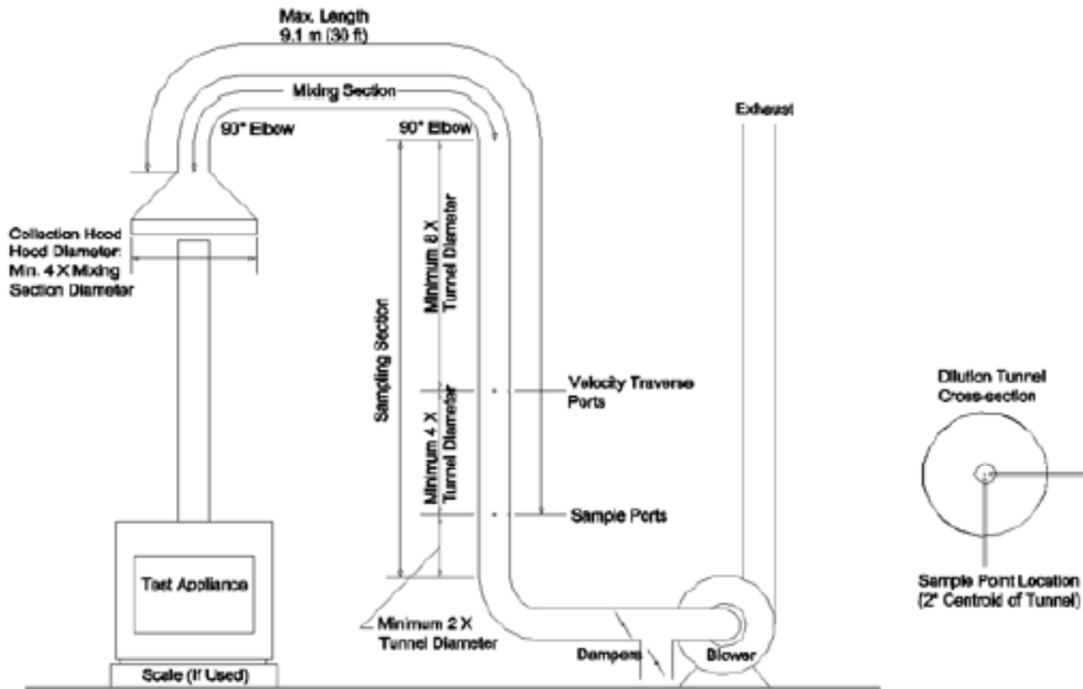
Results issued on this report only reflect the analysis of the sample submitted. Our reports and letters are for the exclusive and confidential use of our clients and may not be reproduced, except in their entirety, without the written approval of Twin Ports Testing. Twin Ports Testing Laboratory is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

*Model: AutoPellet Air  
Maine Energy Systems, Inc.  
8 Airport Road  
Bethel, ME 04217*

# **Appendix C**

## **DILUTION TUNNEL SCHEMATIC & TUNNEL USED**

## Example of ASTM E2515-11 Dilution Tunnel



Prior to testing, sample point and travers point locations are verified to ensure placement is within specifications. Collection hood, tunnel diameter, and mixing section length are also verified to be within specifications.

**Dilution picture Dia 8 no. EG-029**

Polytests Services Inc. 695 B rue Gaudette, St-Jean-sur-Richelieu Québec, Canada, J3B 7S7



Velocity ports at 90 degrees and tunnel temperature sensor location

Particulate sample extraction ports located 48 inches under (requirement 4D=32 inches minimum) velocity ports and 18 inches above downstream Tee. (Requirement 2D=16 inches minimum)

Adjustable damper for flow adjustments

Extraction blower



Last elbow from horizontal run

8 inches diameter stainless steel pipe

Velocity ports located 138 inches downstream of the last elbow (requirement  $8D=64$  inches minimum) and 48 inches upstream of the sampling ports (requirement  $4D=32$  inches minimum)

Total length between hood and sampling port: 23 feet.



Two 8 inches elbow with horizontal mixing section.

60 inches horizontal run between two elbows. Mixing section, No mixing baffle. 8 inches diameter pipe

Hood diameter 32 (requirement  $4D=32$  inches minimum) inches and height of 24 inches (requirement  $3D=24$  inches minimum)

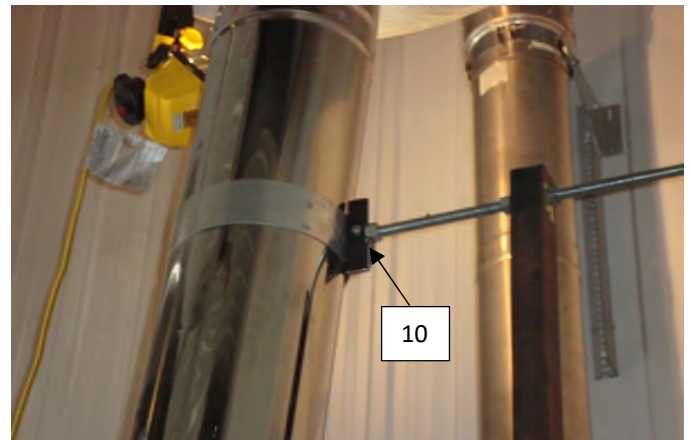
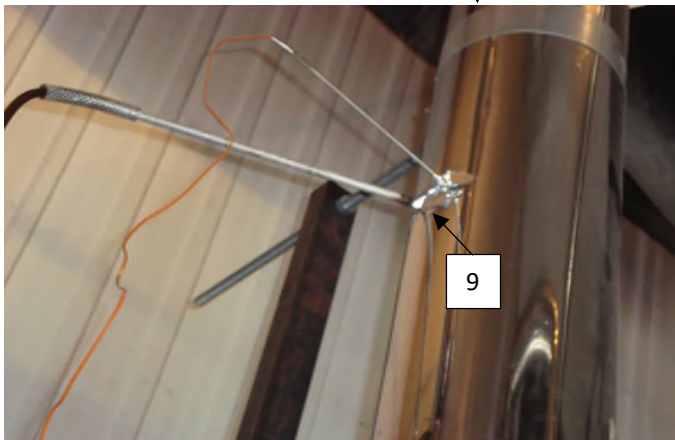
All pipe joints are sealed.

Stack sampling



Gas analysis and temperature probe

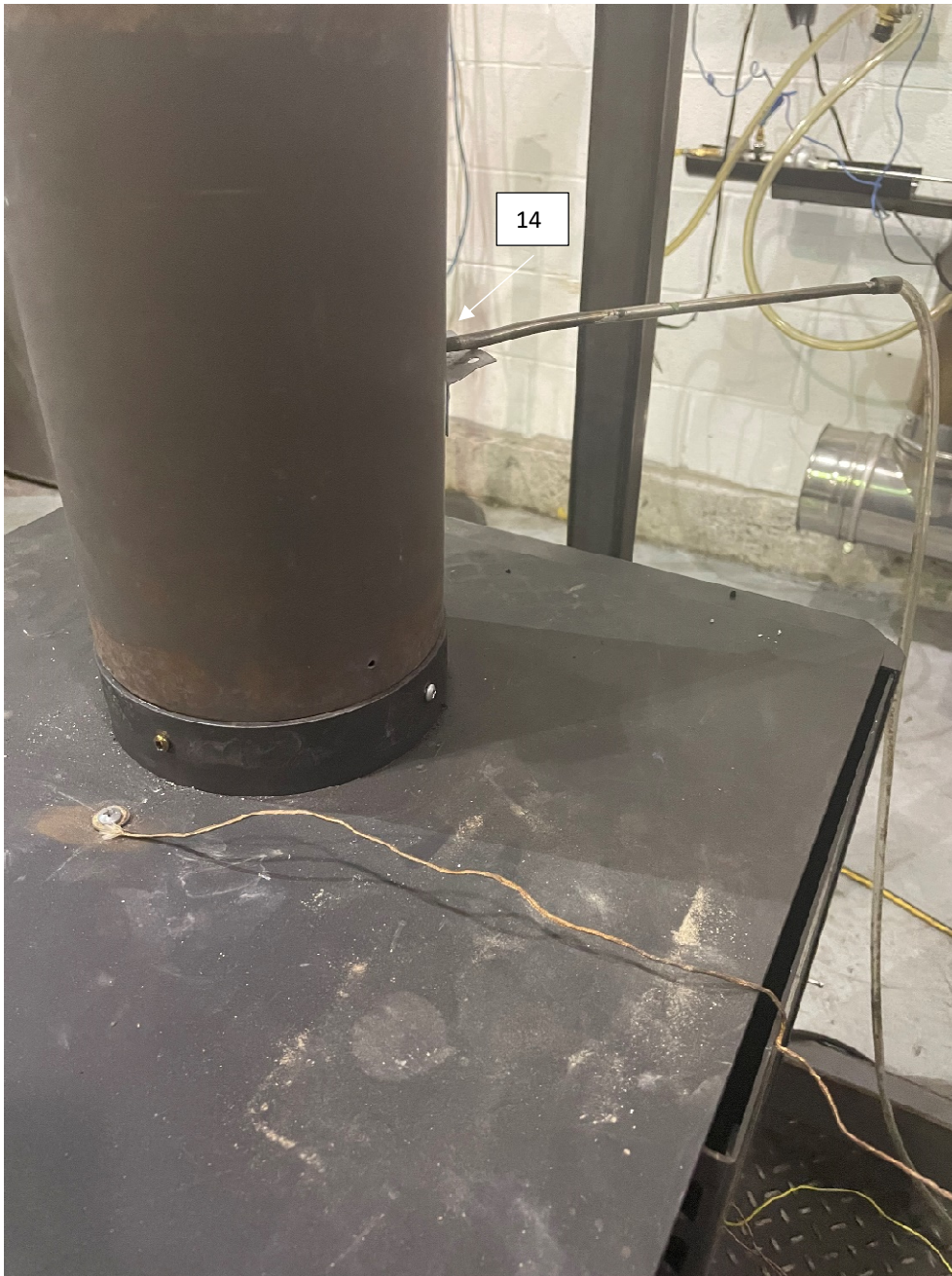
chimney support



**9** : Temperature and gas analyser sampling ports located 9 feet above platform

**10** : Exhaust system support bracket

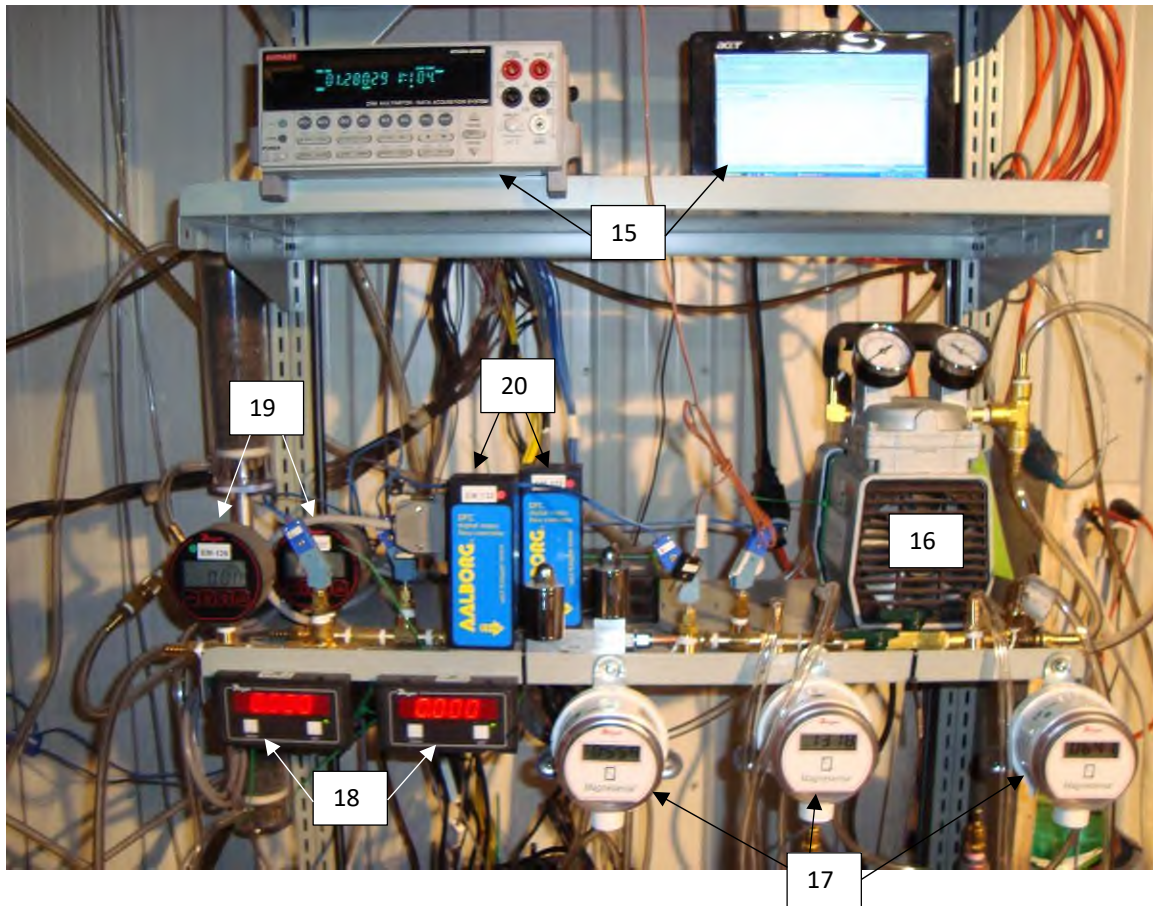
Draft sampling



**14** : Draft sampling port located 6 in. from the flue outlet



Equipment's

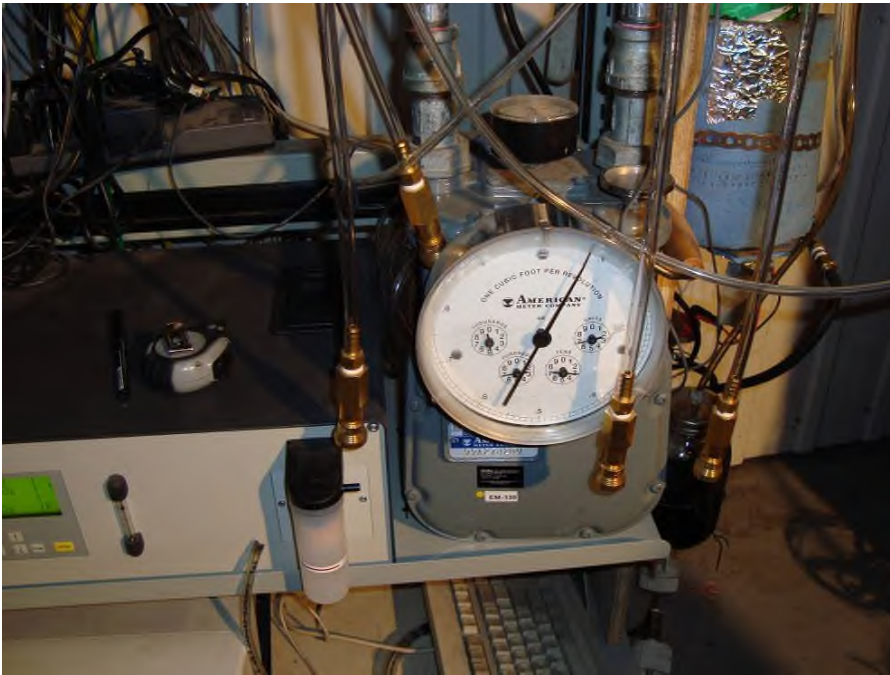


- 15 : Acquisition system
- 16 : Vacuum pump
- 17 : Digital manometer
- 18 : Digital read out for mass flow meter
- 19 : Digital vacuum gage
- 20 : Mass flow meter

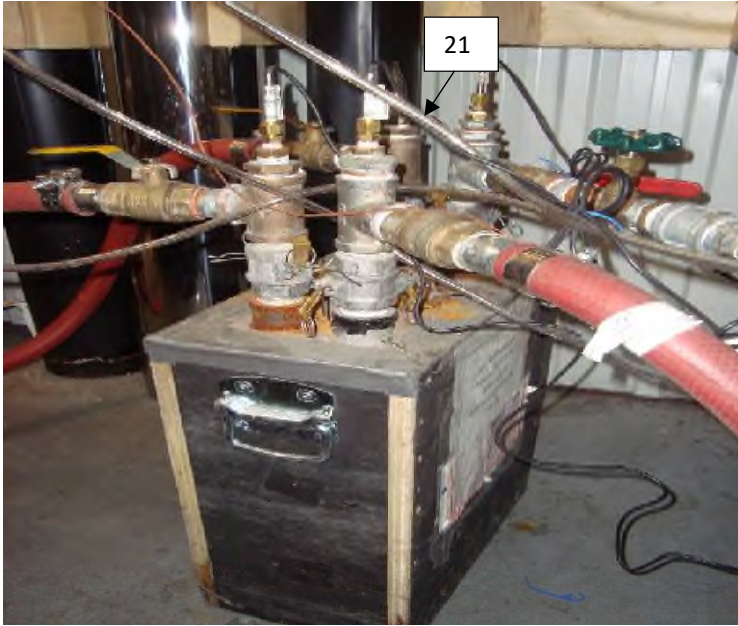
Gaz analyser



Reference dry gas meter

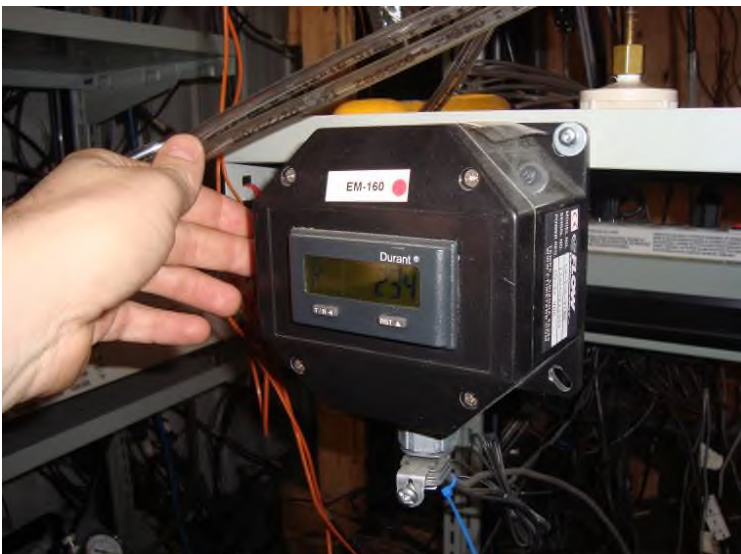


Heat exchanger only for boilers or hydronics



21 : PT 100 insertion probe

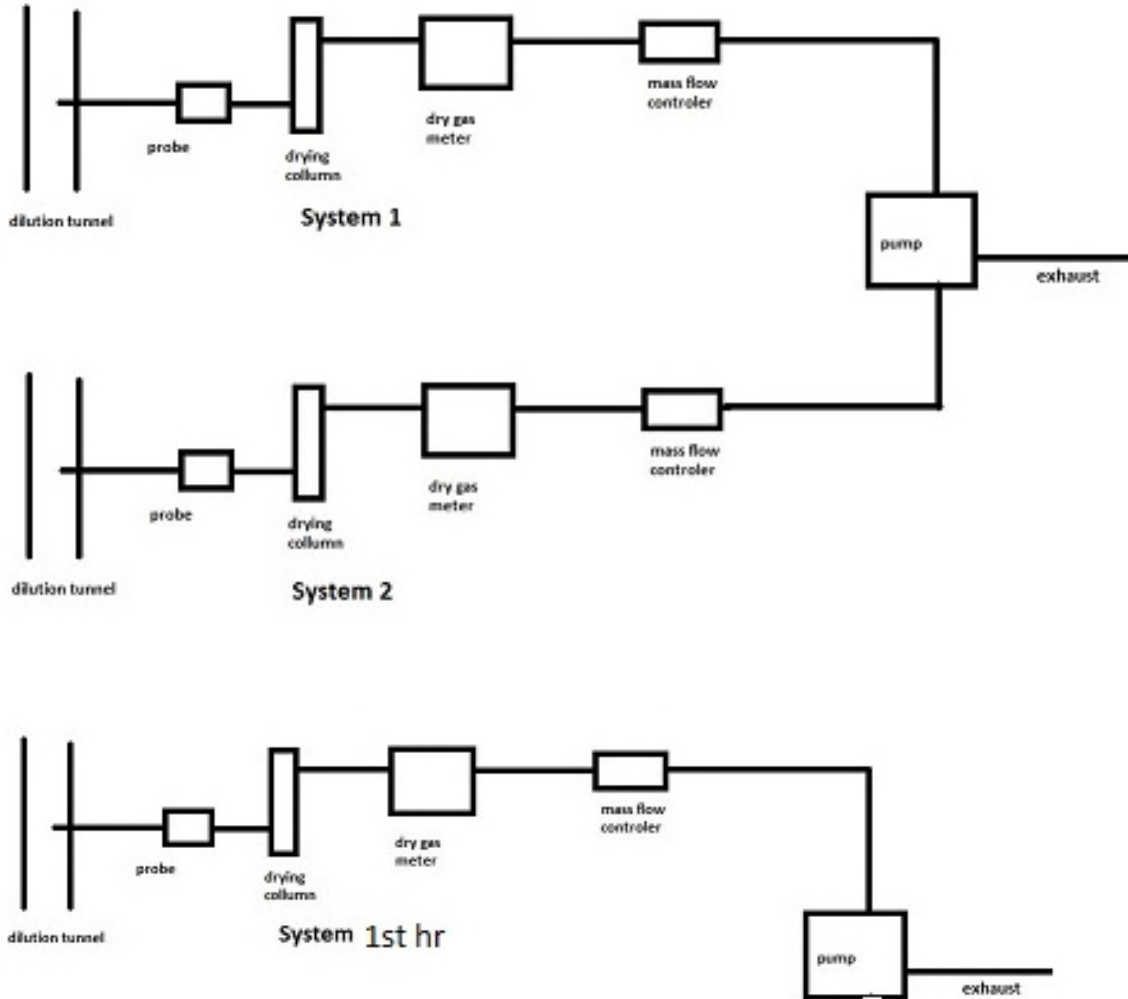
Water flow meter only for boilers or hydronics



Dry gas meter for train 1, train 2 and room filter.



Dilution tunnel sample system



Dilution tunnel

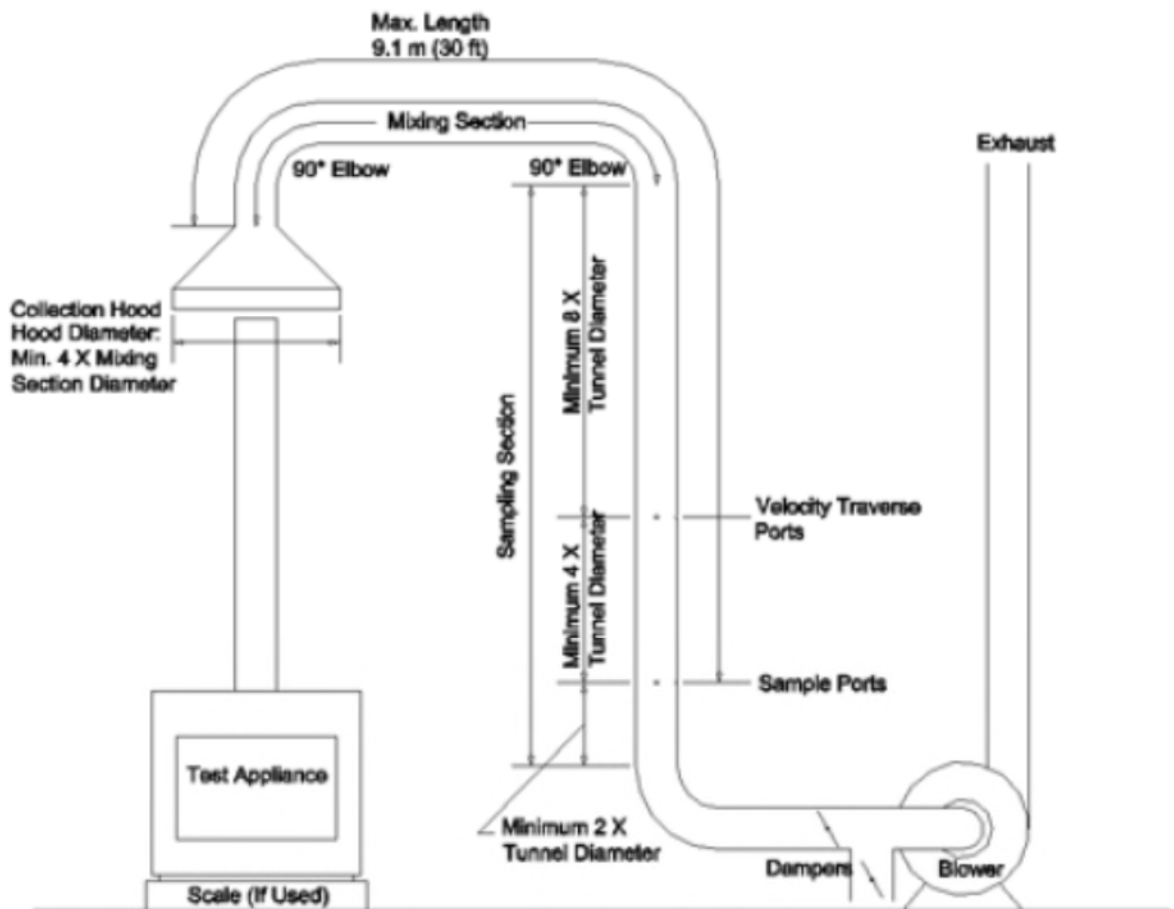


FIG. 3 Steel-Constructed Dilution Tunnel Apparatus

*Model: AutoPellet Air  
Maine Energy Systems, Inc.  
8 Airport Road  
Bethel, ME 04217*

# **Appendix D**

## **CONDITIONING DATA**

**Performed by Polytests Services located in St-Jean-sur-Richelieu at  
Medium Burn Rate**

date	time	Hot Air Sensor[°C]	Modulation %	combustion chamber sensor [°C]	burner auger runtime	pause time	Fan speed	negative draft speed	negativ draft / underpressure	Blower speed
Datum	Zeit	PE1 KT[°C]	PE1 Modulation[%]	PE1 FRT Ist[°C]	PE1 Einschubla	PE1 Pausenze	PE1 Luefterdr	PE1 Saugzugd	PE1 Unterdruck I	PE1 Motor UW[%]
7/27/2015	8:13:22	32	0	545.9	0	0	45	75	114.7	0
7/27/2015	8:23:12	47.8	100	746	34.59	80	62	38	80.4	0
7/27/2015	8:33:02	59.4	100	847.6	34.54	80	62	35	80.4	30
7/27/2015	8:42:52	60	100	861	35.35	80	62	31	80.8	30
7/27/2015	8:52:42	63.8	100	881.9	35.88	80	62	27	80.5	83
7/27/2015	9:02:32	63.6	100	857.7	36.44	80	62	28	80.1	80
7/27/2015	9:12:22	63.3	100	867.4	36.64	80	62	28	79.8	76
7/27/2015	9:22:12	72.4	100	865.5	36.46	80	62	29	82.1	100
7/27/2015	9:32:02	74.3	100	860	36.32	80	62	27	80.3	100
7/27/2015	9:41:52	73.8	100	894.5	35.41	80	62	28	80.2	100
7/27/2015	9:51:42	74.9	100	860	36.02	80	62	27	81.1	100
7/27/2015	10:01:32	76.2	94	865.2	32.67	80	60	27	80.2	100
7/27/2015	10:11:22	77.1	94	870.4	32.11	80	60	28	80.7	100
7/27/2015	10:21:12	77.6	100	862.8	35.3	80	62	27	80.8	100
7/27/2015	10:31:02	77.9	100	857.8	35.2	80	62	28	79.1	100
7/27/2015	10:40:52	79.2	90	870.5	29.36	80	58	28	80.6	100
7/27/2015	10:50:42	79.8	100	853.4	35.05	80	62	28	79.4	100
7/27/2015	11:00:32	81.5	90	842.6	29.56	80	58	28	80.2	100
7/27/2015	11:10:22	82.6	90	842.8	29.03	80	58	28	80.1	100
7/27/2015	11:20:12	83.4	90	856	28.86	80	58	28	80.5	100
7/27/2015	11:30:02	84.1	82	836.6	25.81	80	52	28	80.8	100
7/27/2015	11:39:52	84.1	78	794.1	24.65	80	48	27	81.4	100
7/27/2015	11:49:42	84.1	70	823.6	21.7	80	40	27	81.1	100
7/27/2015	11:59:32	72.8	100	846.7	34.69	80	62	28	80.2	100
7/27/2015	12:09:22	69.3	100	869	33.79	80	62	29	80.3	100
7/27/2015	12:19:12	70.7	100	864.2	33.58	80	62	27	81.3	100
7/27/2015	12:29:02	70.9	100	874	33.76	80	62	28	80.3	100
7/27/2015	12:38:52	75.8	100	884.9	33.04	80	62	28	80.2	100
7/27/2015	12:48:42	79.3	86	836.7	26.54	80	55	28	80.4	100
7/27/2015	12:58:32	78.7	100	841.4	33.68	80	62	28	79.5	100
7/27/2015	13:08:22	78.9	100	890.4	32.57	80	62	28	78.6	100
7/27/2015	13:18:12	82.4	86	843.9	24.92	80	55	27	81.7	100
7/27/2015	13:28:02	81.8	94	827.9	29.86	80	60	28	80.3	100
7/27/2015	13:37:52	82.1	94	851.8	29.69	80	60	28	80.8	100
7/27/2015	13:47:42	82.9	94	874.8	28.88	80	60	28	80.5	100
7/27/2015	13:57:32	81.8	100	855.9	32.38	80	62	28	81.4	100
7/27/2015	14:07:22	82.7	100	891.6	32.13	80	62	27	81.1	100
7/27/2015	14:17:12	82.9	100	905.7	31.72	80	62	29	80	100
7/27/2015	14:27:02	82.4	100	850.7	32.24	80	62	28	80.6	100
7/27/2015	14:36:52	82.2	100	853.9	32.55	80	62	27	80.6	100
7/27/2015	14:46:42	81.9	100	880.4	31.72	80	62	27	80.9	100
7/27/2015	14:56:32	83.4	90	850.3	26.89	80	58	28	80.9	100
7/27/2015	15:06:22	79.3	100	854.1	32.35	80	62	28	80.7	100
7/27/2015	15:16:12	77.4	100	870.2	32.45	80	62	29	79.9	100
7/27/2015	15:26:02	77.9	100	872.1	31.69	80	62	27	81	100
7/27/2015	15:35:52	78.2	94	860.8	28.97	80	60	27	80.3	100
7/27/2015	15:45:42	79.4	94	850.5	29.2	80	60	28	80.2	100
7/27/2015	15:55:32	80.3	94	876.4	28.25	80	60	28	79.8	100
7/27/2015	16:05:22	80.6	100	851.6	31.56	80	72	28	80.2	100
7/27/2015	16:15:12	80.6	100	855.6	31.24	80	62	27	80.7	100
7/27/2015	16:25:02	81.3	94	849	28.07	80	60	28	78.7	100
7/27/2015	16:34:52	81.2	94	857.9	27.85	80	60	27	81.8	100
7/27/2015	16:44:42	80.9	100	865.9	31.2	80	62	28	81.1	100
7/27/2015	16:54:32	81.4	100	861.7	31.41	80	62	27	80	100
7/27/2015	17:04:22	81.7	100	830.3	32.23	80	62	28	79.7	100
7/27/2015	17:14:12	81.7	100	853.2	32.24	80	62	27	81.3	100
7/27/2015	17:24:02	82.1	94	865.8	29.21	80	60	28	80.5	100
7/27/2015	17:33:52	82.1	94	844.2	29.34	80	60	28	80.3	100
7/27/2015	17:43:42	81.5	100	864.4	32.14	80	62	27	80.4	100
7/27/2015	17:53:32	81.6	100	875.1	32.39	80	62	27	80.3	100
7/27/2015	18:03:22	81.9	100	877.7	32.12	80	72	28	79.9	100
7/27/2015	18:13:12	81.5	100	877.7	32.26	80	62	27	80.8	100
7/27/2015	18:23:02	81.6	100	916	30.65	80	62	27	81.5	100
7/27/2015	18:32:52	81.3	100	858	30.92	80	62	27	81.8	100
7/27/2015	18:42:42	80.5	100	851	31.04	80	62	27	81.5	100
7/27/2015	18:52:32	80.3	100	865.7	30.64	80	62	27	80	100
7/27/2015	19:02:22	79.6	100	860	30.5	80	62	27	80.5	100
7/27/2015	19:12:12	78.2	100	864	30.91	80	62	27	82	100
7/27/2015	19:22:02	77.3	100	879.5	30.77	80	62	27	80.5	100
7/27/2015	19:31:52	77.1	100	883.3	30.68	80	62	27	80.7	100
7/27/2015	19:41:42	76.9	100	859.8	30.99	80	62	27	80.3	100



7/27/2015	19:51:32	76.3	100	850	31.54	80	62	28	79.8	100
7/27/2015	20:01:22	75.8	100	886.1	30.7	80	62	28	80.7	100
7/27/2015	20:11:12	75.1	100	858.1	31.47	80	62	28	79.9	100
7/27/2015	20:21:02	74.5	100	867.5	31.44	80	62	27	80.6	100
7/27/2015	20:30:52	73.9	100	867	31.47	80	62	27	80.6	100
7/27/2015	20:40:42	74.9	100	879.9	31.22	80	62	27	80.5	100
7/27/2015	20:50:32	77.5	94	863.1	28.2	80	60	27	81	100
7/27/2015	21:00:22	78.2	94	877.9	27.26	80	60	28	79.7	100
7/27/2015	21:10:12	78.3	100	878.9	30.12	80	62	27	81.1	100
7/27/2015	21:20:02	78.7	100	877.3	29.18	80	62	27	81	100
7/27/2015	21:29:52	77.7	100	871.8	29.74	80	62	27	80.9	100
7/27/2015	21:39:42	77.5	100	870	29.74	80	62	27	80.9	100
7/27/2015	21:49:32	77.1	94	884.6	26.59	80	60	27	80.7	100
7/27/2015	21:59:22	76.1	100	894.7	28.95	80	62	28	79.8	100
7/27/2015	22:09:12	74.2	100	863.3	29.44	80	62	28	79.9	100
7/27/2015	22:19:02	73.6	100	862.8	29.62	80	62	27	81.2	100
7/27/2015	22:28:52	73	100	867.5	29.85	80	62	28	78.9	100
7/27/2015	22:38:42	72.8	100	890.6	28.61	80	62	28	79.5	100
7/27/2015	22:48:32	72	100	868.7	29.12	80	62	27	80.8	100
7/27/2015	22:58:22	73.2	100	889.5	28.9	80	62	27	80.3	100
7/27/2015	23:08:12	74.5	100	900.4	28.41	80	62	27	80.8	100
7/27/2015	23:18:02	74.6	100	882.2	28.44	80	62	27	80.7	100
7/27/2015	23:27:52	74.9	100	883	28.05	80	62	27	81.2	100
7/27/2015	23:37:42	74.5	100	898.9	27.86	80	62	27	80	100
7/27/2015	23:47:32	74.8	100	873	28.09	80	62	27	80	100
7/27/2015	23:57:22	74.7	100	858.4	28.67	80	62	28	79.4	100

date	time	combustion burner					Fan speed	negative draft speed	negative draft / underpressure	Blower speed
		Hot Air Sensor	Modulation	chamber sensor	auger runtime	pause time				
7/28/15	0:10:02	74.5	100	866.7	28.73	80	62	28	79.7	100
7/28/15	0:19:52	74.6	100	858.4	29.1	80	62	27	80.1	100
7/28/15	0:29:42	74.9	100	873	28.67	80	62	27	80	100
7/28/15	0:39:32	75.3	100	862.8	28.51	80	62	27	80	100
7/28/15	0:49:22	74.9	100	872.6	28.66	80	62	27	81.1	100
7/28/15	0:59:12	75.7	100	883.4	27.8	80	62	27	81.7	100
7/28/15	1:09:02	75.8	100	869.8	27.08	80	62	27	80.2	100
7/28/15	1:18:52	75	100	879.7	26.96	80	62	27	80.7	100
7/28/15	1:28:42	74.9	100	862.9	27.15	80	62	27	80.3	100
7/28/15	1:38:32	74.3	100	884.1	26.8	80	62	27	80.5	100
7/28/15	1:48:22	74.2	100	866.2	27.25	80	62	27	80	100
7/28/15	1:58:12	74.6	100	877.5	26.95	80	62	28	79.5	100
7/28/15	2:08:02	74.3	100	865.7	27.44	80	62	28	80	100
7/28/15	2:17:52	74	100	878.8	27.53	80	62	28	79.8	100
7/28/15	2:27:42	74.2	100	868.4	27.54	80	62	28	79.7	100
7/28/15	2:37:32	74.4	100	877.1	26.88	80	62	27	80.3	100
7/28/15	2:47:22	74	100	882.9	26.86	80	62	28	79.9	100
7/28/15	2:57:12	74	100	882.8	26.93	80	62	27	79.8	100
7/28/15	3:07:02	74.2	100	888.1	26.72	80	62	27	80.3	100
7/28/15	3:16:52	74.2	100	872	27.25	80	62	28	78.9	100
7/28/15	3:26:42	74	100	852.8	28.26	80	62	27	80.9	100
7/28/15	3:36:32	74.1	100	857.5	28.28	80	62	27	80	100
7/28/15	3:46:22	73.7	100	858.6	28.69	80	62	27	80.7	100
7/28/15	3:56:12	73.9	100	866.4	28.66	80	62	27	80.2	100
7/28/15	4:06:02	74	100	847.9	29.16	80	72	27	80.5	100
7/28/15	4:15:52	73.9	100	878	28.74	80	62	27	80.9	100
7/28/15	4:25:42	74.2	100	856.8	29.13	80	62	27	80.9	100
7/28/15	4:35:32	74.2	100	874.1	28.34	80	62	27	80.7	100
7/28/15	4:45:22	74.1	100	871.9	28.19	80	62	27	80.3	100
7/28/15	4:55:12	73.6	100	855.8	29.17	80	62	27	80.6	100
7/28/15	5:05:02	73.9	100	863.2	29.25	80	62	28	79.7	100
7/28/15	5:14:52	74.1	100	865.2	29.12	80	62	27	80.2	100
7/28/15	5:24:42	74	100	843.7	29.92	80	62	27	82	100
7/28/15	5:34:32	72.5	100	858.5	29.83	80	62	27	80.4	100
7/28/15	5:44:22	71.6	100	871.2	29.76	80	62	27	80.5	100
7/28/15	5:54:12	72.5	100	866.4	29.62	80	62	27	82	100
7/28/15	6:04:02	72.2	100	880.8	29.52	80	72	27	81.1	100
7/28/15	6:13:52	73	100	863.6	29.96	80	62	27	80.1	100
7/28/15	6:23:42	73	100	882.9	29.86	80	62	27	80.4	100
7/28/15	6:33:32	73.5	100	880.5	29.99	80	62	27	80.9	100
7/28/15	6:43:22	74	100	844.4	30.48	80	62	27	80	100
7/28/15	6:53:12	74.1	100	869.1	29.89	80	62	28	79.6	100
7/28/15	7:03:02	72.8	100	866.8	29.91	80	62	36	87.7	100
7/28/15	7:12:52	69.4	100	860.8	30.61	80	62	27	80.5	100
7/28/15	7:22:42	68.4	100	847	30.94	80	62	28	79.6	100
7/28/15	7:32:32	67.8	100	863.4	31.04	80	62	27	80.6	100
7/28/15	7:42:22	68.1	100	885.8	31.3	80	62	28	79.9	100
7/28/15	7:52:12	68.1	100	860.2	32.13	80	62	27	80.1	100
7/28/15	8:02:02	69.1	100	873	31.54	80	62	27	80.7	100
7/28/15	8:11:52	69.3	100	843.1	32.18	80	62	28	79.2	100
7/28/15	8:21:42	70.3	100	883.5	30.82	80	62	28	79.8	100
7/28/15	8:31:32	70.3	100	854.6	30.88	80	62	27	80.5	100

7/28/15	8:41:22	69.8	100	869.6	30.41	80	62	28	79.4	100
7/28/15	8:51:12	69.9	100	865.5	28.06	80	62	28	79.5	100
7/28/15	9:01:02	68.9	100	842.7	26.04	80	62	28	80.1	100
7/28/15	9:10:52	68.2	100	842.3	23.96	80	62	49	53.2	100
7/28/15	9:20:42	67.2	100	829.8	23.48	80	62	27	81	100
7/28/15	9:30:32	66.3	100	841.4	22.65	80	62	28	80.7	100
7/28/15	9:40:22	66.2	100	811.6	21.84	80	62	34	84.1	100
7/28/15	9:50:12	65.7	100	820.8	21.24	80	62	28	79.3	100
7/28/15	10:00:02	65.7	100	819.5	20.78	80	62	28	80.6	100
7/28/15	10:09:52	65.7	100	813	20.49	80	72	37	85.3	100
7/28/15	10:19:42	66	100	829.8	19.88	80	72	52	90.1	100
7/28/15	10:29:32	68.2	100	832.2	19.94	80	82	54	91.5	100
7/28/15	10:39:22	70.3	100	832.9	20.2	80	82	54	89.5	100
7/28/15	10:49:12	72.1	100	797.5	20.52	80	82	54	91.5	100
7/28/15	10:59:02	72.2	100	841.3	20.72	80	82	54	91.6	100
7/28/15	11:08:52	72.9	100	801.9	21.32	80	82	57	91.6	100
7/28/15	11:18:42	69.9	100	809.1	20.18	80	82	71	94.7	100
7/28/15	11:28:32	67.8	100	832.7	18.05	80	82	57	90.7	100
7/28/15	11:38:22	65.4	100	793	18.37	80	92	70	92.6	100
7/28/15	11:48:12	64.4	100	771.6	19.4	80	92	37	80.5	91
7/28/15	11:58:02	65.6	100	794.2	19.29	80	92	42	84.6	100
7/28/15	12:07:52	67.2	100	799.6	19.01	80	92	37	80.4	100
7/28/15	12:17:42	67.7	100	803.6	18.76	80	92	37	80.1	100
7/28/15	12:27:32	67.3	100	815.3	18.5	80	92	38	79.3	100
7/28/15	12:37:22	68.1	100	791.5	18.67	80	92	37	79	100
7/28/15	12:47:12	69	100	807.8	18.57	80	92	37	82.2	100
7/28/15	12:57:02	68.2	100	794.5	18	80	92	37	80.7	100
7/28/15	13:06:52	66.9	100	785.1	18.22	80	92	37	80	100
7/28/15	13:16:42	68.4	100	793	18.42	80	92	37	81	100
7/28/15	13:26:32	68.9	100	785.4	18.68	80	92	37	80.6	100
7/28/15	13:36:22	69.1	100	812.3	18.14	80	92	38	80.5	100
7/28/15	13:46:12	69.2	100	774.6	19.08	80	92	38	79.7	100
7/28/15	13:56:02	67.3	100	796.9	19.23	80	92	37	80.6	100
7/28/15	14:05:52	67.1	100	781.7	19.37	80	92	38	79.2	100
7/28/15	14:15:42	66.9	100	813.6	18.4	80	92	37	79.5	100
7/28/15	14:25:32	69.9	100	770	19.2	80	92	37	78.6	100
7/28/15	14:35:22	70.8	100	781.9	17.95	80	92	41	85.3	100
7/28/15	14:45:12	70.9	100	783.7	16.64	80	62	36	82.9	100
7/28/15	14:55:02	71.1	100	867	18.03	80	62	29	79.9	100
7/28/15	15:04:52	73	100	825.4	21.21	80	62	29	81.6	100
7/28/15	15:14:42	74.4	100	853.1	22.38	80	62	28	80	100
7/28/15	15:24:32	76	94	854.5	20.58	80	60	30	80.3	100
7/28/15	15:34:22	75.8	100	869.2	24	80	62	32	80.4	100
7/28/15	15:44:12	76.3	100	848.3	24.72	80	62	30	80.9	100
7/28/15	15:54:02	76.7	100	842.4	25.99	80	62	32	81.8	100
7/28/15	16:03:52	77.8	100	848.4	25.96	80	72	28	80.2	100
7/28/15	16:13:42	78.2	94	844.9	23.1	80	60	28	80.8	100
7/28/15	16:23:32	77.8	100	883	26.15	80	62	27	80.8	100
7/28/15	16:33:22	78	100	871.7	26.1	80	62	27	81	100
7/28/15	16:43:12	77.3	100	883.8	25.97	80	62	29	80.7	100
7/28/15	16:53:02	78.2	94	869	23.03	80	60	28	81.7	100
7/28/15	17:02:52	78.2	100	855.5	26.45	80	62	27	81	100
7/28/15	17:12:42	78.2	94	855.9	23.45	80	60	28	80.9	100
7/28/15	17:22:32	77.5	100	864.1	26.76	80	62	29	79.2	100
7/28/15	17:32:22	78.2	94	845.1	23.18	80	60	28	80.1	100
7/28/15	17:42:12	77.5	100	854.7	25.89	80	62	29	79.1	100

7/28/15	17:52:02	77.3	100	886.4	25.62	80	62	27	81.4	100
7/28/15	18:01:52	77.3	100	879.4	25.61	80	62	28	81.6	100
7/28/15	18:11:42	76.9	100	890.4	25.83	80	62	28	79.8	100
7/28/15	18:21:32	77.1	100	860.5	26.03	80	62	27	80.1	100
7/28/15	18:31:22	77.1	100	845.3	26	80	62	28	79.7	100
7/28/15	18:41:12	76.7	100	875.6	25.56	80	62	28	80.6	100
7/28/15	18:51:02	75.8	100	875.8	25.74	80	62	27	80.5	100
7/28/15	19:00:52	75.4	100	839.1	26.34	80	62	27	81.6	100
7/28/15	19:10:42	74.7	100	867.1	26.81	80	62	28	80.5	100
7/28/15	19:20:32	75.3	100	860.6	26.4	80	62	25	85.4	100
7/28/15	19:30:22	74.4	100	886.8	26.24	80	62	27	80.6	100
7/28/15	19:40:12	74.6	100	865.5	26.17	80	62	27	80.1	100
7/28/15	19:50:02	74.6	100	901.6	24.92	80	62	22	80.9	100
7/28/15	19:59:52	74.2	100	885.5	24.36	80	62	24	78.5	100
7/28/15	20:09:42	73.4	100	848.5	25.4	80	62	25	79.2	100
7/28/15	20:19:32	73.1	100	889.6	24.7	80	62	27	76.3	100
7/28/15	20:29:22	72.9	100	857.7	25.74	80	62	20	83.2	100
7/28/15	20:39:12	72.5	100	872	26.14	80	62	19	84.7	100
7/28/15	20:49:02	72.8	100	874.8	25.22	80	62	23	76.4	100
7/28/15	20:58:52	72.6	100	876	24.95	80	62	24	79.4	100
7/28/15	21:08:42	71.6	100	859.2	25.4	80	62	23	81.9	100
7/28/15	21:18:32	69.9	100	865.3	25.5	80	62	25	82.3	100
7/28/15	21:28:22	69.6	100	882.7	25.12	80	62	27	81	100
7/28/15	21:38:12	69.2	100	873	24.73	80	62	25	78.7	100
7/28/15	21:48:02	69	100	894.9	24.46	80	62	18	84.9	100
7/28/15	21:57:52	69.2	100	880.8	24.01	80	62	23	77.7	100
7/28/15	22:07:42	69.4	100	862.3	23.78	80	62	20	79.7	100
7/28/15	22:17:32	68.8	100	878.2	23.54	80	62	24	85.3	100
7/28/15	22:27:22	69	100	876.4	23.14	80	62	26	82	100
7/28/15	22:37:12	68.5	100	865.8	23.09	80	62	22	81.1	100
7/28/15	22:47:02	67.9	100	868.7	23.52	80	62	23	79.5	100
7/28/15	22:56:52	68.2	100	876.3	23.49	80	62	24	82	100
7/28/15	23:06:42	67.7	100	869.1	24	80	62	6	84.6	100
7/28/15	23:16:32	67.7	100	870.6	23.62	80	62	28	79.7	100
7/28/15	23:26:22	67.5	100	879.3	23.44	80	62	28	78.8	100
7/28/15	23:36:12	67.7	100	866.3	23.12	80	62	28	79.3	100
7/28/15	23:46:02	67.5	100	889.8	22.36	80	62	27	79.8	100
7/28/15	23:55:52	66.7	100	860.6	22.54	80	62	27	81.9	100

date	time	Hot Air Sensor	Modulation	combustion			Fan speed	negativ draft speed	negativ draft / underpressure	Blower speed
				chamber sensor	burner auger runtime	pause time				
7/29/2015	0:10:02	66.1	100	876	22.62	80	62	27	80.4	100
7/29/2015	0:19:52	66	100	884.7	22.26	80	62	24	80.3	100
7/29/2015	0:29:42	65.3	100	886.8	22.57	80	62	28	79.1	100
7/29/2015	0:39:32	65.4	100	870.2	22.5	80	62	27	80.3	100
7/29/2015	0:49:22	65	100	852.9	22.48	80	62	27	81.5	100
7/29/2015	0:59:12	64.6	100	817.7	23.61	80	62	27	81.4	94
7/29/2015	1:09:02	65.3	100	862.7	23.14	80	62	27	82	100
7/29/2015	1:18:52	65	100	848.9	24.11	80	62	27	81.5	100
7/29/2015	1:28:42	65.1	100	862	23.76	80	62	28	79.1	100
7/29/2015	1:38:32	65	100	888.4	23.02	80	62	28	79.5	100
7/29/2015	1:48:22	64.7	100	882.9	23.54	80	62	27	81.9	95
7/29/2015	1:58:12	64.8	100	870.7	23.95	80	62	27	81.1	97
7/29/2015	2:08:02	65.2	100	896.3	22.36	80	62	23	79	100
7/29/2015	2:17:52	64.4	100	875.7	22.43	80	62	26	83.8	91
7/29/2015	2:27:42	64.7	100	882.4	21.78	80	62	27	81.3	95
7/29/2015	2:37:32	64.6	100	886	21.2	80	62	27	80.1	94
7/29/2015	2:47:22	64.5	100	861.6	21.68	80	62	27	82.1	93
7/29/2015	2:57:12	64.6	100	879.2	21.22	80	62	27	80.7	94
7/29/2015	3:07:02	64.7	100	874.1	20.66	80	62	27	80.1	95
7/29/2015	3:16:52	64.2	100	850.1	21.31	80	62	27	81.3	88
7/29/2015	3:26:42	64.4	100	889.8	20.65	80	62	26	82.1	91
7/29/2015	3:36:32	64.3	100	878	21.27	80	62	27	81	90
7/29/2015	3:46:22	64.6	100	883.2	20.72	80	62	27	80.1	94
7/29/2015	3:56:12	64.6	100	885.4	20.4	80	62	27	80.5	94
7/29/2015	4:06:02	64.3	100	841.5	21.49	80	72	27	80.2	90
7/29/2015	4:15:52	64.5	100	872.4	21.32	80	62	28	79.3	93
7/29/2015	4:25:42	64.6	100	890.9	20.78	80	62	27	80.5	94
7/29/2015	4:35:32	64.1	100	878	20.8	80	62	28	78.6	87
7/29/2015	4:45:22	64.3	100	839.9	22.04	80	62	27	81.1	90
7/29/2015	4:55:12	64.1	100	874.9	21.56	80	62	28	80.7	87
7/29/2015	5:05:02	64.5	100	853.4	22.2	80	62	27	80.4	93
7/29/2015	5:14:52	64.3	100	848.3	22.56	80	62	27	81.7	90
7/29/2015	5:24:42	64.3	100	876	21.83	80	62	26	79.5	90
7/29/2015	5:34:32	64.6	100	855.1	22.14	80	62	27	80.4	94
7/29/2015	5:44:22	64.6	100	857.1	22.41	80	62	28	79.9	94
7/29/2015	5:54:12	64.3	100	886.1	22.45	80	62	28	78.2	90
7/29/2015	6:04:02	64.4	100	865.6	22.63	80	72	27	80.8	91
7/29/2015	6:13:52	64.6	100	861.6	22.63	80	62	27	80.4	94
7/29/2015	6:23:42	64.4	100	870.9	22.31	80	62	28	79.1	91
7/29/2015	6:33:32	64.3	100	861.5	22.36	80	62	28	80.2	90
7/29/2015	6:43:22	64.3	100	875.7	22.28	80	62	27	81.3	90
7/29/2015	6:53:12	64.4	100	893.4	22.05	80	62	27	81.1	91
7/29/2015	7:03:02	63.9	100	859.3	22.67	80	62	27	81.6	84
7/29/2015	7:12:52	64.7	100	857	22.82	80	62	28	79.4	95
7/29/2015	7:22:42	64.6	100	872.8	23.3	80	62	28	80.5	94
7/29/2015	7:32:32	64.6	100	881.8	23.35	80	62	27	81.2	94
7/29/2015	7:42:22	64.5	100	851	23.7	80	62	28	80.9	93
7/29/2015	7:52:12	64.5	100	885.9	23.26	80	62	28	80.6	93
7/29/2015	8:02:02	64.3	100	884.2	23.29	80	62	27	81.2	90
7/29/2015	8:11:52	64.4	100	850.9	24.16	80	62	27	81	91
7/29/2015	8:21:42	64.7	100	883.2	23.78	80	62	27	80.3	95
7/29/2015	8:31:32	64.5	100	865.8	24.3	80	62	28	79.9	93
7/29/2015	8:41:22	64.6	100	872.1	23.9	80	62	27	81.9	94
7/29/2015	8:51:12	64.4	100	883.8	24.31	80	62	27	80.1	91
7/29/2015	9:01:02	64.6	100	868.1	24.61	80	62	28	80.1	94
7/29/2015	9:10:52	64.7	100	863.9	24.28	80	62	27	80.3	95
7/29/2015	9:20:42	64.8	100	871	24.25	80	62	28	80.7	97
7/29/2015	9:30:32	64.6	100	852.9	24.46	80	62	28	79.9	94
7/29/2015	9:40:22	64.8	100	877.9	23.81	80	62	28	80.4	97
7/29/2015	9:50:12	64.6	100	857.2	25	80	62	27	81.1	94
7/29/2015	10:00:02	64.7	100	872.1	25.46	80	62	28	80.6	95
7/29/2015	10:09:52	64.8	100	862.7	24.84	80	62	27	81.2	97
7/29/2015	10:19:42	64.7	100	882.6	24.94	80	62	28	78.8	95
7/29/2015	10:29:32	64.9	100	864.3	25.26	80	62	28	80.3	98
7/29/2015	10:39:22	65.1	100	869.8	24.82	80	62	37	86	100
7/29/2015	10:49:12	64.8	100	864.1	25.7	80	62	27	81.6	97
7/29/2015	10:59:02	64.9	100	884	25.65	80	62	27	80.3	98
7/29/2015	11:08:52	65.5	100	881.1	25.14	80	62	28	79.4	100
7/29/2015	11:18:42	65.1	100	851.2	25.96	80	62	28	80.5	100
7/29/2015	11:28:32	65.3	100	878.4	25.18	80	62	28	79.7	100

# **Appendix E**

## **LAB TECHNICIAN NOTES/LEAK CHECKS**

NOTE: The EPA inquired about the seemingly minimal number of hand-written notes related to this project. OMNI communicated with Polytests who performed the testing and were told that because this was an automatically fueled appliance that responds automatically to the load imposed upon it and therefore no extra notes regarding fueling or control were necessary. This is consistent with OMNI's experience with these types of appliances.



Date: 2015-09-01  
Project #: PI 2012

Manufacturer: Mesy  
Run: 1

Tech: MM

Model: autopilot air  
Reviewer: SP

Side view	Front view	Top view



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

Manufacturer: \_\_\_\_\_

Model: \_\_\_\_\_

Project #: \_\_\_\_\_

Run: \_\_\_\_\_

Tech: \_\_\_\_\_

Reviewer: \_\_\_\_\_

	ADDITION		SUBSTRACTION	
	ft3	Volume	ft3	Volume
V measure				
V ashlip				
%				
V usable				
Usable Firebox: _____				
Test load weight: _____		Minimum: _____		Maximum: _____
Déviation: _____				

*J.P.*

Date: 2015-09-01  
 Manufacturer: MESY  
 Project #: PI 2012 Run: 1

Model: auto pallet air  
 Tech: MM Reviewer: JP

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
N.A	_____	_____	_____

Pre-Test

Post-Test

**Facility Conditions:**

Air Velocity from less than 2 feet .....  
 Smoke Capture Check.....  
 Picture.....

20 (max50 Fpm)	19 (max50 Fpm)
ok	ok
Front ok	Side ok

**Wood Heater Conditions:**

Date Wood Heater Stack Cleaned.....  
 Date Dilution Tunnel Cleaned.....  
 Induced Draft Check (max 0.005 H2O).....  
 Traverse before ignition.....  
 Flow Rate 140 cfm ±10%.....

2015-08-31
2015-05-31
ok
ok

ok
----

**Temperature System:**

Ambient (65°-90°F).....  
 Wood Heater Surface (±125°F).....

ok	°F
ok	°F

**Proportional Checks:**

Thermocouple check.....  
 Pitot Clean.....  
 Pitot verification.....

ok
ok
ok

**Sampling Train ID Numbers:**

Probe.....  
 Filter Front.....  
 Filter Back.....  
 Filter Thermocouple.....  
 Filter 5G-3 (<90°F).....

Train 1	Train 2
20	21
41	43
42	44
11	12
ok	ok

**SAMPLING EQUIPMENT CHECK OUT**

Date: 2015-09-01

Manufacturer: ME SY

Project #: PL 20112 Run: 1

Model: auto pellet air

Tech: MM Reviewer: JP

**Leakage Checks Tunnel Samplers**

	SYSTEM 1		SYSTEM 2	
	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Unplugged Flow Rate = .25cfm				
Vacuum (inches Hg.)	-15	-15	-15	-15
Final 1minute DGM (Liter)	290254,6L	290859,93	248546,73	249122,3L
Initial 1minute DGM (Liter)	290259,6L	290859,40	248546,71	249122,27
Change © (Liter)	0	0,03	0,02	0,05
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 ( 0.56)				
Check OK	ok	ok	ok	ok

**Leakage Checks Flue Gas Sampler**

	Pre Test	Post Test
Plugged Probe		
Vacuum (inches Hg.)	-5	-5
Rotometer Reading (mml/min.)	0	0
Flow Rate (lpm)	1.5	1.5
Allowable (.02 x Sample Rate)	30	30
Check OK	ok	ok

**Leakage Checks Pitot**

	Pre Test 3 H2o static	Pre Test 0.4-0.5 H2o velocity	Post Test 3 H2o Static	Post Test 0.4-0.5 H2o velocity
Plugged Probe				
Vacuum (inches Hg.)	3	.4	3	.5
Check OK (no change after 15 sec.)	ok	ok	ok	ok

Date: 2015-09-01

Manufacturer: MESY

Project #: PI 2012 Run: 1

Model: auto pellet air  
 Tech: MM Reviewer: JP

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM-090	4.4 lbs, Class F	4.4 lbs
Wood	EM-090	4.4 lbs, Class F	4.4 lbs
Analytical	EM-128	100 mg, Class S	100 mg
Analytical	EM-129	200 g, Class S	200 g

**LIMITS OF WEIGHT RANGES**

**ANALYTICAL SCALE:** ..... 50%-150% of dry filter weight, ± 0.1 mg  
**PLATFORM SCALE** ..... 20%-80% of ideal test load weight, ± 0.1 lbs or 1%  
**WOOD SCALE** ..... 20%-80% of ideal test load weight, ± 0.01 lbs or 1%

Date: 2015-09-01

Manufacturer: MESYS

Model: auto pellet ash

Project #: P1 2012 Run: 1

Tech: MM-1 Reviewer: DP

FOR TUNNELS < 12 in

Barometric pressure ( $P_{bar}$ ) 101.7 (KPa.) Static pressure ( $P_q$ ) 0.16 (inches w.c.)  
 Inside diameter: Port A \_\_\_\_\_ Port B \_\_\_\_\_  
 Tunnel cross sectional area: .1963Ft<sup>2</sup>  
 Pitot tube type: Standard

Traverse Point	Position (inches)			Velocity Head $\Delta_p$ (inches H <sub>2</sub> O)	Tunnel Temperature (°F)	$\sqrt{\Delta_p}$
	6 po	7 po	8 po			
A- Centroid	3.00	3.50	4	0.044	79.01	
B - Centroid	3.00	3.50	4	0.043	79.10	
A-1	0.40	0.50	0.50	0.040	79.08	
A-2	1.50	1.75	2	0.048	79.00	
A-3	4.50	5.25	6	0.042	79.31	
A-4	5.60	6.5	7.5	0.041	79.41	
B-1	0.40	0.50	0.50	0.046	79.50	
B-2	1.50	1.75	2	0.043	79.53	
B-3	4.50	5.25	6	0.043	79.50	
B-4	5.60	6.5	7.5	0.044	79.59	
				AVERAGE		

$$V_s = K_p C_p (\sqrt{\Delta_p})_{avg} \sqrt{\frac{(T_s)_{avg}}{P_s M_s}}$$

- Where,
- $C_p$  = pitot tube coefficient, dimension less = 0.99 for standard pitot.
  - $\Delta_p$  = manometer reading (inches H<sub>2</sub>O)
  - $T_s$  = average absolute dilution tunnel temperature (°F + 460)
  - $P_s$  = absolute dilution tunnel gas pressure or  $P_{bar} + P_{qg}$
  - $P_q$  = static pressure in. H<sub>2</sub>O  
 { 13.6 }
  - $M_s$  = 28.56, wet molecular weight of stack gas (alternatively, it may be measured)
  - $K_p$  = 85.49 pitot tube constant, (conversion factor for English units)

$\Delta_p$ .avg. = average of the square roots of the velocity heads ( $\Delta_p$ ) measured at each traverse point.

Date: 2015-09-01

Manufacturer: MESY

Project #: pl 20112 Run: 1

Model: auto pellet air  
 Tech: MM Reviewer: NO

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
	Actual	Should Be	Actual	Should Be	Actual	Should Be
CO	0	0	2,945	2,971	<del>0,00</del> 0,995	1,031
Tolerance CO		+/- 0.02		+/- 0.15		+/- 0.05
CO <sub>2</sub>	0	0	17,81	17,87	9,78	9,968
Tolerance CO <sub>2</sub>		+/- 0.02		+/- 0.5		+/- 0.5
O <sub>2</sub> informative CSA B415 calculated value	20,97	20,90	2,25	1,989	10,22	9,995
	Actual	Should Be	Actual	Should Be	Actual	Should Be

Post Test (Record Only)

	Zero	Span	Cal.	Zero Drift	Limit	Span Drift	Limit	Cal. Drift	Limit	OK?	Not OK*
CO	0	2,962	0,994	0	0.02	0,015	0.15	0,001	0.05	ok	
CO <sub>2</sub>	0	17,86	9,77	0	0.02	0,05	0.5	0,01	0.5	ok	
O <sub>2</sub>	20,96	2,22	10,31	0,01	na	0,03	na	<del>0,09</del> 0,11	na	ok	

m.m

Date: 2015-09-01  
 Manufacturer: MESy  
 Project #: PT 2012 Run: 1

Model: auto pellet a.n  
 Tech: MM Reviewer: SP

**RAW DRY GAS METER READINGS**

	System 1	System 2
Final (Liter)	290853,75	249121,65
Initial (Liter)	290254,81	248547,54
Flow meter (Liter)	N.A	N.A

**AMBIENT CONDITIONS**

	Before	After
Barometer (kPa):	101,7	101,7
Dry Bulb (F):	80,6	82,1
Humidity (%):	52,2	47,5
Air velocity (ft/min)	20	19

**FUEL DATA**

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

Manufacturer: \_\_\_\_\_

Model: \_\_\_\_\_

Project #: \_\_\_\_\_

Run: \_\_\_\_\_

Tech: \_\_\_\_\_

Reviewer: \_\_\_\_\_

**FUEL DESCRIPTION:**

Type of wood :

**PRE-TEST LOAD**

Piece Size	Weight	Meter Moisture Content (% dry)*
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	

N.A.

**TEST LOAD WEIGHT:** \_\_\_\_\_ lbs



**FUEL DATA**

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

Manufacturer: \_\_\_\_\_

Model: \_\_\_\_\_

Project #: \_\_\_\_\_ Run: \_\_\_\_\_

Tech: \_\_\_\_\_ Reviewer: \_\_\_\_\_

**FUEL DESCRIPTION:**

Type of wood :

**TEST LOAD**

Piece Size			Weight	Meter Moisture Content (% dry)*			
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				

**TEST LOAD WEIGHT:** \_\_\_\_\_ lbs

**DILUTION TUNNEL PARTICULATE SAMPLER DATA**

Date: 2015-08-31 Model: Avto p-f/ct air

Manufacturer: MLE Sy Reviewer: AS

Project #: PL 2012 Run: 1 Tech: MM

Pre-test Weight Record		SYSTEM 1 - 1 <sup>st</sup> hour					SYSTEM 1					Blank		
Date	Time	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blank
		18	29	40	3	20	41	42	6					45
2015-08-31	17:00	108, 9630	0, 1225	0, 1242	10, 1303	108, 8440	0, 1239	0, 1218	10, 3216					0, 1218
2015-09-01	14:30	108, 9630	0, 1224	0, 1243	10, 1303	108, 8440	0, 1238	0, 1220	10, 3217					0, 1218

410

Post-test Weight Record		SYSTEM 1 - 1 <sup>st</sup> hour					SYSTEM 1					Blank		
Date	Time	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blank
		18	29	40	3	20	41	42	6					45
2015-09-01	19:30	108, 9631	0, 1235	0, 1243	10, 1326	108, 8440	0, 1248	0, 1221	10, 3272					0, 1218
2015-09-15	16:00	108, 9630	0, 1234	0, 1243	10, 1303	108, 8440	0, 1248	0, 1220	10, 3226					0, 1218
2015-09-24	16:00	108, 9630	0, 1234	0, 1243	10, 1303	108, 8440	0, 1248	0, 1220	10, 3227					0, 1218

**DILUTION TUNNEL PARTICULATE SAMPLER DATA**

Date: 2015-08-31  
Project #: PT 20112 Run: 1

Manufacturer: MESY M.M  
Tech: M.M  
Reviewer: AP

Model: cut & pull cl Ash

SYSTEM 2					
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
	21	43	44	10	
Date	Time				
2015-08-31	17:00	108, 7481	0, 1219	0, 1229	10, 1259
2015-08-01	14:30	108, 7482	0, 1219	0, 1230	10, 1258
	14:30 <sup>AM</sup>				

SYSTEM 2					
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
	21	43	44	10	
Date	Time				
2015-09-01	19:30	108, 7484	0, 1231	0, 1230	10, 1300
2015-09-15	16:00	108, 7482	0, 1230	0, 1230	10, 1264
2015-09-21	16:00	108, 7482	0, 1230	0, 1230	10, 1264

Date: 2015-09-02

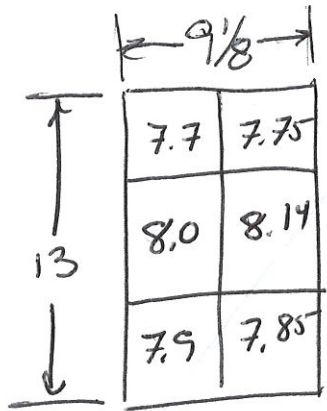
Manufacturer: Mesy

Model: auto pellet air

Project #: PI 20112 Run: 2

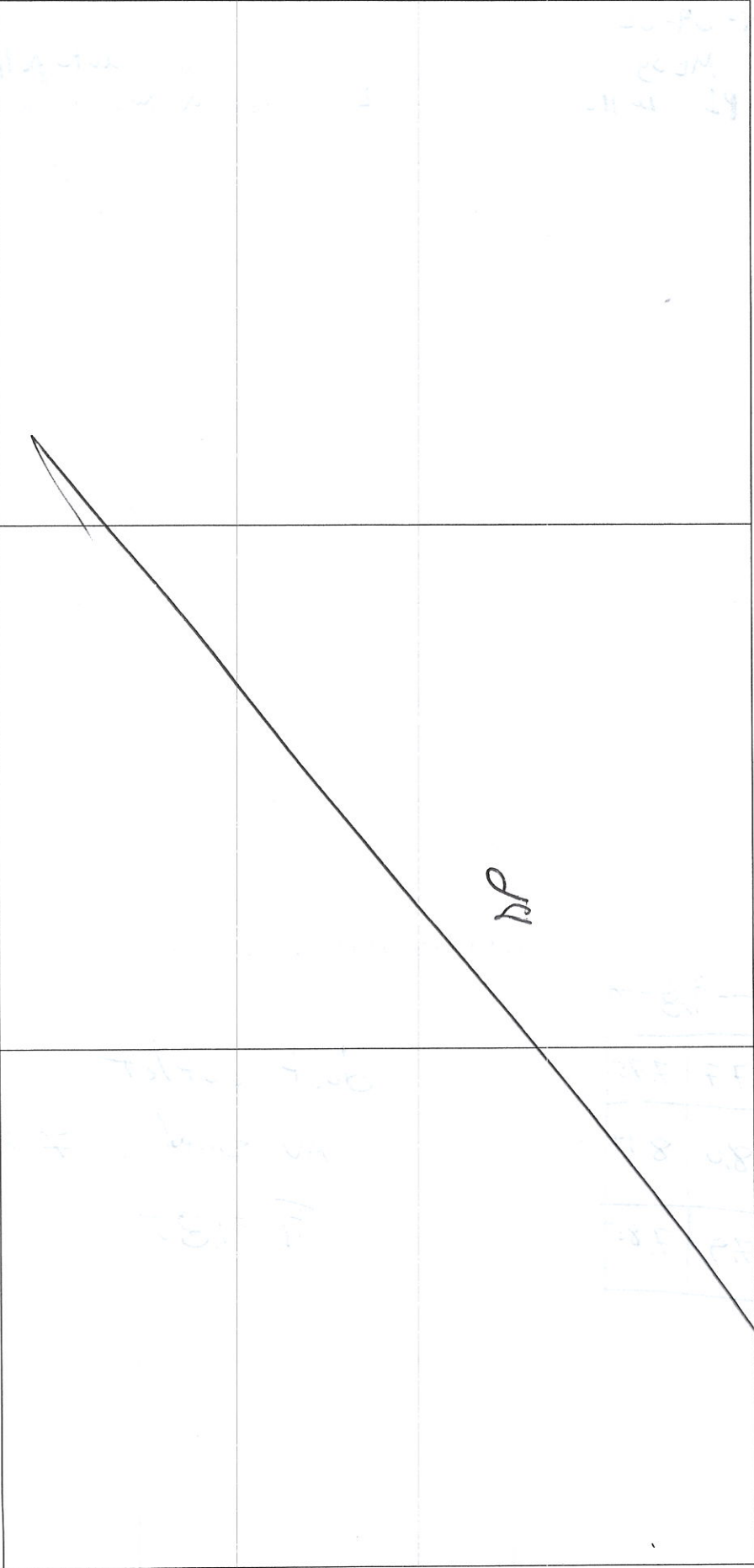
Tech: MM Reviewer: JS


TEST LOAD CONFIGURATION



duct outlet  
AV. speed : 7.89 m/s  
 $F_p = 1.85$

Date: 2015-09-02      Project #: PI 2012  
Manufacturer: MESY      Run: 2  
Tech: mm      Model: auto pulkt air  
Reviewer: DP

Side view	Front view	Top view
 <p style="text-align: center;">DP</p>		

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

Manufacturer: \_\_\_\_\_


Model: \_\_\_\_\_

Project #: \_\_\_\_\_

Run: \_\_\_\_\_

Tech: \_\_\_\_\_

Reviewer: \_\_\_\_\_

	ADDITION		SUBSTRACTION	
	ft3	Volume	ft3	Volume
V measure				
V ashlip				
%				
V usable				
Usable Firebox: _____				
Test load weight: _____	<u>Minimum:</u> _____		<u>Maximum:</u> _____	
Déviation: _____				

Date: 2015-09-02

Manufacturer: ME SY

Model: auto pellet ash

Project #: PI 2012 2012 Run: 2  
N.M.

Tech: MM Reviewer: AP

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
<u>N.A</u>	<u>—————</u>	<u>—————</u>	<u>—————</u>

Pre-Test

Post-Test

**Facility Conditions:**

Air Velocity from less than 2 feet .....

<u>18</u> (max50 Fpm)	<u>19</u> (max50 Fpm)
<u>ok</u>	<u>ok</u>
Front <u>ok</u>	Side <u>ok</u>

Smoke Capture Check .....

Picture .....

**Wood Heater Conditions:**

Date Wood Heater Stack Cleaned .....

<u>2015-08-31</u>
<u>2015-08-31</u>
<u>ok</u>
<u>ok</u>

Date Dilution Tunnel Cleaned .....

Induced Draft Check (max 0.005 H2O) .....

Traverse before ignition .....

Flow Rate 140 cfm ±10% .....

<u>ok</u>
-----------

**Temperature System:**

Ambient (65°-90°F) .....

<u>ok</u>	°F
-----------	----

Wood Heater Surface (±125°F) .....

<u>ok</u>	°F
-----------	----

**Proportional Checks:**

Thermocouple check .....

<u>ok</u>
<u>ok</u>
<u>ok</u>

Pitot Clean .....

Pitot verification .....

**Sampling Train ID Numbers:**

Probe .....

Filter Front .....

Filter Back .....

Filter Thermocouple .....

Filter 5G-3 (<90°F) .....

Train 1	Train 2
<u>16</u>	<u>19</u>
<u>20</u>	<u>23</u>
<u>22</u>	<u>26</u>
<u>11</u>	<u>12</u>
<u>0</u>	<u>06</u>

Date: 2015-09-02

Manufacturer: MESY

Model: auto pellet air

Project #: PL 20112 Run: 2

Tech: MM Reviewer: SP

**Leakage Checks Tunnel Samplers**

	SYSTEM 1		SYSTEM 2	
	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Unplugged Flow Rate = .25cfm				
Vacuum (inches Hg.)	-15	-15	-15	-15
Final 1minute DGM (Liter)	290854, 91	291455, 50	249123, 05	249702, 14
Initial 1minute DGM (Liter)	290854, 89	291455, 50	249123, 05	249702, 14
Change © (Liter)	0,02	∅	∅	∅
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 ( 0.56)				
Check OK	ok	ok	ok	ok

**Leakage Checks Flue Gas Sampler**

	Pre Test	Post Test
Plugged Probe		
Vacuum (inches Hg.)	-5	-5
Rotometer Reading (mml/min.)	0	0
Flow Rate (lpm)	1.5	1.5
Allowable (.02 x Sample Rate)	30	30
Check OK	ok	ok

**Leakage Checks Pitot**

Plugged Probe	Pre Test 3 H2o static	Pre Test 0.4-0.5 H2o velocity	Post Test 3 H2o Static	Post Test 0.4-0.5 H2o velocity
Vacuum (inches Hg.)	3	.5	4	.5
Check OK (no change after 15 sec.)	ok	ok	ok	ok



Date: 2015-09-02

Manufacturer: MESY

Project #: PI 20112

Run: 2

Model: auto pellet air

Tech: mm

Reviewer: SP

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	<u>EM-090</u>	<u>4.4</u> lbs, Class F	<u>4.4</u> lbs
Wood	<u>EM-090</u>	<u>4.4</u> lbs, Class F	<u>4.4</u> lbs
Analytical	<u>EM-128</u>	<u>100</u> mg, Class S	<u>100</u> mg
Analytical	<u>EA-129</u>	<u>200</u> g, Class S	<u>200</u> g

**LIMITS OF WEIGHT RANGES**

**ANALYTICAL SCALE:** ..... 50%-150% of dry filter weight, ± 0.1 mg

**PLATFORM SCALE** ..... 20%-80% of ideal test load weight, ± 0.1 lbs or 1%

**WOOD SCALE** ..... 20%-80% of ideal test load weight, ± 0.01 lbs or 1%

Date: 2015-09-02  
 Manufacturer: MESY Model: auto pitot air  
 Project #: pt 20112 Run: 2 Tech: MM Reviewer: SP

FOR TUNNELS < 12 in

Barometric pressure (P<sub>bar</sub>) 101.6 (KPa.) Static pressure (P<sub>q</sub>) 0.17 (inches w.c.)  
 Inside diameter: Port A \_\_\_\_\_ Port B \_\_\_\_\_  
 Tunnel cross sectional area: .1963Ft<sup>2</sup>  
 Pitot tube type: Standard

Traverse Point	Position (inches)			Velocity Head Δ <sub>p</sub> (inches H <sub>2</sub> O)	Tunnel Temperature (°F)	√Δ <sub>p</sub>
	6 po	7 po	8 po			
A- Centroid	3.00	3.50	4	0.048	78.01	
B - Centroid	3.00	3.50	4	0.047	78.06	
A-1	0.40	0.50	0.50	0.047	78.10	
A-2	1.50	1.75	2	0.050	78.13	
A-3	4.50	5.25	6	0.053	78.17	
A-4	5.60	6.5	7.5	0.047	78.18	
B-1	0.40	0.50	0.50	0.048	78.31	
B-2	1.50	1.75	2	0.049	78.29	
B-3	4.50	5.25	6	0.045	78.35	
B-4	5.60	6.5	7.5	0.041	78.40	
				AVERAGE		

$$v_s = K_p C_p (\sqrt{\Delta p})_{avg} \sqrt{\frac{(T_s)_{avg}}{P_s M_s}}$$

Where,

C<sub>p</sub> = pitot tube coefficient, dimension less = 0.99 for standard pitot.

Δ<sub>p</sub> = manometer reading (inches H<sub>2</sub>O)

T<sub>s</sub> = average absolute dilution tunnel temperature (°F + 460)

P<sub>s</sub> = absolute dilution tunnel gas pressure or P<sub>bar</sub> + P<sub>qg</sub>

P<sub>q</sub> = static pressure in. H<sub>2</sub>O  
 { 13.6 }

M<sub>s</sub> = 28.56, wet molecular weight of stack gas (alternatively, it may be measured)

K<sub>p</sub> = 85.49 pitot tube constant, (conversion factor for English units)

√Δ<sub>p</sub>.avg. = average of the square roots of the velocity heads (Δ<sub>p</sub>) measured at each traverse point.

Date: 2015-09-02

Manufacturer: MESY

Project #: p1 20112

Run: 2

Model: auto pellet air

Tech: M.M.

Reviewer: DP

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
	Actual	Should Be	Actual	Should Be	Actual	Should Be
CO	0	0	2,960	2,971	0,994	1,031
Tolerance CO		+/- 0.02		+/- 0.15		+/- 0.05
CO <sub>2</sub>	0	0	17,86	17,87	9,77	9,968
Tolerance CO <sub>2</sub>		+/- 0.02		+/- 0.5		+/- 0.5
O <sub>2</sub> informative CSA B415 calculated value	20,96	20,90	2,22	1,989	10,31	9,995
	Actual	Should Be	Actual	Should Be	Actual	Should Be

Post Test (Record Only)

	Zero	Span	Cal.	Zero Drift	Limit	Span Drift	Limit	Cal. Drift	Limit	OK?	Not OK*
CO	0,002	2,935	0,994	0,002	0.02	0,025	0.15	0	0.05	ok	
CO <sub>2</sub>	0,07	17,80	9,78	0,007	0.02	0,06	0.5	0,01	0.5	ok	
O <sub>2</sub>	20,80	2,16	10,16	0,16	na	0,06	na	0,15	na	ok	

Date: 2015-09-02

Manufacturer: Mesy

Model: auto pellet air

Project #: PL 20112 Run: 2

Tech: MM Reviewer: SP

**RAW DRY GAS METER READINGS**

	System 1	System 2
Final (Liter)	291454, 92	249701, 58
Initial (Liter)	290854, 91	249123, 64
Flow meter (Liter)	N.A	N.A

**AMBIENT CONDITIONS**

	Before	After
Barometer (kPa):	101,6	101,4
Dry Bulb (F):	76,4	86
Humidity (%):	69,3	57
Air velocity (ft/min)	18	19

**FUEL DATA**

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

Manufacturer: \_\_\_\_\_

Model: \_\_\_\_\_

Project #: \_\_\_\_\_

Run: \_\_\_\_\_

Tech: \_\_\_\_\_

Reviewer: SP

**FUEL DESCRIPTION:**

Type of wood :

**PRE-TEST LOAD**

Piece Size			Weight	Meter Moisture Content (% dry)*				
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					

*NA*

**TEST LOAD WEIGHT:** \_\_\_\_\_ lbs

**FUEL DATA**

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

Manufacturer: \_\_\_\_\_

Model: \_\_\_\_\_

Project #: \_\_\_\_\_ Run: \_\_\_\_\_

Tech: \_\_\_\_\_ Reviewer: AP

**FUEL DESCRIPTION:**

Type of wood :

**TEST LOAD**

Piece Size			Weight	Meter Moisture Content (% dry)*				
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					
x	x	in.	lbs.					

*(A large diagonal line is drawn across the table from the top-left to the bottom-right. The letters "N.A." are handwritten in the center of the table.)*

**TEST LOAD WEIGHT:** \_\_\_\_\_ lbs

**DILUTION TUNNEL PARTICULATE SAMPLER DATA**

Date: 2015-09-01 Project #: PL 20112 Run: 2 Manufacturer: MESy Model: avto pellet s/n

Tech: MR Reviewer: NS

Pre-test Weight Record		SYSTEM 1 - 1 <sup>st</sup> hour					SYSTEM 1				
Date	Time	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blank	
2015-09-01	17:00	108, 7839	0, 1261	0, 1263	10, 3686	108, 7560	0, 1252	0, 1294	10, 4308	0, 1254	
2015-09-02	9:00	108, 7840	0, 1260	0, 1264	10, 3688	108, 7560	0, 1253	0, 1295	10, 4310	0, 1255	

Post-test Weight Record		SYSTEM 1 - 1 <sup>st</sup> hour					SYSTEM 1				
Date	Time	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blank	
2015-09-02	15:00	108, 7841	0, 1261	0, 1267	10, 3722	108, 7560	0, 1255	0, 1296	10, 4351	0, 1255	
2015-09-15	16:15	108, 7840	0, 1262	0, 1264	10, 3694	108, 7560	0, 1256	0, 1295	10, 4314	0, 1256	
2015-09-21	16:00	108, 7840	0, 1262	0, 1264	10, 3692	108, 7560	0, 1256	0, 1295	10, 4313	0, 1255	

Date: 2015-09-01 Project #: PI 20112 Run: 2 Manufacturer: MESy Model: avto-p-11kt air  
 Tech: M.N. Reviewer: NS

SYSTEM 2					
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time				
2015-09-01	17:00	109,0984	0,1296	0,1215	10,2243
2015-09-01	9:00	109,0984	0,1292	0,1214	10,2245

424

SYSTEM 2					
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time				
2015-09-02	15:00	109,0986	0,1301	0,1214	10,2275
2015-09-15	16:15	109,0984	0,1300	0,1214	10,2248
2015-09-21	16:00	109,0984	0,1300	0,1214	10,2248



Date: 2015-09-03

Manufacturer: M&S

Model: auto pellet a.n

Project #: PI 20112

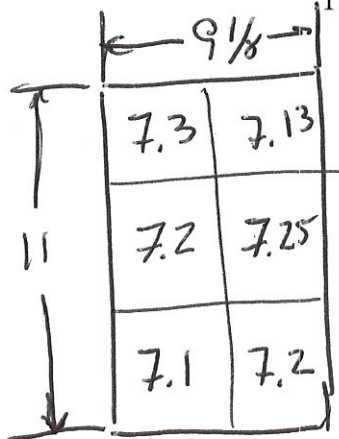
Run: 3

Tech: MM

Reviewer: RP

Blank lined area for notes.

TEST LOAD CONFIGURATION



duct outlet  
AV. speed : 7.197 m/s  
FP : 2.2  
stat pres. : 0.214120

Date: 2015-09-03

Project #: 012012




Manufacturer: MESY

Run: 3

Tech: MM

Model: auto pellet air

Reviewer: \_\_\_\_\_

Side view	Front view	Top view
		

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

Manufacturer: \_\_\_\_\_

Model: \_\_\_\_\_

Project #: \_\_\_\_\_

Run: \_\_\_\_\_

Tech: \_\_\_\_\_

Reviewer: \_\_\_\_\_

	ADDITION		SUBSTRACTION	
	ft3	Volume	ft3	Volume
V measure				
V ashlip				
%				
V usable				
<p>Usable Firebox: _____</p> <p style="text-align: center;"><i>DP</i></p> <p>Test load weight: _____      Minimum: _____      Maximum: _____</p> <p>Déviation: _____</p>				

Date: 2015-09-03

Manufacturer: ME Sy

Project #: pl 2012 Run: 3

Model: auto pellet air

Tech: Mm Reviewer: DP

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
<u>N.A</u>	<u>—————</u>		

Pre-Test

Post-Test

**Facility Conditions:**

Air Velocity from less than 2 feet .....

<u>22</u> (max50 Fpm)	<u>20</u> (max50 Fpm)
-----------------------	-----------------------

Smoke Capture Check .....

<u>ok</u>	<u>ok</u>
-----------	-----------

Picture .....

Front <u>ok</u>	Side <u>ok</u>
--------------------	-------------------

**Wood Heater Conditions:**

Date Wood Heater Stack Cleaned .....

<u>2015-08-31</u>
-------------------

Date Dilution Tunnel Cleaned .....

<u>2015-08-31</u>
-------------------

Induced Draft Check (max 0.005 H2O) .....

<u>ok</u>
-----------

Traverse before ignition .....

<u>ok</u>
-----------

Flow Rate 140 cfm ±10% .....

<u>ok</u>
-----------

**Temperature System:**

Ambient (65°-90°F) .....

<u>ok</u>	°F
-----------	----

Wood Heater Surface (±125°F) .....

<u>ok</u>	°F
-----------	----

**Proportional Checks:**

Thermocouple check .....

<u>ok</u>
-----------

Pitot Clean .....

<u>ok</u>
-----------

Pitot verification .....

<u>ok</u>
-----------

**Sampling Train ID Numbers:**

Probe .....

Train 1	Train 2
<u>4</u>	<u>6</u>

Filter Front .....

<u>14</u>	<u>16</u>
-----------	-----------

Filter Back .....

<u>15</u>	<u>30</u>
-----------	-----------

Filter Thermocouple .....

<u>11</u>	<u>12</u>
-----------	-----------

Filter 5G-3 (<90°F) .....

<u>ok</u>	<u>ok</u>
-----------	-----------

**SAMPLING EQUIPMENT CHECK OUT**

Date: 2015-09-03

Manufacturer: ME sy

Model: auto pellet air

Project #: PI 2012 Run: 3

Tech: MM Reviewer: DP

**Leakage Checks Tunnel Samplers**

Unplugged Flow Rate = .25cfm	SYSTEM 1		SYSTEM 2	
	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Vacuum (inches Hg.)	-15	-15	-15	-15
Final 1minute DGM (Liter)	291456,12	292054,76	249703,04	250280,60
Initial 1minute DGM (Liter)	291456,12	292054,75	249702,99	250280,57
Change © (Liter)	0	0,01	0,05	0,03
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)				
Check OK	OK	OK	OK	OK

**Leakage Checks Flue Gas Sampler**

Plugged Probe	Pre Test	Post Test
Vacuum (inches Hg.)	-5	-5
Rotometer Reading (mml/min.)	0	0
Flow Rate (lpm)	1.5	1.5
Allowable (.02 x Sample Rate)	30	30
Check OK	OK	OK

**Leakage Checks Pitot**

Plugged Probe	Pre Test 3 H2o static	Pre Test 0.4-0.5 H2o velocity	Post Test 3 H2o Static	Post Test 0.4-0.5 H2o velocity
Vacuum (inches Hg.)	3	4	3	.5
Check OK (no change after 15 sec.)	OK	OK	OK	OK

Date: 2015-09-03

Manufacturer: MESY

Model: auto pellet air

Project #: PI 2012 Run: 3

Tech: MM Reviewer: DP

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM-090	4.4 lbs, Class F	4.4 lbs
Wood	EM-090	4.4 lbs, Class F	4.4 lbs
Analytical	EM-128	100 mg, Class S	100 mg
Analytical	EM-129	200 g, Class S	200 g

**LIMITS OF WEIGHT RANGES**

**ANALYTICAL SCALE:** ..... 50%-150% of dry filter weight, ± 0.1 mg  
**PLATFORM SCALE** ..... 20%-80% of ideal test load weight, ± 0.1 lbs or 1%  
**WOOD SCALE** ..... 20%-80% of ideal test load weight, ± 0.01 lbs or 1%

Date: 2015-09-03  
 Manufacturer: MESY Model: auto pellet air  
 Project #: p1 2012 Run: 3 Tech: MM Reviewer: [Signature]

FOR TUNNELS < 12 in

Barometric pressure ( $P_{bar}$ ) 101.3 (KPa.) Static pressure ( $P_q$ ) 0.17 (inches w.c.)  
 Inside diameter: Port A \_\_\_\_\_ Port B \_\_\_\_\_  
 Tunnel cross sectional area: .1963Ft<sup>2</sup>  
 Pitot tube type: Standard

Traverse Point	Position (inches)			Velocity Head $\Delta_p$ (inches H <sub>2</sub> O)	Tunnel Temperature (°F)	$\sqrt{\Delta_p}$
	6 po	7 po	8 po			
A - Centroid	3.00	3.50	4	0.077	78.41	
B - Centroid	3.00	3.50	4	0.077	78.81	
A-1	0.40	0.50	0.50	0.040	78.78	
A-2	1.50	1.75	2	0.047	78.70	
A-3	4.50	5.25	6	0.050	78.77	
A-4	5.60	6.5	7.5	0.045	78.76	
B-1	0.40	0.50	0.50	0.048	78.90	
B-2	1.50	1.75	2	0.049	78.52	
B-3	4.50	5.25	6	0.046	78.47	
B-4	5.60	6.5	7.5	0.047	78.43	
				AVERAGE		

$$v_s = K_p C_p (\sqrt{\Delta p})_{avg} \sqrt{\frac{(T_s)_{avg}}{P_s M_s}}$$

Where,

$C_p$  = pitot tube coefficient, dimension less = 0.99 for standard pitot.

$\Delta_p$  = manometer reading (inches H<sub>2</sub>O)

$T_s$  = average absolute dilution tunnel temperature (°F + 460)

$P_s$  = absolute dilution tunnel gas pressure or  $P_{bar} + P_{qg}$

$P_q$  = static pressure in. H<sub>2</sub>O  
 { 13.6 }

$M_s$  = 28.56, wet molecular weight of stack gas (alternatively, it may be measured)

$K_p$  = 85.49 pitot tube constant, (conversion factor for English units)

$\Delta_p$ .avg. = average of the square roots of the velocity heads ( $\Delta_p$ ) measured at each traverse point.

Date: 2015-09-03

Manufacturer: ME Sy

Project #: PI 2012 Run: 3

Model: auto pellet air

Tech: MR Reviewer: DP

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
	Actual	Should Be	Actual	Should Be	Actual	Should Be
CO	0	0	2,965	2,971	0,993	1,031
Tolerance CO		+/- 0.02		+/- 0.15		+/- 0.05
CO <sub>2</sub>	0	0	17,83	17,87	9,75	9,968
Tolerance CO <sub>2</sub>		+/- 0.02		+/- 0.5		+/- 0.5
O <sub>2</sub> informative CSA B415 calculated value	20,93	20,90	2,10	1,989	10,10	9,995
	Actual	Should Be	Actual	Should Be	Actual	Should Be

Post Test (Record Only)

	Zero	Span	Cal.	Zero Drift	Limit	Span Drift	Limit	Cal. Drift	Limit	OK?	Not OK*
CO	0	2,960	0,997	0	0.02	0,005	0.15	0,004	0.05	ok	
CO <sub>2</sub>	0	17,82	9,74	0	0.02	0,01	0.5	0,01	0.5	ok	
O <sub>2</sub>	21,20	2,18	10,40	0,23	na	0,08	na	0,20	na	ok	



Date: 2015-09-03

Manufacturer: MESY

Model: auto pellet a.n

Project #: PI 2112 Run: 3

Tech: MM Reviewer: DO

**RAW DRY GAS METER READINGS**

	System 1	System 2
Final (Liter)	292054,18	250279,95
Initial (Liter)	291456,36	249703,55
Flow meter (Liter)	N.A	N.A

**AMBIENT CONDITIONS**

	Before	After
Barometer (kPa):	101,3	101,5
Dry Bulb (F):	77,2	84,2
Humidity (%):	73,3	42,2
Air velocity (ft/min)	22	20

FUEL DATA

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

Manufacturer: \_\_\_\_\_

Model: \_\_\_\_\_

Project #: \_\_\_\_\_

Run: \_\_\_\_\_

Tech: \_\_\_\_\_

Reviewer: DP

**FUEL DESCRIPTION:**

Type of wood :

**PRE-TEST LOAD**

Piece Size	Weight	Meter Moisture Content (% dry)*
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	
x x in.	lbs.	

N/A

TEST LOAD WEIGHT: \_\_\_\_\_ lbs



**DILUTION TUNNEL PARTICULATE SAMPLER DATA**

Date: 2015-09-02 Model: auto pilot 9.1A

Manufacturer: MESY Reviewer: DP

Project #: PI 2012 Run: 3 Tech: MM

Pre-test Weight Record		SYSTEM 1 - 1 <sup>st</sup> hour					SYSTEM 1					Blank		
Date	Time	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blank
		3	12	13	1	4	14	15	2					36
2015-09-02	17:00	614591	01261	01263	10, 2410	613837	01249	01233	10, 2468					0, 1270
2015-09-03	21:15	614593	01261	01265	10, 2412	613837	01250	01233	10, 2169					0, 1272

436

Post-test Weight Record		SYSTEM 1 - 1 <sup>st</sup> hour					SYSTEM 1					Blank		
Date	Time	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blank
		3	12	13	1	4	14	15	2					36
2015-09-03	16:00	614594	01262	01266	10, 2446	613840	01251	01236	10, 2206					0, 1273
2015-09-15	16:30	614593	01262	01265	10, 2418	613837	01251	01234	10, 2173					0, 1273
2015-09-21	16:30	614593	01262	01265	10, 2417	613837	01251	01233	10, 2173					0, 1273

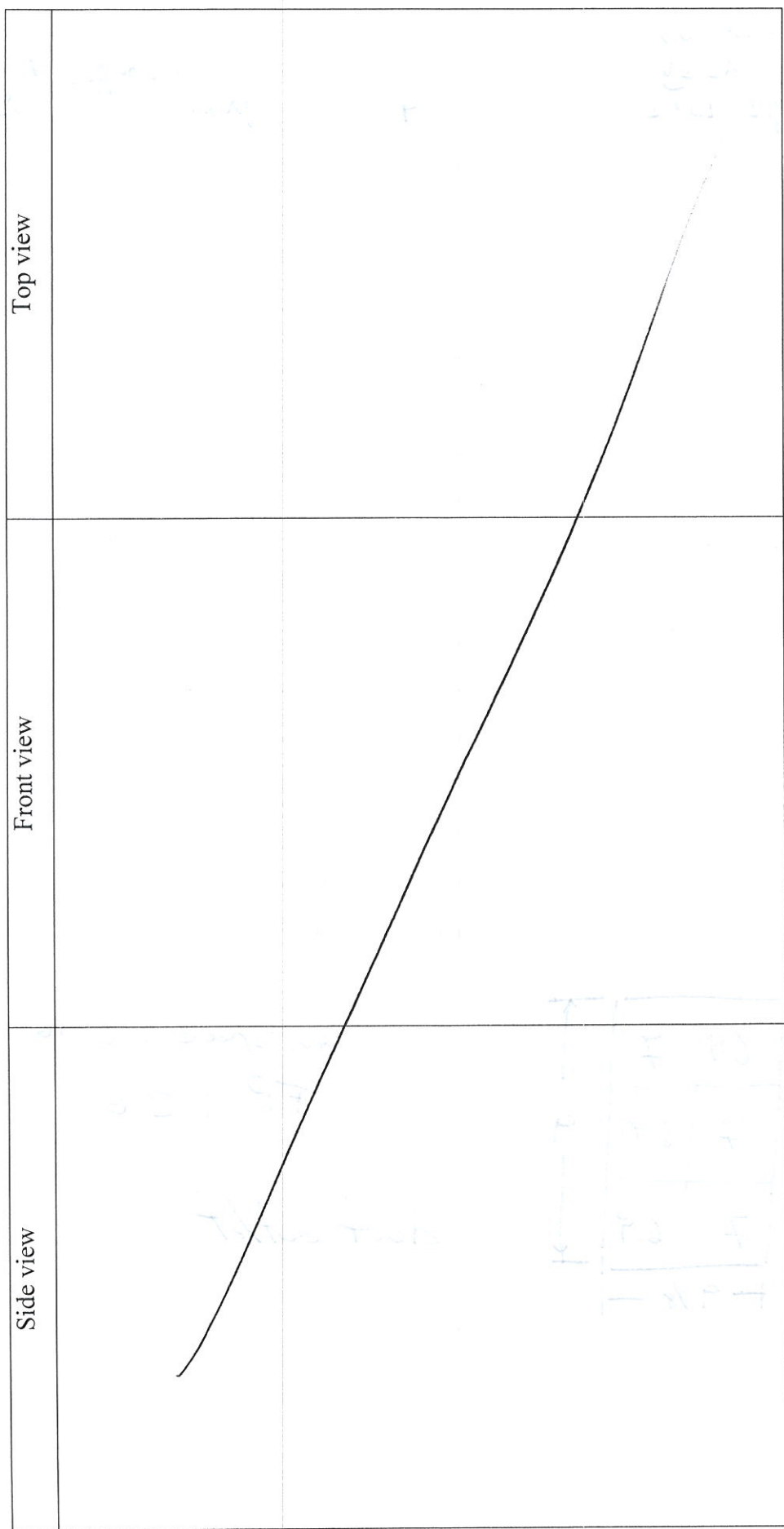
Date: 2015-09-02      Manufacturer: MESy      Model: auto-pellet a.n  
 Project #: PT20112      Run: 3      Tech: MM      Reviewer: DP  
 P.S. - PI 20112

SYSTEM 2					
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time				
2015-09-02	17:00	61,3786	0,1251	0,1222	10,9955
2015-09-03	7:15	61,3787	0,1252	0,1222	10,9956

SYSTEM 2					
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time				
2015-09-03	16:00	61,3788	0,1256	0,1223	10,9995
2015-09-15	16:30	61,3787	0,1256	0,1222	10,9963
2015-09-21	16:30	61,3787	0,1256	0,1222	10,9963



Date: 2015-09-03      Manufacturer: ME 3y      Model: auto pellet a.h  
 Project #: 01 20112      Run: 4      Tech: MM      Reviewer: [Signature]



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

Manufacturer: \_\_\_\_\_

Model: \_\_\_\_\_

Project #: \_\_\_\_\_

Run: \_\_\_\_\_

Tech: \_\_\_\_\_

Reviewer: JS

	ADDITION		SUBSTRACTION	
	ft3	Volume	ft3	Volume
V measure				
V ashlip				
%				
V usable				
Usable Firebox: _____				
Test load weight: _____		Minimum: _____		Maximum: _____
Déviation: _____				



Date: 2015-09-03  
 Manufacturer: MESY  
 Project #: PE 2012 Run: 4

Model: auto pellet e.n  
 Tech: MR. Reviewer: AP

Moisture Meter Calibration Check:

Equipment #	Time	12%	22%
N.A			

Pre-Test

Post-Test

**Facility Conditions:**  
 Air Velocity from less than 2 feet .....  
 Smoke Capture Check.....  
 Picture.....

	21 (max50 Fpm)	20 (max50 Fpm)
	ok	ok
Front	ok	Side ok

**Wood Heater Conditions:**  
 Date Wood Heater Stack Cleaned.....  
 Date Dilution Tunnel Cleaned.....  
 Induced Draft Check (max 0.005 H2O).....  
 Traverse before ignition.....  
 Flow Rate 140 cfm ±10%.....

2015-08-31
2015-08-31
ok
ok
ok

**Temperature System:**  
 Ambient (65°-90°F).....  
 Wood Heater Surface (±125°F).....

ok	°F
ok	°F

**Proportional Checks:**  
 Thermocouple check.....  
 Pitot Clean.....  
 Pitot verification.....

ok
ok
ok

**Sampling Train ID Numbers:**  
 Probe.....  
 Filter Front.....  
 Filter Back.....  
 Filter Thermocouple.....  
 Filter 5G-3 (<90°F).....

	Train 1	Train 2
Probe	11	17
Filter Front	33	820
Filter Back	35	821
Filter Thermocouple	11	12
Filter 5G-3 (<90°F)	ok	ok

**SAMPLING EQUIPMENT CHECK OUT**

Date: 2015-09-03

Manufacturer: MESY

Model: auto pellet air

Project #: PI 20112 Run: 4

Tech: MM Reviewer: DP

**Leakage Checks Tunnel Samplers**

	SYSTEM 1		SYSTEM 2	
	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (max test)	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (Max test)
Unplugged Flow Rate = .25cfm				
Vacuum (inches Hg.)	<del>n.r. -0.92</del> -15	-15	-15	-15
Final 1minute DGM (Liter)	<del>n.r. 292092.91</del> 292681.70	292681.70	250317.91	250882.81
Initial 1minute DGM (Liter)	292092.88	292681.70	250317.89	250882.81
Change © (Liter)	0.02	∅	0.02	∅
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 ( 0.56)				
Check OK	ok	ok	ok	ok

**Leakage Checks Flue Gas Sampler**

	Pre Test	Post Test
Plugged Probe		
Vacuum (inches Hg.)	-5	-5
Rotometer Reading (mml/min.)	0	n.r. 0x
Flow Rate (lpm)	1.5	1.5
Allowable (.02 x Sample Rate)	30	30
Check OK	ok	ok

**Leakage Checks Pitot**

	Pre Test 3 H2o static	Pre Test 0.4-0.5 H2o velocity	Post Test 3 H2o Static	Post Test 0.4-0.5 H2o velocity
Plugged Probe				
Vacuum (inches Hg.)	3	.5	3	.5
Check OK (no change after 15 sec.)	ok	ok	ok	ok

Date: 2015-09-03

Manufacturer: MESY

Model: auto pellet air

Project #: PI 2012 Run: 4

Tech: MM Reviewer: SP

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM-090	4,4 lbs, Class F	4,4 lbs
Wood	EM-090	4,4 lbs, Class F	4,4 lbs
Analytical	EM-128	100 mg, Class S	100 mg
Analytical	EM-129	200 g, Class S	200 g

**LIMITS OF WEIGHT RANGES**

**ANALYTICAL SCALE:** ..... 50%-150% of dry filter weight, ± 0.1 mg  
**PLATFORM SCALE** ..... 20%-80% of ideal test load weight, ± 0.1 lbs or 1%  
**WOOD SCALE** ..... 20%-80% of ideal test load weight, ± 0.01 lbs or 1%

Date: 2015-09-03  
 Manufacturer: MC sy Model: auto pellet a.k  
 Project #: PI 2111 Run: 4 Tech: MM Reviewer: JP

FOR TUNNELS < 12 in

Barometric pressure ( $P_{bar}$ ) 101.5 (KPa.) Static pressure ( $P_q$ ) 0.13 (inches w.c.)  
 Inside diameter: Port A \_\_\_\_\_ Port B \_\_\_\_\_  
 Tunnel cross sectional area: .1963Ft<sup>2</sup>  
 Pitot tube type: Standard

Traverse Point	Position (inches)			Velocity Head $\Delta_p$ (inches H <sub>2</sub> O)	Tunnel Temperature (°F)	$\sqrt{\Delta_p}$
	6 po	7 po	8 po			
A- Centroid	3.00	3.50	4	0,047	78,41	
B - Centroid	3.00	3.50	4	0,047	78,81	
A-1	0.40	0.50	0.50	0,040	78,78	
A-2	1.50	1.75	2	0,047	78,70	
A-3	4.50	5.25	6	0,050	78,77	
A-4	5.60	6.5	7.5	0,045	78,76	
B-1	0.40	0.50	0.50	0,048	78,90	
B-2	1.50	1.75	2	0,049	78,52	
B-3	4.50	5.25	6	0,046	78,47	
B-4	5.60	6.5	7.5	0,047	78,43	
AVERAGE						

$$v_s = K_p C_p (\sqrt{\Delta p})_{avg} \sqrt{\frac{(T_s)_{avg}}{P_s M_s}}$$

Where,

$C_p$  = pitot tube coefficient, dimension less = 0.99 for standard pitot.

$\Delta_p$  = manometer reading (inches H<sub>2</sub>O)

$T_s$  = average absolute dilution tunnel temperature (°F + 460)

$P_s$  = absolute dilution tunnel gas pressure or  $P_{bar} + P_{qg}$

$P_q$  = static pressure in. H<sub>2</sub>O  
 { 13.6 }

$M_s$  = 28.56, wet molecular weight of stack gas (alternatively, it may be measured)

$K_p$  = 85.49 pitot tube constant, (conversion factor for English units)

$\Delta_p$  avg. = average of the square roots of the velocity heads ( $\Delta_p$ ) measured at each traverse point.

Date: 2015-09-03

Manufacturer: ME Sy

Model: auto pellet air

Project #: P1 2012 Run: 4

Tech: MM Reviewer: \_\_\_\_\_

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
	Actual	Should Be	Actual	Should Be	Actual	Should Be
CO	0	0	2,964	2,971	0,995	1,031
Tolerance CO		+/- 0.02		+/- 0.15		+/- 0.05
CO <sub>2</sub>	0	0	17,79	17,87	9,81	9,968
Tolerance CO <sub>2</sub>		+/- 0.02		+/- 0.5		+/- 0.5
O <sub>2</sub> informative CSA B415 calculated value	20,95	20,90	311	2,971	10,22	9,995
	Actual	Should Be	Actual	Should Be	Actual	Should Be

Post Test (Record Only)

	Zero	Span	Cal.	Zero Drift	Limit	Span Drift	Limit	Cal. Drift	Limit	OK?	Not OK*
CO	0,001	2,968	0,997	0,001	0.02	0,004	0.15	0,005	0.05	ok	
CO <sub>2</sub>	0,0	17,81	9,88	0	0.02	0,02	0.5	0,07	0.5	ok	
O <sub>2</sub>	20,99	2,09	10,18	0,04	na	0,02	na	0,04	na	ok	

Date: 2015-09-03  
 Manufacturer: METS Model: auto pellet  
 Project #: p1 2012 Run: 4 Tech: MM Reviewer: DP

**RAW DRY GAS METER READINGS**

	System 1	System 2
Final (Liter)	292681,01	250882,15
Initial (Liter)	292093,31	250318,31
Flow meter (Liter)	N.A	N.A

**AMBIENT CONDITIONS**

	Before	After
Barometer (kPa):	101,5	101,5
Dry Bulb (F):	84,2	83,3
Humidity (%):	42,2	41
Air velocity (ft/min)	21	20

**FUEL DATA**

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

Manufacturer: \_\_\_\_\_

Model: \_\_\_\_\_

Project #: \_\_\_\_\_ Run: \_\_\_\_\_

Tech: \_\_\_\_\_ Reviewer: \_\_\_\_\_

**FUEL DESCRIPTION:**

Type of wood :

**PRE-TEST LOAD**

Piece Size			Weight	Meter Moisture Content (% dry)*			
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				
x	x	in.	lbs.				

**TEST LOAD WEIGHT:** \_\_\_\_\_ lbs

**FUEL DATA**

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

Manufacturer: \_\_\_\_\_

Model: \_\_\_\_\_

Project #: \_\_\_\_\_ Run: \_\_\_\_\_

Tech: \_\_\_\_\_ Reviewer: \_\_\_\_\_

**FUEL DESCRIPTION:**

Type of wood :

**TEST LOAD**

Piece Size	Weight	Meter Moisture Content (% dry)*			
x x in.	lbs.				
x x in.	lbs.				
x x in.	lbs.				
x x in.	lbs.				
x x in.	lbs.				
x x in.	lbs.				
x x in.	lbs.				
x x in.	lbs.				
x x in.	lbs.				
x x in.	lbs.				
x x in.	lbs.				
x x in.	lbs.				
x x in.	lbs.				
x x in.	lbs.				
x x in.	lbs.				
x x in.	lbs.				
x x in.	lbs.				
x x in.	lbs.				
x x in.	lbs.				
x x in.	lbs.				
x x in.	lbs.				
x x in.	lbs.				

*(Large diagonal scribble across the table)*

*(Handwritten 'N.A.' in the moisture content columns)*

**TEST LOAD WEIGHT:** \_\_\_\_\_ lbs



Date: 2015-09-02  
2015-09-02 M-F

Manufacturer: M&S Model: auto pellet air

Project #: PI 2012 Run: 4

Tech: M.M Reviewer: [Signature]

		SYSTEM 1 - 1 <sup>st</sup> hour					SYSTEM 1				
Pre-test Weight Record	Time	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blank	
		10	28	31	7	11	33	35	9	823	
2015-09-02	19:30	946440	0,1231	0,1279	10,4570	93,7296	0,1281	0,1224	10,3261	0,1278	
2015-09-02	15:00	946442	0,1230	0,1278	10,4570	93,7297	0,1281	0,1224	10,3263	0,1278	

449

		SYSTEM 1 - 1 <sup>st</sup> hour					SYSTEM 1				
Post-test Weight Record	Time	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blank	
		10	28	31	7	11	33	35	9	823	
2015-09-03	20:00	946443	0,1240	0,1281	10,4581	93,7298	0,1291	0,1224	10,3278	0,1278	
2015-09-15	17:00	946442	0,1239	0,1278	10,4571	93,7297	0,1290	0,1224	10,3264	0,1278	
2015-09-21	17:00	946442	0,1239	0,1278	10,4571	93,7297	0,1289	0,1224	10,3264	0,1278	

Date: 2015-09-02 Model: ant pd let a'n

Project #: P I 2012 Run: 4 Manufacturer: MESY Reviewer: [Signature]

Tech: [Signature]

SYSTEM 2					
Pre-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time	820	821	11	
2015-09-02	19:30	108,9538	0,1288	10,3017	
2015-09-03	15:00	108,9538	0,1288	10,3017	

SYSTEM 2					
Post-test Weight Record	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	
Date	Time	820	821	11	
2015-09-03	20:00	108,9538	0,1298	10,3029	
2015-09-15	17:00	108,9538	0,1298	10,3026	
2015-09-21	17:00	108,9538	0,1298	10,3026	

*Model: AutoPellet Air  
Maine Energy Systems, Inc.  
8 Airport Road  
Bethel, ME 04217*

# **Appendix F**

## **PELLET FUEL CERTIFICATION**

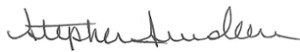


Twin Ports Testing, Inc.  
 1301 North 3rd Street  
 Superior, WI 54880  
 p: 715-392-7114  
 p: 800-373-2562  
 f: 715-392-7163  
 www.twinportstesting.com

**Report No:** USR:W215-0978-01  
**Issue No:** 2  
*Revised Report. Previous report is USR:W215-0978-01 issue number 1*

## Analytical Test Report

**Client:** POLYTESTS  
 695-B Gaudette  
 St-jean-sur-richelieu, QB J3B 7S7  
**Attention:** Danick Power  
**PO No:** 100371

**Signed:**   
 Stephen Sundeen  
 Chemistry Laboratory Manager  
**Date of Issue:** 9/17/2015  
*THIS DOCUMENT SHALL NOT BE REPRODUCED EXCEPT IN FULL*

**Sample Details**  
**Sample Log No:** W215-0978-01      **Sample Date:**  
**Sample Designation:** Pellet Sample      **Sample Time:**  
**Sample Recognized As:** Pellets      **Arrival Date:** 9/8/2015

	METHOD	UNITS	MOISTURE FREE	AS RECEIVED
Moisture Total	ASTM E871	wt. %		5.90
Ash	ASTM D1102	wt. %	0.38	0.36
Volatile Matter	ASTM D3175	wt. %		
Fixed Carbon by Difference	ASTM D3172	wt. %		
Sulfur	ASTM D4239	wt. %	0.007	0.006
SO <sub>2</sub>	Calculated	lb/mmbtu		0.015
Net Cal. Value at Const. Pressure	ISO 1928	GJ/tonne	18.89	16.58
Net Cal. Value at Const. Pressure	ISO 1928	J/g	18890	16582
Gross Cal. Value at Const. Vol.	ASTM E711	J/g	20214	19021
Gross Cal. Value at Const. Vol.	ASTM E711	Btu/lb	8691	8178
Carbon	ASTM D5373	wt. %	50.43	47.45
Hydrogen*	ASTM D5373	wt. %	6.08	5.73
Nitrogen	ASTM D5373	wt. %	< 0.20	< 0.19
Oxygen*	ASTM D3176	wt. %	> 42.90	> 40.36

\*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<sup>3</sup>  
**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**

# Appendix G

## Manufacturer's Written Instructions

Aside from the user manual supplied by the manufacturer, no other written instructions were provided to the test lab for the purpose of testing.

NOTE: The previous revision erroneously reported and contained a “manufacturer supplied instruction”. Communication with the test lab revealed that this document was for a different appliance that the laboratory had also worked with the manufacturer on. A copy of the communicate with the laboratory has been added to this appendix.

In the communicate, the test laboratory sent to OMNI a file called “unit operating procedure”. This is the same document that is already in this report under Table 8 on page 603. It is the noted appliance parameters during each test.

Communication with the manufacturer confirms that aside from the instruction manual, no testing-specific instructions were given to the test lab.

**From:** [Danick Power](#)  
**To:** [Ken Morgan](#); [Les Otten](#); [parrott.forestry@gmail.com](mailto:parrott.forestry@gmail.com)  
**Cc:** ["Les Otten"](#); ["BJ Otten"](#); ["Hannah Campbell"](#); ["Dan Wheeler"](#); [Alex Tiegs](#); [Finance](#)  
**Subject:** RE: AutoPellet Air report  
**Date:** Monday, March 10, 2025 1:16:08 PM  
**Attachments:** [unit operating procedure.pdf](#)

---

Ken,

Sorry for the mismatch on project it was not clear to me if it was the warm air furnace or the hydronic heater.

Please find enclosed the operating procedure for the test series.

Technician notes, yes there is not so much there, but from I remember this unit can be fully automated and we can fix the target output and it deliver the requested amount of output, moreover a pellet automated feeder, so there is not so much to tell here during the test.

Please find a link with all technicians note for the test series.

<https://www.transfernow.net/dl/20250310xfVXgiNj>

I hope this can help

Thank you  
Best regards,

**Danick Power P. Eng.**  
Vice-President Operations

Polytests Services Inc.  
695 B rue Gaudette,  
St-Jean-sur-Richelieu  
Québec, Canada, J3B 7S7  
450.741.3636  
[www.polytests.com](http://www.polytests.com)

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**De :** Ken Morgan <kmorgan@omni-test.com>

**Envoyé :** 7 mars 2025 11:30

**À :** Danick Power <dpower@polytests.com>; Les Otten <Les@lbohholdings.com>;  
parrott.forestry@gmail.com

**Cc :** 'Les Otten' <les@maineenergysystems.com>; 'BJ Otten' <BJ@maineenergysystems.com>;  
'Hannah Campbell' <hannah@maineenergysystems.com>; 'Dan Wheeler'  
<dan@maineenergysystems.com>; Alex Tiegs <atiegs@omni-test.com>; Finance <finance@omni-  
test.com>

**Objet :** RE: AutoPellet Air report

Hi Danick,

Thank you for the fast responses you provided last week. The reports were revised and re-submitted by Maine Energy last week and Dr. Sanchez responded with a few more discrepancies. Two of the discrepancies will require Polytests' attention.

1. The document you provided last week "Unit operating procedures PI-20113" (see attached) is titled "Unit operating procedure Maine Energy System 16-20Kw EasyPel". Rafael is having issues that it does not match the name on the report and certificate of "AutoPellet Air".
  - Can you check that we received the correct document? The project number appearing in the file name of the document is PI-20113, but the project number in the report is PI-20112.
  - If incorrect, please provide the correct document.
  - If it is the correct document, can you revise it to refer to the "AutoPellet Air".
2. Dr. Sanchez replied "***The lab technician's notes are minimal. Please explain why the lab technician did not document sufficient data and information.***" He did not elaborate on what he felt was lacking. Can you please review the files and the report to determine if all notes were indeed included? If they were, the client may ask for a statement that attests that all notes have been included.

We're working with the manufacturer to resolve these issues (copied on this email) and have been speaking primarily with Dr. Jonathan Parrott. At my suggestion, I am writing this email with him in mind as a sort of introduction to you as he may wish to interject via this email directly with you and you with him.

Regards,

## Ken Morgan

**OMNI-Test Laboratories, Inc.**  
Technical Services Director

[www.omni-test.com](http://www.omni-test.com)  
[kmorgan@omni-test.com](mailto:kmorgan@omni-test.com)

13327 NE Airport Way  
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Fax: (503) 643-3799

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*please forward it back to the sender. Errors in the presentation of test data, or from the omission of information, or due to other such circumstances are unintentional. If it is suspected that this has occurred, please notify the sender of this message to discuss/resolve.*

---

**From:** Danick Power <[dpower@polytests.com](mailto:dpower@polytests.com)>  
**Sent:** Wednesday, February 26, 2025 11:05 AM  
**To:** Les Otten <[Les@lboholdings.com](mailto:Les@lboholdings.com)>; Ken Morgan <[kmorgan@omni-test.com](mailto:kmorgan@omni-test.com)>;  
[parrott.forestry@gmail.com](mailto:parrott.forestry@gmail.com)  
**Cc:** 'Les Otten' <[les@maineenergysystems.com](mailto:les@maineenergysystems.com)>; 'BJ Otten' <[BJ@maineenergysystems.com](mailto:BJ@maineenergysystems.com)>;  
'Hannah Campbell' <[hannah@maineenergysystems.com](mailto:hannah@maineenergysystems.com)>; 'Dan Wheeler'  
<[dan@maineenergysystems.com](mailto:dan@maineenergysystems.com)>; Alex Tiegs <[atiegs@omni-test.com](mailto:atiegs@omni-test.com)>; Finance <[finance@omni-test.com](mailto:finance@omni-test.com)>  
**Subject:** RE: AutoPellet Air report

My bad, I had no project number as reference.

Ken,

Please find enclosed procedure for the pellet furnace

Best regards

**Danick Power P. Eng.**

Vice-President Operations

Polytests Services Inc.  
695 B rue Gaudette,  
St-Jean-sur-Richelieu  
Québec, Canada, J3B 7S7  
450.741.3636  
[www.polytests.com](http://www.polytests.com)

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---

**De :** Les Otten <[Les@lboholdings.com](mailto:Les@lboholdings.com)>

**Envoyé :** 26 février 2025 13:57

**À :** Danick Power <[dpower@polytests.com](mailto:dpower@polytests.com)>; Ken Morgan <[kmorgan@omni-test.com](mailto:kmorgan@omni-test.com)>; [parrott.forestry@gmail.com](mailto:parrott.forestry@gmail.com)

**Cc :** 'Les Otten' <[les@maineenergysystems.com](mailto:les@maineenergysystems.com)>; 'BJ Otten' <[BJ@maineenergysystems.com](mailto:BJ@maineenergysystems.com)>; 'Hannah Campbell' <[hannah@maineenergysystems.com](mailto:hannah@maineenergysystems.com)>; 'Dan Wheeler' <[dan@maineenergysystems.com](mailto:dan@maineenergysystems.com)>; Alex Tiegs <[atiegs@omni-test.com](mailto:atiegs@omni-test.com)>; Finance <[finance@omni-test.com](mailto:finance@omni-test.com)>

**Objet :** RE: AutoPellet Air report

We mean furnace correct?, not boiler

Leslie B Otten  
PO Box 547  
Bethel, Maine 04217

Office 207-824-7402  
Cell 207-557-1505  
[Les@lboholdings.com](mailto:Les@lboholdings.com)

---

**From:** Danick Power <[dpower@polytests.com](mailto:dpower@polytests.com)>

**Sent:** Wednesday, February 26, 2025 1:54 PM

**To:** Ken Morgan <[kmorgan@omni-test.com](mailto:kmorgan@omni-test.com)>; [parrott.forestry@gmail.com](mailto:parrott.forestry@gmail.com)

**Cc:** 'Les Otten' <[les@maineenergysystems.com](mailto:les@maineenergysystems.com)>; 'BJ Otten' <[BJ@maineenergysystems.com](mailto:BJ@maineenergysystems.com)>; 'Hannah Campbell' <[hannah@maineenergysystems.com](mailto:hannah@maineenergysystems.com)>; 'Dan Wheeler' <[dan@maineenergysystems.com](mailto:dan@maineenergysystems.com)>; Alex Tiegs <[atiegs@omni-test.com](mailto:atiegs@omni-test.com)>; Finance <[finance@omni-test.com](mailto:finance@omni-test.com)>

**Subject:** RE: AutoPellet Air report

Ken,

Please find enclosed a copy of section 3.1 in our original report. There is the description of what we did during the test, you can find all this already in our report.

As it is a pellet boiler there is not so much than : make sure it doesn't miss pellet for the test, adjusting water flow for the right output rate and start sampling pump when we start the test.

Hope this can help

Best regards

**Danick Power P. Eng.**

Vice-President Operations

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**De :** Ken Morgan <[kmorgan@omni-test.com](mailto:kmorgan@omni-test.com)>  
**Envoyé :** 26 février 2025 11:37  
**À :** Danick Power <[dpower@polytests.com](mailto:dpower@polytests.com)>; [parrott.forestry@gmail.com](mailto:parrott.forestry@gmail.com)  
**Cc :** 'Les Otten' <[les@maineenergysystems.com](mailto:les@maineenergysystems.com)>; 'BJ Otten' <[BJ@maineenergysystems.com](mailto:BJ@maineenergysystems.com)>; 'Hannah Campbell' <[hannah@maineenergysystems.com](mailto:hannah@maineenergysystems.com)>; 'Dan Wheeler' <[dan@maineenergysystems.com](mailto:dan@maineenergysystems.com)>; Alex Tiegs <[atiegs@omni-test.com](mailto:atiegs@omni-test.com)>; Finance <[finance@omni-test.com](mailto:finance@omni-test.com)>  
**Objet :** RE: AutoPellet Air report

Hi Danick,

Thank you. The document shows specific “recommended” settings from the manufacturer. Do you have any documentation that demonstrates what settings were used for the test, or can you confirm whether or not the “recommended” settings in the document were in fact what were used for testing? We want to clearly address both deficiencies (manufacturer’s instructions and actual settings used).

Thanks for getting back quickly.

**Note: OMNI is closed on Fridays.**

Regards,

<b>Ken Morgan</b>	
<b>OMNI-Test Laboratories, Inc.</b> Technical Services Director	<a href="http://www.omni-test.com">www.omni-test.com</a> <a href="mailto:kmorgan@omni-test.com">kmorgan@omni-test.com</a>
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---

**From:** Danick Power <[dpower@polytests.com](mailto:dpower@polytests.com)>

**Sent:** Wednesday, February 26, 2025 7:50 AM

**To:** Ken Morgan <[kmorgan@omni-test.com](mailto:kmorgan@omni-test.com)>; [parrott.forestry@gmail.com](mailto:parrott.forestry@gmail.com)

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**Subject:** RE: AutoPellet Air report

Ken,

This what I found in our file from 2015 test series about instruction to the lab  
let me know if you need anything else

Best regards

**Danick Power P. Eng.**

Vice-President Operations

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**De :** Ken Morgan <[kmorgan@omni-test.com](mailto:kmorgan@omni-test.com)>  
**Envoyé :** 24 février 2025 16:42  
**À :** [parrott.forestry@gmail.com](mailto:parrott.forestry@gmail.com)  
**Cc :** 'Les Otten' <[les@maineenergysystems.com](mailto:les@maineenergysystems.com)>; 'BJ Otten' <[BJ@maineenergysystems.com](mailto:BJ@maineenergysystems.com)>; 'Hannah Campbell' <[hannah@maineenergysystems.com](mailto:hannah@maineenergysystems.com)>; 'Dan Wheeler' <[dan@maineenergysystems.com](mailto:dan@maineenergysystems.com)>; Alex Tiegs <[atiegs@omni-test.com](mailto:atiegs@omni-test.com)>; Danick Power <[dpower@polytests.com](mailto:dpower@polytests.com)>; Finance <[finance@omni-test.com](mailto:finance@omni-test.com)>  
**Objet :** RE: AutoPellet Air report

Hello Dr. Parrott,

To be very clear on identifying which report the deficiencies were listed for, please verify if it pertains to OMNI test report No. 0444PB008E. Unfortunately, the EPA never cites the report number which happens to be our absolute means of identification.

Assuming that is report number 0444PB008E, please note that OMNI provided the 3<sup>rd</sup> party certification, however the appliance was tested at Polytests Services. The report was last revised on September 6, 2023 where one of the current items listed as the lack of the technician's hand-written notes was already addressed and added as Appendix E.

The manufacturer's instructions to the test lab and the settings used for each test we will need to get from Polytests Services. I am copying Mr. Power at Polytests Services on this email. It may be that Danick Power reaches out to you with questions or confirmations. When OMNI receives these pieces of information, we can revise the reports (CBI and Non-CBI) and update the certificates.

Let me know if you have any questions (you too Danick).

Regards,

<b>Ken Morgan</b>	
<b>OMNI-Test Laboratories, Inc.</b> Technical Services Director	<a href="http://www.omni-test.com">www.omni-test.com</a> <a href="mailto:kmorgan@omni-test.com">kmorgan@omni-test.com</a>
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**From:** [parrott.forestry@gmail.com](mailto:parrott.forestry@gmail.com) <[parrott.forestry@gmail.com](mailto:parrott.forestry@gmail.com)>  
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**Subject:** AutoPellet Air report

Ken,  
 Thank you for the conversation this morning regarding Maine Energy Systems' pellet furnace and our pursuit of a renewed listing with the EPA. As mentioned, the Agency has identified a number of deficiencies within the existing report that require amending (below). To assist in this effort, I have attached our revised owner's manual with changes made to page 5 & 10 reflecting the needs listed in blue below. I appreciate your engagement and look forward to discussing this with you later this week once your team has had a chance to assess the effort.

Jon

AutoPellet Air 28

<b>Test Report Problems or Irregularities</b>	<b>Regulatory Citation and/or Test Method</b>	<b>Information Needed to Address Problems or Irregularities</b>
Missing – Manufacturer's Instructions to Lab	40 CFR § 60.5478 (f)(1)	Include in the revised test report the manufacturer's instructions to the lab.
Missing Information – Lab Technician Notes	40 CFR § 60.5475 (b)(5)	Include the lab technician's notes in the revised test report. The updated lab notes lack sufficient information documenting the test runs.
Missing Information – Feed Rate Setting	40 CFR § 60.5475 (b)(5)	Include in the revised test report the feed rate setting.
Missing Information in Owner's Manual – Smoke Detectors and Carbon Monoxide Monitors	40 CFR Appendix I to Part 60	Include in the revised test report and the updated Owner's Manual information on the recommended use of smoke detectors and carbon

		<p>monoxide monitors. The updated information is deficient. Include the following:</p> <p>INSTALL CO SMOKE DETECTORS IN THE LIVING AREA AND BEDROOMS OF YOUR HOME. TEST THEM REGULARLY AND INSTALL FRESH BATTERIES TWICE ANNUALLY.</p> <p>WHEN INSTALLED IN THE SAME ROOM AS THE STOVE, A SMOKE OR CARBON MONOXIDE DETECTOR SHOULD BE LOCATED AS FAR FROM THE STOVE AS POSSIBLE TO PREVENT THE ALARM SOUNDING WHEN ADDING FUEL.</p>
<p>Missing Information in Owner’s Manual – EPA Compliance Status</p>	<p>40 CFR Appendix I to Part 60</p>	<p>Include in the revised test report and the revised Owner’s Manual information on the EPA compliance status.</p>

Jonathan T. Parrott, Ph.D.  
Flat Rock Farm, 15 Goose lane, PO Box 92  
Chesterfield MA 01012  
[Parrott.forestry@gmail.com](mailto:Parrott.forestry@gmail.com)  
413.658.8117c

*Model: AutoPellet Air  
Maine Energy Systems, Inc.  
8 Airport Road  
Bethel, ME 04217*

# **Appendix H**

## **ALT-134**



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
RESEARCH TRIANGLE PARK, NC 27711

AUG 19 2019

OFFICE OF  
AIR QUALITY PLANNING  
AND STANDARDS

Mr. Sylvain Bilodeau  
President  
L.S. Bilodeau Inc.  
Steel Products Manufacturing  
281 Route 108 Est  
Saint-Ephrem QC  
Canada, GOM 1R0

Dear Mr. Bilodeau,

I am writing in response to your correspondence, dated July 9, 2019, regarding certification testing of your AirBilo PLUS brand wood-fired forced-air furnace. You are planning to use the cordwood option to obtain 2020 certification under 40 CFR 60, Subpart QQQQ - Standards of Performance for New Residential Hydronic Heaters and Forced Air Furnaces (Subpart QQQQ), Section 60.5476(e). You are requesting an alternative certification procedure to use the Canadian Standards Association (CSA) B415.1-10 test method, "Performance testing of solid-fuel-burning heating appliances," including thermostatically controlled warm air furnaces using cordwood as stated in section 7.2 of the CSA standard in lieu of the Method 28 WHH (40 CFR 60, Appendix A) procedures required by Subpart QQQQ.

In your correspondence, you are requesting the alternative certification testing procedure for your furnace because it is thermostatically-controlled and there is the potential for extreme BTU delivery to cause longer ramp down to the lowest BTU delivered. You also note, that when operating at the lowest rate preset by factory with normal operating mode for the blower, the furnace will produce more delivered BTU output than allowed for the Category 1 burn in EPA Method 28 WHH. In addition, you state that the furnace can not maintain combustion under the required Method 28 test procedure and it will force the fire to go out.

To address these issues, you are requesting to use the burn rate categories of CSA Method B415.1-10 in Section 7.2.1.2 in lieu of those in Method 28 WHH with the following modifications:

- Category IV - Operate at maximum capacity with forced combustion inducer engaged during the entire test.
- Category III - Operate with the switch for inducer "on" and "off" to meet specific output range.
- Category II - Operate with the switch for inducer "on" and "off" to meet specific output range.



- Category I - Operate at the lowest heat output below 35% of the maximum output of the furnace.

With the caveats set forth below, we are approving your alternative method request for certification testing of the AirBilo PLUS brand thermostatically-controlled forced air furnace. As required in Subpart QQQQ, Section 60.5476(c)(6), the manufacturer or approved test lab must also measure the first hour of particulate matter emissions for each test run using a separate filter in one of the two parallel sampling trains. These results must be reported separately and also included in the total particulate matter emissions per run. Also, as required in Subpart QQQQ, Section 60.5476(a), the manufacturer must have the approved test laboratory measure the efficiency, heat output, and carbon monoxide emissions of the tested wood heater using CSA Method B415.1-10. For particulate matter emission concentrations, ASTM E2515-11 "Standard Test Method for Determination of Particulate Matter Emissions Collected by a Dilution Tunnel" must be used; four inch filters are acceptable. Disregard Sections 8.3.1 and 8.4 in CSA Method B415.1-10 regarding the use of Douglas fir lumber in a crib wood configuration for EPA testing. However, for cordwood, you may use Douglas fir as well as any of the other species of wood listed in CSA Method B415.1-10.

The AirBilo PLUS brand forced-air furnace design incorporates a low setting on its controller which is the lowest heat output (Btu/hr) setting available to the user and corresponds to the lowest burn rate to be evaluated during certification testing; this is consistent with 40 CFR part 60, Subpart QQQQ, section 60.5476, which states "*The burn rate for the low burn category must be no greater than the rate that an operator can achieve in home use and no greater than is advertised by the manufacturer or retailer.*"

It is reasonable that this alternative test method approval be broadly applicable to certification testing of forced air furnaces subject to the requirements of 40 CFR part 60, Subpart QQQQ. For this reason, we will post this letter as ALT-134 on our website at <http://www3.epa.gov/ttn/emc/approalt.html> for use by other interested parties. A copy of this letter must be included in each certification test report. The emission limit in the rule remains intact and time weighted averaging is not allowed. This alternative method approval is valid until such time that Subpart QQQQ is revised or replaced to require a different certification method for these units, and at such time, this alternative will be reconsidered and possibly withdrawn.

When doing the certification testing of the AirBilo PLUS, the burn rate requirements in Section 7.2.1.2 of CSA Method B415.1-10 must be followed:

1. Category 1: Operate at the lowest delivered output that the unit is able to operate at (idle mode with no heat demand from the home/thermostat), and be below 35% of the Maximum of the heat output of the furnace.
2. Category 2: Heat output shall be between 35 and 53% of the maximum heat output of furnace.
3. Category 3: Heat output shall be between 53 and 76% of the maximum heat output of furnace.

4. Category 4: Heat output shall be the maximum heat output of the furnace.

The procedures in Section 7.2.2.2 of CSA Method B415.1-10 must be followed completely regarding Category 1 through 3 heat output using the remote control switch in the on position at the beginning of the test and leaving it on until the heat output for these categories are met, at which point the on switch can be turned off, and turned back on when the average heat demand drops below the determined target percentage of maximum heat output, at this point the switch can be in the on position to meet the heat output category being tested. Allow the heat output to fall below the target rate, then switch on the heat demand, and switch that off once target is reached. This cycle should be repeated for the entire test.

The following changes to ASTM E2515-11 must be followed for the certification testing:

1. Filters must be weighed in pairs to reduce weighing error propagation. See ASTM E2515-11, section 10.2.1, Analytical Procedure.
2. Sample filters must be Pall TX-40 or equivalent Teflon-coated glass fiber filters, and 47 mm, 90 mm, 100 mm, or 110 mm in diameter.
3. Only one point is allowed outside the +/- 10 percent proportionality range per test run.

If you have additional questions regarding this approval, please contact Michael Toney of my staff at 919-541-5247 or [toney.mike@epa.gov](mailto:toney.mike@epa.gov).

Sincerely,



Steffan M. Johnson, Group Leader  
Measurement Technology Group

cc: Amanda Aldridge, EPA/OAQPS/OID  
Adam Baumgart-Getz, EPA/OAQPS/OID  
Rochelle Boyd, EPA/OAQPS/SPPD  
Chuck French, EPA/OAQPS/SPPD  
Rafael Sanchez, EPA/OECA  
Michael Toney, EPA/OAQPS/AQAD

### Appendix I - Revision History

Date	Project No.	Evaluator	Report Sect.	Summary of Changes
11/13/2015	0444PB008E	Ken Morgan	ALL	First Issue
09/06/2023	0444PB008E (Edition 001)	Riley Tiegs Ken Morgan	APPENDIX G	Revision History created
			Preface	Updated to current edition.
			1	Introduction was modified to address conditioning, operating instructions, and the addition of the "Report Addendum"
				Table 1.4 created to address Train Precision (pg7)
				All run anomalies were addressed (pg 7)
			APPENDIX B	Addendum Report added
			APPENDIX C	Dilution Tunnel Schematic was added and Tunnel that was used.
			APPENDIX D	Conditioning Data Added
			APPENDIX E	Lab technician notes Added
			APPENDIX F	Pellet Fuel Certification Added
4	New manuals added (Pg 13)			
03/03/25	0444PB008E REV001	Ken Morgan	Appendix E Page 398	Clarified that technician notes had been added previously under Edition 001 as "Appendix E".
			Appendix G Page 453	Added the instructions that were provided by the manufacturer to the laboratory at the time of testing.
				Added test run parameters that indicate the settings of the appliance under test conditions
			Page 310 of this report	Added revised manuals - Includes information on carbon monoxide and smoke detectors.
			Page 295 of this report	Revised manual indicates EPA compliance status
Appendix H Page 456	Renamed Revision History from "Appendix G" to "Appendix H"			

Date	Project No.	Evaluator	Report Sect.	Summary of Changes
3/18/25	0444PB008E REV001 (Ed. 001)	K. Morgan	Section 4	Section 4 “Labeling and Owner’s Manuals” was entirely removed. This was already in Polytests report beginning on page 222 and was redundant.
			Appendix E	Page 398 – Added clarification that all technician notes are contained within the report.
				Page 454 – Added communication between 3 <sup>rd</sup> party certifying body and testing laboratory concerning handwritten notes and testing instructions.
			Page 222	Added revised manual – Includes information on carbon monoxide and smoke detectors. (Incorrect version was added under previous revision)
			Page 295	Revised manual indicates EPA compliance status. (Incorrect version was added under previous revision)
			Appendix G Page 453	No testing-specific instructions were given to the test lab. Further discussion on page 453.
Page 454 – Added communication between 3 <sup>rd</sup> party certifying body and testing laboratory concerning handwritten notes and testing instructions				
3/20/25	0444PB008E REV001 (Ed. 002)	K. Morgan	Appendix H Page 463	Renamed “Appendix H – ALT-134” and added copy of EPA ALT-134.
			Appendix I Page 467	Created Appendix I “Revision History” and moved revision history there to accommodate insertion of “Appendix H – ALT-134”
			Cover, Page 5	Edited Cover and introduction to refer to the full name of the model as “AutoPellet Air 28kW” from just “AutoPellet Air”
			Page 5	Added comment that the appliance was subsequently tested under the auspices of EPA ALT-134