POLYTESTS
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TEST REPORT

TEST OF A PELLET STOVE FOR EMISSIONS AND EFFICIENCY

PER EPA METHODS 28R AND ASTM E2515 and ASTM E2779, MAY 2015

Client:
Laminox s.r.l.
62028 Sarnano
Zona industrial, Italy

Model name: Jessica 11 air

Attention: Rafaël Sanchez

TESTED BY:
Services Polytests inc.
695-B Gaudette
St-jean-sur-Richelieu, QC, J3B 7S7

TEST DATES:
REPORT DATE: April 20th 2018
Test date: April 9th 2018
Revision 1: August 28th 2023
Project number: PI-20163

Tested:

Maxime Martin

written by:

Danick Power, P. Eng

Verified by third party certifier (PFS):

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Revision 1 (August 28th 2023):

- Section 3.6 and appendix 8, updated for more dilution tunnel details
- Appendix 1 Updated to include efficiency sample calculation (CSAB415.1-10 spreadsheet).
- Appendix 3 updated to included fuel analysis and all ISO17025 calibration certificate.
- Section 3.4 updated for appropriateness and validity for the run.
- Section 3.4 updated for discussion about no anomalies occur during the test.
- Appendix 1 include PM report with filters negative weight rounded to 0.
- Appendix 1 revised to include PM emission with uncorrected negative weight in gr/hr.
- Table 2.6 updated for dual train precision in g/Kg and %
- Section 3.4 updated to add discussion about negative weight mass on back filter and they were handled properly, all numbers detail can be found in appendix 1.
- Appendix 7 manual upated for replacement parts critical for emissions and the warranty details. Label

List of appendixes

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1 INTRODUCTION

1.1 GENERAL

Laboratory

- Location: Services Polytests Inc., 695-B Gaudette St-jean-sur-Richelieu QC, Canada J3B 7S7
- Elevation: 100 feet above sea level

Test program

- Purpose: unit qualification NSPS 2020
- Test date: April 11th 2018
- Test methods used:
    - Particulate emissions: ASTM E2779-10; ASTM E2515-11, methods 28R as referred into 40 CFR Part 60 Subpart AAA
    - Efficiency: CSA B415.1-10

1.2 TEST UNIT INFORMATION

General

- Manufacturer: Laminox
- Product type: Pellet stove
- Combustion system: electric, blower and auger motor
- Unit tested: Jessica 11 Air

Particularities

- Included also other models Veronica Air, only Esthetic differences. All stoves have the same combustion components, setting, and firebox dimensions.
- Models included: Jessica 11 Air and veronica 11 Air. ref. appendix 6 for detail on

1.3 RESULTS

Emission results obtained

- Weighted average emission rate: 1.6 grams/hour
- Overall Efficiency: 73%
- Maximum output: 21 400 btu/hr

Conformity: NSPS Phase 2020

1.4 PRETEST INFORMATION

Unit condition: The unit was received by carrier in good condition. The 50hrs of aging is made in January 2018.

Set up

- Venting system type: pellet venting conduit 3inch. diameter
- System height from floor: 15 feet
- Particularities: none

Break in period

- Duration: the unit was received from the manufacturer and ran for at least 50 hours at 50% of the maximum burn rate with adequate documentation of fuel additions and flue and unit temperatures during month of January 2018.
- Fuel: wood pellet

2 SUMMARY OF TEST RESULTS

2.1 EMISSIONS

Run Number	Date			Run Time (Min.)	Heat Output (Btu/hr)	1st Hour Emissions (g/hr)	Integrated Total (g/hr)	CO Emissions (g/min)	Overall CO Emissions (g/min)	Heating Efficiency (% HHV)	Overall Heating Efficiency (% HHV)
		Setting	Burn Rate								
1	April 9th 2018	H	1.5	60	21 400	3.1	1.62	0.32	0.28	75.4	72.8
		M	0.7	120	9 900			0.2		71.9	
		L	0.6	180	7 900			0.32		71.3	
		OA	0.8	360	10 705			0.28		72.8	

2.2 AVERAGE CALCULATION

NA: Pellet Stove tested as ASTM E2779 section 9.4.1 integrate test run

2.3 TEST FACILITY CONDITIONS

Run Number	Room Temperature		Barometric pressure		Relative humidity		Air Velocity	
	Before (F)	After (F)	Before (in.Hg)	After (in.Hg)	Before (%)	After (%)	Before (ft/min)	After (ft/min)
1	70	72	30,062	30,062	19	18	4	3

2.4 FUEL QUALITIES

Run Number	Pre-test Load			Test Load			
	Loading Weight Wet Basis (lbs)	Moisture Content Dry Basis (%)	Coal bed Weight (lbs)	Weight Wet Basis (lbs)	Density Wet Basis (lbs/cuft)	Moisture Content Dry Basis (%)	Piece Length (in.)
1	5	4.4	Na	10.9	Na	4.44	Na

2.5 DILUTION TUNNEL FLOW RATE MEASUREMENTS AND SAMPLING DATA (ASTM E2515)

Average dilution tunnel measurements				Sample Data			
Run Number	Burn Rate (Min)	Volumetric Flow Rate (dscf/min)	Total Temperatures (°R)	Volume sampled (DSCF)		Particulate catch (mg)	
				1	2	1	2
1	360	162,67	550,09	59,809	61,223	9,70	10,40

2.6 DILUTION TUNNEL DUAL TRAIN PRECISION

Run Number	Sample Ratio		Total Emission (g)			
	Train 1	Train 2	Train 1	Train 2	% Deviation	Deviation g/Kg
1	979,15	956,52	9,50	9,95	2,31%	0,095

3 PROCESS DESCRIPTION

3.1 DISCUSSION

At the reception of the unit, setup, and aging (50hrs) at power 2 (medium setting) have been done prior to official emission test.

3.2 UNIT DIMENSIONS

Baffle

- Location: top of the combustion chamber
- Dimensions: refer to appendix 6 drawings
- Material: Steel

Bricks

- Location: back and side of the combustion chamber
- Dimensions: back: 7 7/8 wide X 14 ¼ height X 1 Thick; Sides: 5 3/8 wide X 15 height X 1 ½ Thick
- Material: Vermiculite

Flue gas exhaust

- Location: back of the unit at 7 from the bottom
- Dimensions: 3 inches (inside diameter)
- Material: steel

Overall unit dimension

- Overall dimension: 20 ¾ depth X 21 ¾ wide X 40 ½ height
- Firebox dimensions: 5 1/8 depth X 8 ¾ wide at the back X 14 ¼ Height
- Burner dimension: 3 ½ depth X 3 ½ wide X 3 ¾ height

Gasket

- Door and Glass: Refer to appendix 6 for all details

Auger motor

- Mark: Merkll-Korff
- Model: SNCM-372OU / B4415U

Convection fan

- Mark: Embpapst
- Model QLN65/0030A43-3038LH-68

Exhaust fan

- Mark: Natalini
- Model: PL21UL0290

Glass

	Model Veronica 11 air		Model Jessica 11 air	
	Internal glass	External glass	Internal glass	External curved glass
Dimension	336 mm X 239 mm	740mm X 350 mm	336 mm X 239 mm	773 mm X 328 mm
Material	Ceramic glass	Tempered glass	Ceramic glass	Tempered glass
Thickness	5 mm	4 mm	5 mm	4 mm

3.3 AIR SUPPLY SYSTEM

Description

Setting	**Jessica 11 Air Burning air speed**
Maximum	1650
Medium	1270
Minimum	1200

3.4 OPERATION DURING TEST

Run #1

This run was performed April 9th 2018. It lasted 360 minutes and as ASTM E 2779 section 9.4.1 integrate test run obtained at 0.8 kg/hr & emission at 1.62 gr/hr. The pellet stove is preheated for 90 min. before the beginning of the test. For the first hour of the test the unit was set at the maximum setting (power 5), then for the next 2 hours we set at the medium setting (power 2) to burn less than 50% of the maximum, and for the last portion of the test the pellet stove is set at the minimum setting (power 1) for 3 hours of minimum burn rate. Run have been found appropriate, no anomalies happened and have been validate and found compliant. Negative weight has been found on back filter du to sticking on gasket, these have been handled properly. It is not a weight loss but transfer from filter to gasket, for the compliance number we do not have to round the weight to zero for the filter.

- Details: Refer to the front page of each test run data sheets found in appendix for the detailed test sequence showing air supply settings and adjustments, fuel bed adjustments and operational specifics of the test unit.

Test fuel

- Test fuel: wood pellet (model: Energex),
- Description: The pellet for each test and pre-burn period was sent to Twin ports testing inc for test fuel calorific analysis. This laboratory is ISO/IEC 17025 recognize. For the test fuel property refer to test fuel analysis in the appendix D Calibration data.
- Handling and storage: keep all bags in the same room (at 20C ambient and 50% humidity) all wrap together to ensure the stability of the moisture.

3.5 START-UP OPERATION

The complete manufacturer's firing procedure of each burn rate category is fully described in appendix 13.

3.6 SAMPLING LOCATIONS

Particulate samples are collected from the dilution tunnel at a point 15 feet from the tunnel entrance. The tunnel has two elbows in the system ahead of the sampling section. The sampling section is a continuous section of 6-inch diameter pipe straight over its entire length. Tunnel velocity pressure is determined by a standard pitot tube located 48 inches from the beginning of the sampling section. Thermocouple is installed on the pitot tube to measure the dry bulb temperature. MC is assumed, as allowed, to be 2%. Tunnel samplers are located downstream of the pitot tube and upstream from the end of this section, all details in Appendix 8.

3.7 DRAWINGS

Various drawings of the stack gas sampling train and of dilution tunnel system are found in Appendix 1.

3.8 EMISSIONS EFFICIENCY TESTING EQUIPMENT LIST

The complete test equipment list together with all corresponding calibration data can be found in Appendix 3.

4 SAMPLING METHODS

4.1 PARTICULATE SAMPLING

Particulates were sampled in strict accordance with ASTM E2515. This method uses two identical sampling systems with Gelman A/E 61631 binder free (or equivalent), 47 mm diameter filters. The dryers used in the sample systems are filled with "Drierite" before each test run.

5 QUALITY ASSURANCE

5.1 INSTRUMENT CALIBRATION

5.1.1 GAS METERS

At the conclusion of each test program the gas meters are verified using the reference dry gas meter. This process involves sampling the train operation for 1 cubic foot of volume. With readings made to .01 fr', the resolution is 1 %, giving an accuracy higher than the 2% required by the standard.

5.1.2 SCALES

Before each test program, the different scales used are checked with traceable calibration weights to ensure their accuracy.

5.1.3 GAS ANALYZERS

The continuous analyzers are zeroed and spanned before each test with NBS traceable gases. A mid-scale multi-component calibration gas is then analyzed (values are recorded). At the conclusion of a test, the instruments are checked again with zero, span and calibration gases (values are recorded only). The drift in each meter is then calculated and must not exceed 5% of the scale used for the test.

5.2 TEST METHOD PROCEDURES

5.2.1 LEAK CHECK PROCEDURES

Before and after each test, each sample train is tested for leaks. Leakage rates are measured and must not exceed 0.02 CFM or 4% of the sampling rate. Leak checks are performed checking the entire sampling train. Pre-test and post-test leak checks are conducted with a vacuum of 5 inches of mercury. Vacuum is monitored during each test and the highest vacuum reached is then used for the post test vacuum value. If leakage limits are not met, the test run is rejected. During these tests, the vacuum is typically less than 2 inches of mercury. Thus, leakage rates reported are expected to be much higher than actual leakage during the tests.

5.2.2 TUNNEL VELOCITY FLOW MEASUREMENT

The tunnel velocity is calculated from a center point pitot tube signal multiplied by an adjustment factor. This factor is determined by a traverse of the tunnel as prescribed in EPA Method 1. Final tunnel velocities and flow rates are calculated from EPA Method 2, Equation 6.9 and 6.10. (Tunnel cross sectional area is the average from both lines of traverse.)

Pitot tubes are cleaned before each test and leak checks are conducted after each test.

5.2.3 PM SAMPLING PROPORTIONALITY (ASTM E2515)

Proportionalities were calculated in accordance with ASTM E2515. The data and results are found in appendix.

APPENDIX 1: Raw data, forms and results

Paramètres

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

Code verrouillage:	LAM

Description du test

Test standard	EPA
Run #	1
Date	09-04-2018
Technicien	M.M
Project #	PI 20163

Description de l'unité

Manufacturier	LAMINOX	
Modèle	JESSIKA	
Combustion system	Pellet	
Appliance type	PELLET STOVE	
Firebox volume		cu ft.
Appliance weight empty	N.A	lbs
Appliance weight full	N.A	lbs

Paramètres du test

Logging time	1	min
Manufacturer's rated heat output	N.A	BTU/h Donnée fournie par le manfacturier
Targeted category		
Targeted output	N.A	BTU/h
Cp steel	N.A	BTU/lb-°F

Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	0,988	Dimensionless
Equipment number (DGM #1):	EM-178	
Calibration Factor (DGM #2):	0,988	Dimensionless
Equipment number (DGM #2):	EM-179	
Calibration Factor (DGM #3):	0,986	
Equipment number (DGM #3):	EM-070	Dimensionless

Tunnel

Targeted tunnel flow rate	140	scfm
Tunnel diameter	6	in.
Molecular weight	28,78	May be assumed to be 28,78 (EPA) Si B-415 = 29
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

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Fuel data

Fuel type	Dimension		
Fuel specie	Other		
HHV		19628,0	kJ/kg
%C		49,1	
%H		6,1	
%O		43,8	
%Ash		0,8	
HHV		8439,0	Btu/lb
LHV		7381,0	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):	101,8	101,8
Barometer (in.Hg):	30,061529	30,06152868
Dry Bulb (F):	68,7	71,86
Humidity (%):	19	18
Air velocity (ft/min)	4	3

DGM #1	Final:	23067,507	cuft	Final:	653199,050	Liter
	Initial:	23004,742	cuft	Initial:	651421,750	Liter
DGM #2	Final:	21331,650	cuft	Final:	604045,050	Liter
	Initial:	21267,056	cuft	Initial:	602215,940	Liter
DGM room				Final:	249,240	cuft
				Initial:	228,860	cuft

Numéro de la ligne dans "Raw data" à partir duquel les données du VRAI test commencent: 119

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

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Preload data sheet

Test Load Weight:

Lower	Ideal	Upper
0,00	0,00	0,00

Load Volume: 0,0000 cu. ft

Loading Density: #DIV/0! lbs./ft3

Number of Spaces:

Spacer weight (lbs):

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

Dry Wood Density: #DIV/0!

Piece Size (in): Thick	Wide	x Length	Weight lbs	Meter Moisture Content Dry Uncorrected %					Ave. MC x Weight	Volume Cubic Inches
			5	4,44					22,2	0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
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										0,00
										0,00
										0,00
										0,00
										0,00
										0,00
								SUM MC:	22,2	

PreTest Load Weight: 5,00 lbs.

Dry Weight: 2,17 kg.

Average Moisture Content: %

Dry: 4,44

4,44
Must be 18-28

Wet: 4,25
must be 15,2-22

Project nu. PI 20163
Date 09-04-2018
Technicien

FUEL LOAD DATA SHEET, CSA B415

Test Load Weight:

Lower	Ideal	Upper
0,0	0,0	0,0

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

Load Volume: 0,00 cu. ft

Loading Density: #DIV/0! 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): Thick	Wide	Length	Weight lbs	Meter Moisture Content Dry Uncorrected %					Ave. MC x Weight	Volume Cubic Inches	Ave. MC %
			10,90	4,44					48,396	0,00	4,4
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
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										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
										0,00	
								SUM MCx	48,396		4,4 %

Test Load Weight: 10,90 lbs.

Dry Weight: 4,73 kg.

Average Moisture Content: %

Dry: 4,44 Dry(EPA) 4,44

Dry(B415 4,44

4,44 Must be 19-25

Wet: 4,25 must be 15,2-22

Coal Bed Range: 2,2 lbs. to 2,7 lbs.

TEST CHARGE:

Coal bed weight: lbs.

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Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,23 in. H20
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!	#DIV/0!	0,0000

PITOT CONSTANT=
0,950

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,054	73,35	0,2324
B center	0,053	73,78	0,2302
A1	0,050	73,39	0,2236
A2	0,053	73,26	0,2302
A3	0,045	73,49	0,2121
A4	0,044	73,56	0,2098
B1	0,045	73,790	0,2121
B2	0,052	73,820	0,2280
B3	0,045	73,890	0,2121
B4	0,043	73,890	0,2074
AVERAGE	0,0484	73,6220	0,2198

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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		
Number	1	100	101	25	2	102	103	38	41	104	105	39	106		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	61,0680	0,1270	0,1277	34,9165	61,1007	0,1259	0,1288	34,7861	110,3645	0,1274	0,1271	35,3103	0,1279	2018-04-05	16:00
Before (6)	61,0679	0,1271	0,1277	34,9166	61,1007	0,1258	0,1288	34,7860	110,3646	0,1275	0,1271	35,3104	0,1278	2018-04-09	08:30
After (1)	61,0684	0,1297	0,1273	34,9182	61,1012	0,1325	0,1285	34,7863	110,3656	0,1371	0,1267	35,3113	0,1279	2018-04-09	16:45
After (2)	61,0679	0,1296	0,1272	34,9178	61,1007	0,1323	0,1285	34,7863	110,3650	0,1370	0,1267	35,3113	0,1278	2018-04-19	08:00
After (3)	61,0679	0,1296	0,1272	34,9178	61,1007	0,1323	0,1285	34,7863	110,3650	0,1370	0,1267	35,3113	0,1278	2018-04-20	08:00
After (4)															
After (5)															
After (6)	61,0679	0,1296	0,1272	34,9178	61,1007	0,1323	0,1285	34,7863	110,3650	0,1370	0,1267	35,3113	0,1278	2018-04-20	08:00
Difference	0,0000	0,0025	-0,0005	0,0012	0,0000	0,0065	-0,0003	0,0003	0,0004	0,0095	-0,0004	0,0009	0,0000		
Total (mg)		3,2				9,7				10,4			0		
Total ajusté (mg)		**3,20**				**9,70**				**10,40**					

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Demonstration purpose only, negative back filter weight rounded to 0 mas loss.

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		
Number	1	100	101	25	2	102	103	38	41	104	105	39	106		
Before (1)															
Before (2)															
Before (3)															
Before (4)															
Before (5)	61,0680	0,1270	0,1277	34,9165	61,1007	0,1259	0,1288	34,7861	110,3645	0,1274	0,1271	35,3103	0,1279	2018-04-05	16:00
Before (6)	61,0679	0,1271	0,1277	34,9166	61,1007	0,1258	0,1288	34,7860	110,3646	0,1275	0,1271	35,3104	0,1278	2018-04-09	08:30
After (1)	61,0684	0,1297	0,1273	34,9182	61,1012	0,1325	0,1285	34,7863	110,3656	0,1371	0,1267	35,3113	0,1279	2018-04-09	16:45
After (2)	61,0679	0,1296	0,1272	34,9178	61,1007	0,1323	0,1285	34,7863	110,3650	0,1370	0,1267	35,3113	0,1278	2018-04-19	08:00
After (3)	61,0679	0,1296	0,1272	34,9178	61,1007	0,1323	0,1285	34,7863	110,3650	0,1370	0,1267	35,3113	0,1278	2018-04-20	08:00
After (4)															
After (5)															
After (6)	61,0679	0,1296	0,1272	34,9178	61,1007	0,1323	0,1288	34,7863	110,3650	0,1370	0,1271	35,3113	0,1278	2018-04-20	08:00
Difference	0,0000	0,0025	-0,0005	0,0012	0,0000	0,0065	0,0000	0,0003	0,0004	0,0095	0,0000	0,0009	0,0000		
Total (mg)		3,2				10				10,8			0		
Total ajusté (mg)		**3,20**				**10,00**				**10,80**					

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Elapsed		Weight				Flue	Room	Tunnel
Time	Raw data row	Remaining	CO	CO_2	O_2	Gas	Temp	Dry Bulb
min		lbs	%	%	%	°F	°F	°F
0,00	119,00	10,9	0,0	6,0	0,0	360,7	70,3	99,1
1,0	120,0	10,9	0,0	3,6	0,0	357,4	70,3	99,6
2,0	121,0	10,8	0,0	6,3	0,0	356,7	70,5	99,9
3,0	122,0	10,7	0,0	5,7	0,0	356,6	70,1	99,8
4,0	123,0	10,7	0,0	7,0	0,0	357,8	70,2	100,0
5,0	124,0	10,6	0,1	7,0	0,0	358,9	70,1	99,8
6,0	125,0	10,6	0,1	6,7	0,0	357,7	70,0	99,6
7,0	126,0	10,5	0,0	5,4	0,0	357,5	70,3	99,6
8,0	127,0	10,4	0,1	7,1	0,0	356,6	70,6	99,3
9,0	128,0	10,4	0,0	5,1	0,0	357,5	70,5	99,3
10,0	129,0	10,3	0,2	7,6	0,0	358,1	70,2	99,1
11,0	130,0	10,3	0,2	7,3	0,0	357,3	70,4	99,0
12,0	131,0	10,2	0,0	5,0	0,0	355,6	70,0	98,9
13,0	132,0	10,2	0,0	5,4	0,0	354,2	70,0	99,0
14,0	133,0	10,1	0,0	6,2	0,0	356,2	70,3	98,9
15,0	134,0	10,0	0,2	7,4	0,0	357,1	70,2	98,9
16,0	135,0	10,0	0,0	6,7	0,0	356,6	70,1	98,9
17,0	136,0	10,0	0,0	5,2	0,0	356,3	70,3	98,9
18,0	137,0	9,8	0,0	5,1	0,0	355,3	70,4	99,0
19,0	138,0	9,8	0,1	7,1	0,0	355,2	70,2	99,2
20,0	139,0	9,7	0,2	6,8	0,0	357,1	70,3	99,0
21,0	140,0	9,7	0,1	6,1	0,0	358,3	70,3	99,2
22,0	141,0	9,7	0,1	6,7	0,0	357,4	70,2	98,9
23,0	142,0	9,6	0,0	6,7	0,0	357,5	70,6	99,0
24,0	143,0	9,5	0,0	5,8	0,0	357,4	70,9	99,4
25,0	144,0	9,5	0,1	6,6	0,0	357,5	70,7	99,8
26,0	145,0	9,4	0,1	6,7	0,0	358,4	70,8	100,1
27,0	146,0	9,3	0,1	6,6	0,0	358,2	70,8	99,9
28,0	147,0	9,3	0,0	6,3	0,0	357,9	70,7	100,2
29,0	148,0	9,2	0,2	7,3	0,0	358,6	70,6	99,7
30,0	149,0	9,2	0,1	6,5	0,0	360,2	70,8	99,8
31,0	150,0	9,1	0,1	6,6	0,0	359,1	70,9	99,9
32,0	151,0	9,1	0,1	6,6	0,0	357,6	70,9	100,1
33,0	152,0	9,0	0,0	5,8	0,0	357,1	70,8	99,8
34,0	153,0	8,9	0,1	6,7	0,0	357,0	70,7	100,0
35,0	154,0	8,9	0,1	6,5	0,0	358,0	71,0	99,8
36,0	155,0	8,8	0,1	6,1	0,0	357,6	70,9	100,1
37,0	156,0	8,8	0,1	6,8	0,0	357,9	71,2	100,1
38,0	157,0	8,7	0,2	7,3	0,0	357,8	70,7	99,9
39,0	158,0	8,7	0,0	5,1	0,0	356,3	70,6	100,0
40,0	159,0	8,6	0,1	6,8	0,0	356,3	70,8	99,9
41,0	160,0	8,6	0,1	7,2	0,0	356,7	70,8	99,8
42,0	161,0	8,5	0,1	6,6	0,0	356,8	70,8	100,0
43,0	162,0	8,4	0,0	5,8	0,0	354,8	70,7	99,8
44,0	163,0	8,4	0,0	6,7	0,0	355,1	70,9	100,0
45,0	164,0	8,3	0,0	5,7	0,0	353,1	69,0	99,5
46,0	165,0	8,2	0,0	6,3	0,0	352,8	69,6	99,8
47,0	166,0	8,2	0,0	6,1	0,0	353,2	69,7	99,8
48,0	167,0	8,2	0,1	6,1	0,0	351,3	70,2	99,8
49,0	168,0	8,1	0,0	5,4	0,0	350,8	70,2	99,5
50,0	169,0	8,0	0,1	6,3	0,0	351,1	70,3	99,4
51,0	170,0	8,0	0,1	6,0	0,0	351,7	70,8	99,2
52,0	171,0	7,9	0,1	7,7	0,0	351,5	70,8	99,4
53,0	172,0	7,8	0,1	7,2	0,0	352,8	71,0	100,1
54,0	173,0	7,8	0,3	8,2	0,0	352,8	70,8	100,4
55,0	174,0	7,7	0,1	6,9	0,0	351,3	70,7	100,4
56,0	175,0	7,7	0,0	5,9	0,0	352,1	70,9	100,1
57,0	176,0	7,6	0,1	6,5	0,0	351,5	70,8	100,2
58,0	177,0	7,5	0,1	6,9	0,0	351,9	71,0	100,3
59,0	178,0	7,5	0,2	7,0	0,0	353,1	71,4	100,2
60,0	179,0	7,4	0,2	6,9	0,0	353,6	71,4	99,7
61,0	180,0	7,4	0,1	6,8	0,0	343,2	71,3	97,1
62,0	181,0	7,3	0,0	5,2	0,0	334,5	71,1	96,1
63,0	182,0	7,3	0,0	4,5	0,0	326,9	71,3	95,0
64,0	183,0	7,3	0,0	3,7	0,0	321,7	71,3	94,6
65,0	184,0	7,2	0,0	4,8	0,0	317,6	71,1	94,0
66,0	185,0	7,3	0,0	3,5	0,0	313,9	71,3	93,7
67,0	186,0	7,2	0,0	4,6	0,0	311,0	71,1	93,1
68,0	187,0	7,1	0,0	3,7	0,0	307,3	71,2	92,9
69,0	188,0	7,1	0,1	2,5	0,0	303,9	70,9	92,7
70,0	189,0	7,1	0,0	3,9	0,0	301,9	71,2	92,4
71,0	190,0	7,1	0,1	2,8	0,0	297,7	70,9	92,0
72,0	191,0	7,0	0,0	3,4	0,0	296,5	71,2	92,1
73,0	192,0	7,0	0,0	4,0	0,0	294,0	71,0	92,0
74,0	193,0	7,0	0,0	4,7	0,0	292,4	70,8	91,4
75,0	194,0	6,9	0,0	3,4	0,0	289,7	71,1	91,4
76,0	195,0	6,9	0,0	3,6	0,0	287,6	71,0	91,3
77,0	196,0	7,0	0,1	3,2	0,0	285,5	71,1	91,2
78,0	197,0	6,9	0,0	4,4	0,0	285,0	70,9	91,1
79,0	198,0	6,9	0,0	3,4	0,0	282,5	71,1	91,2
80,0	199,0	6,8	0,0	3,9	0,0	281,9	71,2	90,8

81,0	200,0	6,8	0,0	4,5	0,0	279,8	71,0	90,8
82,0	201,0	6,8	0,1	2,8	0,0	277,8	71,2	90,7
83,0	202,0	6,8	0,0	3,0	0,0	276,4	71,3	90,5
84,0	203,0	6,7	0,0	4,0	0,0	274,8	71,1	90,4
85,0	204,0	6,6	0,0	3,2	0,0	272,5	71,0	89,9
86,0	205,0	6,6	0,1	2,8	0,0	272,1	71,2	90,0
87,0	206,0	6,6	0,1	3,2	0,0	270,0	71,0	89,9
88,0	207,0	6,6	0,1	2,4	0,0	269,8	70,8	90,0
89,0	208,0	6,6	0,0	1,1	0,0	270,1	71,0	89,9
90,0	209,0	6,5	0,0	3,3	0,0	269,2	71,0	89,9
91,0	210,0	6,5	0,0	3,8	0,0	268,7	70,8	89,8
92,0	211,0	6,4	0,0	3,1	0,0	266,9	70,7	89,8
93,0	212,0	6,6	0,1	2,7	0,0	267,1	70,2	89,7
94,0	213,0	6,5	0,0	4,8	0,0	265,2	68,5	89,8
95,0	214,0	6,3	0,1	3,5	0,0	263,3	68,1	89,6
96,0	215,0	6,4	0,1	2,7	0,0	262,5	69,2	90,1
97,0	216,0	6,4	0,0	4,2	0,0	261,9	69,4	90,1
98,0	217,0	6,3	0,1	2,5	0,0	259,3	69,7	90,2
99,0	218,0	6,2	0,1	2,2	0,0	259,4	69,8	90,1
100,0	219,0	6,2	0,0	4,6	0,0	259,8	69,9	90,0
101,0	220,0	6,2	0,0	3,8	0,0	258,5	69,8	89,7
102,0	221,0	6,2	0,1	2,6	0,0	262,2	70,0	90,8
103,0	222,0	6,1	0,0	4,1	0,0	259,7	70,1	89,8
104,0	223,0	6,1	0,1	2,8	0,0	260,3	70,2	89,6
105,0	224,0	6,2	0,0	4,3	0,0	260,6	70,3	89,2
106,0	225,0	6,0	0,0	4,1	0,0	260,8	70,2	89,5
107,0	226,0	6,2	0,0	3,8	0,0	259,3	70,4	89,4
108,0	227,0	6,0	0,0	3,4	0,0	259,1	70,4	89,5
109,0	228,0	6,1	0,0	3,3	0,0	258,9	70,5	89,3
110,0	229,0	6,0	0,0	3,8	0,0	258,3	70,3	89,3
111,0	230,0	6,0	0,0	3,7	0,0	257,6	70,4	89,4
112,0	231,0	6,0	0,0	3,0	0,0	257,0	70,3	89,4
113,0	232,0	5,9	0,0	3,7	0,0	257,6	70,2	89,4
114,0	233,0	5,8	0,0	3,4	0,0	257,7	69,9	89,3
115,0	234,0	5,8	0,0	2,9	0,0	257,6	70,2	89,3
116,0	235,0	5,9	0,0	4,3	0,0	256,6	70,3	89,3
117,0	236,0	5,8	0,0	2,7	0,0	255,8	70,4	89,3
118,0	237,0	5,8	0,0	2,8	0,0	256,7	70,3	89,3
119,0	238,0	5,8	0,0	4,5	0,0	255,5	70,2	89,2
120,0	239,0	5,6	0,1	2,9	0,0	254,2	70,2	89,1
121,0	240,0	5,8	0,0	3,4	0,0	254,5	70,3	89,1
122,0	241,0	5,7	0,0	3,9	0,0	252,7	70,3	89,1
123,0	242,0	5,7	0,1	2,5	0,0	252,7	70,2	89,0
124,0	243,0	5,6	0,0	4,0	0,0	254,6	70,2	89,1
125,0	244,0	5,6	0,0	3,9	0,0	253,1	70,2	89,1
126,0	245,0	5,5	0,0	3,5	0,0	253,9	70,4	88,9
127,0	246,0	5,5	0,0	4,0	0,0	253,2	70,4	88,8
128,0	247,0	5,5	0,1	2,4	0,0	253,2	70,2	88,8
129,0	248,0	5,5	0,0	4,4	0,0	252,2	70,2	88,8
130,0	249,0	5,5	0,0	3,4	0,0	251,9	70,2	89,0
131,0	250,0	5,3	0,0	3,4	0,0	250,4	70,2	88,7
132,0	251,0	5,4	0,0	2,9	0,0	250,4	70,2	88,7
133,0	252,0	5,3	0,0	3,4	0,0	250,4	70,2	88,9
134,0	253,0	5,4	0,1	3,0	0,0	251,5	70,4	88,8
135,0	254,0	5,4	0,0	4,2	0,0	252,6	70,3	89,0
136,0	255,0	5,3	0,0	3,4	0,0	252,0	70,4	89,0
137,0	256,0	5,2	0,1	3,1	0,0	251,9	70,4	89,0
138,0	257,0	5,2	0,0	4,2	0,0	251,6	70,5	89,0
139,0	258,0	5,2	0,1	2,9	0,0	251,4	70,3	88,8
140,0	259,0	5,1	0,0	3,4	0,0	251,7	70,3	88,7
141,0	260,0	5,2	0,0	4,1	0,0	251,5	70,5	88,9
142,0	261,0	5,2	0,0	3,3	0,0	251,1	70,5	88,8
143,0	262,0	5,1	0,0	3,8	0,0	250,9	70,4	88,8
144,0	263,0	5,0	0,1	2,3	0,0	250,7	70,3	88,8
145,0	264,0	4,9	0,0	4,1	0,0	251,5	70,4	88,8
146,0	265,0	5,0	0,0	4,2	0,0	251,2	70,5	88,9
147,0	266,0	4,9	0,0	3,7	0,0	249,8	70,2	88,7
148,0	267,0	4,9	0,0	3,5	0,0	252,0	70,5	88,8
149,0	268,0	5,0	0,0	3,7	0,0	251,1	70,6	88,7
150,0	269,0	4,9	0,0	3,3	0,0	250,7	70,4	88,7
151,0	270,0	4,9	0,0	3,7	0,0	251,3	70,5	88,7
152,0	271,0	4,9	0,0	3,3	0,0	250,9	70,5	88,8
153,0	272,0	4,9	0,0	3,2	0,0	250,8	70,3	88,8
154,0	273,0	4,8	0,0	3,8	0,0	249,1	70,4	88,8
155,0	274,0	4,7	0,1	2,7	0,0	247,8	70,3	88,7
156,0	275,0	4,7	0,1	2,3	0,0	248,6	70,3	88,7
157,0	276,0	4,7	0,0	5,0	0,0	248,1	70,4	88,6
158,0	277,0	4,7	0,1	2,7	0,0	248,5	70,5	88,8
159,0	278,0	4,6	0,0	4,6	0,0	250,1	70,4	88,7
160,0	279,0	4,6	0,0	4,1	0,0	248,1	70,4	88,8
161,0	280,0	4,6	0,1	2,3	0,0	248,0	70,4	88,8
162,0	281,0	4,5	0,0	3,8	0,0	248,6	70,3	88,7
163,0	282,0	4,5	0,0	3,7	0,0	247,2	70,5	88,7
164,0	283,0	4,5	0,1	2,3	0,0	247,6	70,3	88,7

165,0	284,0	4,5	0,0	3,7	0,0	246,9	70,4	88,7
166,0	285,0	4,4	0,1	2,0	0,0	245,6	70,4	88,6
167,0	286,0	4,4	0,0	3,2	0,0	247,5	70,6	88,8
168,0	287,0	4,4	0,0	4,0	0,0	248,6	70,6	88,9
169,0	288,0	4,4	0,0	3,7	0,0	248,7	70,6	88,8
170,0	289,0	4,4	0,0	3,3	0,0	247,0	70,4	88,9
171,0	290,0	4,3	0,1	2,3	0,0	247,9	70,6	88,9
172,0	291,0	4,3	0,0	1,1	0,0	249,6	70,5	88,7
173,0	292,0	4,3	0,0	4,4	0,0	248,5	70,6	88,7
174,0	293,0	4,2	0,1	2,7	0,0	246,7	70,5	88,8
175,0	294,0	4,2	0,0	4,1	0,0	247,8	70,5	88,8
176,0	295,0	4,2	0,0	3,9	0,0	247,2	70,6	88,5
177,0	296,0	4,2	0,1	2,8	0,0	248,0	70,7	88,8
178,0	297,0	4,1	0,0	4,0	0,0	248,3	70,7	88,8
179,0	298,0	4,1	0,1	2,6	0,0	248,2	70,6	89,0
180,0	299,0	4,1	0,0	4,4	0,0	249,5	70,9	89,0
181,0	300,0	4,0	0,1	3,8	0,0	248,5	70,7	88,8
182,0	301,0	4,0	0,1	2,8	0,0	247,3	70,7	88,5
183,0	302,0	4,0	0,1	2,6	0,0	246,4	70,8	88,4
184,0	303,0	3,9	0,1	3,9	0,0	246,2	70,7	88,3
185,0	304,0	3,9	0,1	2,3	0,0	243,4	70,9	88,4
186,0	305,0	3,9	0,1	1,7	0,0	243,3	70,9	88,2
187,0	306,0	3,8	0,0	3,4	0,0	244,0	70,9	88,2
188,0	307,0	3,9	0,1	3,3	0,0	242,7	70,8	88,2
189,0	308,0	3,8	0,1	2,1	0,0	242,6	70,8	88,0
190,0	309,0	3,8	0,0	2,9	0,0	242,2	71,0	88,1
191,0	310,0	3,8	0,0	2,6	0,0	241,3	70,8	88,2
192,0	311,0	3,7	0,0	2,3	0,0	239,0	70,9	87,9
193,0	312,0	3,7	0,1	1,9	0,0	239,1	70,8	88,0
194,0	313,0	3,7	0,0	3,5	0,0	238,6	70,9	87,9
195,0	314,0	3,7	0,0	3,4	0,0	237,7	70,8	87,9
196,0	315,0	3,7	0,1	2,5	0,0	235,6	70,8	87,8
197,0	316,0	3,6	0,1	2,3	0,0	237,5	70,8	87,7
198,0	317,0	3,6	0,0	4,0	0,0	237,1	70,9	87,8
199,0	318,0	3,6	0,1	2,4	0,0	235,4	71,0	87,6
200,0	319,0	3,6	0,1	2,0	0,0	235,7	70,9	87,5
201,0	320,0	3,6	0,0	3,2	0,0	233,6	71,1	87,7
202,0	321,0	3,6	0,1	1,9	0,0	233,2	71,0	87,5
203,0	322,0	3,5	0,1	1,8	0,0	231,6	71,2	87,5
204,0	323,0	3,5	0,0	2,3	0,0	230,7	71,0	87,4
205,0	324,0	3,5	0,0	3,8	0,0	230,4	71,1	87,5
206,0	325,0	3,5	0,1	2,4	0,0	230,4	71,1	87,6
207,0	326,0	3,4	0,0	3,5	0,0	230,8	71,1	87,5
208,0	327,0	3,4	0,0	3,3	0,0	229,7	71,1	87,5
209,0	328,0	3,4	0,2	1,6	0,0	227,7	71,1	87,5
210,0	329,0	3,3	0,1	2,2	0,0	228,0	71,3	87,3
211,0	330,0	3,3	0,0	3,3	0,0	226,4	71,1	87,1
212,0	331,0	3,3	0,1	2,0	0,0	225,4	71,2	87,0
213,0	332,0	3,3	0,1	2,2	0,0	225,6	71,3	87,0
214,0	333,0	3,3	0,0	2,6	0,0	225,0	71,1	87,0
215,0	334,0	3,3	0,1	2,2	0,0	223,3	70,9	87,1
216,0	335,0	3,2	0,1	2,0	0,0	222,9	71,2	87,0
217,0	336,0	3,2	0,0	3,1	0,0	224,6	71,1	87,1
218,0	337,0	3,2	0,0	4,0	0,0	224,8	71,1	86,7
219,0	338,0	3,2	0,1	2,3	0,0	222,4	71,1	86,9
220,0	339,0	3,2	0,1	1,5	0,0	222,5	71,2	87,0
221,0	340,0	3,1	0,0	3,7	0,0	224,3	71,2	87,0
222,0	341,0	3,1	0,1	3,1	0,0	222,8	71,2	86,8
223,0	342,0	3,0	0,1	2,4	0,0	222,1	71,1	86,9
224,0	343,0	3,1	0,1	2,5	0,0	221,4	71,2	86,9
225,0	344,0	3,1	0,1	2,2	0,0	220,1	71,0	86,8
226,0	345,0	3,0	0,1	2,0	0,0	221,2	70,9	87,0
227,0	346,0	3,0	0,1	2,3	0,0	221,1	71,0	86,9
228,0	347,0	3,0	0,0	3,4	0,0	222,4	70,9	87,0
229,0	348,0	3,0	0,1	2,7	0,0	220,3	71,2	86,9
230,0	349,0	2,9	0,1	1,5	0,0	221,6	71,2	87,1
231,0	350,0	2,9	0,0	4,9	0,0	223,2	71,2	87,0
232,0	351,0	2,9	0,1	3,2	0,0	222,7	71,2	86,7
233,0	352,0	2,8	0,1	2,4	0,0	222,4	71,2	86,7
234,0	353,0	2,8	0,0	2,8	0,0	222,7	71,2	86,8
235,0	354,0	2,8	0,0	2,7	0,0	222,2	71,2	86,8
236,0	355,0	2,8	0,1	2,4	0,0	221,6	71,2	86,8
237,0	356,0	2,8	0,1	2,8	0,0	223,6	71,3	87,0
238,0	357,0	2,8	0,0	4,7	0,0	223,9	71,3	87,0
239,0	358,0	2,7	0,1	2,4	0,0	222,7	71,3	87,2
240,0	359,0	2,7	0,1	1,8	0,0	223,5	71,3	87,2
241,0	360,0	2,7	0,0	3,6	0,0	225,3	71,3	87,1
242,0	361,0	2,6	0,0	3,4	0,0	225,9	71,3	87,2
243,0	362,0	2,6	0,1	2,2	0,0	225,0	71,3	87,1
244,0	363,0	2,6	0,1	2,8	0,0	225,3	71,4	87,2
245,0	364,0	2,6	0,0	3,0	0,0	225,2	71,4	87,4
246,0	365,0	2,6	0,0	3,3	0,0	225,4	71,4	87,2
247,0	366,0	2,5	0,1	2,4	0,0	225,3	71,5	87,3
248,0	367,0	2,5	0,0	3,5	0,0	226,2	71,4	87,4

249,0	368,0	2,5	0,0	2,9	0,0	224,3	71,4	87,1
250,0	369,0	2,4	0,1	1,9	0,0	224,4	71,4	87,0
251,0	370,0	2,4	0,0	3,8	0,0	224,5	71,3	87,2
252,0	371,0	2,4	0,1	2,7	0,0	223,7	71,4	87,3
253,0	372,0	2,4	0,1	2,1	0,0	221,7	71,5	87,2
254,0	373,0	2,4	0,1	2,1	0,0	220,5	71,5	87,1
255,0	374,0	2,3	0,0	2,7	0,0	220,6	71,5	87,2
256,0	375,0	2,3	0,0	2,4	0,0	218,6	71,4	87,0
257,0	376,0	2,3	0,1	1,8	0,0	219,5	71,4	87,1
258,0	377,0	2,3	0,0	4,0	0,0	220,6	71,5	87,2
259,0	378,0	2,3	0,1	2,6	0,0	220,2	71,4	87,1
260,0	379,0	2,3	0,0	3,0	0,0	219,5	71,5	87,0
261,0	380,0	2,2	0,1	2,0	0,0	220,3	71,4	87,1
262,0	381,0	2,2	0,0	3,7	0,0	221,9	71,5	87,1
263,0	382,0	2,2	0,1	2,8	0,0	220,8	71,3	87,1
264,0	383,0	2,1	0,1	1,9	0,0	220,9	71,4	87,0
265,0	384,0	2,1	0,0	3,3	0,0	220,3	71,7	86,9
266,0	385,0	2,1	0,1	2,4	0,0	219,6	71,3	87,0
267,0	386,0	2,1	0,1	2,4	0,0	219,1	71,7	87,1
268,0	387,0	2,1	0,1	2,2	0,0	218,9	71,5	87,0
269,0	388,0	2,0	0,0	3,2	0,0	219,6	71,6	86,9
270,0	389,0	2,0	0,0	3,5	0,0	218,6	71,7	87,1
271,0	390,0	2,0	0,1	2,5	0,0	220,7	71,7	87,3
272,0	391,0	2,0	0,0	3,8	0,0	220,4	71,7	87,3
273,0	392,0	1,9	0,1	2,2	0,0	220,2	71,8	87,3
274,0	393,0	1,9	0,1	2,3	0,0	220,7	72,0	87,2
275,0	394,0	1,9	0,0	3,3	0,0	221,6	71,9	87,2
276,0	395,0	1,9	0,1	2,3	0,0	220,5	72,1	87,4
277,0	396,0	1,9	0,1	2,4	0,0	222,6	71,9	87,6
278,0	397,0	1,8	0,0	3,9	0,0	224,3	71,9	87,6
279,0	398,0	1,8	0,0	3,9	0,0	224,3	72,1	87,6
280,0	399,0	1,8	0,1	2,0	0,0	222,6	71,9	87,4
281,0	400,0	1,8	0,1	2,2	0,0	221,7	72,0	87,5
282,0	401,0	1,8	0,0	2,2	0,0	221,2	71,8	87,1
283,0	402,0	1,8	0,1	1,9	0,0	220,3	71,9	87,7
284,0	403,0	1,7	0,1	1,6	0,0	219,5	72,0	87,0
285,0	404,0	1,7	0,0	2,8	0,0	219,9	71,8	87,0
286,0	405,0	1,7	0,0	2,3	0,0	219,2	71,8	86,7
287,0	406,0	1,7	0,0	3,1	0,0	220,5	71,9	86,6
288,0	407,0	1,6	0,0	3,7	0,0	221,6	71,8	86,8
289,0	408,0	1,6	0,1	3,3	0,0	220,5	71,8	86,8
290,0	409,0	1,6	0,1	2,2	0,0	219,2	71,8	86,8
291,0	410,0	1,5	0,1	2,1	0,0	220,2	71,8	86,8
292,0	411,0	1,5	0,0	3,8	0,0	221,4	71,7	86,7
293,0	412,0	1,5	0,1	2,9	0,0	220,3	71,9	86,7
294,0	413,0	1,5	0,1	2,3	0,0	220,0	71,8	86,7
295,0	414,0	1,4	0,0	2,7	0,0	221,1	71,8	86,8
296,0	415,0	1,4	0,0	3,4	0,0	220,7	71,9	87,0
297,0	416,0	1,4	0,1	1,9	0,0	221,3	71,8	87,0
298,0	417,0	1,4	0,0	3,0	0,0	221,1	71,9	87,1
299,0	418,0	1,4	0,0	3,4	0,0	220,4	71,9	87,0
300,0	419,0	1,4	0,1	2,5	0,0	218,7	71,8	87,0
301,0	420,0	1,3	0,1	2,0	0,0	219,4	71,9	86,8
302,0	421,0	1,3	0,0	3,6	0,0	220,4	71,8	86,7
303,0	422,0	1,2	0,1	2,4	0,0	221,0	71,7	86,9
304,0	423,0	1,3	0,1	3,8	0,0	220,5	71,7	86,7
305,0	424,0	1,2	0,1	2,5	0,0	222,0	71,9	86,8
306,0	425,0	1,2	0,1	3,0	0,0	220,8	71,9	86,8
307,0	426,0	1,2	0,1	1,8	0,0	222,0	71,9	86,8
308,0	427,0	1,2	0,0	3,3	0,0	221,9	71,8	86,6
309,0	428,0	1,1	0,1	2,3	0,0	222,2	71,9	86,7
310,0	429,0	1,1	0,1	2,8	0,0	221,4	72,0	86,6
311,0	430,0	1,1	0,1	2,3	0,0	220,6	71,8	86,7
312,0	431,0	1,1	0,0	2,6	0,0	221,7	71,9	86,6
313,0	432,0	1,1	0,0	3,8	0,0	221,7	72,0	86,7
314,0	433,0	1,0	0,1	2,8	0,0	222,2	71,9	86,8
315,0	434,0	1,0	0,0	3,4	0,0	223,0	71,9	86,9
316,0	435,0	1,0	0,0	3,0	0,0	222,2	72,0	87,0
317,0	436,0	0,9	0,1	2,7	0,0	222,8	72,0	87,1
318,0	437,0	0,9	0,0	2,8	0,0	223,5	72,2	86,7
319,0	438,0	0,9	0,0	3,5	0,0	223,1	72,2	87,1
320,0	439,0	0,9	0,1	2,2	0,0	221,8	72,1	86,9
321,0	440,0	0,8	0,1	2,2	0,0	222,7	72,0	86,9
322,0	441,0	0,9	0,0	3,6	0,0	222,9	72,1	86,9
323,0	442,0	0,8	0,1	2,9	0,0	221,9	72,2	86,7
324,0	443,0	0,8	0,1	2,0	0,0	221,7	72,2	86,7
325,0	444,0	0,8	0,0	3,1	0,0	221,0	72,2	86,5
326,0	445,0	0,7	0,0	2,5	0,0	220,1	72,0	86,7
327,0	446,0	0,7	0,0	2,3	0,0	220,8	72,1	86,5
328,0	447,0	0,7	0,0	3,0	0,0	222,7	72,1	86,6
329,0	448,0	0,7	0,1	2,8	0,0	222,8	72,2	86,7
330,0	449,0	0,6	0,1	3,0	0,0	222,3	72,0	86,6
331,0	450,0	0,6	0,0	3,5	0,0	222,9	71,9	86,7
332,0	451,0	0,6	0,0	3,1	0,0	224,2	72,2	86,6

333,0	452,0	0,6	0,1	3,6	0,0	223,5	72,2	86,6
334,0	453,0	0,5	0,1	2,8	0,0	223,7	72,2	86,8
335,0	454,0	0,5	0,1	3,4	0,0	223,6	72,2	86,9
336,0	455,0	0,5	0,1	3,1	0,0	222,7	72,2	86,7
337,0	456,0	0,5	0,1	2,3	0,0	221,9	72,0	86,8
338,0	457,0	0,4	0,0	2,4	0,0	221,9	72,1	86,8
339,0	458,0	0,5	0,1	2,7	0,0	221,3	72,2	86,7
340,0	459,0	0,4	0,1	2,7	0,0	220,4	72,3	86,6
341,0	460,0	0,4	0,1	2,4	0,0	219,9	72,3	86,7
342,0	461,0	0,4	0,0	2,5	0,0	221,0	72,3	86,6
343,0	462,0	0,4	0,0	3,5	0,0	220,0	72,2	86,6
344,0	463,0	0,3	0,1	2,3	0,0	219,4	72,2	86,5
345,0	464,0	0,3	0,1	2,6	0,0	221,5	72,3	86,6
346,0	465,0	0,3	0,0	4,7	0,0	222,2	72,4	86,5
347,0	466,0	0,3	0,1	2,4	0,0	221,2	72,2	86,5
348,0	467,0	0,2	0,1	2,8	0,0	220,7	72,4	86,5
349,0	468,0	0,2	0,1	2,6	0,0	220,4	72,4	86,4
350,0	469,0	0,2	0,1	1,9	0,0	218,4	72,4	86,5
351,0	470,0	0,2	0,1	2,1	0,0	217,6	72,3	86,1
352,0	471,0	0,2	0,1	1,9	0,0	218,6	72,2	86,3
353,0	472,0	0,2	0,0	2,8	0,0	217,2	72,0	86,3
354,0	473,0	0,1	0,1	1,8	0,0	215,9	72,1	86,3
355,0	474,0	0,1	0,0	2,5	0,0	217,4	72,1	86,5
356,0	475,0	0,1	0,0	4,0	0,0	218,5	72,3	86,4
357,0	476,0	0,1	0,1	2,7	0,0	216,4	72,3	86,2
358,0	477,0	0,1	0,1	1,6	0,0	217,0	72,2	86,3
359,0	478,0	0,1	0,0	4,2	0,0	218,9	72,2	86,5
360,0	479,0	0,0	0,1	3,8	0,0	218,8	72,1	86,4

SFBA EPA EMISSION RESULTS

Test Duration: **360** min

PRESSURE FACTOR:
DGM 1 0,97522
DGM 2 0,97022
DGM 3 1,00473

TEMPERATURE FACTORS
DGM 1 0,98911
DGM 2 0,98834
DGM 3 0,99427

VOLUMES SAMPLED
DGM 1 59,809 SCft
DGM 2 61,223 Scft
DGM 3 20,082 SCft

TOTAL TUNNEL VOLUME : 58562

SAMPLE RATIOS
Sample Train 1: 979,146
Sample Train 2: 956,523

Paticulate concentration
Sample Train 1 **0,000162** g/dscf
Sample Train 2 **0,000170** g/dscf
Room **0,000000** g/dscf

TOTAL EMISSIONS
Sample Train 1 **9,50** g
Sample Train 2 **9,95** g

EMISSION RATES
Sample Train 1 **1,58** g/hr
Sample Train 2 **1,66** g/hr

1st hour emission rate **3,13** g/hr

	Train 1	Train 2
Cs	0,0001622	0,00016987

RESULTS

Average emission rate: 1,6 g/hr

Burn Rate : 0,789 Dry kg/hr

BAROMETRIC PRESSURE
Average: 30,0615287 in Hg
Start: 30,0615287 in Hg
End: 30,0615287 in Hg

DGM CONTROLLER VALUES

DGM 1 Final: 23067,507 Cuft
Initial: 23004,742 Cuft

DGM 2 Final: 21331,650 Cuft
Initial: 21267,056 Cuft

DGM #3 Final: 249,240 Cuft
Initial: 228,860 Cuft

TEMPERATURES
DGM 1 533,811 °R
DGM 2 534,229 °R

CALIBRATION FACTORS
DGM 1 0,9879
DGM 2 0,9884
DGM #3 0,9864

TUNNEL FLOW RATE: 162,671 Dscfm

PARTICULATE CATCH
Total Sample Train 1: 9,70 mg
Total Sample Train 2: 10,40 mg
Total Sample Train 1 1st hour: 3,20 mg

DEVIATION: 2,31%

Manufacturer: LAMINOX
Model: JESSIKA

Run: 1
Project #: PI 20163
Test Duration: 360 min

Note: In the "Input data", "Calc. % O_2", "Fuel Properties", and "Mass Balance" columns, [e], [d], [g], [a]. [b], [c], [h], [u], [w], [j], and [k] refer to their respective variables in Clauses

	HHV	LHV
Eff	72,77%	77,95%
Comb Eff	99,50%	99,50%
HT Eff	73,13%	78,34%
Output	11 285	kJ/h
Burn Rate	0,79	kg/h
Grams CO	102	g
Input	15 508	kJ/h
MC wet	4,25	

Ultimate CO_2
$CO_{2\text{-ult}}$ 20,40
F_0
1,016

Overall Heating Efficiency: 72,77%
Combustion Efficiency: 99,50%
Heat Transfer Efficiency: 73,13%

Heat Output: 10 705 Btu/h
Heat Input: 14 711 Btu/h
Burn Duration: 6,00 h
Burn Rate: 1,74 lb/h
Stack Temp: 259,2 Deg. F

Averages	0,06	3,62	5,39	20,84	17,19	126,40	21,55	100,0%	72,6%	#DIV/0!
INPUT DATA			Oxygen Calculation			Input Data		Combust	Heat	Net
Elapsed Time	Weight Remaining (kg)	% CO [e]	% CO_2 [d]	Excess Air EA	Total O_2	Calc. % O_2 [g]	Flue Gas (ºC)	Room Temp (ºC)	Eff %	Transfer %	Eff %
0,00	4,95	0,02	6,00	238,4%	20,78	14,76	182,6	21,3	100,4%	74,8%	75,1%
1,00	4,95	0,04	3,64	454,2%	20,84	17,18	180,8	21,3	100,5%	64,6%	64,9%
2,00	4,91	0,04	6,33	220,6%	20,77	14,43	180,4	21,4	100,1%	75,9%	76,0%
3,00	4,86	0,02	5,66	259,3%	20,79	15,12	180,3	21,2	100,5%	74,1%	74,4%
4,00	4,86	0,04	7,01	189,2%	20,75	13,72	181,0	21,2	100,1%	77,3%	77,4%
5,00	4,82	0,05	6,97	190,5%	20,75	13,76	181,6	21,2	99,9%	77,2%	77,1%
6,00	4,82	0,07	6,65	203,4%	20,76	14,07	181,0	21,1	99,7%	76,6%	76,4%
7,00	4,77	0,03	5,39	276,6%	20,80	15,39	180,8	21,3	100,3%	73,2%	73,4%
8,00	4,72	0,09	7,08	184,5%	20,75	13,62	180,3	21,5	99,5%	77,5%	77,2%
9,00	4,72	0,03	5,15	293,9%	20,80	15,64	180,8	21,4	100,3%	72,3%	72,6%
10,00	4,68	0,18	7,62	161,6%	20,73	13,02	181,2	21,2	98,5%	78,4%	77,3%
11,00	4,68	0,16	7,33	172,6%	20,74	13,34	180,7	21,3	98,7%	77,9%	76,9%
12,00	4,63	0,04	4,97	307,3%	20,81	15,82	179,8	21,1	100,3%	71,8%	72,0%
13,00	4,63	0,03	5,39	276,4%	20,80	15,39	179,0	21,1	100,4%	73,4%	73,7%
14,00	4,59	0,04	6,16	229,0%	20,78	14,59	180,1	21,3	100,2%	75,5%	75,6%
15,00	4,54	0,21	7,37	169,4%	20,74	13,27	180,6	21,2	98,2%	78,0%	76,6%
16,00	4,54	0,05	6,73	201,0%	20,76	14,01	180,3	21,2	100,0%	76,8%	76,8%
17,00	4,53	0,04	5,15	293,2%	20,80	15,63	180,2	21,3	100,3%	72,4%	72,6%
18,00	4,47	0,03	5,13	294,9%	20,80	15,65	179,6	21,3	100,3%	72,4%	72,7%
19,00	4,45	0,10	7,08	184,1%	20,75	13,62	179,6	21,2	99,4%	77,6%	77,1%
20,00	4,41	0,19	6,83	190,4%	20,75	13,83	180,6	21,3	98,2%	77,0%	75,6%
21,00	4,41	0,08	6,15	227,7%	20,78	14,59	181,3	21,3	99,6%	75,4%	75,1%
22,00	4,41	0,06	6,75	199,4%	20,76	13,98	180,8	21,2	99,8%	76,8%	76,6%
23,00	4,36	0,05	6,67	203,8%	20,76	14,07	180,8	21,4	100,0%	76,6%	76,7%
24,00	4,32	0,04	5,82	248,2%	20,78	14,95	180,8	21,6	100,1%	74,5%	74,6%
25,00	4,32	0,08	6,60	205,2%	20,76	14,12	180,8	21,5	99,6%	76,5%	76,2%
26,00	4,27	0,06	6,70	201,6%	20,76	14,03	181,3	21,6	99,8%	76,7%	76,6%
27,00	4,23	0,07	6,59	206,5%	20,76	14,14	181,2	21,6	99,7%	76,4%	76,2%
28,00	4,23	0,03	6,29	222,5%	20,77	14,46	181,0	21,5	100,2%	75,8%	75,9%
29,00	4,18	0,23	7,31	170,3%	20,74	13,31	181,4	21,4	97,9%	77,9%	76,2%
30,00	4,18	0,14	6,47	208,9%	20,76	14,23	182,3	21,6	98,9%	76,1%	75,2%
31,00	4,13	0,12	6,55	205,6%	20,76	14,15	181,7	21,6	99,0%	76,3%	75,6%
32,00	4,13	0,06	6,57	207,6%	20,76	14,16	180,9	21,6	99,8%	76,4%	76,3%
33,00	4,09	0,03	5,78	251,0%	20,79	14,99	180,6	21,6	100,3%	74,4%	74,7%
34,00	4,04	0,05	6,73	200,7%	20,76	14,00	180,6	21,5	99,9%	76,8%	76,7%
35,00	4,04	0,06	6,46	212,9%	20,77	14,28	181,1	21,6	99,8%	76,1%	76,0%
36,00	4,00	0,05	6,06	233,6%	20,78	14,69	180,9	21,6	100,0%	75,2%	75,2%
37,00	4,00	0,06	6,80	197,1%	20,76	13,92	181,0	21,8	99,8%	76,9%	76,8%
38,00	3,95	0,20	7,33	170,9%	20,74	13,31	181,0	21,5	98,3%	77,9%	76,6%
39,00	3,95	0,04	5,07	299,2%	20,80	15,71	180,2	21,5	100,2%	72,1%	72,3%
40,00	3,91	0,09	6,80	196,0%	20,76	13,91	180,1	21,5	99,5%	77,0%	76,6%
41,00	3,91	0,07	7,25	178,6%	20,75	13,46	180,4	21,6	99,7%	77,9%	77,6%
42,00	3,86	0,06	6,62	205,6%	20,76	14,11	180,4	21,5	99,9%	76,6%	76,5%
43,00	3,82	0,03	5,82	248,5%	20,78	14,95	179,3	21,5	100,2%	74,7%	74,9%
44,00	3,82	0,05	6,73	200,8%	20,76	14,00	179,5	21,6	100,0%	76,9%	76,9%
45,00	3,77	0,04	5,72	254,4%	20,79	15,05	178,4	20,6	100,1%	74,4%	74,5%
46,00	3,73	0,05	6,26	223,5%	20,77	14,49	178,2	20,9	100,0%	75,9%	75,9%
47,00	3,73	0,03	6,15	230,3%	20,78	14,62	178,4	20,9	100,2%	75,6%	75,8%
48,00	3,72	0,06	6,05	233,9%	20,78	14,70	177,4	21,2	99,9%	75,5%	75,5%
49,00	3,68	0,02	5,41	275,5%	20,80	15,37	177,1	21,2	100,5%	73,7%	74,1%
50,00	3,64	0,10	6,34	216,9%	20,77	14,38	177,3	21,3	99,4%	76,3%	75,8%
51,00	3,64	0,06	6,02	235,9%	20,78	14,73	177,6	21,6	99,9%	75,4%	75,4%
52,00	3,59	0,09	7,71	161,6%	20,73	12,98	177,5	21,6	99,5%	78,9%	78,6%
53,00	3,54	0,14	7,16	179,5%	20,75	13,52	178,2	21,7	98,9%	77,9%	77,0%
54,00	3,54	0,29	8,19	140,7%	20,72	12,38	178,2	21,6	97,5%	79,6%	77,6%
55,00	3,50	0,06	6,90	193,2%	20,76	13,83	177,4	21,5	99,9%	77,5%	77,4%
56,00	3,50	0,03	5,93	242,3%	20,78	14,84	177,9	21,6	100,3%	75,2%	75,4%
57,00	3,45	0,06	6,52	209,8%	20,77	14,21	177,5	21,6	99,8%	76,7%	76,5%
58,00	3,41	0,13	6,90	190,0%	20,75	13,79	177,7	21,6	98,9%	77,5%	76,6%
59,00	3,41	0,15	6,99	185,6%	20,75	13,68	178,4	21,9	98,7%	77,6%	76,6%
60,00	3,36	0,18	6,90	188,5%	20,75	13,77	178,7	21,9	98,4%	77,4%	76,2%
61,00	3,36	0,07	6,83	195,3%	20,76	13,89	172,9	21,8	99,7%	77,8%	77,6%
62,00	3,32	0,03	5,17	292,6%	20,80	15,62	168,1	21,7	100,4%	74,1%	74,4%
63,00	3,32	0,03	4,54	346,4%	20,82	16,27	163,8	21,8	100,4%	72,3%	72,6%
64,00	3,32	0,05	3,66	450,7%	20,84	17,16	161,0	21,8	100,2%	68,3%	68,4%
65,00	3,27	0,02	4,77	326,3%	20,81	16,04	158,7	21,7	100,6%	73,9%	74,4%
66,00	3,32	0,03	3,46	484,7%	20,85	17,38	156,6	21,8	100,6%	67,8%	68,2%
67,00	3,27	0,02	4,56	346,1%	20,82	16,26	155,0	21,7	100,7%	73,7%	74,2%
68,00	3,23	0,03	3,70	447,1%	20,84	17,13	152,9	21,8	100,6%	69,9%	70,4%
69,00	3,23	0,07	2,48	702,2%	20,87	18,36	151,0	21,6	99,8%	59,9%	59,8%
70,00	3,23	0,04	3,89	418,3%	20,84	16,92	149,9	21,8	100,3%	71,5%	71,8%
71,00	3,23	0,05	2,84	605,6%	20,86	18,00	147,6	21,6	100,2%	64,6%	64,8%
72,00	3,18	0,03	3,45	486,6%	20,85	17,39	146,9	21,8	100,6%	69,5%	69,9%
73,00	3,18	0,03	4,03	402,3%	20,83	16,79	145,6	21,7	100,5%	72,9%	73,3%
74,00	3,18	0,02	4,69	333,4%	20,82	16,12	144,6	21,5	100,7%	75,6%	76,1%
75,00	3,13	0,03	3,40	493,6%	20,85	17,43	143,2	21,7	100,6%	69,9%	70,3%
76,00	3,13	0,02	3,63	459,3%	20,84	17,21	142,0	21,6	100,9%	71,4%	72,0%
77,00	3,17	0,05	3,15	537,0%	20,86	17,68	140,8	21,7	100,2%	68,7%	68,9%
78,00	3,13	0,02	4,40	361,4%	20,82	16,41	140,5	21,6	100,6%	75,2%	75,6%
79,00	3,13	0,05	3,39	493,7%	20,85	17,44	139,2	21,7	100,2%	70,6%	70,7%
80,00	3,09	0,04	3,89	419,1%	20,84	16,93	138,8	21,8	100,3%	73,3%	73,5%
81,00	3,09	0,02	4,55	346,2%	20,82	16,26	137,7	21,7	100,6%	76,1%	76,6%
82,00	3,09	0,05	2,85	604,1%	20,86	17,99	136,6	21,8	100,2%	67,2%	67,4%
83,00	3,09	0,04	3,02	567,0%	20,86	17,82	135,8	21,8	100,5%	68,8%	69,1%
84,00	3,04	0,02	4,05	401,5%	20,83	16,78	134,9	21,7	100,7%	74,7%	75,2%
85,00	3,00	0,04	3,22	526,1%	20,85	17,62	133,6	21,6	100,4%	70,6%	70,9%
86,00	3,00	0,06	2,77	621,2%	20,87	18,07	133,4	21,8	100,0%	67,3%	67,3%
87,00	3,00	0,06	3,19	528,2%	20,85	17,64	132,2	21,7	99,9%	70,7%	70,6%
88,00	3,00	0,08	2,42	718,1%	20,87	18,42	132,1	21,5	99,4%	64,1%	63,7%
89,00	3,00	0,03	1,06	1770,7%	20,91	19,83	132,3	21,7	103,1%	29,8%	30,7%
90,00	2,95	0,05	3,25	518,5%	20,85	17,58	131,8	21,7	100,3%	71,2%	71,4%
91,00	2,95	0,04	3,79	433,2%	20,84	17,03	131,5	21,6	100,4%	74,1%	74,4%
92,00	2,91	0,05	3,06	556,0%	20,86	17,77	130,5	21,5	100,4%	70,1%	70,4%

93,00	3,00	0,06	2,69	641,2%	20,87	18,15	130,6	21,2	100,0%	67,1%	67,1%
94,00	2,95	0,04	4,83	319,4%	20,81	15,97	129,5	20,3	100,3%	77,9%	78,2%
95,00	2,86	0,06	3,49	474,8%	20,85	17,33	128,5	20,1	99,9%	72,8%	72,8%
96,00	2,91	0,07	2,69	639,9%	20,87	18,14	128,0	20,7	99,8%	67,6%	67,5%
97,00	2,91	0,02	4,23	380,2%	20,83	16,59	127,7	20,8	100,8%	76,4%	77,0%
98,00	2,86	0,13	2,48	681,8%	20,87	18,33	126,3	21,0	97,7%	66,2%	64,7%
99,00	2,82	0,06	2,18	811,9%	20,88	18,67	126,3	21,0	100,2%	62,6%	62,7%
100,00	2,82	0,02	4,58	343,8%	20,82	16,23	126,6	21,1	100,7%	77,7%	78,3%
101,00	2,82	0,03	3,78	435,9%	20,84	17,05	125,8	21,0	100,7%	74,9%	75,4%
102,00	2,82	0,05	2,64	656,6%	20,87	18,20	127,9	21,1	100,2%	67,3%	67,4%
103,00	2,77	0,03	4,05	400,3%	20,83	16,77	126,5	21,2	100,6%	75,9%	76,4%
104,00	2,77	0,06	2,80	612,6%	20,86	18,03	126,8	21,2	100,0%	68,9%	68,9%
105,00	2,82	0,03	4,32	369,8%	20,82	16,50	127,0	21,3	100,6%	76,8%	77,3%
106,00	2,73	0,02	4,11	394,1%	20,83	16,71	127,1	21,2	100,8%	76,1%	76,7%
107,00	2,82	0,03	3,80	432,7%	20,84	17,02	126,3	21,3	100,6%	75,0%	75,4%
108,00	2,73	0,05	3,39	493,4%	20,85	17,44	126,2	21,3	100,2%	73,0%	73,1%
109,00	2,77	0,04	3,25	520,0%	20,85	17,58	126,1	21,4	100,5%	72,2%	72,6%
110,00	2,73	0,03	3,77	437,6%	20,84	17,06	125,7	21,3	100,6%	74,9%	75,4%
111,00	2,70	0,02	3,70	448,0%	20,84	17,13	125,3	21,3	100,9%	74,7%	75,3%
112,00	2,73	0,04	2,96	579,7%	20,86	17,88	125,0	21,3	100,5%	70,5%	70,8%
113,00	2,68	0,04	3,71	445,0%	20,84	17,12	125,3	21,2	100,5%	74,7%	75,0%
114,00	2,64	0,02	3,36	502,6%	20,85	17,48	125,4	21,0	100,9%	72,9%	73,6%
115,00	2,64	0,03	2,92	589,7%	20,86	17,92	125,4	21,2	100,8%	70,2%	70,7%
116,00	2,68	0,01	4,29	374,2%	20,83	16,53	124,8	21,3	100,8%	77,1%	77,7%
117,00	2,64	0,04	2,74	635,9%	20,87	18,11	124,3	21,3	100,8%	69,0%	69,5%
118,00	2,64	0,05	2,77	623,7%	20,87	18,07	124,8	21,3	100,3%	69,1%	69,4%
119,00	2,64	0,02	4,53	348,4%	20,82	16,28	124,2	21,2	100,6%	77,9%	78,4%
120,00	2,54	0,06	2,87	594,9%	20,86	17,96	123,5	21,2	100,0%	70,2%	70,2%
121,00	2,64	0,04	3,38	496,2%	20,85	17,45	123,6	21,3	100,4%	73,4%	73,7%
122,00	2,59	0,03	3,91	418,1%	20,84	16,91	122,6	21,3	100,6%	76,0%	76,5%
123,00	2,59	0,06	2,53	688,4%	20,87	18,31	122,6	21,2	100,2%	67,6%	67,7%
124,00	2,54	0,03	4,02	404,6%	20,83	16,80	123,7	21,2	100,6%	76,3%	76,8%
125,00	2,54	0,04	3,89	419,0%	20,84	16,93	122,8	21,2	100,4%	75,9%	76,2%
126,00	2,50	0,05	3,52	472,4%	20,85	17,30	123,3	21,3	100,3%	74,2%	74,4%
127,00	2,50	0,02	3,98	410,5%	20,83	16,85	122,9	21,3	100,8%	76,3%	76,9%
128,00	2,50	0,07	2,37	735,2%	20,88	18,47	122,9	21,2	99,6%	65,9%	65,7%
129,00	2,50	0,03	4,35	365,8%	20,82	16,46	122,3	21,2	100,6%	77,7%	78,1%
130,00	2,50	0,03	3,39	496,1%	20,85	17,44	122,1	21,2	100,7%	73,7%	74,3%
131,00	2,41	0,03	3,40	494,4%	20,85	17,43	121,3	21,2	100,8%	73,9%	74,5%
132,00	2,45	0,05	2,95	581,1%	20,86	17,89	121,3	21,2	100,4%	71,2%	71,5%
133,00	2,41	0,03	3,41	493,0%	20,85	17,42	121,3	21,2	100,8%	74,0%	74,6%
134,00	2,45	0,06	2,98	570,5%	20,86	17,85	122,0	21,3	99,9%	71,3%	71,3%
135,00	2,45	0,02	4,21	382,9%	20,83	16,61	122,5	21,3	100,8%	77,2%	77,8%
136,00	2,41	0,05	3,43	485,8%	20,85	17,39	122,2	21,3	100,2%	73,9%	74,1%
137,00	2,36	0,05	3,14	538,1%	20,86	17,69	122,1	21,3	100,1%	72,3%	72,4%
138,00	2,36	0,02	4,18	386,2%	20,83	16,64	122,0	21,4	100,8%	77,1%	77,8%
139,00	2,36	0,06	2,88	594,4%	20,86	17,95	121,9	21,3	100,0%	70,6%	70,6%
140,00	2,32	0,03	3,35	503,3%	20,85	17,48	122,1	21,3	100,8%	73,5%	74,1%
141,00	2,36	0,02	4,13	392,0%	20,83	16,69	121,9	21,4	100,7%	77,0%	77,5%
142,00	2,36	0,03	3,32	507,9%	20,85	17,51	121,7	21,4	100,7%	73,5%	74,0%
143,00	2,32	0,04	3,75	438,1%	20,84	17,07	121,6	21,3	100,4%	75,5%	75,8%
144,00	2,27	0,10	2,33	738,1%	20,88	18,49	121,5	21,3	98,6%	65,9%	65,0%
145,00	2,23	0,02	4,11	393,7%	20,83	16,71	121,9	21,3	100,8%	76,9%	77,5%
146,00	2,27	0,03	4,16	387,0%	20,83	16,66	121,8	21,4	100,5%	77,1%	77,5%
147,00	2,23	0,05	3,69	445,3%	20,84	17,12	121,0	21,2	100,2%	75,4%	75,6%
148,00	2,23	0,05	3,49	476,0%	20,85	17,33	122,2	21,4	100,2%	74,3%	74,4%
149,00	2,27	0,05	3,72	442,0%	20,84	17,10	121,7	21,5	100,2%	75,4%	75,6%
150,00	2,23	0,04	3,32	507,3%	20,85	17,51	121,5	21,3	100,5%	73,5%	73,9%
151,00	2,23	0,03	3,72	443,7%	20,84	17,10	121,8	21,4	100,6%	75,4%	75,8%
152,00	2,23	0,03	3,26	520,6%	20,85	17,58	121,6	21,4	100,8%	73,1%	73,7%
153,00	2,23	0,03	3,16	538,1%	20,86	17,68	121,6	21,3	100,7%	72,6%	73,0%
154,00	2,18	0,02	3,81	432,7%	20,84	17,02	120,6	21,4	100,8%	76,0%	76,5%
155,00	2,14	0,08	2,72	630,5%	20,87	18,11	119,9	21,3	99,5%	69,9%	69,5%
156,00	2,14	0,07	2,34	747,5%	20,88	18,50	120,3	21,3	99,7%	66,2%	66,1%
157,00	2,14	0,04	4,96	308,6%	20,81	15,83	120,1	21,3	100,3%	79,7%	79,9%
158,00	2,14	0,07	2,70	635,4%	20,87	18,13	120,3	21,4	99,6%	69,7%	69,4%
159,00	2,09	0,04	4,61	338,5%	20,82	16,19	121,2	21,3	100,2%	78,6%	78,8%
160,00	2,09	0,03	4,14	388,7%	20,83	16,67	120,1	21,4	100,5%	77,3%	77,7%
161,00	2,09	0,08	2,31	753,2%	20,88	18,53	120,0	21,3	99,3%	66,1%	65,6%
162,00	2,05	0,02	3,76	440,3%	20,84	17,07	120,4	21,3	100,9%	75,8%	76,4%
163,00	2,05	0,03	3,67	451,5%	20,84	17,16	119,6	21,4	100,7%	75,6%	76,1%
164,00	2,05	0,08	2,34	742,8%	20,88	18,50	119,8	21,3	99,2%	66,4%	65,9%
165,00	2,05	0,03	3,71	445,6%	20,84	17,11	119,4	21,3	100,7%	75,8%	76,3%
166,00	2,00	0,12	1,95	884,1%	20,89	18,87	118,7	21,3	97,6%	62,0%	60,5%
167,00	2,00	0,03	3,20	532,6%	20,85	17,64	119,7	21,4	100,8%	73,2%	73,7%
168,00	2,00	0,02	3,99	408,3%	20,83	16,83	120,3	21,4	100,8%	76,8%	77,4%
169,00	2,00	0,04	3,74	440,3%	20,84	17,08	120,4	21,4	100,4%	75,7%	76,0%
170,00	2,00	0,04	3,28	513,5%	20,85	17,55	119,4	21,3	100,5%	73,7%	74,0%
171,00	1,95	0,10	2,29	752,0%	20,88	18,53	119,9	21,4	98,5%	65,9%	65,0%
172,00	1,95	0,03	1,06	1770,1%	20,91	19,84	120,9	21,4	102,6%	36,0%	37,0%
173,00	1,95	0,03	4,39	360,7%	20,82	16,41	120,3	21,4	100,4%	78,1%	78,4%
174,00	1,91	0,07	2,72	629,0%	20,87	18,10	119,3	21,4	99,6%	70,1%	69,8%
175,00	1,91	0,05	4,11	390,4%	20,83	16,69	119,9	21,4	100,1%	77,2%	77,3%
176,00	1,91	0,03	3,92	416,5%	20,84	16,90	119,5	21,4	100,6%	76,6%	77,1%
177,00	1,91	0,07	2,83	603,5%	20,86	18,00	120,0	21,5	99,6%	70,7%	70,4%
178,00	1,86	0,02	4,00	407,0%	20,83	16,82	120,2	21,5	100,8%	76,8%	77,4%
179,00	1,86	0,10	2,60	655,3%	20,87	18,22	120,1	21,5	98,6%	68,9%	67,9%
180,00	1,86	0,02	4,38	362,8%	20,82	16,43	120,9	21,6	100,6%	78,0%	78,5%
181,00	1,82	0,05	3,80	430,3%	20,84	17,02	120,3	21,5	100,2%	76,0%	76,1%
182,00	1,82	0,06	2,84	602,7%	20,86	17,99	119,6	21,5	99,9%	70,9%	70,8%
183,00	1,82	0,06	2,56	679,4%	20,87	18,28	119,1	21,5	100,1%	68,8%	68,8%
184,00	1,77	0,05	3,86	421,3%	20,84	16,95	119,0	21,5	100,1%	76,5%	76,6%
185,00	1,77	0,11	2,26	760,0%	20,88	18,56	117,4	21,6	98,2%	66,3%	65,2%
186,00	1,77	0,14	1,71	1006,7%	20,89	19,12	117,4	21,6	96,5%	58,4%	56,4%
187,00	1,73	0,02	3,43	490,6%	20,85	17,41	117,8	21,6	100,9%	74,8%	75,5%
188,00	1,77	0,06	3,31	505,5%	20,85	17,51	117,1	21,5	100,0%	74,3%	74,4%
189,00	1,73	0,09	2,15	812,2%	20,88	18,69	117,0	21,5	99,1%	65,1%	64,5%
190,00	1,73	0,05	2,94	582,6%	20,86	17,90	116,8	21,6	100,4%	72,2%	72,5%
191,00	1,71	0,05	2,61	666,8%	20,87	18,23	116,3	21,5	100,4%	69,9%	70,2%
192,00	1,68	0,05	2,34	755,0%	20,88	18,52	115,0	21,6	100,5%	67,7%	68,1%
193,00	1,70	0,07	1,87	949,5%	20,89	18,98	115,0	21,6	99,6%	61,9%	61,6%
194,00	1,68	0,02	3,48	483,2%	20,85	17,36	114,8	21,6	100,9%	75,6%	76,3%
195,00	1,68	0,04	3,36	499,8%	20,85	17,47	114,3	21,5	100,5%	75,1%	75,5%
196,00	1,68	0,08	2,46	706,0%	20,87	18,38	113,1	21,6	99,5%	69,4%	69,0%
197,00	1,64	0,07	2,33	751,0%	20,88	18,51	114,1	21,6	99,9%	67,9%	67,8%
198,00	1,64	0,02	4,00	407,5%	20,83	16,82	113,9	21,6	100,8%	77,8%	78,4%
199,00	1,64	0,07	2,42	721,9%	20,87	18,42	113,0	21,7	99,9%	69,1%	69,0%
200,00	1,64	0,09	2,03	860,7%	20,88	18,81	113,2	21,6	98,8%	64,8%	64,1%
201,00	1,64	0,04	3,24	521,6%	20,85	17,59	112,0	21,7	100,6%	75,0%	75,4%
202,00	1,64	0,09	1,90	928,4%	20,89	18,95	111,8	21,6	99,0%	63,4%	62,7%
203,00	1,59	0,06	1,85	971,7%	20,89	19,01	110,9	21,8	100,3%	62,9%	63,1%
204,00	1,59	0,05	2,31	763,2%	20,88	18,54	110,4	21,7	100,5%	68,8%	69,1%
205,00	1,59	0,02	3,77	437,9%	20,84	17,06	110,2	21,7	100,8%	77,6%	78,3%
206,00	1,59	0,06	2,38	736,5%	20,88	18,47	110,2	21,7	100,0%	69,4%	69,4%

207,00	1,55	0,03	3,48	480,7%	20,85	17,35	110,5	21,7	100,7%	76,4%	76,9%
208,00	1,55	0,03	3,26	520,6%	20,85	17,58	109,8	21,7	100,9%	75,5%	76,2%
209,00	1,55	0,22	1,59	1028,5%	20,89	19,19	108,7	21,7	92,6%	59,6%	55,2%
210,00	1,50	0,06	2,18	809,8%	20,88	18,67	108,9	21,8	100,0%	67,8%	67,8%
211,00	1,50	0,03	3,28	516,5%	20,85	17,56	108,0	21,7	100,7%	76,0%	76,5%
212,00	1,50	0,11	2,03	852,2%	20,88	18,80	107,4	21,8	98,1%	66,6%	65,3%
213,00	1,50	0,05	2,22	798,6%	20,88	18,64	107,5	21,8	100,3%	68,6%	68,8%
214,00	1,50	0,05	2,57	678,8%	20,87	18,28	107,2	21,7	100,4%	71,8%	72,1%
215,00	1,50	0,08	2,18	805,3%	20,88	18,67	106,3	21,6	99,4%	68,5%	68,1%
216,00	1,45	0,06	2,05	867,3%	20,88	18,81	106,1	21,8	100,0%	67,2%	67,2%
217,00	1,45	0,03	3,14	544,5%	20,86	17,71	107,0	21,7	100,8%	75,4%	76,0%
218,00	1,45	0,02	3,97	410,4%	20,83	16,85	107,1	21,7	100,7%	78,9%	79,4%
219,00	1,45	0,11	2,28	751,6%	20,88	18,54	105,8	21,7	98,2%	69,8%	68,5%
220,00	1,45	0,14	1,45	1183,9%	20,90	19,38	105,8	21,8	96,1%	57,7%	55,4%
221,00	1,41	0,04	3,75	438,5%	20,84	17,07	106,8	21,8	100,4%	78,1%	78,4%
222,00	1,41	0,06	3,08	549,9%	20,86	17,75	106,0	21,8	99,9%	75,3%	75,3%
223,00	1,36	0,07	2,44	715,1%	20,87	18,40	105,6	21,7	99,8%	71,1%	71,0%
224,00	1,41	0,06	2,45	713,5%	20,87	18,39	105,2	21,8	100,2%	71,4%	71,5%
225,00	1,41	0,08	2,25	775,8%	20,88	18,59	104,5	21,7	99,2%	69,7%	69,2%
226,00	1,36	0,09	1,96	893,3%	20,89	18,88	105,1	21,6	98,8%	66,4%	65,6%
227,00	1,36	0,06	2,34	749,6%	20,88	18,50	105,1	21,7	100,2%	70,5%	70,6%
228,00	1,36	0,04	3,39	494,0%	20,85	17,44	105,8	21,6	100,4%	76,9%	77,2%
229,00	1,36	0,07	2,68	641,6%	20,87	18,15	104,6	21,8	99,7%	73,3%	73,1%
230,00	1,32	0,15	1,54	1110,5%	20,90	19,28	105,3	21,8	95,7%	59,7%	57,2%
231,00	1,32	0,02	4,89	315,0%	20,81	15,91	106,2	21,8	100,5%	81,4%	81,8%
232,00	1,32	0,06	3,25	516,1%	20,85	17,57	105,9	21,8	99,9%	76,2%	76,2%
233,00	1,27	0,07	2,40	726,0%	20,87	18,44	105,8	21,8	99,8%	70,8%	70,7%
234,00	1,27	0,04	2,79	620,8%	20,87	18,06	106,0	21,8	100,6%	73,7%	74,1%
235,00	1,27	0,05	2,67	651,2%	20,87	18,18	105,7	21,8	100,5%	72,9%	73,3%
236,00	1,27	0,05	2,42	724,6%	20,87	18,43	105,4	21,8	100,3%	71,1%	71,3%
237,00	1,27	0,05	2,78	619,8%	20,86	18,06	106,5	21,8	100,3%	73,5%	73,7%
238,00	1,27	0,03	4,71	330,6%	20,81	16,09	106,6	21,8	100,5%	81,0%	81,4%
239,00	1,23	0,09	2,44	707,8%	20,87	18,39	105,9	21,8	99,2%	71,1%	70,5%
240,00	1,23	0,11	1,82	956,6%	20,89	19,01	106,4	21,8	98,1%	64,2%	63,0%
241,00	1,23	0,03	3,61	461,4%	20,84	17,22	107,4	21,8	100,7%	77,5%	78,1%
242,00	1,19	0,04	3,38	495,9%	20,85	17,45	107,7	21,8	100,4%	76,5%	76,8%
243,00	1,18	0,12	2,23	765,6%	20,88	18,58	107,2	21,8	97,8%	69,0%	67,4%
244,00	1,18	0,06	2,79	616,1%	20,86	18,04	107,4	21,9	100,1%	73,4%	73,5%
245,00	1,18	0,05	2,99	572,1%	20,86	17,85	107,3	21,9	100,4%	74,6%	74,9%
246,00	1,18	0,05	3,27	514,7%	20,85	17,56	107,5	21,9	100,3%	76,1%	76,2%
247,00	1,14	0,07	2,43	716,2%	20,87	18,41	107,4	21,9	99,6%	70,7%	70,4%
248,00	1,14	0,03	3,47	483,8%	20,85	17,37	107,9	21,9	100,8%	76,9%	77,5%
249,00	1,14	0,03	2,95	584,6%	20,86	17,90	106,9	21,9	100,8%	74,5%	75,0%
250,00	1,09	0,09	1,90	927,5%	20,89	18,95	106,9	21,9	98,9%	65,1%	64,3%
251,00	1,09	0,02	3,83	429,0%	20,84	16,99	107,0	21,9	100,7%	78,4%	79,0%
252,00	1,09	0,07	2,67	645,2%	20,87	18,17	106,5	21,9	99,7%	72,8%	72,5%
253,00	1,09	0,09	2,08	840,3%	20,88	18,76	105,4	21,9	99,1%	67,9%	67,2%
254,00	1,09	0,09	2,06	851,6%	20,88	18,78	104,7	21,9	99,0%	67,8%	67,1%
255,00	1,05	0,04	2,67	652,9%	20,87	18,18	104,8	22,0	100,7%	73,2%	73,7%
256,00	1,05	0,03	2,42	731,2%	20,87	18,44	103,7	21,9	101,1%	71,6%	72,3%
257,00	1,05	0,07	1,77	1004,2%	20,89	19,08	104,2	21,9	99,5%	64,2%	63,9%
258,00	1,05	0,03	3,97	409,9%	20,83	16,85	104,8	21,9	100,6%	79,3%	79,8%
259,00	1,05	0,06	2,62	659,4%	20,87	18,21	104,6	21,9	99,9%	72,9%	72,8%
260,00	1,05	0,04	3,02	565,8%	20,86	17,82	104,2	21,9	100,4%	75,5%	75,8%
261,00	1,00	0,12	2,00	862,8%	20,88	18,82	104,6	21,9	97,7%	67,2%	65,6%
262,00	1,00	0,03	3,65	454,3%	20,84	17,18	105,5	22,0	100,7%	78,1%	78,6%
263,00	1,00	0,06	2,76	622,2%	20,87	18,07	104,9	21,9	99,9%	73,8%	73,7%
264,00	0,96	0,11	1,92	900,4%	20,89	18,90	105,0	21,9	97,8%	66,1%	64,7%
265,00	0,96	0,03	3,34	505,5%	20,85	17,49	104,6	22,0	100,8%	77,0%	77,6%
266,00	0,96	0,07	2,36	741,2%	20,88	18,48	104,2	21,8	99,9%	70,9%	70,8%
267,00	0,96	0,06	2,43	721,1%	20,87	18,42	103,9	22,0	100,2%	71,6%	71,7%
268,00	0,95	0,11	2,19	783,8%	20,88	18,63	103,8	22,0	98,1%	69,5%	68,2%
269,00	0,91	0,04	3,18	534,0%	20,85	17,66	104,2	22,0	100,6%	76,3%	76,7%
270,00	0,91	0,03	3,48	481,5%	20,85	17,36	103,6	22,1	100,6%	77,7%	78,2%
271,00	0,91	0,06	2,47	705,6%	20,87	18,37	104,8	22,0	99,9%	71,7%	71,6%
272,00	0,91	0,03	3,83	428,7%	20,84	17,00	104,7	22,0	100,5%	78,8%	79,2%
273,00	0,86	0,10	2,24	769,7%	20,88	18,58	104,5	22,1	98,6%	69,8%	68,8%
274,00	0,86	0,11	2,27	757,0%	20,88	18,55	104,8	22,2	98,1%	70,0%	68,7%
275,00	0,86	0,05	3,32	505,9%	20,85	17,51	105,3	22,2	100,3%	76,7%	76,9%
276,00	0,86	0,12	2,28	752,4%	20,88	18,54	104,7	22,3	98,0%	70,2%	68,8%
277,00	0,86	0,08	2,35	737,5%	20,88	18,48	105,9	22,2	99,3%	70,5%	70,0%
278,00	0,82	0,03	3,88	421,8%	20,84	16,94	106,9	22,2	100,6%	78,7%	79,2%
279,00	0,82	0,03	3,89	419,6%	20,84	16,93	106,8	22,3	100,5%	78,7%	79,2%
280,00	0,82	0,11	2,04	846,6%	20,88	18,78	105,9	22,2	98,1%	67,4%	66,1%
281,00	0,82	0,09	2,20	791,0%	20,88	18,64	105,4	22,2	98,9%	69,2%	68,4%
282,00	0,82	0,04	2,23	798,8%	20,88	18,63	105,1	22,1	100,8%	69,5%	70,1%
283,00	0,81	0,08	1,88	939,7%	20,89	18,97	104,6	22,2	99,4%	65,7%	65,3%
284,00	0,77	0,07	1,62	1104,0%	20,90	19,24	104,2	22,2	99,5%	61,7%	61,4%
285,00	0,77	0,02	2,84	613,0%	20,86	18,01	104,4	22,1	101,2%	74,4%	75,3%
286,00	0,77	0,04	2,30	772,3%	20,88	18,56	104,0	22,1	100,8%	70,4%	71,0%
287,00	0,75	0,03	3,07	558,0%	20,86	17,77	104,7	22,2	100,7%	75,6%	76,2%
288,00	0,73	0,03	3,72	443,6%	20,84	17,10	105,3	22,1	100,7%	78,4%	78,9%
289,00	0,73	0,07	3,32	502,5%	20,85	17,50	104,7	22,1	99,8%	76,9%	76,7%
290,00	0,73	0,10	2,25	770,8%	20,88	18,58	104,0	22,1	98,7%	70,0%	69,1%
291,00	0,68	0,07	2,06	856,2%	20,88	18,78	104,6	22,1	99,7%	67,9%	67,7%
292,00	0,68	0,02	3,77	438,2%	20,84	17,06	105,2	22,1	100,8%	78,5%	79,1%
293,00	0,68	0,08	2,92	578,9%	20,86	17,90	104,6	22,2	99,4%	74,9%	74,4%
294,00	0,68	0,08	2,28	761,1%	20,88	18,55	104,4	22,1	99,2%	70,2%	69,7%
295,00	0,64	0,04	2,66	656,2%	20,87	18,19	105,0	22,1	100,8%	73,1%	73,7%
296,00	0,64	0,03	3,40	496,0%	20,85	17,44	104,8	22,2	100,8%	77,2%	77,8%
297,00	0,64	0,08	1,95	907,5%	20,89	18,90	105,2	22,1	99,5%	66,4%	66,0%
298,00	0,64	0,03	2,99	576,1%	20,86	17,86	105,0	22,2	100,8%	75,1%	75,8%
299,00	0,64	0,03	3,36	500,6%	20,85	17,47	104,6	22,2	100,6%	77,1%	77,6%
300,00	0,64	0,08	2,55	678,0%	20,87	18,29	103,7	22,1	99,5%	72,6%	72,3%
301,00	0,59	0,10	1,96	891,2%	20,89	18,88	104,1	22,2	98,6%	66,9%	65,9%
302,00	0,59	0,03	3,61	461,7%	20,84	17,23	104,7	22,1	100,7%	78,0%	78,6%
303,00	0,55	0,08	2,41	717,5%	20,87	18,42	105,0	22,1	99,3%	71,2%	70,7%
304,00	0,58	0,05	3,84	424,7%	20,84	16,98	104,7	22,1	100,1%	78,9%	78,9%
305,00	0,55	0,06	2,55	683,8%	20,87	18,30	105,5	22,2	100,1%	72,2%	72,2%
306,00	0,55	0,06	3,04	556,7%	20,86	17,78	104,9	22,2	99,9%	75,5%	75,4%
307,00	0,55	0,13	1,76	977,9%	20,89	19,06	105,5	22,2	97,0%	63,8%	61,9%
308,00	0,55	0,04	3,27	515,9%	20,85	17,56	105,5	22,1	100,5%	76,5%	76,9%
309,00	0,50	0,07	2,31	754,6%	20,88	18,53	105,7	22,2	99,6%	70,2%	69,9%
310,00	0,50	0,06	2,76	624,2%	20,87	18,08	105,2	22,2	100,1%	73,7%	73,8%
311,00	0,50	0,07	2,33	747,9%	20,88	18,51	104,8	22,1	99,6%	70,6%	70,3%
312,00	0,50	0,04	2,61	668,8%	20,87	18,24	105,4	22,1	100,6%	72,7%	73,1%
313,00	0,50	0,02	3,81	432,3%	20,84	17,02	105,4	22,2	100,8%	78,7%	79,3%
314,00	0,46	0,06	2,84	604,1%	20,86	18,00	105,7	22,2	100,0%	74,1%	74,2%
315,00	0,46	0,04	3,40	494,3%	20,85	17,43	106,1	22,2	100,6%	76,9%	77,4%
316,00	0,46	0,05	3,04	561,2%	20,86	17,80	105,7	22,2	100,3%	75,3%	75,5%
317,00	0,41	0,06	2,73	631,1%	20,87	18,10	106,0	22,2	100,1%	73,4%	73,5%
318,00	0,41	0,03	2,84	609,8%	20,86	18,00	106,4	22,3	100,9%	74,0%	74,7%
319,00	0,41	0,03	3,49	480,4%	20,85	17,35	106,2	22,3	100,8%	77,3%	77,9%
320,00	0,41	0,12	2,20	776,2%	20,88	18,61	105,4	22,3	97,7%	69,3%	67,7%

321,00	0,37	0,05	2,18	814,0%	20,88	18,68	105,9	22,2	100,4%	68,8%	69,0%
322,00	0,41	0,03	3,59	464,2%	20,84	17,24	106,1	22,3	100,8%	77,8%	78,4%
323,00	0,37	0,09	2,94	572,7%	20,86	17,87	105,5	22,3	99,1%	74,8%	74,2%
324,00	0,37	0,10	1,99	876,0%	20,88	18,84	105,4	22,3	98,5%	66,9%	65,9%
325,00	0,37	0,04	3,13	544,5%	20,86	17,71	105,0	22,3	100,5%	75,9%	76,3%
326,00	0,32	0,04	2,48	709,8%	20,87	18,38	104,5	22,2	100,6%	71,9%	72,3%
327,00	0,32	0,03	2,28	782,2%	20,88	18,58	104,9	22,3	101,0%	70,1%	70,8%
328,00	0,32	0,02	3,04	565,9%	20,86	17,81	105,9	22,3	101,0%	75,3%	76,1%
329,00	0,32	0,05	2,82	610,7%	20,86	18,02	106,0	22,3	100,2%	74,0%	74,1%
330,00	0,27	0,06	2,96	574,8%	20,86	17,87	105,7	22,2	100,0%	74,9%	74,9%
331,00	0,27	0,03	3,48	481,1%	20,85	17,35	106,0	22,1	100,6%	77,3%	77,7%
332,00	0,27	0,05	3,10	547,6%	20,86	17,73	106,8	22,4	100,4%	75,4%	75,7%
333,00	0,27	0,08	3,63	448,8%	20,84	17,17	106,4	22,3	99,4%	77,9%	77,4%
334,00	0,23	0,07	2,78	614,3%	20,86	18,05	106,5	22,3	99,6%	73,6%	73,3%
335,00	0,23	0,05	3,44	484,8%	20,85	17,39	106,5	22,3	100,2%	77,1%	77,2%
336,00	0,23	0,05	3,13	540,3%	20,86	17,70	105,9	22,3	100,2%	75,8%	75,9%
337,00	0,23	0,06	2,28	769,3%	20,88	18,56	105,5	22,2	100,0%	70,0%	70,0%
338,00	0,18	0,04	2,38	744,6%	20,88	18,48	105,5	22,3	100,8%	70,8%	71,4%
339,00	0,21	0,06	2,69	641,8%	20,87	18,15	105,2	22,3	100,1%	73,3%	73,4%
340,00	0,18	0,07	2,67	643,9%	20,87	18,16	104,7	22,4	99,6%	73,3%	73,0%
341,00	0,18	0,06	2,37	741,1%	20,88	18,48	104,4	22,4	100,2%	71,1%	71,2%
342,00	0,18	0,04	2,52	695,7%	20,87	18,33	105,0	22,4	100,6%	72,1%	72,5%
343,00	0,18	0,03	3,47	484,1%	20,85	17,37	104,4	22,3	100,8%	77,6%	78,2%
344,00	0,14	0,06	2,27	775,8%	20,88	18,58	104,1	22,3	100,2%	70,2%	70,4%
345,00	0,14	0,05	2,59	671,0%	20,87	18,25	105,3	22,4	100,3%	72,6%	72,9%
346,00	0,14	0,04	4,73	328,1%	20,81	16,07	105,7	22,4	100,3%	81,2%	81,5%
347,00	0,14	0,11	2,35	727,8%	20,87	18,47	105,1	22,4	98,3%	70,8%	69,6%
348,00	0,10	0,08	2,76	618,8%	20,86	18,06	104,8	22,5	99,6%	73,9%	73,6%
349,00	0,09	0,05	2,58	674,8%	20,87	18,26	104,7	22,5	100,3%	72,7%	72,9%
350,00	0,09	0,09	1,92	914,2%	20,89	18,92	103,5	22,4	98,8%	66,6%	65,8%
351,00	0,09	0,06	2,05	862,5%	20,88	18,80	103,1	22,4	99,9%	68,3%	68,3%
352,00	0,09	0,07	1,94	914,1%	20,89	18,91	103,6	22,3	99,8%	66,8%	66,7%
353,00	0,09	0,03	2,82	615,8%	20,86	18,03	102,9	22,2	100,9%	74,6%	75,3%
354,00	0,05	0,11	1,78	976,6%	20,89	19,05	102,2	22,3	97,9%	65,2%	63,8%
355,00	0,05	0,04	2,52	698,0%	20,87	18,34	103,0	22,3	100,7%	72,6%	73,1%
356,00	0,05	0,02	4,01	405,9%	20,83	16,81	103,6	22,4	100,7%	79,6%	80,2%
357,00	0,05	0,10	2,70	629,1%	20,87	18,12	102,5	22,4	98,7%	74,0%	73,1%
358,00	0,05	0,10	1,59	1106,7%	20,90	19,26	102,8	22,3	98,1%	61,8%	#DIV/0!
359,00	0,05	0,03	4,22	380,2%	20,83	16,59	103,9	22,4	100,6%	80,2%	80,7%
360,00	0,00	0,09	3,79	425,8%	20,84	17,00	103,8	22,3	99,3%	78,9%	78,3%

POLYTESTS
TESTING THROUGH YOUR REALITY

Date: 2018-04-09 Manufacturer: laminoa Model: Jessika

Project #: PI 20163 Run: 1 Tech: M M Reviewer: SP

test granule

debut ligne

debut ligne 119 1h puissance 5

ligne 178 2h puissance 2

debut ligne 298 3h puissance 1

TEST LOAD CONFIGURATION

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE / POST CHECKS

Date: 2018-04-09 Manufacturer: laminox Model: Jossa

Project #: ~~PI 20163~~ PI 20163 Run: 1 Tech: MM Reviewer: [illegible]

MM

Equipment #	Time	12%	22%
EM-191	7:00	ok	ok

Moisture Meter Calibration Check:

Pre-Test **Post-Test**

Facility Conditions:

	Pre-Test	Post-Test
Air Velocity from less than 2 feet	4 (max50 Fpm)	3 (max50 Fpm)
Smoke Capture Check	ok	ok
Picture (4 sides)	ok	ok

Wood Heater Conditions:

Date Wood Heater Stack Cleaned	2018-04-09
Date Dilution Tunnel Cleaned	2018-04-09
Induced Draft Check (max 0.005 H2O)	ok
Traverse before ignition	ok

Flow Rate 140 cfm ±10%: ok

Temperature System:

Ambient (65°-90°F)	ok °F
Wood Heater Surface (±125°F)	ok °F

Proportional Checks:

Thermocouple check	ok
Pitot Clean	ok
Pitot verification	ok

Sampling Train ID Numbers:

	Train 1st hour	Train 1	Train 2
Probe	1	2	91
Filter Front	100	102	104
Filter Back	101	103	105
Filter Thermocouple	11	11	12
Filter (<90°F)	ok	ok	ok

POLYTESTS
TESTING THROUGH YOUR REALITY

SAMPLING EQUIPMENT CHECK OUT

Date: 2018-04-09 Manufacturer: laminox Model: Jess: kA

Project #: pI 2163 Run: 1 Tech: MM Reviewer: AP

Leakage Checks Tunnel Samplers

	System 1st hour		System 1		System 2	
Unplugged Flow Rate = .25cfm	Pre-Test ASTM (-15) CSA B415 (-5)	Post-Test (max test)	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	-15	-15
Final 1minute DGM (Liter)	651421.55	653200.06	651421.61	653200.14	602212.35	604046.02
Initial 1minute DGM (Liter)	651421.55	653200.06	651421.60	653200.13	602212.35	604046.02
Change © (Liter)	∅	∅	0.01	0.01	∅	∅
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)						
Check OK	ok	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	.4
Check OK (no change after 15 sec.)	ok	ok	ok	ok

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE-TEST SCALE AUDIT

Date: 2018-09-09 Manufacturer: Laminox Model: Jessika

Project #: PI 20163 Run: 1 Tech: MM Reviewer: DP

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM-090	44 lbs, Class F	44 lbs
Wood	EM-096	44 lbs, Class F	44 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: 2018-04-09 Manufacturer: Laminos Model: Jessika

Project #: pI 20163 Run: 1 Tech: MM Reviewer: BP

FOR TUNNELS < 12 in

Barometric pressure (P_{bar}) 101,8 (KPa.) Static pressure (P_q) 023 (inches w.c.)
Inside diameter: Port A _____ Port B ____.
Tunnel cross sectional area: .1963Ft^2
Pitot tube type: Standard

Traverse Point	Position (inches)			Velocity Head Δ_p (inches H_2O)	Tunnel Temperature (°F)
	6 po	7 po	8 po		
A- Centroid	3.00	3.50	4	0054	7335
B - Centroid	3.00	3.50	4	0053	7378
A-1	0.40	0.50	0.50	0050	7339
A-2	1.50	1.75	2	0053	7326
A-3	4.50	5.25	6	0045	7349
A-4	5.60	6.5	7.5	0044	7356
B-1	0.40	0.50	0.50	0045	7379
B-2	1.50	1.75	2	0052	7382
B-3	4.50	5.25	6	0045	7389
B-4	5.60	6.5	7.5	0043	7369
				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.
Δ_p = manometer reading (inches H_2O)
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 $\frac{\text{in. } H_2O}{\{\ 13.6\ \}}$
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 (Δ_p) measured at each traverse point.

POLYTESTS
TESTING THROUGH YOUR REALITY

CONTINUOUS ANALYZERS

Date: 2018-04-09 Manufacturer: lamNOx Model: Jessica

Project #: PT 20163 Run: 1 Tech: MM Reviewer: DP

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	0	0	2.997	3.000	~~1.010~~ 1.008 MM	1.00
Tolerance CO		+/- 0.02		+/- 0.15		+/- 0.05
CO_2	0	0	17.88	18.00	9.94	10.00
Tolerance CO2		+/- 0.02		+/- 0.5		+/- 0.5
O_2 informative CSA B415 calculated value	na	na	na	na	na	na
	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	0.003	2.993	1.006	0.003	0.02	0.004	0.15	0.002	0.05	✓	
CO_2	0	17.92	9.97	0	0.02	0.04	0.5	0.03	0.5	✓	

POLYTESTS
TESTING THROUGH YOUR REALITY

TEST DATA LOG

Date: 2018-04-09 Manufacturer: laminox Model: Jessika

Project #: PI 2163 Run: 1 Tech: MM Reviewer: DP

RAW DRY GAS METER READINGS

	System 1	System 2	Blanck
Final (Liter)	653199,05	604045,05	249,24
Initial (Liter)	651421,75	602215,94	228,86

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	101,8	101,8
Dry Bulb (F):	68,72	71,86
Humidity (%):	19	18

Flow Meter

	Start	End
Flow meter reading	N.A	N.A

Flow Meter Verification

	Before	After
Flow meter Check (liters)	N.A	N.A
Scale Weight (Kg)	N.A	N.A

POLYTESTS
TESTING THROUGH YOUR REALITY

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.	N. A				
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

POLYTESTS
TESTING THROUGH YOUR REALITY

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.	N/A				
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 Min 20%:………….. Max 25%:________

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2018-04-09 Manufacturer: laminar Model: Jessika

Project #: PT2163 Run: 1 Tech: MM Reviewer: BO

Pre-test Weight Record		SYSTEM 1 – 1st hour				SYSTEM 1				
		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blanck
Date	Time	1	100	101	25	2	102	103	38	106
2018-04-05	16:06	61,0680	0,1270	0,1277	34,9165	61,1007	0,1259	0,1288	34,7861	0,1279
2018-04-09	8:30	61,0679	0,1271	0,1277	34,9166	61,1007	0,1258	0,1288	34,7860	0,1278

Post-test Weight Record		SYSTEM 1 – 1st hour				SYSTEM 1				
		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blanck
Date	Time	1	100	101	25	2	102	103	38	106
2018-04-09	16:45	61,0684	0,1297	0,1273	34,9182	61,1012	0,1325	0,1285	34,7863	0,1278
2018-04-19	8:00	61,0679	0,1296	0,1272	34,9178	61,1007	0,1323	0,1285	34,7863	0,1278
2018-04-20	8:00	61.0679	0,1296	0,1272	34,9178	61,1007	0,1323	0,1285	34,7863	0,1278

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 2018-04-09 Manufacturer: Laminar Model: Jessika

Project #: PT 2063 Run: 1 Tech: MM Reviewer: LP

		SYSTEM 2			
Pre-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	41	104	105	39
2018-04-05	16:00	110,3645	0,1274	0,1271	35,3103
2018-04-09	8:30	110,3646	0,1275	0,1271	35,3104	

		SYSTEM 2			
Post-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	41 nr.	104	105	39
2018-04-09	16:45	~~119,3656~~ ~~110,3680~~	0,1371	0,1267	35,3113
2018.04.19	8:00	110,3650	0,1370	0,1267	~~35~~ 35,3113
2018.04.20	8:00	110.3650	0.1370	0,1267	35.3113

APPENDIX 2: Proportionality results

	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	100,18	99,11	System 1	System 2		SQRT
Velocity	Meter 1	Meter 2	**Proportional Rates**		Vol.Std.	Vol.Std.		Delta-P
			PR1	**PR2**			Time	
Ft/Sec	Deg. R	Deg. R	**%**	**%**	(ft3)	(ft3)	min	(in H2O)2
14,702	532,7	532,8			0,164	0,167	0	0,2273265
14,809	532,8	532,9	101,28	100,37	0,164	0,167	1	0,2288823
14,436	532,8	532,9	103,50	102,39	0,164	0,166	2	0,2230481
14,212	532,8	532,9	107,15	103,36	0,165	0,165	3	0,2196109
14,518	532,8	532,9	102,82	102,42	0,165	0,166	4	0,2242971
14,435	532,7	532,9	103,95	102,46	0,164	0,166	5	0,2230476
14,491	532,7	532,9	103,06	102,34	0,164	0,166	6	0,2239557
14,284	532,7	532,9	106,59	103,32	0,166	0,166	7	0,2207622
14,457	532,7	532,9	104,82	102,22	0,167	0,166	8	0,223501
14,427	532,7	532,9	104,26	102,12	0,166	0,166	9	0,2230439
14,484	532,6	532,9	105,01	102,02	0,166	0,166	10	0,2239563
14,599	532,7	532,9	102,00	101,38	0,165	0,166	11	0,2257558
14,449	532,7	533,0	104,38	102,22	0,165	0,166	12	0,2234438
14,201	532,7	533,0	106,69	103,78	0,166	0,166	13	0,2196117
14,597	532,7	533,0	104,17	100,75	0,167	0,166	14	0,2257599
14,344	532,7	533,0	105,39	102,67	0,167	0,166	15	0,221829
14,422	532,7	533,0	103,81	102,63	0,165	0,166	16	0,223048
14,305	532,7	533,0	104,45	103,51	0,164	0,166	17	0,2212223
14,247	532,7	533,0	106,44	103,57	0,165	0,166	18	0,2203037
14,660	532,7	533,0	103,60	100,37	0,167	0,166	19	0,2266569
14,424	532,7	533,1	102,65	102,90	0,165	0,166	20	0,2230477
14,529	532,7	533,1	102,98	101,61	0,164	0,166	21	0,224634
14,554	532,8	533,1	103,86	101,04	0,165	0,166	22	0,225085
14,021	532,8	533,2	106,75	104,94	0,165	0,165	23	0,2168236
14,459	532,9	533,2	105,04	101,91	0,166	0,166	24	0,2235023
14,883	533,0	533,2	100,03	99,46	0,165	0,166	25	0,2299883
14,468	533,0	533,3	105,08	101,83	0,165	0,166	26	0,2235021
14,357	533,1	533,4	105,03	102,64	0,166	0,165	27	0,2218404
14,615	533,1	533,4	103,75	101,04	0,166	0,166	28	0,22576
14,536	533,1	533,4	101,65	101,89	0,164	0,166	29	0,2246346
14,360	533,1	533,4	104,92	102,70	0,164	0,166	30	0,2219084
14,494	533,1	533,4	104,24	101,72	0,166	0,166	31	0,2239559
14,570	533,2	533,5	102,81	101,36	0,165	0,166	32	0,2250849
14,287	533,2	533,5	103,06	103,68	0,163	0,166	33	0,2207629
14,539	533,2	533,5	101,49	102,03	0,162	0,166	34	0,2246343
14,565	533,2	533,6	102,21	101,72	0,163	0,166	35	0,225085
14,215	533,2	533,6	103,97	104,04	0,163	0,166	36	0,219614
14,364	533,3	533,6	105,20	102,73	0,164	0,166	37	0,2219094
14,741	533,3	533,6	100,07	100,71	0,164	0,166	38	0,2277726
14,814	533,3	533,7	101,94	99,02	0,164	0,166	39	0,2288824
14,465	533,3	533,7	101,77	102,34	0,164	0,165	40	0,2235028
14,712	533,3	533,7	100,02	100,38	0,161	0,166	41	0,2273288
14,742	533,3	533,7	100,69	100,15	0,162	0,166	42	0,2277732
14,668	533,3	533,7	102,86	100,22	0,164	0,165	43	0,2266574
14,437	533,3	533,7	101,84	102,51	0,163	0,166	44	0,2230496
14,532	533,3	533,7	101,16	101,51	0,161	0,166	45	0,2246346
14,317	533,2	533,7	104,00	103,20	0,162	0,166	46	0,221223
14,740	533,2	533,6	102,81	99,91	0,165	0,166	47	0,2277734
14,360	533,2	533,6	105,44	102,64	0,166	0,165	48	0,22191
14,605	533,2	533,7	101,24	100,81	0,164	0,165	49	0,2257614
14,580	533,3	533,7	102,25	100,99	0,163	0,165	50	0,2253906
14,278	533,3	533,7	105,02	103,26	0,164	0,166	51	0,220763
14,429	533,4	533,8	102,04	102,73	0,163	0,166	52	0,223049
14,260	533,5	533,8	105,74	103,42	0,163	0,166	53	0,2203049
14,219	533,5	533,9	103,79	103,70	0,164	0,165	54	0,2196125
14,675	533,6	533,9	102,57	100,43	0,163	0,165	55	0,2266584
14,541	533,6	533,9	101,16	101,81	0,163	0,166	56	0,2246359
14,498	533,7	534,0	103,94	101,16	0,163	0,165	57	0,223958
14,573	533,7	534,0	102,03	100,69	0,164	0,165	58	0,2250868
14,615	533,8	534,1	102,72	100,31	0,164	0,165	59	0,2257616
14,709	533,8	534,1	100,29	100,22	0,163	0,165	60	0,2273115
14,847	533,8	534,1	98,64	99,06	0,162	0,166	61	0,2299912
14,387	533,8	534,2	101,96	101,61	0,162	0,166	62	0,2230503
14,748	533,9	534,2	98,87	99,11	0,162	0,165	63	0,2288859
14,400	533,9	534,2	103,05	101,53	0,163	0,166	64	0,2235699
14,562	533,9	534,2	100,79	99,80	0,164	0,165	65	0,2262104
14,802	533,9	534,2	100,65	98,30	0,164	0,165	66	0,2299907

14,651	533,8	534,2	99,22	99,54	0,163	0,165	67	0,2277744
14,476	533,8	534,2	101,19	100,95	0,162	0,166	68	0,2250874
14,474	533,8	534,2	102,66	100,59	0,164	0,166	69	0,2250873
14,397	533,8	534,2	102,62	100,38	0,165	0,165	70	0,2239581
14,362	533,8	534,2	103,63	100,77	0,165	0,165	71	0,223504
14,509	533,8	534,2	102,11	100,15	0,165	0,165	72	0,225764
14,464	533,7	534,2	102,06	101,01	0,165	0,166	73	0,225088
14,428	533,7	534,2	102,71	100,36	0,165	0,166	74	0,2246365
14,499	533,7	534,2	101,76	100,34	0,165	0,165	75	0,2257621
14,628	533,7	534,2	99,72	98,68	0,163	0,165	76	0,2277745
14,424	533,7	534,2	101,66	101,04	0,163	0,165	77	0,2246366
14,524	533,7	534,2	102,07	99,54	0,164	0,166	78	0,2262105
14,626	533,7	534,2	98,75	99,30	0,163	0,165	79	0,2277746
14,835	533,7	534,2	99,63	97,73	0,163	0,166	80	0,2310965
14,171	533,7	534,2	102,28	102,38	0,163	0,166	81	0,220764
14,590	533,7	534,2	101,60	99,31	0,163	0,165	82	0,2273296
14,830	533,7	534,2	98,32	97,25	0,164	0,165	83	0,2310906
14,587	533,7	534,2	101,21	99,77	0,164	0,165	84	0,227329
14,509	533,7	534,2	99,91	100,04	0,163	0,166	85	0,2262108
14,611	533,7	534,2	101,54	99,44	0,164	0,166	86	0,2277757
14,581	533,7	534,2	100,88	98,66	0,165	0,165	87	0,227329
14,611	533,7	534,2	101,09	98,70	0,165	0,165	88	0,2277748
14,609	533,7	534,2	101,12	98,96	0,165	0,165	89	0,2277753
14,877	533,7	534,2	99,19	97,04	0,165	0,165	90	0,2319602
14,749	533,7	534,2	98,17	97,48	0,163	0,165	91	0,2299905
14,579	533,7	534,2	98,96	99,11	0,161	0,165	92	0,2273291
14,361	533,7	534,2	100,32	100,70	0,161	0,165	93	0,2239574
14,877	533,6	534,1	98,48	97,61	0,162	0,166	94	0,2319666
14,504	533,5	534,0	99,65	99,49	0,163	0,166	95	0,2262103
14,825	533,5	534,0	98,57	97,39	0,162	0,165	96	0,2310904
14,511	533,4	534,0	101,97	99,92	0,164	0,165	97	0,2262025
14,684	533,4	534,0	98,73	97,86	0,164	0,165	98	0,2288848
14,583	533,5	534,0	101,18	99,06	0,163	0,165	99	0,2273285
14,336	533,5	534,0	100,83	100,55	0,163	0,165	100	0,2235034
14,332	533,6	534,0	100,40	100,68	0,161	0,165	101	0,2235041
14,692	533,6	534,0	100,52	98,59	0,163	0,165	102	0,2288854
14,678	533,6	534,0	98,00	98,42	0,163	0,165	103	0,2288844
14,704	533,6	534,0	98,17	97,76	0,161	0,165	104	0,229328
14,572	533,6	534,0	98,96	98,77	0,161	0,165	105	0,2273295
14,674	533,6	534,0	98,56	98,74	0,161	0,165	106	0,228885
14,574	533,6	534,0	100,62	99,38	0,163	0,166	107	0,2273289
14,575	533,6	534,0	101,33	99,70	0,165	0,166	108	0,2273291
14,573	533,6	534,0	100,57	99,25	0,164	0,166	109	0,2273293
14,328	533,6	534,0	101,22	101,15	0,163	0,166	110	0,2235018
14,430	533,6	534,0	102,12	100,59	0,163	0,166	111	0,2250869
14,602	533,5	534,0	98,81	98,72	0,163	0,166	112	0,2277744
14,574	533,6	534,0	101,18	99,26	0,163	0,165	113	0,2273293
14,870	533,6	534,0	99,03	97,71	0,165	0,166	114	0,2319669
14,429	533,5	534,0	102,41	100,25	0,165	0,166	115	0,2250867
14,530	533,5	534,0	100,30	99,14	0,164	0,165	116	0,2266591
14,744	533,5	534,0	98,19	98,06	0,162	0,165	117	0,2299906
14,814	533,5	534,0	99,88	97,93	0,164	0,166	118	0,2310915
14,841	533,5	534,0	99,48	97,55	0,165	0,166	119	0,231528
14,698	533,5	534,0	100,56	98,34	0,165	0,166	120	0,229328
14,738	533,5	533,9	98,17	97,56	0,164	0,165	121	0,2299553
14,324	533,5	533,9	101,96	100,98	0,163	0,165	122	0,2235048
14,865	533,5	534,0	96,79	97,14	0,162	0,165	123	0,2319667
14,698	533,5	534,0	100,33	98,78	0,163	0,166	124	0,2293283
14,698	533,5	534,0	101,19	98,95	0,166	0,166	125	0,2293282
14,667	533,5	533,9	100,25	98,70	0,165	0,166	126	0,2288852
14,666	533,5	533,9	100,81	99,27	0,165	0,166	127	0,2288848
14,522	533,5	533,9	101,76	99,60	0,165	0,166	128	0,2266542
14,975	533,5	533,9	96,58	96,32	0,164	0,165	129	0,2337094
14,525	533,5	533,9	100,04	99,19	0,162	0,165	130	0,2266585
14,565	533,5	533,9	98,95	99,01	0,162	0,165	131	0,2273286
14,522	533,5	533,9	101,60	99,43	0,163	0,165	132	0,2266546
14,808	533,5	534,0	97,38	97,60	0,163	0,165	133	0,2310894
14,666	533,5	534,0	100,68	98,55	0,163	0,166	134	0,2288845
14,497	533,5	534,0	101,49	99,97	0,165	0,166	135	0,2262104
14,467	533,5	534,0	101,88	100,28	0,165	0,166	136	0,2257583
14,526	533,5	534,0	99,26	99,25	0,163	0,166	137	0,2266591
14,767	533,6	534,0	100,04	98,47	0,163	0,166	138	0,2304305

14,764	533,5	534,0	100,16	97,85	0,165	0,166	139	0,2304306
14,594	533,5	534,0	98,37	98,31	0,163	0,165	140	0,2277738
14,766	533,5	534,0	100,13	98,22	0,163	0,165	141	0,2304306
14,595	533,5	534,0	98,98	98,62	0,164	0,165	142	0,2277739
14,835	533,5	534,0	98,95	97,17	0,163	0,165	143	0,2315279
14,692	533,6	534,0	100,08	98,54	0,164	0,165	144	0,2293005
14,350	533,5	534,0	100,52	100,30	0,163	0,165	145	0,2239569
14,595	533,5	534,0	98,90	98,55	0,161	0,165	146	0,2277744
14,806	533,6	534,0	97,48	97,02	0,162	0,165	147	0,2310906
14,834	533,5	534,0	97,36	97,19	0,162	0,165	148	0,2315284
14,592	533,5	534,0	100,81	99,11	0,163	0,165	149	0,2277573
14,522	533,5	534,0	101,23	99,57	0,165	0,166	150	0,2266587
14,692	533,5	534,0	99,09	98,42	0,164	0,166	151	0,2293283
14,422	533,5	534,0	102,73	100,54	0,164	0,166	152	0,2250871
14,737	533,6	534,0	98,46	97,79	0,164	0,166	153	0,2299908
14,933	533,5	534,0	98,55	97,19	0,164	0,166	154	0,2330571
14,564	533,5	534,0	98,45	98,82	0,163	0,166	155	0,22733
14,865	533,5	534,0	98,49	97,07	0,162	0,165	156	0,232016
14,462	533,5	534,0	100,05	99,60	0,163	0,165	157	0,2257616
14,765	533,5	534,0	97,39	97,40	0,161	0,165	158	0,230431
14,421	533,5	534,0	102,43	100,57	0,163	0,165	159	0,2250907
14,464	533,5	534,0	99,71	99,44	0,163	0,165	160	0,2257513
14,736	533,5	534,0	100,07	98,21	0,163	0,165	161	0,2299936
14,664	533,5	534,0	100,64	98,82	0,165	0,166	162	0,2288849
14,735	533,5	534,0	100,18	98,16	0,165	0,166	163	0,2299905
14,493	533,5	534,0	101,76	100,02	0,165	0,166	164	0,2262106
14,693	533,5	534,0	100,72	98,73	0,165	0,166	165	0,2293281
14,592	533,6	534,0	99,03	98,90	0,164	0,166	166	0,2277741
14,861	533,6	534,0	99,34	97,39	0,163	0,166	167	0,231931
14,567	533,6	534,0	101,44	99,53	0,165	0,166	168	0,2273291
14,321	533,6	534,0	102,68	100,96	0,165	0,166	169	0,2235104
14,695	533,6	534,0	100,27	98,89	0,165	0,166	170	0,2293281
14,864	533,6	534,0	98,78	97,06	0,165	0,166	171	0,2319675
14,862	533,6	534,0	97,08	96,72	0,163	0,165	172	0,2319667
14,664	533,6	534,0	98,11	98,48	0,161	0,165	173	0,2288859
14,737	533,6	534,0	97,92	97,40	0,161	0,165	174	0,2299911
14,566	533,6	534,0	99,20	98,81	0,162	0,165	175	0,2273292
14,563	533,6	534,0	100,37	99,51	0,163	0,165	176	0,2273483
14,666	533,6	534,0	97,89	98,19	0,162	0,166	177	0,2288859
14,523	533,6	534,0	99,89	99,33	0,162	0,165	178	0,2266577
14,767	533,6	534,0	97,89	97,63	0,162	0,165	179	0,2304313
14,526	533,6	534,1	100,81	99,35	0,163	0,165	180	0,2266588
14,694	533,6	534,1	100,40	98,64	0,164	0,166	181	0,2293285
14,732	533,6	534,1	99,96	98,44	0,165	0,166	182	0,2299905
14,589	533,7	534,1	101,47	99,09	0,165	0,166	183	0,2277744
14,560	533,7	534,1	99,12	98,72	0,164	0,165	184	0,227329
14,727	533,7	534,1	98,23	97,83	0,162	0,165	185	0,2299213
14,658	533,7	534,1	98,57	97,92	0,162	0,165	186	0,2288852
14,686	533,7	534,1	98,82	98,43	0,162	0,165	187	0,2293277
14,385	533,7	534,2	101,57	100,36	0,163	0,166	188	0,2246359
14,579	533,7	534,2	98,67	98,78	0,162	0,165	189	0,2276995
14,585	533,7	534,2	101,27	99,15	0,163	0,166	190	0,2277747
14,586	533,7	534,1	98,85	98,64	0,164	0,165	191	0,2277745
14,511	533,7	534,2	99,81	99,66	0,162	0,165	192	0,2266589
14,629	533,7	534,2	100,67	98,52	0,164	0,166	193	0,2284853
14,722	533,7	534,2	97,69	97,31	0,163	0,165	194	0,2299525
14,582	533,7	534,2	100,37	98,64	0,163	0,165	195	0,2277739
14,680	533,8	534,2	99,20	98,11	0,164	0,165	196	0,2293281
14,721	533,8	534,2	100,23	97,86	0,164	0,165	197	0,2299908
15,086	533,8	534,2	95,42	94,85	0,163	0,165	198	0,2356538
14,720	533,8	534,2	98,95	97,73	0,162	0,165	199	0,2299912
14,718	533,8	534,2	99,45	97,99	0,164	0,165	200	0,2299909
14,450	533,8	534,2	99,50	99,54	0,163	0,165	201	0,2257627
14,377	533,8	534,2	100,57	99,37	0,162	0,165	202	0,2246368
14,376	533,8	534,2	101,94	99,84	0,163	0,164	203	0,224636
14,788	533,8	534,2	97,82	97,53	0,163	0,165	204	0,2310923
14,477	533,8	534,2	101,50	99,68	0,164	0,166	205	0,2262106
14,406	533,8	534,2	102,26	100,34	0,165	0,166	206	0,225086
14,577	533,8	534,3	100,57	99,05	0,165	0,166	207	0,2277748
14,506	533,8	534,3	99,39	99,28	0,163	0,166	208	0,2266592
14,548	533,8	534,3	101,31	99,12	0,164	0,165	209	0,227329
14,716	533,8	534,3	97,87	97,98	0,163	0,166	210	0,2299911

14,444	533,8	534,3	102,03	99,70	0,164	0,166	211	0,2257631
14,500	533,9	534,3	100,56	99,03	0,165	0,165	212	0,226659
14,712	533,9	534,3	99,70	98,16	0,164	0,165	213	0,2299911
14,811	533,9	534,3	97,37	97,08	0,163	0,166	214	0,2315281
14,713	533,9	534,3	99,03	97,24	0,163	0,165	215	0,2299965
14,399	533,8	534,3	102,14	100,21	0,164	0,165	216	0,2250866
14,713	533,9	534,3	99,50	97,84	0,165	0,166	217	0,2299869
14,395	533,9	534,3	101,11	100,31	0,164	0,166	218	0,2250865
14,729	533,9	534,3	98,19	97,99	0,163	0,166	219	0,2302747
14,783	533,9	534,3	98,75	97,59	0,163	0,166	220	0,2310902
14,641	533,9	534,3	100,35	98,60	0,164	0,166	221	0,2288855
14,090	533,9	534,3	101,61	101,86	0,163	0,165	222	0,2202962
14,781	533,8	534,3	99,22	97,48	0,163	0,165	223	0,2310913
14,726	533,9	534,3	97,80	97,64	0,163	0,165	224	0,2302225
14,737	533,9	534,3	98,36	98,06	0,162	0,166	225	0,230431
14,399	533,9	534,3	102,06	99,95	0,164	0,166	226	0,2250868
14,640	533,9	534,3	97,90	98,17	0,163	0,165	227	0,2288853
14,782	533,9	534,3	97,10	97,30	0,161	0,165	228	0,231091
14,782	533,9	534,3	98,98	97,03	0,163	0,165	229	0,2310927
14,742	533,9	534,3	97,67	97,95	0,163	0,165	230	0,2304313
14,783	533,9	534,3	97,02	97,14	0,161	0,165	231	0,2310909
14,323	533,9	534,3	100,37	100,26	0,161	0,165	232	0,2239588
14,567	533,9	534,4	99,44	98,16	0,162	0,165	233	0,2277746
14,709	533,9	534,3	100,19	97,58	0,164	0,165	234	0,2299913
14,709	533,9	534,4	98,54	98,21	0,164	0,166	235	0,2299914
14,877	533,9	534,3	96,16	96,66	0,162	0,166	236	0,2326221
14,713	533,9	534,4	97,25	97,91	0,161	0,165	237	0,2299919
14,298	534,0	534,4	102,38	100,47	0,162	0,165	238	0,2235051
14,644	533,9	534,4	98,28	98,70	0,163	0,166	239	0,2288856
14,533	534,0	534,4	98,35	98,64	0,161	0,165	240	0,2271427
14,643	534,0	534,4	99,80	98,28	0,162	0,165	241	0,2288853
14,672	534,0	534,4	100,29	97,87	0,165	0,165	242	0,2293286
14,672	534,1	534,5	97,88	97,96	0,163	0,165	243	0,2293283
14,785	534,1	534,5	97,31	97,34	0,161	0,165	244	0,2310913
14,332	534,1	534,5	101,99	99,96	0,163	0,165	245	0,2239588
14,573	534,1	534,5	100,56	98,69	0,164	0,165	246	0,2277749
14,673	534,1	534,5	97,83	97,92	0,163	0,165	247	0,2293282
14,844	534,1	534,5	96,27	96,94	0,161	0,165	248	0,2319672
14,671	534,1	534,5	99,96	97,81	0,162	0,165	249	0,2293289
14,471	534,1	534,5	99,19	99,41	0,163	0,165	250	0,2262123
14,841	534,1	534,5	98,65	97,09	0,163	0,165	251	0,231968
14,716	534,1	534,5	99,67	97,56	0,164	0,165	252	0,2299915
14,714	534,1	534,5	100,22	97,34	0,165	0,165	253	0,2299916
14,714	534,1	534,5	97,67	97,71	0,163	0,165	254	0,2299916
14,573	534,1	534,5	101,18	98,29	0,163	0,165	255	0,2277773
14,741	534,1	534,5	99,23	96,98	0,165	0,164	256	0,2304313
14,543	534,1	534,6	101,14	98,63	0,165	0,165	257	0,2273308
14,743	534,1	534,6	97,87	97,89	0,164	0,165	258	0,2304318
14,671	534,1	534,6	98,06	98,05	0,162	0,166	259	0,2293284
14,712	534,1	534,6	99,86	97,24	0,163	0,165	260	0,2299912
14,840	534,1	534,6	96,42	97,13	0,163	0,165	261	0,2319681
14,479	534,1	534,6	99,22	99,00	0,161	0,165	262	0,2263383
14,840	534,2	534,6	98,97	96,06	0,163	0,164	263	0,2319678
14,499	534,2	534,6	100,31	98,95	0,164	0,164	264	0,2266596
14,641	534,2	534,6	99,70	97,99	0,164	0,165	265	0,2288867
14,783	534,2	534,6	97,14	97,12	0,163	0,165	266	0,2310911
14,784	534,2	534,6	96,79	97,76	0,161	0,166	267	0,2310919
14,542	534,2	534,7	101,12	98,44	0,163	0,165	268	0,2273272
14,782	534,2	534,7	96,83	97,31	0,163	0,165	269	0,2310913
14,671	534,2	534,7	100,31	97,55	0,163	0,165	270	0,2293286
14,717	534,2	534,7	98,17	97,67	0,164	0,165	271	0,2299913
14,503	534,2	534,7	100,12	99,09	0,163	0,165	272	0,2266593
14,330	534,3	534,7	102,61	100,12	0,164	0,165	273	0,2239606
14,673	534,3	534,7	99,98	97,91	0,165	0,165	274	0,2293288
14,504	534,3	534,7	100,83	98,61	0,164	0,165	275	0,226695
14,886	534,3	534,7	98,22	96,98	0,164	0,165	276	0,2326231
14,678	534,3	534,8	97,99	98,63	0,163	0,166	277	0,2293288
14,720	534,3	534,8	99,84	97,44	0,163	0,165	278	0,2299919
14,355	534,4	534,8	99,53	100,77	0,163	0,165	279	0,2242884
14,647	534,4	534,8	99,50	98,25	0,162	0,166	280	0,2288842
14,505	534,4	534,8	100,79	99,27	0,164	0,165	281	0,2266598
14,713	534,4	534,8	98,44	97,92	0,163	0,165	282	0,2299916

14,551	534,4	534,8	100,91	98,44	0,164	0,165	283	0,2273301
14,782	534,4	534,8	97,39	97,44	0,163	0,165	284	0,2310919
14,783	534,3	534,8	99,02	97,05	0,163	0,165	285	0,2310915
14,835	534,3	534,8	99,00	96,50	0,165	0,165	286	0,231968
14,494	534,3	534,8	101,47	98,49	0,165	0,164	287	0,2266601
14,835	534,3	534,8	96,54	97,32	0,163	0,165	288	0,2319672
14,779	534,3	534,8	96,96	97,43	0,161	0,166	289	0,2310915
14,780	534,3	534,8	98,65	96,99	0,162	0,165	290	0,2310922
14,780	534,3	534,8	99,39	96,63	0,164	0,164	291	0,2310914
14,708	534,3	534,8	97,60	97,63	0,163	0,165	292	0,2299923
14,736	534,3	534,8	97,40	97,49	0,161	0,165	293	0,2304315
14,395	534,3	534,8	99,81	99,89	0,161	0,165	294	0,225087
14,481	534,3	534,8	98,57	99,70	0,161	0,166	295	0,2264198
14,643	534,4	534,8	97,72	98,05	0,161	0,165	296	0,2289202
14,571	534,4	534,8	98,70	98,79	0,161	0,165	297	0,227775
14,642	534,4	534,8	98,09	98,11	0,161	0,165	298	0,2288859
14,642	534,4	534,8	98,09	98,36	0,161	0,165	299	0,2288853
14,399	534,4	534,8	99,69	99,94	0,161	0,165	300	0,2250883
14,710	534,4	534,8	97,52	97,87	0,161	0,165	301	0,2299916
14,366	534,4	534,8	101,68	100,10	0,163	0,165	302	0,2246367
14,541	534,4	534,8	98,34	99,36	0,162	0,166	303	0,2273294
14,637	534,4	534,9	99,11	97,90	0,162	0,165	304	0,2288859
14,496	534,4	534,9	101,25	98,63	0,164	0,165	305	0,2266591
14,567	534,4	534,9	100,30	98,50	0,165	0,165	306	0,227775
14,719	534,4	534,9	99,74	97,24	0,165	0,165	307	0,2301379
14,636	534,5	534,9	99,28	97,76	0,164	0,165	308	0,228886
14,708	534,5	534,9	97,79	98,04	0,162	0,165	309	0,2299921
14,706	534,5	534,9	99,58	97,58	0,163	0,165	310	0,2299784
14,438	534,5	534,9	99,47	99,79	0,163	0,165	311	0,2257629
14,393	534,5	534,9	100,00	99,83	0,162	0,165	312	0,2250882
14,567	534,5	534,9	98,37	98,81	0,161	0,165	313	0,2277752
14,539	534,5	534,9	98,90	98,83	0,161	0,165	314	0,2273313
14,711	534,5	534,9	99,87	97,05	0,163	0,165	315	0,2299913
14,542	534,5	534,9	101,30	98,06	0,165	0,164	316	0,2273299
14,383	534,5	534,9	101,10	99,91	0,164	0,164	317	0,2248218
14,322	534,5	534,9	99,91	100,81	0,162	0,166	318	0,2239595
14,811	534,5	535,0	96,92	97,42	0,161	0,166	319	0,2315295
14,837	534,5	535,0	96,63	96,84	0,161	0,165	320	0,2319676
14,669	534,6	535,0	97,56	98,08	0,161	0,165	321	0,2293299
14,669	534,6	535,0	100,39	97,88	0,163	0,165	322	0,2293282
14,366	534,6	535,0	99,72	100,08	0,163	0,165	323	0,224637
14,806	534,6	535,0	99,19	96,62	0,163	0,165	324	0,2315296
14,563	534,6	535,0	98,64	98,66	0,163	0,165	325	0,227775
14,709	534,6	535,0	97,09	98,00	0,161	0,166	326	0,2299919
14,536	534,6	535,0	98,71	98,68	0,161	0,165	327	0,2273298
14,637	534,6	535,0	99,72	97,89	0,163	0,165	328	0,2288859
14,566	534,6	535,0	98,35	98,93	0,162	0,165	329	0,2277757
14,437	534,6	535,0	100,95	99,42	0,162	0,165	330	0,2257635
14,778	534,6	535,0	97,05	97,50	0,162	0,165	331	0,2310905
14,767	534,6	535,0	97,42	97,22	0,161	0,165	332	0,2309324
14,568	534,6	535,0	98,00	98,83	0,161	0,165	333	0,2278217
14,710	534,6	535,0	99,36	97,48	0,162	0,165	334	0,2299919
14,540	534,6	535,0	100,66	98,62	0,164	0,165	335	0,2273297
14,566	534,6	535,0	98,13	98,71	0,162	0,165	336	0,2277754
14,568	534,6	535,0	98,28	98,71	0,161	0,165	337	0,2277754
14,496	534,6	535,1	100,82	99,24	0,162	0,165	338	0,2266603
14,643	534,6	535,1	100,41	97,84	0,165	0,165	339	0,2289771
14,636	534,6	535,1	98,11	97,96	0,163	0,165	340	0,2288862
14,666	534,6	535,1	98,60	97,61	0,162	0,165	341	0,2293299
14,634	534,7	535,1	98,03	98,03	0,162	0,165	342	0,2288489
14,494	534,7	535,1	99,39	99,09	0,162	0,165	343	0,2266607
14,664	534,7	535,1	97,90	97,73	0,162	0,165	344	0,2293293
14,707	534,7	535,1	97,59	97,58	0,161	0,165	345	0,2299914
14,262	534,7	535,1	102,34	100,15	0,163	0,165	346	0,2230515
14,734	534,7	535,1	97,60	97,23	0,163	0,165	347	0,2304325
14,733	534,7	535,1	99,38	97,13	0,163	0,165	348	0,2304321
14,873	534,7	535,1	96,43	96,34	0,163	0,165	349	0,2326231
14,705	534,7	535,1	97,32	97,84	0,161	0,165	350	0,2299923
14,630	534,7	535,1	99,53	98,34	0,162	0,166	351	0,2288863
14,731	534,6	535,1	98,50	97,11	0,163	0,165	352	0,2304321
14,801	534,6	535,1	99,07	96,46	0,164	0,164	353	0,2315301
14,660	534,6	535,1	97,84	97,78	0,163	0,165	354	0,2293298

14,634	534,6	535,1	100,24	97,67	0,163	0,165	355	0,2288855
14,774	534,6	535,1	98,81	97,05	0,164	0,165	356	0,2310919
14,729	534,6	535,1	99,30	97,42	0,164	0,165	357	0,2304321
14,462	534,7	535,1	99,03	99,60	0,163	0,165	358	0,2262119
14,706	534,7	535,1	98,25	97,44	0,162	0,165	359	0,2299922
14,658	534,7	535,1	99,10	97,85	0,163	0,165	360	0,22927

APPENDIX 3: Calibration data

TEST DATA PACKAGE

CLIENT	Laminox	PROJECT NUMBER	PI-20163
PRODUCT	Pellet Stove	SAMPLE ID#	QI_20236
MODEL	Jessika		
STANDARDS	EPA method 28R; ASTME2779-10		

TEST EQUIPMENT

ITEM	EQUIPMENT TYPE	MANUFACTURER	EQUIPMENT #	CALIBRATION DUE DATE	COMPLIES WITH STANDARD REQUIREMENTS
1	Dessicator cabinet	Shop built	EG-014	Na	Y
2	Wood humidity chamber	Shop built	EG-034	Na	Y
3	Filter holder 47 mm in line(4)	Pall	EG-052	Na	Y
4	Filter holder 47 mm in line(4)	Pall	EG-053	Na	Y
5	Impiger train	Shop built	EG-054	Na	Y
6	Diaphragm Vacuum pump avec gauge	GAST	EG-055 / EG-056	Na	Y
7	Laboratory gas drying unit	Drierite	EG-061/ EG-062	Na	Y
8	Moisture meter	Delmhosrt	EM-003/	Verification before use	Y
9	Moisture meter Hammer	Delmhorst	EM-112	Verification before use	Y
10	Calibration block	Delmhorst	EM-191	2018 december	Y
11	Digital Manometer	Dwyer	EM-006	2019 March	Y
12	Digital Manometer	Dwyer	EM-007	2019 March	Y
13	Data aquisition System	Keithley	EM-012	2018 September	Y
14	analytical scale 200gr.	Ohaus	EM-232	2018-may	Y
15	Weight 2kg	na	EM-090	2018 nov.	Y
16	Pitot tube	Dwyer	EM-111	Verification before use	Y
17	Scale 0-1000lbs Rough Deck	Rice lake	EM-114	Sept 2018	Y
18	Gas analyzer	Siemen's	EM-118	Verification before use	Y
19	Vacuum gauge	Dwyer	EM-126	2019 March	Y
20	Vacuum gauge	Dwyer	EM-127	2019 March	Y
21	Calibration weight 100mg	Troemer	EM-128	2018 nov	y

TEST DATA PACKAGE

CLIENT	Laminox	PROJECT NUMBER	PI-20163
PRODUCT	Pellet Stove	SAMPLE ID#	QI_20236
MODEL	Jessika		
STANDARDS	EPA method 28R; ASTME2779-10		

22	Calibration weight 200g	Troemer	EM-129	November 2018	Y
23	Reference Dry gas meter	American meter	EM-130	Oct. 2018	Y
24	Temperature humidity meter	Fluke	EM-136	March 2019	Y
25	Digital weight indicator	Rice lake	EM-020	Sept 2018	Y
26	Vane anemometer	Omega	EM-153	August 2019	Y
27	Measuring tape	Stanley	EM-224	Dec. 2018	Y
28	Chronometer	Extech	EM-175	December 2018	Y
29	Dry gas meter	Shinagwa corporation	EM-178	Oct. 2018	Y
30	Dry gas meter	Shinagwa corporation	EM-179	Oct. 2018	Y
31	Calibrabration gas	Praxair	EM-183	2021 oct	Y
32	Calibrabration gas	Praxair	EM-201	2021 oct	Y
33	Thermometer	Fluke	EM-001	March 2019-03-06	Y
34	20 channel card	Keithley	EM-015	September 2018	Y
35	20 channel card	Keithley	EM-154	September 2018	Y
36	Filter holder	Pall	EG-086	na	Y
37	Barometer	Control Company	EM-266	Sept 2018	y

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

Analytical Test Report

Report No: USR:W218-0099-01
Issue No: 1

Client: POLYTESTS
695-B Gaudette
St-jean-sur-richelieu, QB
Attention: Danick Power

PO No: 100450

Signed: Katy Mickelson
Katy Mickelson
Senior Chemist
Date of Issue: 2/12/2018

Sample Details

Sample Log No:	W218-0099-01	**Sample Date:**	
Sample Designation:	Pellet Sample	**Sample Time:**	
Sample Recognized As:	Wood Pellets	**Arrival Date:**	2/1/2018

Test Results

	METHOD	UNITS	MOISTURE FREE	AS RECEIVED
Moisture Total	ASTM E871	wt. %		4.44
Ash	ASTM D1102	wt. %	0.81	0.77
Volatile Matter	ASTM D3175	wt. %		
Fixed Carbon by Difference	ASTM D3172	wt. %		
Sulfur	ASTM D4239	wt. %	0.009	0.008
SO_2	Calculated	lb/mmbtu		0.019
Net Cal. Value at Const. Pressure	ISO 1928	GJ/tonne	18.31	17.39
Net Cal. Value at Const. Pressure	ISO 1928	J/g	18311	17389
Gross Cal. Value at Const. Vol.	ASTM E711	J/g	19628	18756
Gross Cal. Value at Const. Vol.	ASTM E711	Btu/lb	8439	8064
Carbon	ASTM D5373	wt. %	49.12	46.94
Hydrogen*	ASTM D5373	wt. %	6.05	5.78
Nitrogen	ASTM D5373	wt. %	< 0.20	< 0.19
Oxygen*	ASTM D3176	wt. %	> 43.81	> 41.87
Chlorine	ASTM D6721	mg/kg		
Fluorine	ASTM D3761	mg/kg		
Mercury	ASTM D6722	mg/kg		
Bulk Density	ASTM E873	lbs/ft^3		
Fines (Less than 1/8")	TPT CH-P-06	wt.%		
Durability Index	Kansas State	PDI		
Sample Above 1.50"	TPT CH-P-06	wt.%		
Maximum Length (Single Pellet)	TPT CH-P-06	inch		
Diameter, Range	TPT CH-P-05	inch		to
Diameter, Average	TPT CH-P-05	inch		
Stated Bag Weight	TPT CH-P-01	lbs		
Actual Bag Weight	TPT CH-P-01	lbs		

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

Comments

Instrumentation Saint•Laurent inc.
Accrédité ISO 17025

CLAS NRC-CNRC CLAS 2010-02

SCC Accredited LAB
LAB Accrédité CCN N°669

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-015 05/03/18

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:	N/A	**No. Machine:**	N.A.

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Fluke 744	**No. du certificat d'étalonnage:**	2017004079
No. Série:	7798010	**Dernière date d'étalonnage:**	5-Jul-17
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	5-Jul-18
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	-190.7 °C	-0.7 °C	-190.7 °C	1.0 °C	Input#1TypeK
0.0 °C	0.0 °C	-0.3 °C	-0.3 °C	-0.3 °C	1.0 °C	Input#1TypeK
750.0 °C	750.0 °C	749.7 °C	-0.3 °C	749.7 °C	1.0 °C	Input#1TypeK
100.0 °C	100.0 °C	99.7 °C	-0.3 °C	99.7 °C	1.0 °C	Input#2 TypeK
100.0 °C	100.0 °C	99.7 °C	-0.3 °C	99.7 °C	1.0 °C	Input#3 TypeK
100.0 °C	100.0 °C	99.6 °C	-0.4 °C	99.6 °C	1.0 °C	Input#4 TypeK
100.0 °C	100.0 °C	99.6 °C	-0.4 °C	99.6 °C	1.0 °C	Input#5TypeK
100.0 °C	100.0 °C	99.7 °C	-0.3 °C	99.7 °C	1.0 °C	Input#6TypeK
100.0 °C	100.0 °C	99.7 °C	-0.3 °C	99.7 °C	1.0 °C	Input#7TypeK
100.0 °C	100.0 °C	99.7 °C	-0.3 °C	99.7 °C	1.0 °C	Input#8TypeK
100.0 °C	100.0 °C	99.8 °C	-0.2 °C	99.8 °C	1.0 °C	Input#9TypeK
100.0 °C	100.0 °C	99.7 °C	-0.3 °C	99.7 °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	99.7 °C	-0.3 °C	99.7 °C	1.0 °C	Input#12TypeJ
100.0 °C	100.0 °C	99.7 °C	-0.3 °C	99.7 °C	1.0 °C	Input#13 TypeJ
100.0 °C	100.0 °C	99.7 °C	-0.3 °C	99.7 °C	1.0 °C	Input#14TypeJ
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	99.7 °C	-0.3 °C	99.7 °C	1.0 °C	Input#16TypeJ
100.0 °C	100.0 °C	99.7 °C	-0.3 °C	99.7 °C	1.0 °C	Input#17TypeJ
100.0 °C	100.0 °C	99.8 °C	-0.2 °C	99.8 °C	1.0 °C	Input#18TypeJ
100.0 °C	100.0 °C	99.8 °C	-0.2 °C	99.8 °C	1.0 °C	Input#19TypeJ
100.0 °C	100.0 °C	99.9 °C	-0.1 °C	99.9 °C	1.0 °C	Input#20TypeJ
12.000 mA	12.000 mA	12.005 mA	+0.005 mA	12.005 mA	1.00 mA	Input#21
12.000 mA	12.000 mA	12.005 mA	+0.005 mA	12.005 mA	1.00 mA	Input#22

Conditions Environnementales: Température: 21 °C Humidité: 31 %RH

5F09101

Instrumentation Saint•Laurent inc.
Accrédité ISO 17025

CLAS NRC-CNRC CLAS 2010-02

SCC Accredited LAB
LAB Accrédité CCN N°669

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-015 05/03/18

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:	N/A	**No. Machine:**	N.A.

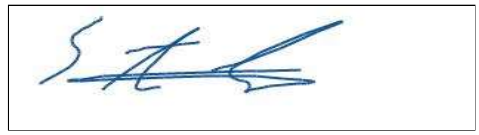
Type d'Étalonnage: Test avec EM-012

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 retraçâble 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 Mars 2018
Date du prochain Étalonnage:	5 Mars 2019
Date d'émission du certificat:	5 Mars 2018

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.



Stéphane - Technicien

5F09101

Instrumentation Saint•Laurent inc.
Accrédité ISO 17025

CLAS NRC-CNRC CLAS 2010-02

SCC Accredited LAB
LAB Accrédité CCN N°669

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-154 05/03/18

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:	N/A	**No. Machine:**	N.A.

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Fluke 744	**No. du certificat d'étalonnage:**	2017004079
No. Série:	7798010	**Dernière date d'étalonnage:**	5-Jul-17
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	5-Jul-18
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	-16.985 mV	+0.015 mV	-16.985 mV	0.1 mV	Input#1
0.000 mV	0.000 mV	0.081 mV	+0.081 mV	0.081 mV	0.1 mV	Input#1
20.000 mV	20.000 mV	20.058 mV	+0.058 mV	20.058 mV	0.1 mV	Input#1
30.000 mV	30.000 mV	30.048 mV	+0.048 mV	30.048 mV	0.1 mV	Input#2
Input#3 Non-Conforme						
5.000 V.DC.	5.000 V.DC.	4.999 V.DC.	-0.001 V.DC.	4.999 V.DC.	0.1 V.DC.	Input#4
30.000 mV	30.000 mV	30.026 mV	+0.026 mV	30.026 mV	0.1 mV	Input#5
30.000 mV	30.000 mV	29.992 mV	-0.008 mV	29.992 mV	0.1 mV	Input#6
100.00 Ohms	100.00 Ohms	99.99 Ohms	-0.01 Ohms	99.99 Ohms	1.0 Ohms	Input#7
100.00 Ohms	100.00 Ohms	99.99 Ohms	-0.01 Ohms	99.99 Ohms	1.0 Ohms	Input#8
100.00 Ohms	100.00 Ohms	100.01 Ohms	+0.01 Ohms	100.01 Ohms	1.0 Ohms	Input#9
100.00 Ohms	100.00 Ohms	99.92 Ohms	-0.08 Ohms	99.92 Ohms	1.0 Ohms	Input#10
100.0 °C	100.0 °C	99.6 °C	-0.4 °C	99.6 °C	1.0 °C	Input#11TypeT
100.0 °C	100.0 °C	99.6 °C	-0.4 °C	99.6 °C	1.0 °C	Input#12TypeT
100.0 °C	100.0 °C	99.7 °C	-0.3 °C	99.7 °C	1.0 °C	Input#13 TypeJ
100.0 °C	100.0 °C	99.7 °C	-0.3 °C	99.7 °C	1.0 °C	Input#14TypeJ
100.0 °C	100.0 °C	99.6 °C	-0.4 °C	99.6 °C	1.0 °C	Input#15 TypeJ
100.0 °C	100.0 °C	99.6 °C	-0.4 °C	99.6 °C	1.0 °C	Input#16TypeJ
100.00 Ohms	100.00 Ohms	99.98 Ohms	-0.02 Ohms	99.98 Ohms	1.0 Ohms	Input#17
100.00 Ohms	100.00 Ohms	99.89 Ohms	-0.11 Ohms	99.89 Ohms	1.0 Ohms	Input#18
100.00 Ohms	100.00 Ohms	99.90 Ohms	-0.10 Ohms	99.90 Ohms	1.0 Ohms	Input#19
100.00 Ohms	100.00 Ohms	99.86 Ohms	-0.14 Ohms	99.86 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	12.005 mA	+0.005 mA	12.005 mA	1.00 mA	Input#22

Conditions Environnementales: Température: 21 °C Humidité: 31 %RH

5F09101

Instrumentation Saint•Laurent inc.
Accrédité ISO 17025

CLAS NRC-CNRC CLAS 2010-02

SCC Accredited LAB
LAB Accrédité CCN N°669

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-154 05/03/18

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:	N/A	**No. Machine:**	N.A.

Type d'Étalonnage: Test avec EM-012

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 retraçâble 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 Mars 2018
Date du prochain Étalonnage:	5 Mars 2019
Date d'émission du certificat:	5 Mars 2018

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.

Stéphane - Technicien

5F09101

DISPERSION
Laboratoire • Laboratory DIVISION • TRANSCOT CANADA

CLAS
NRC·CNRC
CLAS 2010-01

CERTIFICAT D'ÉTALONNAGE

9900 Chemin de la Côte-de-Liesse, Lachine, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

Client :	Polytests	**No. du Certificat :**	**142-492011-171-1649**
Adresse :	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	**Date d'étalonnage :**	13-11-2017

Technicien:
Gatto, Angelo

David Llorens, Responsable Qualité

DESCRIPTION DU SERVICE:

Modèle de Balance :	AR2140	**Méthode :**	ISO 17025
Manufacturier :	Ohaus	**Date d'approbation :**	13-11-2017
Numéro de Série :	M3658329010091	**Date prochain étalonnage :**	13-11-2018
Numéro d'identification :	EM-051	**accréditation CCN n. :**	668
Capacité :	210g	**Certification CLAS n. :**	2010-01
Résolution:	0.0001g		

Condition d'essai :	Temp °C:	77	Pression kPa:	102.6	Humidité %:	91.7

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:	☑ Oui ☐ Non
Linéarité:	☑ Oui ☐ Non
Sensibilité:	☑ Oui ☐ Non
Répétabilité:	☑ Oui ☐ 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.

DISPERSION
Laboratoire • Laboratory DIVISION • TRANSCAT CANADA

CLAS
CLAS 2010-01

CERTIFICAT D'ÉTALONNAGE

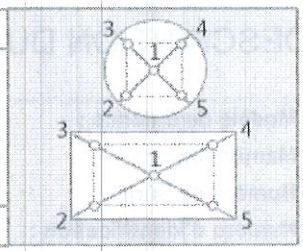
9900 Chemin de la Côte-de-Liesse, Lachine, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

Client :	Polytests	**No. du Certificat :**	**142-492011-171-1649**
Adresse :	695 B rue Gaudette	**Accrédtation CCN n. :**	668
	St-Jean-sur-Richelieu, QC	**Certification CLAS n. :**	2010-01
	J3B7S7	**Modèle de Balance :**	AR2140
		Date d'étalonnage :	13-11-2017
Méthode :	ISO 17025	**Date du prochain étalonnage :**	13-11-2018

TEST D'EXCENTRICITÉ:

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

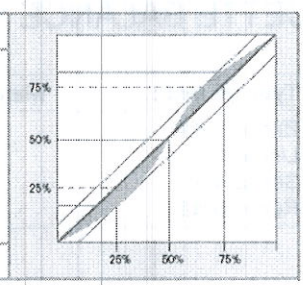
Position	Avant Ajustement	Après Ajustement
1: Centre:	0.0000 g	---
2: Avant Gauche:	0.0000 g	---
3: Arrière Gauche:	0.0000 g	---
4: Arrière Droit:	0.0000 g	---
5: Avant Droit:	0.0000 g	---
Résultats	0.0000 g	---
STATUT	**CONFORME**	**N/A**



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	49.9997 g	---
50.0000 g	49.9997 g	---
100.0000 g	49.9998 g	---
150.0000 g	49.9997 g	---
---	---	---
---	---	---
---	---	---
Résultats	**0.00005 g**	---
STATUT	**CONFORME**	**N/A**



TEST DE SENSIBILITÉ:

Valeur de masse conventionnelle: 200.0003 g Tolérance: 0.0004 g Résultats: 0.00% ≤ 0.10%

	Avant Ajustement	**Après Ajustement**
Lecture:	200.0000 g	---
Résultats:	**0.0003 g**	---
STATUT	**CONFORME**	**N/A**

$$S = \frac{\Delta W}{\Delta m}$$

DISPERSION
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CERTIFICAT D'ÉTALONNAGE

9900 Chemin de la Côte-de-Liesse, Lachine, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

Client :	Polytests	**No. du Certificat :**	**142-492011-171-1649**
Adresse :	695 B rue Gaudette	**Accrédtation CCN n. :**	668
	St-Jean-sur-Richelieu, QC	**Certification CLAS n. :**	2010-01
	J3B7S7	**Modèle de Balance :**	AR2140
		Date d'étalonnage :	13-11-2017
Méthode :	ISO 17025	**Date du prochain étalonnage :**	13-11-2018

TEST DE RÉPÉTABILITÉ:

AVANT AJUSTEMENT:

Charge Utilisée:
100.0000 g

Tolérance:
0.00010 g

Résolution d'affichage:
0.0001 g

Moyenne:
99.99979 g

Écart-type:
0.00003 g

#	Vide	Chargé	Différence
1	0.0000 g	99.9998 g	99.9998 g
2	0.0000 g	99.9998 g	99.9998 g
3	0.0000 g	99.9998 g	99.9998 g
4	0.0000 g	99.9997 g	99.9997 g
5	0.0000 g	99.9998 g	99.9998 g
6	0.0000 g	99.9998 g	99.9998 g
7	0.0000 g	99.9998 g	99.9998 g
8	0.0000 g	99.9998 g	99.9998 g
9	0.0000 g	99.9998 g	99.9998 g
10	0.0000 g	99.9998 g	99.9998 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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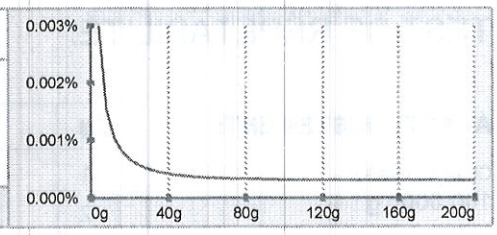
www.dispersion.ca 1.866.390.5066

INCERTITUDE AVANT AJUSTEMENT :

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

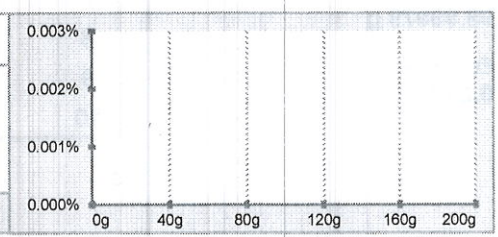
u(cr) = Incertitude reliée à l'étalon utilisé
Sp = Incertitude de l'écart-type
u(l) = Incertitude associée à la linéarité
u(dr) = Incertitude associée à résolution si Sp = 0
u(s) = Incertitude liée à la sensibilité (span)

Valeur	Incertitude	Incertitude (%)
12.5000 g	0.00017 g	0.001321 %
25.0000 g	0.00018 g	0.000713 %
50.0000 g	0.00022 g	0.000446 %
100.0000 g	0.00035 g	0.000349 %
200.0000 g	0.00065 g	0.000324 %



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

9900 Chemin de la Côte-de-Liesse, Lachine, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

RÉFÉRENCE

ENSEMBLE DE RÉFÉRENCE:

Référence	No de série	Fabricant	Date d'étalonnage
1mg-5kg	DK000A175	Dispersion	29-09-2017

INCERTITUDES:

Les incertitudes que nous retrouvons comprennent :

1. *L'incertitude associée à l'opération de pesage.*
2. *L'incertitude associée à l'écart-type.*
3. *L'incertitude associée à l'étalon utilisé.*
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:

POLYCONTROLS

CLAS 2009-02

Conseil canadien des normes
Laboratoire accrédité
Portée d'accréditation 655

ISO/IEC 17025-2005

CERTIFICAT D'ÉTALONNAGE # 7274

Date d'étalonnage : 2017-09-29
Date d'émission du certificat : 2017-09-29

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 ±0.2% de la lecture pour les mesures entre 5 SCCM à 10 SLPM, ±0.3% de la lecture pour les mesures entre 10 SLPM à 30 SLPM, ±0.2% de la lecture pour les mesures entre 30 SLPM à 3000 SLPM, ±0.3% de la lecture pour les mesures supérieures à 3000 SLPM jusqu'à 6000 SLPM et ±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 incluant la résolution de l'instrument. 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
	Lectures Initiales = Lectures finales, aucun ajustement
Résultats	Lectures finales dans les tolérances
Remarques	Fréquence d'étalonnage aux 12 mois

Métrologiste

Responsable du laboratoire

POLYCONTROLS

CLAS 2009-02 | Conseil canadien des normes Laboratoire accrédité Portée d'accréditation 655 | ISO/IEC 17025-2005 CERTIFICATION

Certificat d'étalonnage # 7274

Numero de série:	99A274209	Station de mesure:	3
Date d'étalonnage:	2017-09-29	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 (120 slpm)	2E2-S	237	1500210395	2017-12-28
DHI molbloc (30 slpm)	3E4-VCR-V-Q	3444	1500218603	2018-06-05
DHI molbox1	Molbox1	755	1500215634	2018-04-18
RTD Mist	M22	1871501	2017002165	2018-04-20
Module 44.5 PSI avec Baro 163671	Module 30	160659	2017002162	2018-04-26

Spécifications finales de l'appareil

Gaz	Air
Température d'opération	
Pression à l'entrée	
Pression à la sortie	
Température de référence	
Pression de référence	
Étendue d'échelle	0-200 ACFH
Signaux Entrée/Sortie	-
Alimentation	
Tolérance ±1 %O.R.	

Condition d'étalonnage

Gaz	Air
Température ambiante	24 °C
Pression ambiante	1010.52 mbar
Orientation	Verticale
Élastomère	Viton
Valve	Viton

Lectures finales

Débit du test ACFH	Instrument en test ft³	Valeurs mesurées Pression PSIA	Température °C	Référence ft³	Référence calculée ft³	Erreur calculée ft³	Tolérance acceptable ft³	TUR
41.7507	6.920	14.671	23.16	6.879	6.939	-0.019	0.069	2.92
70.7794	11.810	14.765	22.18	11.805	11.793	0.017	0.118	3.99
160.2473	26.690	14.870	22.27	26.906	26.697	-0.007	0.267	>4

Fact. corr : 1,002745 66

3 oct 2017

Bernard Poirier
Métrologiste

B Poirier
Signature

POLYCONTROLS

CLAS IRC·CNRC
CLAS 2009-02

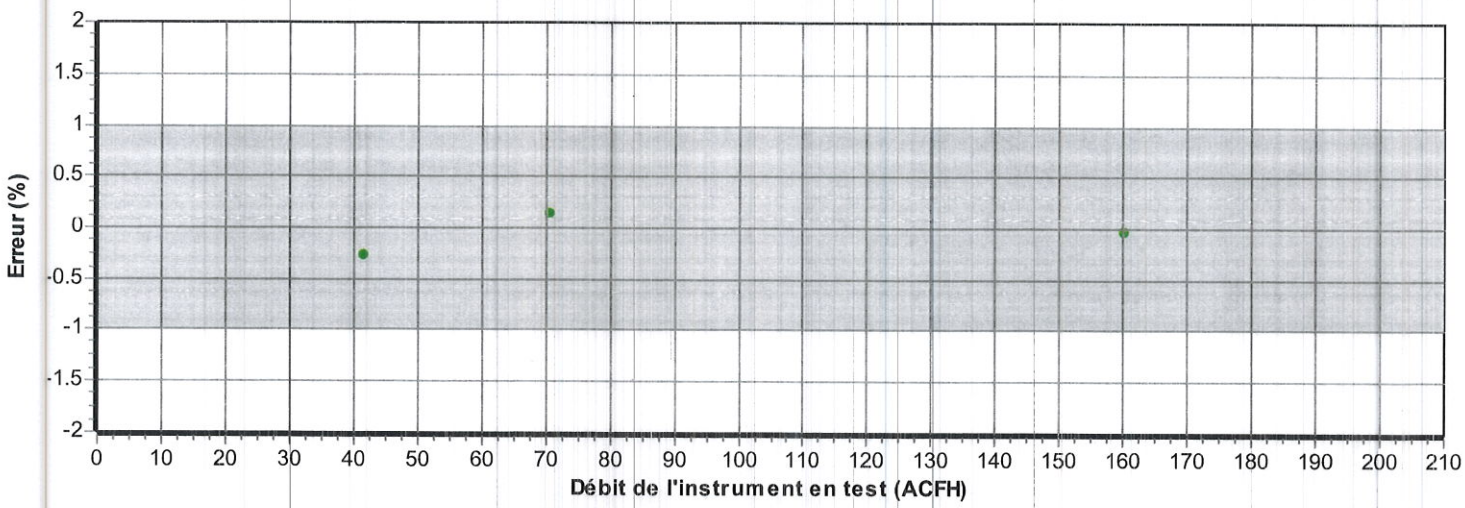
Conseil canadien des normes
Laboratoire accrédité
Portée d'accréditation 655

ISO/IEC 17025-2005 CERTIFICATION

Certificat d'étalonnage # 7274

Numero de série:	99A274209	Station de mesure:	3
Date d'étalonnage:	2017-09-29	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

3 oct 2017

Bernard Poirier
Métrologiste

Signature

POLYCONTROLS

CLAS 2009-02

Conseil canadien des normes
Laboratoire accrédité
Portée d'accréditation 655

ISO/IEC 17025:2005

CERTIFICAT D'ÉTALONNAGE # 8084

Date d'étalonnage : 2018-04-18
Date d'émission du certificat : 2018-04-18

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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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 ±0.2% de la lecture pour les mesures entre 5 SCCM à 10 SLPM, ±0.3% de la lecture pour les mesures entre 10 SLPM à 30 SLPM, ±0.2% de la lecture pour les mesures entre 30 SLPM à 3000 SLPM, ±0.3% de la lecture pour les mesures supérieures à 3000 SLPM jusqu'à 6000 SLPM et ±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 incluant la résolution de l'instrument. 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
	Lectures Initiales = Lectures finales, aucun ajustement
Résultats	Lectures finales dans les tolérances
Remarques	Fréquence d'étalonnage aux 12 mois

Métrologiste

Responsable du laboratoire

POLYCONTROLS

CLAS 2009-02

Conseil canadien des normes
Laboratoire accrédité
Portée d'accréditation 655

ISO/IEC 17025:2005

Certificat d'étalonnage # 8084

Numéro de série:	23544	Station de mesure:	3
Date d'étalonnage:	2018-04-18	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	1500231794	2019-01-19
DHI molbox1	Molbox1	881	1500218459	2018-06-01
RTD Mist	M22	2208102	2018002234	2019-04-11
Module 44.5 PSI avec Baro 163671	Module 30	160659	2018002180	2019-04-12

Spécifications finales de l'appareil

Gaz	Air
Température d'opération	
Pression à l'entrée	
Pression à la sortie	
Température de référence	
Pression de référence	
Étendue d'échelle	10-2000 ALH
Signaux Entrée/Sortie	-
Alimentation	
Tolérance	±2 %O.R.

Condition d'étalonnage

Gaz	Air
Température ambiante	21 °C
Pression ambiante	999.612 mbar
Orientation	Horizontale
Élastomère	Viton
Valve	

Lectures finales

Débit du test ALH	Instrument en test L	Valeurs mesurées Pression PSIA	Température °C	Référence L	Référence calculée L	Erreur calculée L	Tolérance acceptable L	TUR
363.7092	61.1300	14.5138	21.77	59.5417	60.4252	0.7048	1.2085	>4
609.9954	103.0400	14.5168	21.72	100.0904	101.5371	1.5029	2.0307	>4
1667.4809	282.0500	14.5361	21.62	274.0687	277.5684	4.4816	5.5514	>4

Fc. : 0,988470473

3 MAI 2018

Bernard Poirier
Métrologiste

Signature

POLYCONTROLS

CLAS 2009-02

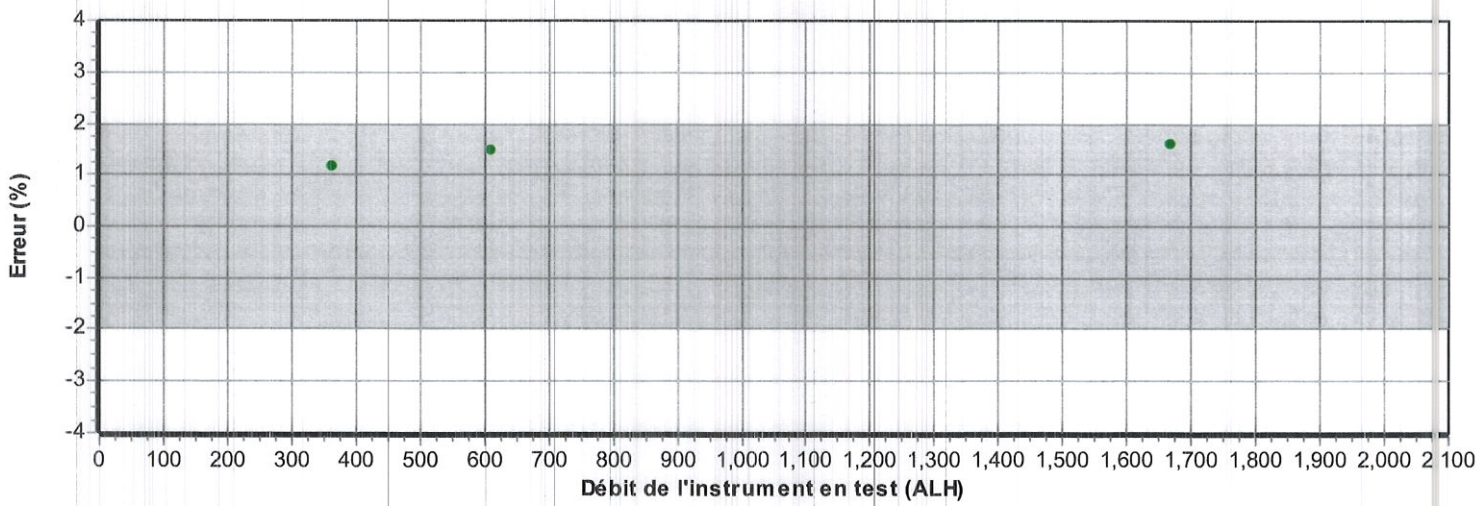
Conseil canadien des normes
Laboratoire accrédité
Portée d'accréditation 655

ISO/IEC 17025:2005

Certificat d'étalonnage # 8084

Numéro de série:	23544	Station de mesure:	3
Date d'étalonnage:	2018-04-18	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

Bernard Poirier
Métrologiste

Signature

POLYCONTROLS

CLAS 2009-02

Conseil canadien des normes
Laboratoire accrédité
Portée d'accréditation 655

ISO/IEC 17025-2005

CERTIFICAT D'ÉTALONNAGE # 8086

Date d'étalonnage : 2018-04-18
Date d'émission du certificat : 2018-04-18

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.

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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 ±0.2% de la lecture pour les mesures entre 5 SCCM à 10 SLPM, ±0.3% de la lecture pour les mesures entre 10 SLPM à 30 SLPM, ±0.2% de la lecture pour les mesures entre 30 SLPM à 3000 SLPM, ±0.3% de la lecture pour les mesures supérieures à 3000 SLPM jusqu'à 6000 SLPM et ±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 incluant la résolution de l'instrument. 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
	Lectures Initiales = Lectures finales, aucun ajustement
Résultats	Lectures finales dans les tolérances
Remarques	Fréquence d'étalonnage aux 12 mois

Métrologiste

Responsable du laboratoire

POLYCONTROLS

CLAS 2009-02

Conseil canadien des normes
Laboratoire accrédité
Portée d'accréditation 655

ISO/IEC 17025-2005

Certificat d'étalonnage # 8086

Numéro de série:	23543	Station de mesure:	3
Date d'étalonnage:	2018-04-18	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	1500231794	2019-01-19
DHI molbox1	Molbox1	881	1500218459	2018-06-01
RTD Mist	M22	2208102	2018002234	2019-04-11
Module 44.5 PSI avec Baro 163671	Module 30	160659	2018002180	2019-04-12

Spécifications finales de l'appareil

Gaz	Air
Température d'opération	
Pression à l'entrée	
Pression à la sortie	
Température de référence	
Pression de référence	
Étendue d'échelle	10-2000 ALH
Signaux Entrée/Sortie	-
Alimentation	
Tolérance	±2 %O.R.

Condition d'étalonnage

Gaz	Air
Température ambiante	21 °C
Pression ambiante	1000.05 mbar
Orientation	Horizontale
Élastomère	Viton
Valve	

Lectures finales

Débit du test ALH	Instrument en test L	Valeurs mesurées Pression PSIA	Température °C	Référence L	Référence calculée L	Erreur calculée L	Tolérance acceptable L	TUR
384.7785	64.6300	14.5124	21.72	63.1428	64.0745	0.5555	1.2815	>4
613.1464	103.1100	14.5145	21.66	100.6570	102.1054	1.0046	2.0421	>4
1707.3283	285.6900	14.5319	21.59	280.6440	284.2771	1.4129	5.6855	>4

Fc : 0,9914

3 MAI

Bernard Poirier
Métrologiste

Signature

POLYCONTROLS

CLAS 2009-02

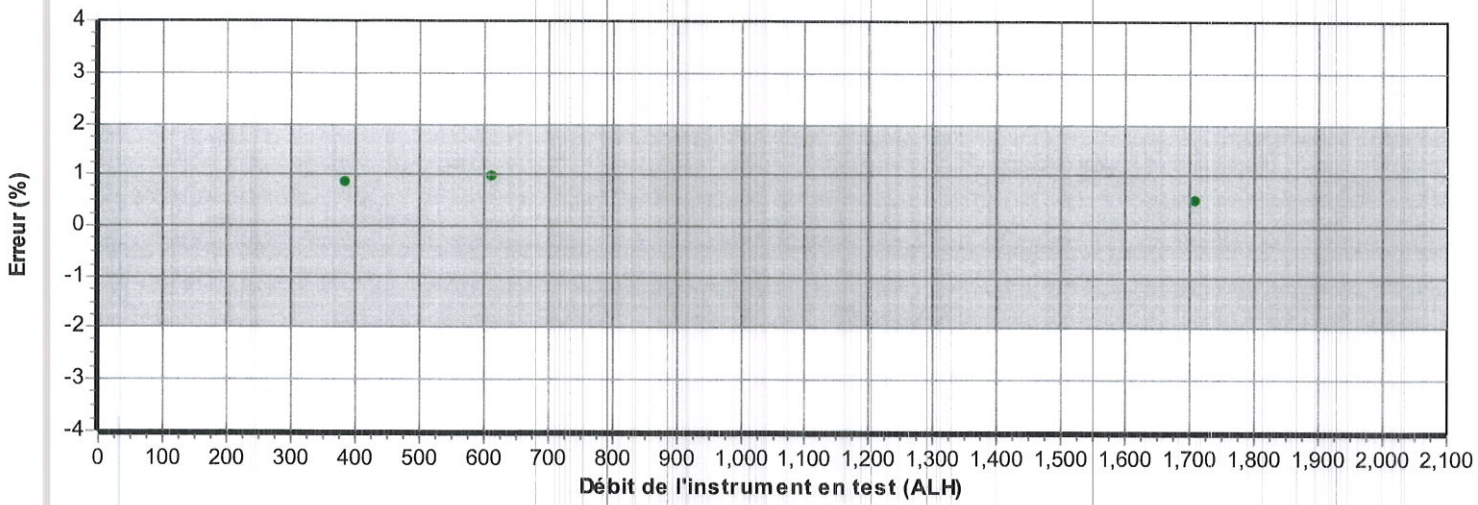
Conseil canadien des normes
Laboratoire accrédité
Portée d'accréditation 655

ISO/IEC 17025-2005

Certificat d'étalonnage # 8086

Numéro de série:	23543	Station de mesure:	3
Date d'étalonnage:	2018-04-18	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

Bernard Poirier
Métrologiste

Signature

Instrumentation Saint•Laurent inc.
Accrédité ISO 17025

CLAS NRC-CNRC CLAS 2010-02

SCC Accredited LAB
LAB Accrédité CCN N°669

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-006 07/03/18

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:	E47U020014	**Gamme:**	0-0.5"H2O
Emplacement:	N.A.	**No. Machine:**	N.A.

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Fluke 744	**No. du certificat d'étalonnage:**	2017004079
No. Série:	7798010	**Dernière date d'étalonnage:**	5-Jul-17
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	5-Jul-18
Commentaire:			

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Setra	**No. du certificat d'étalonnage:**	2018001018
No. Série:	2784759	**Dernière date d'étalonnage:**	21-Feb-18
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	21-Feb-19
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	Vérification indicateur
0.2500 "H2O	0.250 "H2O	0.249 "H2O	-0.001 "H2O	0.249 "H2O	0.25 "H2O	Vérification indicateur
0.5000 "H2O	0.500 "H2O	0.505 "H2O	0.005 "H2O	0.505 "H2O	0.25 "H2O	Vérification indicateur
0.7500 "H2O	0.750 "H2O	0.754 "H2O	0.004 "H2O	0.754 "H2O	0.25 "H2O	Vérification indicateur
1.0000 "H2O	1.000 "H2O	1.001 "H2O	0.001 "H2O	1.001 "H2O	0.25 "H2O	Vérification indicateur
0.0000 "H2O	0.0000 V.DC.	0.0003 V.DC.	+0.0003 V.DC.	0.0003 V.DC.	0.00 V.DC.	Vérification sortie analogique
0.2500 "H2O	2.5000 V.DC.	2.4811 V.DC.	-0.0189 V.DC.	2.4811 V.DC.	0.00 V.DC.	Vérification sortie analogique
0.5000 "H2O	5.0000 V.DC.	5.0389 V.DC.	0.0389 V.DC.	5.0389 V.DC.	0.00 V.DC.	Vérification sortie analogique
0.7500 "H2O	7.5000 V.DC.	7.5582 V.DC.	0.0582 V.DC.	7.5582 V.DC.	0.00 V.DC.	Vérification sortie analogique
1.0000 "H2O	10.0000 V.DC.	10.0285 V.DC.	0.0285 V.DC.	10.0285 V.DC.	0.00 V.DC.	Vérification sortie analogique

Conditions Environnementales: Température: 20 °C Humidité: 33 %RH

Type d'Étalonnage:

5F09106

Instrumentation Saint•Laurent inc.
Accrédité ISO 17025

CLAS NRC-CNRC CLAS 2010-02

SCC Accredited LAB
LAB Accrédité CCN N°669

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-006 07/03/18

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

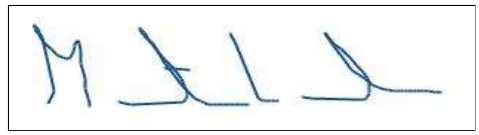
SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Indicateur	**Type d'entrée:**	Pression
Manufacturier:	Dwyer	**Type de sortie:**	Digitale
No. Model:	MS-321-LCD	**Type de mesure:**	Pression
No. Série:	E47U020014	**Gamme:**	0-0.5"H2O
Emplacement:	N.A.	**No. Machine:**	N.A.

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:	7 Mars 2018
Date du prochain Étalonnage:	7 Mars 2019
Date d'émission du certificat:	7 Mars 2018

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

Instrumentation Saint•Laurent inc.
Accrédité ISO 17025

CLAS NRC-CNRC CLAS 2010-02

SCC Accredited LAB
LAB Accrédité CCN N°669

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-007 07/03/18

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.	**No. Machine:**	N.A.

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Fluke 744	**No. du certificat d'étalonnage:**	2017004079
No. Série:	7798010	**Dernière date d'étalonnage:**	5-Jul-17
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	5-Jul-18
Commentaire:			

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Setra	**No. du certificat d'étalonnage:**	2018001018
No. Série:	2784759	**Dernière date d'étalonnage:**	21-Feb-18
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	21-Feb-19
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	Vérification indicateur
0.0250 "H2O	0.0250 "H2O	0.0249 "H2O	-0.0001 "H2O	0.0249 "H2O	0.25 "H2O	Vérification indicateur
0.0500 "H2O	0.0500 "H2O	0.0498 "H2O	-0.0002 "H2O	0.0498 "H2O	0.25 "H2O	Vérification indicateur
0.0750 "H2O	0.0750 "H2O	0.0747 "H2O	-0.0003 "H2O	0.0747 "H2O	0.25 "H2O	Vérification indicateur
0.1000 "H2O	0.1000 "H2O	0.0996 "H2O	-0.0004 "H2O	0.0996 "H2O	0.25 "H2O	Vérification indicateur
0.0000 "H2O	0.0000 V.DC.	0.0015 V.DC.	+0.0015 V.DC.	0.0015 V.DC.	0.01 V.DC.	Vérification sortie analogique
0.0250 "H2O	2.5000 V.DC.	2.5020 V.DC.	0.0020 V.DC.	2.5020 V.DC.	0.01 V.DC.	Vérification sortie analogique
0.0500 "H2O	5.0000 V.DC.	4.9842 V.DC.	-0.0158 V.DC.	4.9842 V.DC.	0.01 V.DC.	Vérification sortie analogique
0.0750 "H2O	7.5000 V.DC.	7.4924 V.DC.	-0.0076 V.DC.	7.4924 V.DC.	0.01 V.DC.	Vérification sortie analogique
0.1000 "H2O	10.0000 V.DC.	9.9524 V.DC.	-0.0476 V.DC.	9.9524 V.DC.	0.01 V.DC.	Vérification sortie analogique

Conditions Environnementales: Température: 20 °C Humidité: 33 %RH

Type d'Étalonnage:

5F09106

Instrumentation Saint•Laurent inc.
Accrédité ISO 17025

CLAS NRC-CNRC CLAS 2010-02

SCC Accredited LAB
LAB Accrédité CCN N°669

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-007 07/03/18

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.	**No. Machine:**	N.A.

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:	7 Mars 2018
Date du prochain Étalonnage:	7 Mars 2019
Date d'émission du certificat:	7 Mars 2018

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

Instrumentation Saint•Laurent inc.
Accrédité ISO 17025

CLAS NRC-CNRC CLAS 2010-02

SCC Accredited LAB
LAB Accrédité CCN N°669

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-012 05/03/18

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.	**No. Machine:**	N.A.

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Fluke 744	**No. du certificat d'étalonnage:**	2017004079
No. Série:	7798010	**Dernière date d'étalonnage:**	5-Jul-17
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	5-Jul-18
Commentaire:			

RÉSULTAT D'ÉTALONNAGE

Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Incertitude Élargie	Commentaire
Voir Commentaire						

Conditions Environnementales: Température: 21 °C Humidité: 31 %RH

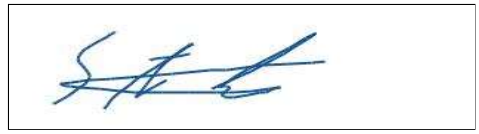
Type d'Étalonnage: Data Acquisition system Conforme
Cartes: EM-014, EM-154
Utilisé un maximum de 2 cartes d'entrées sinon les valeurs ne sont plus précises.

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:	5 Mars 2018
Date du prochain Étalonnage:	5 Mars 2019
Date d'émission du certificat:	5 Mars 2018

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.



Stéphane - Technicien

5F09101

DISPERSION
Laboratoire • Laboratory DIVISION • TRANSCAT CANADA

CLAS
NRC CNRC
CLAS 2010-01

CERTIFICAT D'ÉTALONNAGE

9900 Chemin de la Côte-de-Liesse, Lachine, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

Client :	Polytests	**No. du Certificat :**	**152-4BB901-181**
Adresse :	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	**Date d'étalonnage :**	09-01-2018

Technicien:
Simeonidis, Georgios

David Llorens, Responsable Qualité

DESCRIPTION DU SERVICE:

Description des masses :	ASTM E617	**Date d'approbation :**	09-01-2018
Classe de précision :	ASTM 6	**Date prochain étalonnage :**	09-01-2023
Densité :	7.95g/cm³	**Accrédtation CCN n. :**	668
Identification (si unique) :	EM-090	**Certification CLAS n. :**	2010-01

Condition d'essai :	Temp °C:	21.17	Pression kPa:	101.475	Humidité:	48.665

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:

11 JAN. 2018

DISPERSION
Laboratoire • Laboratory DIVISION • TRANSCAT CANADA

CLAS
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CLAS 2010-01

CERTIFICAT D'ÉTALONNAGE

9900 Chemin de la Côte-de-Liesse, Lachine, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

Client :	Polytests	**No. du Certificat :**	**152-4BB901-181**
Adresse :	695 B rue Gaudette	**Accrédtation CCN n. :**	668
	St-Jean-sur-Richelieu, QC	**Certification CLAS n. :**	2010-01
	J3B7S7	**Classe d'exactitude :**	ASTM 6
		Date d'étalonnage :	09-01-2018
Masse :	2 kg	**Date du prochain étalonnage :**	09-01-2023

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	2.0001538 kg		200 mg	2.0 mg

S.P

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CLAS
NRC CNRC
CLAS 2010-01

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www.dispersion.ca 1.866.390.5066

CERTIFICAT D'ÉTALONNAGE

Client :	Polytests	**No. du Certificat :**	**152-4BB901-181**
Adresse :	695 B rue Gaudette	**Accréditation CCN n. :**	668
	St-Jean-sur-Richelieu, QC	**Certification CLAS n. :**	2010-01
	J3B7S7	**Classe d'exactitude :**	ASTM 6
		Date d'étalonnage :	09-01-2018
Masse :	2 kg	**Date du prochain étalonnage :**	09-01-2023

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	153.8 mg		200 mg	2.0 mg

CERTIFICAT D'ÉTALONNAGE

9900 Chemin de la Côte-de-Liesse, Lachine, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

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.

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CERTIFICAT D'ÉTALONNAGE

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RÉFÉRENCES UTILISÉES

Poids	No de série	Fabricant	Date d'étalonnage	Date due
20kg	69976	Troemner	30-05-2017	30-05-2018
5kg	129099	Mettler Toledo	02-09-2017	02-09-2018
5kg	96-0888-50-3	Denver Instrument Company	02-09-2017	02-09-2018
2kg	129098	Mettler Toledo	02-09-2017	02-09-2018
2kg	96-0888-50-3	Denver Instrument Company	02-09-2017	02-09-2018
300g	96-0888-50-2	Denver Instrument Company	02-09-2017	02-09-2018
1kg - 1mg	MT-01	Mettler Toledo	02-09-2017	02-09-2018

ÉTALONS CERTFIÉS PAR LE CNRC(**Référence NRC MS-2016-0021**)

Poids	No de série	Fabricant	Date d'étalonnage	Date due
100g	95170	Mettler Toledo	17-10-2016	17-10-2018
10kg	129100	Mettler Toledo	17-10-2016	17-10-2018
1kg	95171	Mettler Toledo	17-10-2016	17-10-2018

RÉFÉRENCES DE LA STATION ROBOTISÉE

Poids	No de série	Fabricant	Date d'étalonnage	Date due
1kg - 1mg	DK000A132	Laboratoire Dispersion	01-08-2017	01-08-2018

Instrumentation Saint•Laurent inc.
Accrédité ISO 17025

CLAS NRC-CNRC CLAS 2010-02

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LAB Accrédité CCN N°669

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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-126 06/03/18

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.	**No. Machine:**	N.A.

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Crystal XP2i	**No. du certificat d'étalonnage:**	2017004083
No. Série:	258139	**Dernière date d'étalonnage:**	4-Jul-17
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	4-Jul-18
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	Vérification indicateur
-7.50 "Hg	-7.50 "Hg	-7.61 "Hg	-0.11 "Hg	-7.61 "Hg	1 "Hg	Vérification indicateur
-15.00 "Hg	-15.00 "Hg	-15.23 "Hg	-0.23 "Hg	-15.23 "Hg	1 "Hg	Vérification indicateur
-22.50 "Hg	-22.50 "Hg	-22.85 "Hg	-0.35 "Hg	-22.85 "Hg	1 "Hg	Vérification indicateur
-28.00 "Hg	-28.00 "Hg	-28.45 "Hg	-0.45 "Hg	-28.45 "Hg	1 "Hg	Vérification indicateur
0.00 "Hg	10.0000 V.DC.	10.0516 V.DC.	+0.0600 V.DC.	10.0600 V.DC.	0.5 V.DC.	Vérification sortie analogique
-7.50 "Hg	8.0000 V.DC.	8.0377 V.DC.	+0.0377 V.DC.	8.0377 V.DC.	0.5 V.DC.	Vérification sortie analogique
-15.00 "Hg	6.0000 V.DC.	6.0080 V.DC.	+0.0080 V.DC.	6.0080 V.DC.	0.5 V.DC.	Vérification sortie analogique
-22.50 "Hg	4.0000 V.DC.	3.9666 V.DC.	-0.0333 V.DC.	3.9666 V.DC.	0.5 V.DC.	Vérification sortie analogique
-28.00 "Hg	2.5333 V.DC.	2.4615 V.DC.	-0.0718 V.DC.	2.4615 V.DC.	0.5 V.DC.	Vérification sortie analogique

Conditions Environnementales: Température: 20 °C Humidité: 33 %RH

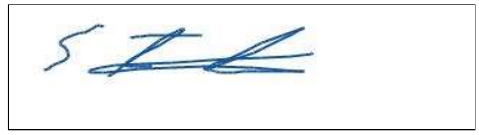
Type d'Étalonnage:

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 retraçâble 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 Mars 2018
Date du prochain Étalonnage:	6 Mars 2019
Date d'émission du certificat:	6 Mars 2018

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.



Stéphane - Technicien

5F09106

Instrumentation Saint•Laurent inc.
Accrédité ISO 17025

CLAS NRC-CNRC CLAS 2010-02

SCC Accredited LAB
LAB Accrédité CCN N°669

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 06/03/18

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.	**No. Machine:**	N.A.

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Crystal XP2i	**No. du certificat d'étalonnage:**	2017004083
No. Série:	258139	**Dernière date d'étalonnage:**	4-Jul-17
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	4-Jul-18
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	Vérification indicateur
-7.50 "Hg	-7.50 "Hg	-7.52 "Hg	-0.03 "Hg	-7.52 "Hg	1 "Hg	Vérification indicateur
-15.00 "Hg	-15.00 "Hg	-15.05 "Hg	-0.05 "Hg	-15.05 "Hg	1 "Hg	Vérification indicateur
-22.50 "Hg	-22.50 "Hg	-22.60 "Hg	-0.10 "Hg	-22.60 "Hg	1 "Hg	Vérification indicateur
-28.00 "Hg	-28.00 "Hg	-28.11 "Hg	-0.11 "Hg	-28.11 "Hg	1 "Hg	Vérification indicateur
0.00 "Hg	10.0000 V.DC.	10.0048 V.DC.	+0.0048 V.DC.	10.0048 V.DC.	0.01 V.DC.	Vérification sortie analogique
-7.50 "Hg	8.0000 V.DC.	8.0156 V.DC.	+0.0156 V.DC.	8.0156 V.DC.	0.01 V.DC.	Vérification sortie analogique
-15.00 "Hg	6.0000 V.DC.	6.0141 V.DC.	+0.0141 V.DC.	6.0141 V.DC.	0.01 V.DC.	Vérification sortie analogique
-22.50 "Hg	4.0000 V.DC.	3.9973 V.DC.	-0.0027 V.DC.	3.9973 V.DC.	0.01 V.DC.	Vérification sortie analogique
-28.00 "Hg	2.5333 V.DC.	2.5129 V.DC.	-0.0204 V.DC.	2.5129 V.DC.	0.01 V.DC.	Vérification sortie analogique

Conditions Environnementales: Température: 20 °C Humidité: 33 %RH

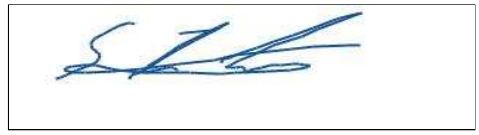
Type d'Étalonnage:

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 retraçâble 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 Mars 2018
Date du prochain Étalonnage:	6 Mars 2019
Date d'émission du certificat:	6 Mars 2018

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.



Stéphane - Technicien

5F09106

DISPERSION
Laboratoire • Laboratory DIVISION - TRANSCAT CANADA

CLAS
ARC·CNRC
CLAS 2010-01

CERTIFICAT D'ÉTALONNAGE

9900 Chemin de la Côte-de-Liesse, Lachine, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

Client :	Polytests	**No. du Certificat :**	**152-4BB901-182**
Adresse :	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	**Date d'étalonnage :**	09-01-2018

Technicien:
Simeonidis, Georgios

David Llorens, Responsable Qualité

DESCRIPTION DU SERVICE:

Description des masses :	ASTM E617	**Date d'approbation :**	09-01-2018
Classe de précision :	ASTM 1	**Date prochain étalonnage :**	09-01-2023
Densité :	7.95g/cm³	**Accrédtation CCN n. :**	668
Identification (si unique) :	(items multiples)	**Certification CLAS n. :**	2010-01

Condition d'essai :	Temp °C:	21.265	Pression kPa:	101.565	Humidité:	49.58

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:

11 JAN. 2018

DISPERSION
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CERTIFICAT D'ÉTALONNAGE

9900 Chemin de la Côte-de-Liesse, Lachine, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

Client :	Polytests	**No. du Certificat :**	**152-4BB901-182**
Adresse :	695 B rue Gaudette	**Accréditation CCN n. :**	668
	St-Jean-sur-Richelieu, QC	**Certification CLAS n. :**	2010-01
	J3B7S7	**Classe d'exactitude :**	ASTM 1
		Date d'étalonnage :	09-01-2018
Masse :	100 mg - 200 g	**Date du prochain étalonnage :**	09-01-2023

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	99.9993 mg		0.010 mg	0.002 mg
200 g	1000026013	EM-129	199.99962 g		0.50 mg	0.10 mg

D.P.

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www.dispersion.ca 1.866.390.5066

CERTIFICAT D'ÉTALONNAGE

Client :	Polytests	**No. du Certificat :**	**152-4BB901-182**
Adresse :	695 B rue Gaudette	**Accrédtation CCN n. :**	668
	St-Jean-sur-Richelieu, QC	**Certification CLAS n. :**	2010-01
	J3B7S7	**Classe d'exactitude :**	ASTM 1
		Date d'étalonnage :	09-01-2018
Masse :	100 mg - 200 g	**Date du prochain étalonnage :**	09-01-2023

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	-0.0007 mg		0.010 mg	0.002 mg
200 g	1000026013	EM-129	-0.38 mg		0.50 mg	0.10 mg

D.P.

CERTIFICAT D'ÉTALONNAGE

9900 Chemin de la Côte-de-Liesse, Lachine, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

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.

DISPERSION
Laboratoire • Laboratory DIVISION • TRANSCAT CANADA

CLAS
ARC CNRC
CLAS 2010-01

9900 Chemin de la Côte-de-Liesse, Lachine, QC H8T 1A1
www.dispersion.ca 1.866.390.5066

CERTIFICAT D'ÉTALONNAGE

RÉFÉRENCES UTILISÉES

Poids	No de série	Fabricant	Date d'étalonnage	Date due
20kg	69976	Troemner	30-05-2017	30-05-2018
5kg	129099	Mettler Toledo	02-09-2017	02-09-2018
5kg	96-0888-50-3	Denver Instrument Company	02-09-2017	02-09-2018
2kg	129098	Mettler Toledo	02-09-2017	02-09-2018
2kg	96-0888-50-3	Denver Instrument Company	02-09-2017	02-09-2018
300g	96-0888-50-2	Denver Instrument Company	02-09-2017	02-09-2018
1kg - 1mg	MT-01	Mettler Toledo	02-09-2017	02-09-2018

ÉTALONS CERTFIÉS PAR LE CNRC(**Référence NRC MS-2016-0021**)

Poids	No de série	Fabricant	Date d'étalonnage	Date due
100g	95170	Mettler Toledo	17-10-2016	17-10-2018
10kg	129100	Mettler Toledo	17-10-2016	17-10-2018
1kg	95171	Mettler Toledo	17-10-2016	17-10-2018

RÉFÉRENCES DE LA STATION ROBOTISÉE

Poids	No de série	Fabricant	Date d'étalonnage	Date due
1kg - 1mg	DK000A132	Laboratoire Dispersion	01-08-2017	01-08-2018

Trescal

4407 rue Charleroi, Montréal-Nord (Québec) H1H 1T6 Canada
TEL.: (514) 329-3242 / 1 888 774-6665
FAX : (514) 329-3750
info.canada@trescal.com

Certificat d'Étalonnage / Certificate of Calibration

CLIENT :
SERVICES POLYTESTS INC.
695-B GAUDETTE
ST-JEAN-SUR-RICHELIEU, QUEBEC

Description: VÉRIFICATEUR D'HUMIDITÉ / MOISTURE METER
Fabricant/ Manufacturer: DELMHORST
Modèle/ Model : MCS-1 REFERENCE STANDARD
No série / Serial no : N/A
 # Inventaire / Asset # : **EM-191**

CERTIFICAT No / Certificate No: **227990**

PROCÉDURE / Procedure :
TRESCAL - DELMHORST_MCS-1 REFERENCE STANDARD

yyyy-mm-dd
Date étalonnage/ Calibration Performed : **2017-12-22**

Echéance/ Due Date : **2018-12-22**

Type de résultat / *Results type* : **As-Found = As-Left**

Résultats d'essais / *Test results* : **Conforme / In Tolerance**

Conditions de mesure / Measurement conditions

TEMPÉRATURE / Temp. : **22°C**

HUMIDITÉ / Humidity : **22%RH**

Usage restreint/ *Restricted use* : ☐

Réparation effectuée / *Repair performed* : ☐

Ajustement effectué / *Adjustment performed* : ☐

ÉTALONS UTILISÉS/ Standards Used:

Identification	Manuf.	Model	Description	Ser. #	Etalonné/ Cal.	Echéance/ Due
PR0661	FLUKE	8508A	REFERENCE MULTIMETER	389272208	2017-06-19	2018-06-19

Les spécifications mentionnées comme limites de tolérances d'essai sont celles établies par le manufacturier, sauf indication contraire.
Test tolerance limits are based on manufacturers specifications unless stated otherwise.

NOTES :

2018-01-11

Technicien :
Technician
A. GAUDETTE

Le système qualité de la société est conforme aux exigences de la norme **ISO 17025** et les étalons utilisés pour le processus d'étalonnage sont retraçables au SI par l'entremise du CNRC et/ou du NIST.
*Our quality system complies with the requirements of **ISO 17025** and the standards used for the calibration are traceable to SI through NRC and/or NIST.*

Trescal

Certificat d'Étalonnage
Certificate of Calibration

	227990
CLIENT / Customer :	SERVICES POLYTESTS INC.
DESCRIPTION / Description :	VÉRIFICATEUR D'HUMIDITÉ / MOISTURE METER
MANUFACTURIER / Manufacturer :	DELMHORST
MODÈLE / Model :	MCS-1 REFERENCE STANDARD

DESCRIPTION Description		LIMITES Limits	LECTURES Readings	LIMITES Limits
DOUGLAS-FIR @ 80°F	**Nominal**			**Déviation** *Mohms*
12 %	120 MOhms		116.5	3.5
22 %	1.10 MOhms		1.095	0.005

BP

S:\CERTIFICAT\MANUFACTURIER\DELMHORST\MCS-1 REFERENCE STANDARD

FORME : REV. 2011-12-13

ACCREDITATION 17025 ISO/IEC

Rapport d'étalonnage No. 520501-772-092517

Mettler Toledo
Service Business Unit Industrial
1900 Polaris Parkway
Columbus, Ohio 43240
1-800-METTLER

METTLER TOLEDO

ISO 9001 Registered

ANSI/NCSL Z540-1 Accrédité

Accrédité par l'American Association for Laboratory Accreditation (A2LA)

CERT.CALIBRATION #1902.02

Certificat d'étalonnage

Client

Société :	Services Polytests		
Adresse :	695-B Rue Gaudette		
Ville :	Saint-Jean-Sur-Richelieu	*État/Province :*	Quebec
Code postal :	J3B 7S7	Astea Customer ID:	301288671

Instrument

Constructeur :	RICE LAKE	*Modèle de terminal :*	IQ+355
Modèle :	4 X 4HP-10K	*# série du terminal:*	164851
No de série :	C18395	*# série de l'imprimant*	N/A
Capacité :	400 kg		N/A
Résolution :	0.05 kg	*Nbre de Divisions:*	8000
Classe :	III	*Procédure utilisée :*	NIST Handbook 44
No./ID d'inventaire:	EM-137		
Procédure:	Le présent certificat est émis conformément aux conditions de certification accordées par l'A2LA, en vertu de la norme ISO/IEC 17025. A2LA a évalué la capacité de mesure du laboratoire et la traçabilité des normes nationales reconnues.		

Date de calibrage :	25-sept-2017	*Date, prochaine Cal.*	30-sept-2018
Signataire autorisé (A2LA) :	Stephane Poisson	*Signature:*	ELECTRONIC SIGNATURE

Étalons de travail

Retracabilité: Les poids de test utilisés se réfèrent au National Institute of Standards and Technology.

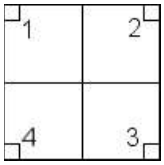
Jeu de poids no :	*Traçabilité NIST No.:*	*Classe ASTM/OIML*	*Date d'étalonnage :*	*Date proch. étalonnage*
S	1412405	M1	9-mai-2017	9-mai-2018
BE10	M16-0725	M1	28-févr-2017	28-févr-2018

Résultats de mesure

La température : 24 °C

Les conditions ambiantes ont été vérifiées afin d'assurer l'exactitude de l'étalonnage.

Test de variation



		Avant Réglage	*Après Réglage*
Poids Appliqués	*Position*	*Valeur lue*	*Valeur lue*
1: 100.00 kg	*Position 1*	99.90 kg	100.00 kg
2: 100.00 kg	*Position 2*	99.75 kg	100.00 kg
3: 100.00 kg	*Position 3*	99.85 kg	100.00 kg
4: 100.00 kg	*Position 4*	99.90 kg	100.00 kg
Erreur maximum :		0.25 kg	0.00 kg
Max Erreur Admissible :		0.10 kg	0.1 kg

Linéarité

	Avant réglage					
	Poids Appliqués	*Valeur lue*	*Erreur*		*Erreur admissible*	*Dans la Tolérance*
Zero 1	0.00 kg	0.00 kg	0.00 kg	0 d	1 d	OUI
2	100.00 kg	99.90 kg	-0.10 kg	2 d	2 d	OUI
Max 3	200.00 kg	199.75 kg	-0.25 kg	5 d	3 d	NON
4	100.00 kg	99.90 kg	-0.10 kg	2 d	2 d	OUI
Zero 5	0.00 kg	0.05 kg	0.05 kg	1 d	1 d	OUI

☑ Méthode de substitution utilisée

Commentaires : 153,95 + 200 kg = 353,85 kg

	Après réglage					
	Poids Appliqués	*Valeur lue*	*Erreur*		*Erreur admissible*	*Dans la Tolérance*
Zero 1	0.00 kg	0.00 kg	0.00 kg	0 d	1 d	OUI
2	100.00 kg	100.00 kg	0.00 kg	0 d	2 d	OUI
Max 3	200.00 kg	200.05 kg	0.05 kg	1 d	3 d	OUI
4	100.00 kg	100.00 kg	0.00 kg	0 d	2 d	OUI
Zero 5	0.00 kg	-0.05 kg	-0.05 kg	1 d	1 d	OUI

☑ Méthode de substitution utilisée

Commentaires : 154,10 + 200 kg = 354, 30 kg

Un réglage de la balance a été requis
Si non, les résultats "avant réglage" correspondent aux résultats tel que laissé.

☑ **OUI** ☐ **NON**

Répétabilité

Poids appliqués : 100.00 kg

	Chargé	*Vide*	*Différence*
1	99.95 kg	0.00 kg	99.95 kg
2	99.95 kg	0.00 kg	99.95 kg
3	99.95 kg	0.00 kg	99.95 kg
	Erreur maximale :	0.05 kg	1.0 d
	Tolérance :	0.10 kg	2 d

Incertitude

Mesure de l'incertitude = 0.029 kg

L'incertitude de mesure représente les incertitudes étendues selon un facteur de sécurité K=2 générant un niveau de confiance approximatif de 95 %. Des dispositions doivent être prises en matière d'environnement au lieu d'étalonnage, d'incertitude induite par l'article en étalonnage et d'effets indésirables causés par le transport du matériel d'étalonnage. Ces facteurs pourraient entraîner une incertitude plus grande que le CMC.

Remarques

Vous pouriez gagner en précision avec des cellules Mettler.

Instrumentation Saint•Laurent inc.
Accrédité ISO 17025

CLAS NRC-CNRC CLAS 2010-02

SCC Accredited LAB
LAB Accrédité CCN N°669

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-001 06/03/18

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.	**No. Machine:**	N.A.

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Fluke 744	**No. du certificat d'étalonnage:**	2017004079
No. Série:	7798010	**Dernière date d'étalonnage:**	5-Jul-17
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	5-Jul-18
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	-0.1 °C	-0.1 °C	-0.1 °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	374.9 °C	-0.1 °C	374.9 °C	1.0 °C	T1 typeJ
500.0 °C	500.0 °C	499.9 °C	-0.1 °C	499.9 °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	374.9 °C	-0.1 °C	374.9 °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: 33 %RH

Type d'Étalonnage:

5F09101

Instrumentation Saint•Laurent inc.
Accrédité ISO 17025

CLAS NRC-CNRC CLAS 2010-02

SCC Accredited LAB
LAB Accrédité CCN N°669

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-001 06/03/18

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

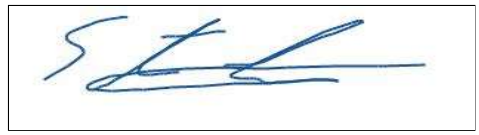
SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Enregistreur	**Type d'entrée:**	Temp
Manufacturier:	Fluke	**Type de sortie:**	Digitale
No. Model:	52-II	**Type de mesure:**	Température
No. Série:	90630037	**Gamme:**	Divers
Emplacement:	N.A.	**No. Machine:**	N.A.

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 Mars 2018
Date du prochain Étalonnage:	6 Mars 2019
Date d'émission du certificat:	6 Mars 2018

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.



Stéphane - Technicien

5F09101

Instrumentation Saint•Laurent inc.
Accrédité ISO 17025

CLAS NRC-CNRC CLAS 2010-02

SCC Accredited LAB
LAB Accrédité CCN N°669

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-136 06/03/18

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

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	ISL-004
Précision requise:	+\-2°C +\-3%RH
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.	**No. Machine:**	N.A.

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Vaisala Portable 1	**No. du certificat d'étalonnage:**	2017004428
No. Série:	U4840010/U4920031	**Dernière date d'étalonnage:**	19-Jul-17
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	19-Jul-18
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	25.2 °C	+0.2 °C	25.2 °C	1.0 °C	
40.0 °C	40.0 °C	40.1 °C	+0.1 °C	40.1 °C	1.0 °C	
33.0 %RH	33.0 %RH	32.5 %RH	-0.5 %RH	32.5 %RH	3.0 %RH	
50.0 %RH	50.0 %RH	49.1 %RH	-0.9 %RH	49.1 %RH	3.0 %RH	
80.0 %RH	80.0 %RH	79.2 %RH	-0.8 %RH	79.2 %RH	3.0 %RH	

Conditions Environnementales: Température: 21 °C Humidité: 29 %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 Mars 2018
Date du prochain Étalonnage:	6 Mars 2019
Date d'émission du certificat:	6 Mars 2018

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.

Stéphane - Technicien

CERTIFICATE OF NIST TRACEABLE CALIBRATION

Calibration Certificate No: 63484

Customer Information

Customer: Services Polytests, Inc.

Address : 695-B Gaudette
St-Jean-sur-richelieu
J3B 7S7

Customer PO #: 100431

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

Graftel ID	Manufacturer	Model #	Description	CAL Due
10017	Hart Scientific/Burns	1502A/3925	Thermometer	2/18/2018
10086	Furness Controls	FC0332	DP Transmitter	6/6/2018
10100	Graftel	n/a	Temperature	10/29/2019
10155	HOBO	UX100-011	RH/Temp logger	11/15/2017
10171	Furness	FC0332-2W	0 - .4" H2O	11/10/2017
10187	Vaisala	PTB210	Barometric Pressure Gauge	12/6/2017

Sensor Information

Manufacturer: Omega
Description: Anemometer
Method Used: Pitot Tube

Model #: HHF143
Rated Accuracy: ± See Attachment
Accuracy Specified By: Omega

Instrument ID#: EM153
Range: 40 to 7800 fpm
Condition: Functional

Serial #: 1015949

Comments: Calibration Date: 08/22/2017 *Limited calibration up to 5000 fpm
Calibration Due: 08/22/2018

The instruments(s) listed on this certificate have been calibrated against standards traceable to the National Institue 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. Graftel, LLC. Quality Assurance System complies with applicable requirements of ISO/IEC-17025-2005, ANSI/NCSL Z540-I-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 Graftel, LLC. Acceptance Criteria per Simple Acceptance Rule: Measurement Uncertainty is not applied to the measured value when in/out of tolerance statement is made.

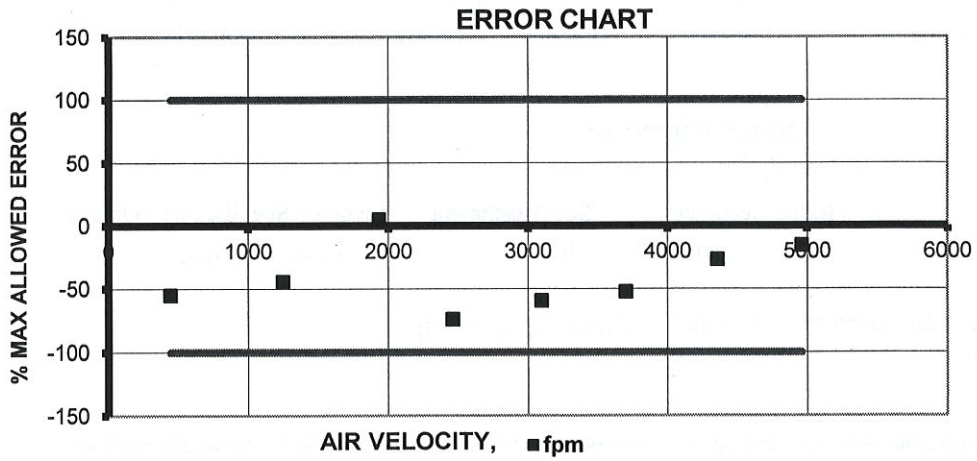
Performed By: _____ Date: 8/22/2017

D. Paras
Calibration Technician

GRAFTEL, LLC. 870 Cambridge Drive, Elk Grove Village, IL 60007 847.364.2600
www.graftel.com

ATTACHMENT TO CALIBRATION CERTIFICATE 63484
AS FOUND/AS LEFT DATA

Reading From Standard,	Lower Limit of Meter Reading,	Measured Reading From Meter,	Upper Limit of Meter Reading,	Error,	Measurement Uncertainty,	STATUS
Actual Air Velocity						
fpm	fpm	fpm	fpm	fpm	fpm	
446	441	443	451	-3	2.23	Pass
1249	1236	1243	1262	-6	6.25	Pass
1932	1912	1933	1952	1	9.66	Pass
2459	2433	2440	2485	-19	12.30	Pass
3096	3064	3077	3128	-19	15.48	Pass
3701	3663	3681	3739	-20	18.51	Pass
4361	4316	4349	4406	-12	21.81	Pass
4960	4909	4952	5011	-8	24.8	Pass



INSTRUMENT SPECIFICATIONS		
Test Fluid	Air	
Lower Range	40	fpm
Upper Range	7800	fpm
Rated Accuracy	+/- 1% reading +/-1 digit	
LABORATORY AMBIENT CONDITIONS		
Pressure	14.42	psia
Humidity	51.10	% RH
Temperature	78.65	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

sept 5th 2017

Certificat d'Étalonnage / Certificate of Calibration

CLIENT :
SERVICES POLYTESTS INC.
695-B GAUDETTE
ST-JEAN-SUR-RICHELIEU, QUEBEC

Description: CHRONOMÈTRE / STOPWATCH TIMER
Fabricant/ Manufacturer: EXTECH
Modèle/ Model : 365510
No série / Serial no : 131636
 # Inventaire / Asset # : **EM-175**

CERTIFICAT No / Certificate No: **227991**

PROCÉDURE / Procedure :
TRESCAL - EXTECH_365510

Date étalonnage/ Calibration Performed : yyyy-mm-dd **2017-12-28**

Echéance/ Due Date : **2018-12-28**

Type de résultat / *Results type* : **As-Found = As-Left**

Résultats d'essais / *Test results* : **Conforme / In Tolerance**

Conditions de mesure / Measurement conditions

TEMPÉRATURE / Temp. : **22°C**

HUMIDITÉ / Humidity : **23%RH**

Usage restreint/ *Restricted use* : ☐

Réparation effectuée / *Repair performed* : ☐

Ajustement effectué / *Adjustment performed* : ☐

ÉTALONS UTILISÉS/ Standards Used:

Identification	Manuf.	Model	Description	Ser. #	Etalonné/ Cal.	Echéance/ Due
PR0313	H-P	53132A	UNIVERSAL COUNTER	3546A03142	2017-06-20	2018-06-20
PR0392	AGILENT	33250A	FUNCTION/ARBITRARY WAVEFORM GENERATOR	MY40008014	2017-06-19	2019-06-19

Les spécifications mentionnées comme limites de tolérances d'essai sont celles établies par le manufacturier, sauf indication contraire.
Test tolerance limits are based on manufacturers specifications unless stated otherwise.

NOTES :

2018-01-11

Technicien :
Technician M. ZAIDI

Le système qualité de la société est conforme aux exigences de la norme **ISO 17025** et les étalons utilisés pour le processus d'étalonnage sont retraçables au SI par l'entremise du CNRC et/ou du NIST.
Our quality system complies with the requirements of ***ISO 17025*** *and the standards used for the calibration are traceable to SI through NRC and/or NIST.*

Trescal

Certificat d'Étalonnage
Certificate of Calibration

227991

CLIENT / Customer : SERVICES POLYTESTS INC.

DESCRIPTION / Description : CHRONOMÈTRE / STOPWATCH TIMER

MANUFACTURIER / Manufacturer : EXTECH

MODÈLE / Model : 365510

DESCRIPTION Description	LIMITES Limits	LECTURES Readings	LIMITES Limits
	Min		Max
Temps écoulé, chronomètre sous test / Elapsed time on test stopwatch		**Comptes / Counts** Chronomètre/timer	
Minutes: 27 / Seconds: 31 / 1/100 sec: 15		165115	
Total au compteur / Reference timer: 165114.0 comptes/counts			
(Δt) Deviation (1/100sec): 1.00			
Deviation Par jour/ Per day (%): 0.0006 %	*** Secondes**	Deviation 24hrs	*** Secondes**
Deviation Par jour/ Per day (sec): **0.52 sec**	-3.00	**0.52**	3.00

* Tolérances basées sur une déviation maximale de 3 sec/jour
* Tolerances based on a 3 sec/day maximum deviation

Incertitude/ Uncertainty: ±37 ms

Lorsque fournies dans le rapport, les incertitudes de mesure sont des incertitudes élargies représentant un niveau de confiance d'approximativement 95% , obtenu en multipliant l'incertitude-type composée par un facteur de couverture de k=2.

When supplied in the report, the measurement uncertainties are expanded uncertainties representing a confidence level of approximately 95% , obtain by multiplying the combined standard uncertainty by a coverage factor of k=2.

EM-183

Airgas

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

Airgas

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

Instrumentation Saint•Laurent inc.

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-224 06/03/18

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

SPÉCIFICATION DE CALIBRATION	
Procédure de service:	ISL-022
Précision requise:	+/- 1/32"
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Ruban à mesurer	**Type d'entrée:**	Mesure
Manufacturier:	Stanley	**Type de sortie:**	N/A
No. Model:	Leverlock 12'	**Type de mesure:**	Inch
No. Série:	N/A	**Gamme:**	0 à 12'
Emplacement:	Portable	**No. Machine:**	N/A

SPÉCIFICATION DE L'ÉTALON			
Étalon Utilisé:	Ruban à mesurer	**No. du certificat d'étalonnage:**	1
No. Série:	1	**Dernière date d'étalonnage:**	1-Sep-17
Certificat fait par:	Marco Miron	**Prochaine date d'étalonnage:**	1-Sep-19
Commentaire: sert à titre indicatif seulement			

RÉSULTAT D'ÉTALONNAGE

Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage		Commentaire
1.00 "	1.00 "	1.00 "	0.00 "	1.00 "		
36.00 "	36.00 "	36.00 "	0.00 "	36.00 "		
72.00 "	72.00 "	72.00 "	0.00 "	72.00 "		
108.00 "	108.00 "	108.00 "	0.00 "	108.00 "		
132.00 "	132.00 "	132.00 "	0.00 "	132.00 "		

Conditions Environnementales: Température: 21 °C Humidité: 28 %RH

Commentaire:

Instrumentation St-Laurent Inc. Certifie que l'instrument ci-haut, rencontre ou excède les spécifications établies par le fabriquant. Les étalons utilisés pour effectuer l'étalonnage est retraçable au CNRC et/ou au NIST.

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	6 Mars 2018
Date du prochain Étalonnage:	6 Mars 2019
Date d'émission du certificat:	6 Mars 2018

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

Stéphane - Technicien

APPENDIX 4: Unit pre burn

Temps acquisition de données minutes	Flue temp °F	scale lbs	Tunnel Velocity Pressure in. Wc
0,00	215,60	24,79	0,0450
10,00	213,57	24,69	0,0450
20,00	207,94	24,49	0,0450
30,00	212,27	24,29	0,0450
40,00	213,19	24,19	0,0450
50,00	211,15	23,99	0,0450
60,00	211,27	23,79	0,0450
70,00	212,67	23,59	0,0450
80,00	208,60	23,49	0,0450
90,00	216,65	23,29	0,0450
100,00	210,94	23,09	0,0450
110,00	206,75	22,99	0,0450
120,00	210,39	22,79	0,0450
130,00	215,28	22,59	0,0450
140,00	207,30	22,39	0,0450
150,00	205,82	22,29	0,0450
160,00	215,26	55,04	0,0450
170,00	211,90	35,28	0,0450
180,00	212,30	35,08	0,0450
190,00	213,73	34,88	0,0450
200,00	211,25	34,68	0,0450
210,00	208,90	34,58	0,0450
220,00	214,61	34,38	0,0450
230,00	211,40	34,18	0,0450
240,00	214,67	33,98	0,0450
250,00	208,36	33,88	0,0450
260,00	213,12	33,68	0,0450
270,00	211,11	33,48	0,0450
280,00	217,94	33,28	0,0450
290,00	212,31	33,08	0,0450
300,00	213,06	32,98	0,0450
310,00	207,82	32,78	0,0450
320,00	215,32	32,58	0,0450
330,00	208,77	32,48	0,0450
340,00	216,04	32,18	0,0450
350,00	206,96	32,08	0,0450
360,00	212,14	31,88	0,0450
370,00	218,89	31,68	0,0450
380,00	215,70	31,58	0,0450
390,00	211,70	31,38	0,0450
400,00	208,73	31,18	0,0450
410,00	212,34	31,08	0,0450
420,00	213,84	30,88	0,0450
430,00	212,43	30,68	0,0450
440,00	206,23	30,58	0,0450
450,00	213,19	30,38	0,0450
460,00	218,24	30,18	0,0450
470,00	215,12	29,98	0,0450
480,00	215,06	29,78	0,0450
490,00	211,38	29,69	0,0450
500,00	213,49	29,49	0,0450
510,00	211,58	29,29	0,0450
520,00	211,32	29,09	0,0450
530,00	214,41	28,99	0,0450
540,00	214,24	28,79	0,0450
550,00	218,02	28,59	0,0450
560,00	209,78	28,49	0,0450
570,00	211,25	28,29	0,0450
580,00	212,41	28,09	0,0450
590,00	210,86	27,99	0,0450
600,00	212,08	27,79	0,0450
610,00	213,75	27,59	0,0450
620,00	211,30	27,39	0,0450
630,00	210,19	27,29	0,0450
640,00	222,70	27,09	0,0450
650,00	213,16	26,89	0,0450
660,00	214,71	26,69	0,0450
670,00	212,78	26,59	0,0450
680,00	211,01	26,39	0,0450
690,00	218,25	26,19	0,0450
700,00	210,33	25,99	0,0450
710,00	212,74	25,89	0,0450
720,00	215,74	25,69	0,0450
730,00	214,21	25,49	0,0450
740,00	208,33	25,29	0,0450
750,00	209,28	25,19	0,0450
760,00	209,32	24,99	0,0450
770,00	213,24	24,89	0,0450
780,00	212,47	24,69	0,0450
790,00	203,82	24,49	0,0450
800,00	213,56	24,39	0,0450
810,00	211,53	24,19	0,0450
820,00	210,33	23,99	0,0450
830,00	211,99	23,89	0,0450
840,00	209,07	23,69	0,0450
850,00	207,76	23,49	0,0450
860,00	210,53	23,39	0,0450
870,00	209,54	23,19	0,0450
880,00	211,19	22,99	0,0450

890,00	216,70	22,79	0,0450
900,00	212,50	22,59	0,0450
910,00	213,96	22,49	0,0450
920,00	215,34	22,29	0,0450
930,00	212,05	22,09	0,0450
940,00	210,45	21,99	0,0450
950,00	217,16	21,79	0,0450
960,00	216,38	21,59	0,0450
970,00	213,91	21,39	0,0450
980,00	211,18	21,29	0,0450
990,00	209,81	21,09	0,0450
1000,00	210,49	20,89	0,0450
1010,00	214,05	20,79	0,0450
1020,00	214,56	20,59	0,0450
1030,00	215,81	20,39	0,0450
1040,00	214,62	20,19	0,0450
1050,00	214,94	19,99	0,0450
1060,00	213,15	19,89	0,0450
1070,00	213,96	19,69	0,0450
1080,00	213,59	19,49	0,0450
1090,00	212,51	19,29	0,0450
1100,00	215,15	19,09	0,0450
1110,00	211,72	18,99	0,0450
1120,00	214,70	18,79	0,0450
1130,00	211,88	18,59	0,0450
1140,00	214,18	18,49	0,0450
1150,00	211,97	18,29	0,0450
1160,00	217,82	18,09	0,0450
1170,00	214,75	17,89	0,0450
1180,00	212,42	17,79	0,0450
1190,00	213,36	17,59	0,0450
1200,00	217,76	17,39	0,0450
1210,00	211,97	17,19	0,0450
1220,00	214,14	17,09	0,0450
1230,00	213,92	16,89	0,0450
1240,00	216,33	16,69	0,0450
1250,00	212,99	16,49	0,0450
1260,00	212,18	16,29	0,0450
1270,00	212,82	16,19	0,0450
1280,00	213,95	15,99	0,0450
1290,00	216,09	15,79	0,0450
1300,00	219,64	15,59	0,0450
1310,00	213,59	15,39	0,0450
1320,00	217,26	15,29	0,0450
1330,00	213,78	15,09	0,0450
1340,00	210,55	14,89	0,0450
1350,00	212,04	14,69	0,0450
1360,00	211,91	14,59	0,0450
1370,00	216,56	14,39	0,0450
1380,00	207,88	14,19	0,0450
1390,00	214,96	13,99	0,0450
1400,00	211,68	13,89	0,0450
1410,00	215,75	13,69	0,0450
1420,00	208,42	13,49	0,0450
1430,00	214,71	13,29	0,0450
1440,00	217,91	13,09	0,0450
1450,00	218,60	12,89	0,0450
1460,00	215,59	12,79	0,0450
1470,00	217,33	12,59	0,0450
1480,00	213,46	12,39	0,0450
1490,00	215,57	12,19	0,0450
1500,00	217,12	12,10	0,0450
1510,00	214,06	11,90	0,0450
1520,00	213,65	11,70	0,0450
1530,00	214,46	11,59	0,0450
1540,00	219,78	11,40	0,0450
1550,00	213,47	11,20	0,0450
1560,00	215,08	11,00	0,0450
1570,00	211,69	10,80	0,0450
1580,00	213,63	10,70	0,0450
1590,00	215,56	10,50	0,0450
1600,00	212,11	10,30	0,0450
1610,00	208,90	10,20	0,0450
1620,00	214,55	10,00	0,0450
1630,00	216,20	9,80	0,0450
1640,00	213,00	9,70	0,0450
1650,00	214,10	9,50	0,0450
1660,00	213,62	9,30	0,0450
1670,00	210,67	9,10	0,0450
1680,00	221,50	8,90	0,0450
1690,00	216,08	8,80	0,0450
1700,00	209,62	8,60	0,0450
1710,00	217,21	8,40	0,0450
1720,00	210,63	8,30	0,0450
1730,00	213,57	8,10	0,0450
1740,00	216,70	7,90	0,0450
1750,00	214,79	7,70	0,0450
1760,00	216,61	7,60	0,0450
1770,00	223,70	7,40	0,0450
1780,00	213,55	7,20	0,0450
1790,00	215,39	7,00	0,0450
1800,00	213,64	6,90	0,0450
1810,00	217,33	6,70	0,0450
1820,00	212,38	6,50	0,0450

1830,00	216,70	6,30	0,0450
1840,00	214,60	6,20	0,0450
1850,00	216,47	6,00	0,0450
1860,00	215,64	5,80	0,0450
1870,00	213,38	5,60	0,0450
1880,00	206,48	5,40	0,0450
1890,00	219,21	5,20	0,0450
1900,00	210,09	5,10	0,0450
1910,00	216,82	4,90	0,0450
1920,00	208,50	4,70	0,0450
1930,00	213,24	4,60	0,0450
1940,00	215,44	4,40	0,0450
1950,00	215,89	4,20	0,0450
1960,00	209,61	4,00	0,0450
1970,00	211,14	3,90	0,0450
1980,00	213,17	3,70	0,0450
1990,00	210,85	3,50	0,0450
2000,00	216,20	3,30	0,0450
2010,00	220,59	3,20	0,0450
2020,00	214,06	3,00	0,0450
2030,00	208,47	2,80	0,0450
2040,00	222,62	2,60	0,0450
2050,00	210,17	2,50	0,0450
2060,00	217,47	2,30	0,0450
2070,00	210,91	2,10	0,0450
2080,00	208,67	2,00	0,0450
2090,00	213,05	1,80	0,0450
2100,00	213,11	1,60	0,0450
2110,00	212,05	1,50	0,0450
2120,00	212,60	1,30	0,0450
2130,00	214,75	1,10	0,0450
2140,00	211,45	1,00	0,0450
2150,00	200,33	0,80	0,0450
2160,00	210,01	0,60	0,0450
2170,00	211,78	0,50	0,0450
2180,00	209,94	0,30	0,0450
2190,00	206,02	0,20	0,0450
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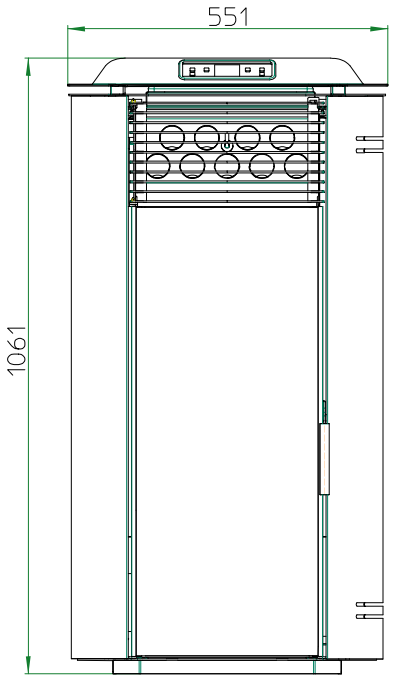
3550,00	217,89	12,79	0,0450
3560,00	219,86	12,59	0,0450
3570,00	215,83	12,49	0,0450
3580,00	217,82	12,29	0,0450
3590,00	213,60	12,10	0,0450
3600,00	211,25	11,90	0,0450

APPENDIX 5: Participants

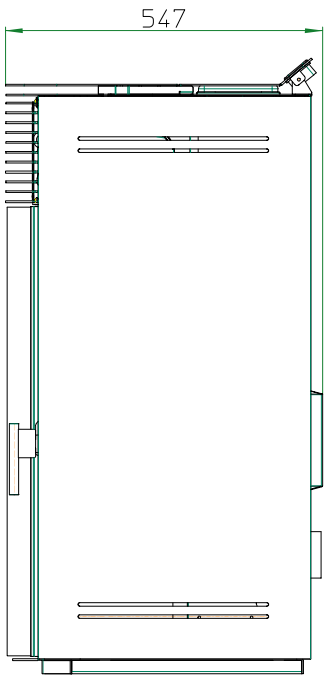
Danick Power ing.
v-p operation
Services Polytests inc.
450.741.3636
www.polytests.com

Maxime Martin
Technicien
Services Polytests inc.
450.741.3636
www.polytests.com

APPENDIX 6: Drawings and specifications



Anteriore
Scala 1:3



Da Destra
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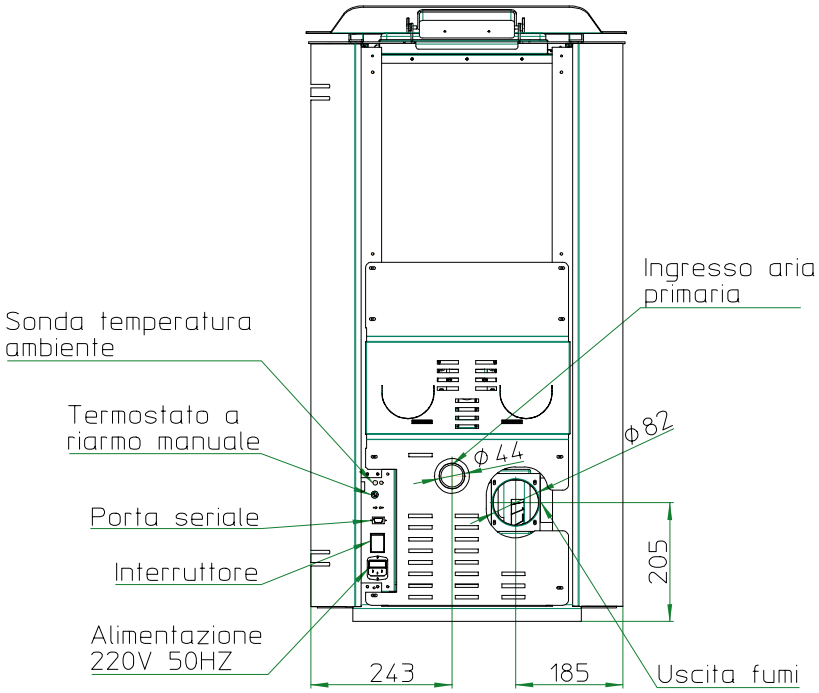

Posteriore
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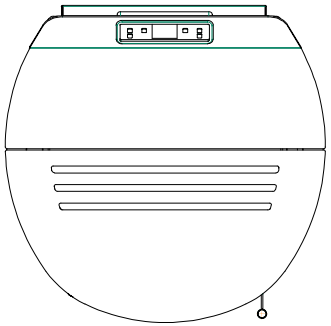

Dall'alto
Scala 1:3

Articolo	Jessica 11 Air	Quantità	Scala	Sezione Dis.
Particolare	Schema attacchi		1:3	A0

LAMINOX

Tel-0733-657622
Zona Industriale
62028 SARNANO (MC) ITALY

Dis.	Data
Ventura	30/05/2017
Disegno N° :	001

APPENDIX 7: Operator's manual

LAMINOX IDRO

c UL us LISTED

USE AND MAINTENANCE INSTRUCTIONS

PELLET STOVE

Jessica air

Veronica air

SAVE THIS INSTRUCTIONS

WARNING: Please read this entire manual before installation and use of this pellet fuel-burning room heater.
Failure to follow these instructions could result in property damage, bodily injury or even death

CAUTION: Contact local building of fire official about restrictions and installation inspection requirement in your area

Dear Customer, Thank you for choosing one of our products, which is a result of technological expertise and our continuous quest for superior products in terms of safety, reliability and performance. This manual contains all the information and helpful tips for using your product with maximum safety and efficiency.

IMPORTANT INFORMATION

This manual has been prepared by the manufacturer and is an integral and essential part of the product. In the event of sale or transfer of the product, always ensure the presence of the manual as the information it contains is addressed to the purchaser and to all those various people involved in the installation, use and maintenance of the product. Carefully read the instructions and information contained in this manual before installation, operation and maintenance of the product. The instructions contained in this instruction manual guarantee the safety of persons and property and ensure efficient operation and a longer service life. The manufacturer declines all responsibility for damage caused by failure to observe instructions regarding installation, use and maintenance listed in the instruction manual, for unauthorised modifications or non-original replacement parts. Product installation and use must be carried out in accordance with the manufacturer's instructions and in compliance with European, national and local regulations. Installation, electrical connection, functional testing, maintenance and repairs are operations that must be performed by qualified and licensed personnel who must have appropriate knowledge of the product. Product installation must not be carried out close to walls made of wood or combustible material. For proper installation, you must observe the following "Safety distances" section. Verify the exact flatness of the floor where you will install the product. When handling the steel parts of the cladding, use clean cotton gloves to avoid leaving difficult to remove fingerprints for the first cleaning. Stove installation must be performed by at least two people. Connect the stove to the mains only after proper professional connection to the chimney flue. The power cable plug must remain accessible after installation of the stove. Only operate the stove with regulation wood pellets (refer to the "FUEL" chapter). Never use liquid fuels to operate the pellet stove or to stoke the embers present. Provide adequate ventilation in the installation area throughout the year. In the presence of operation failures, fuel supply will be interrupted. Re-start the unit after removing the cause of the failure. Discontinue use of the product in the event of failure or malfunction. Do not remove the safety guard located in the pellet tank. Any accumulated unburned pellets in the burner as a result of repeated "failed ignitions must be removed prior to ignition." Pellet stove operation can cause very hot heating of the handles, the chimney flue and glass surfaces. Only touch these parts during operation when wearing protective clothing or with adequate aids. Because of the creation of heat on the glass, make sure that no persons unfamiliar with stove operation stand in the installation area. Inform children of the precautions to be observed during product operation and of possible dangers. In the event of problems or misunderstanding of the instructions manual, contact your dealer. Placing objects which cannot withstand heat on the stove or within the minimum required safety range is prohibited. Do not open the door during operation or operate the stove with its glass broken. For product terms, limitations and exclusions, please refer to the warranty included with the product. In order to pursue a policy of constant product development and renewal, the manufacturer may make changes to it as deems appropriate without notice. This document is the property of the manufacturer and cannot be disclosed in whole or in part to any third party without the written consent of the company, which reserves all rights to the rigor of the law.

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1 GENERAL STANDARDS

1.1 Fireplace or Chimney flue

Each device must have a vertical duct, called a chimney flue, for outside release of combustion fumes produced by a natural draft.
The chimney flue must meet the following requirements:

- It should not be connected to any other fireplace, stove, boiler, or hood of any kind (Fig. 1).
- It must be properly spaced from combustible or flammable materials through an air gap or suitable insulating material.
- The internal section must be uniform, preferably circular: the square or rectangular sections must have rounded corners with a radius of no less than 20 mm, maximum ratio between the sides of 1.5, walls as smooth as possible and without restrictions, curves must be regular and seamless, deviations from the axis no greater than 45° (Fig-2).
- Each device must have its own chimney flue with a section equal to or greater than the diameter of the fume exhaust pipe of the stove and a height no less than the one stated (see table 2).
- Never use two stoves, a fireplace and a stove, a stove and a wood stove, etc. in the same room since the draft of one could damage the draft of the other. In addition, collective ventilation ducts that can cause a vacuum in the installation environment are not permitted, even if installed in adjacent rooms and communicating with the installation room.
- Creating fixed or mobile apertures on the chimney flue to connect equipment other than auxiliary devices is prohibited.
- Passing other air supply channels and piping for utilities through the chimney flue, however large, is prohibited.
- The chimney flue should be equipped with a collection chamber for solid materials and any condensate, located below the mouth of the flue, so as to be easily opened and inspected from an airtight door.
- Whenever using parallel output chimneys, it is advisable to raise a bracing element. (Fig.3)

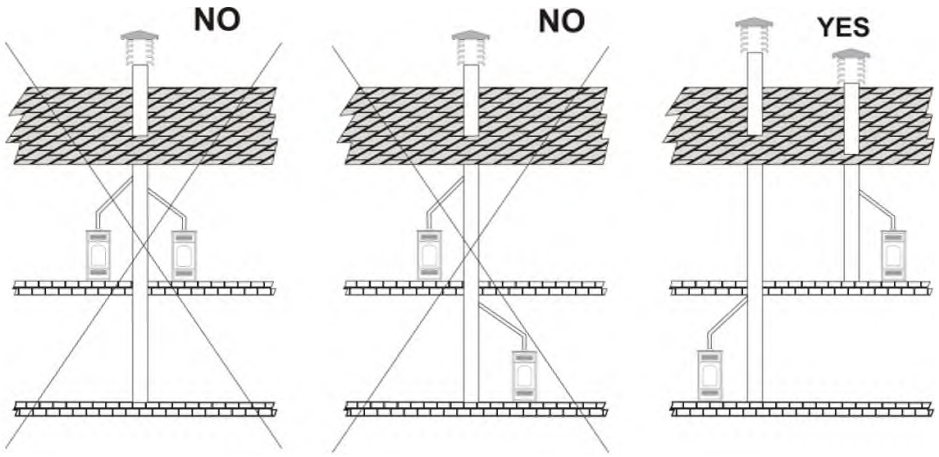


Fig 1

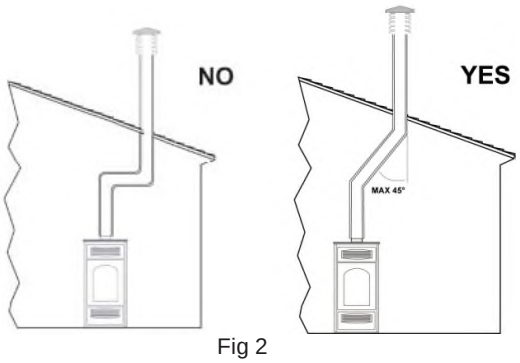


Fig 2

1.2 Chimey cap

The top of the chimney flue must be equipped with a device, called a chimey cap, which facilitates dispersion into the atmosphere of combustion products.
The chimey cap must meet the following requirements:

- Its internal section and shape must be equivalent to that of the chimney flue.
- Have a useful outlet section no less than double that of the chimney flue.
- Chimey caps that emerges from the roof or which remain in contact with the outside (for example in the case of an open loft), must be covered with brick elements and well isolated. It must be constructed so as to prevent penetration into the flue of rain, snow, or foreign bodies and so that, in the event of winds in any direction and at any angle, it assures the discharge of combustion products (windproof chimey cap).
- The chimey cap must be positioned so as to guarantee an adequate dispersion and dilution of combustion products and, in any case, outside the zone of reflux. This zone can be different sizes and shapes depending on the angle of slope of the roof, so it is necessary to adopt the minimum heights shown in Fig.4 and Fig.5.
- The chimey cap must be of windproof and exceed the height of the ridge, Fig.4 and Fig.5.
- Any buildings or other obstacles that exceed the height of the chimey cap must not be close to the chimey cap itself (Fig.4).

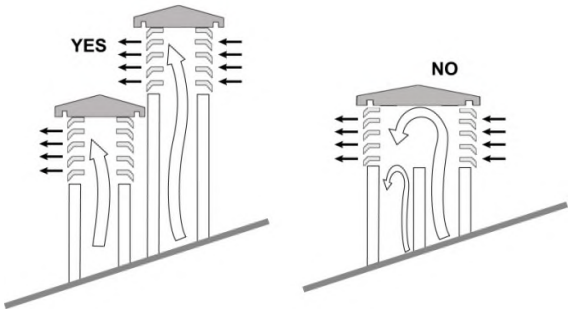


Fig.3

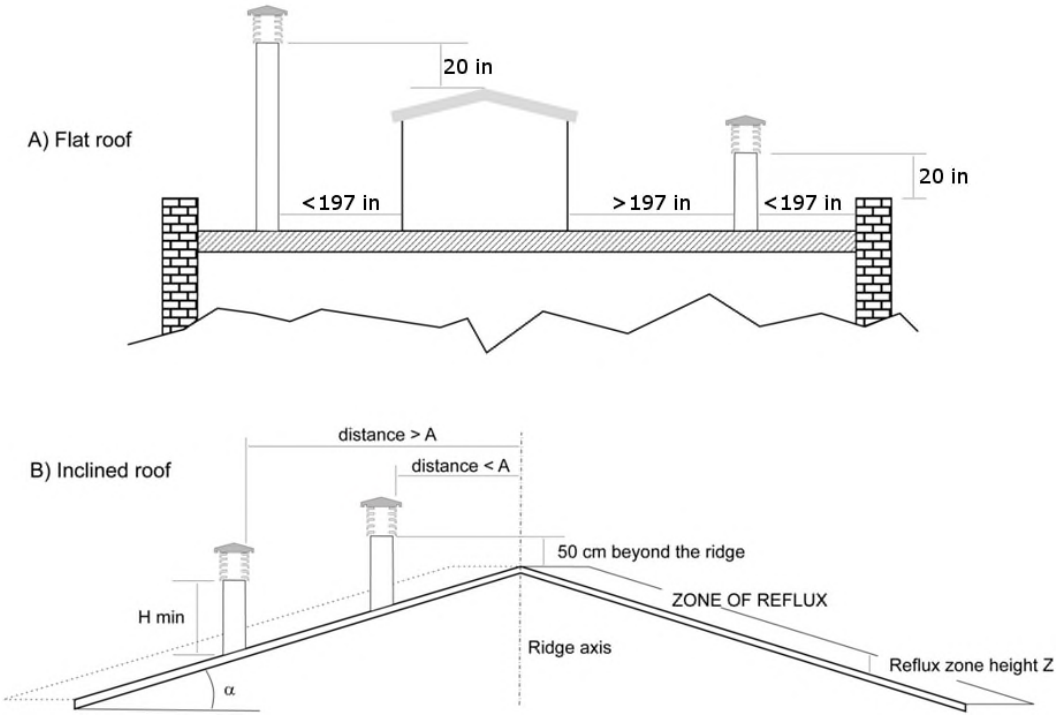


Fig.4

Roof pitch ? [°]	Horizontal width of the zone of reflux from the axis of the ridge A	Minimum height of the outlet from the roof	Height of the reflux zone Z
15	6 feet (1.85m)	3 feet (1.00m)	1 feet (0.50m)
30	5 feet (1.50m)	4 feet (1.30m)	2 feet (0.80m)
45	4 feet (1.30m)	6 feet (2.00m)	5 feet (1.50m)
60	4 feet (1.20m)	8 feet (2.60m)	7 feet (2.10m)

Table 2

1.3 External air intake vent

- The stove must have the air necessary to ensure smooth combustion operation and good environmental well-being.
- Make sure that the room where the stove is installed offers sufficient ventilation and install an air supply duct from the outside with the recommended minimum section of 15 in².
- The air intake vent must communicate directly with the installation room of the stove, positioned so as to prevent it from being blocked and protected with a permanent non-lockable grid or other suitable protection provided that it does not reduce the minimum section.
- Air flow can also be obtained from a room adjacent to the installation room, provided that this flow can be carried out freely through permanent, non-closable openings communicating with the outside.
- With respect to the installation room, the adjacent room should not be put under vacuum with respect to the external environment as a result of a reverse draft caused by the presence in this space of another utility device or suction device. The room adjacent to the permanent openings must meet the requirements set out in the paragraphs above. The adjacent room cannot be used as a garage, for storage of combustible material or for activities involving a risk of fire.

1.4 Connection to the chimney flue

(see paragraph 4.5)

1.5 Preventing house fires

Installation and use of the stove must be in accordance with the manufacturer's instructions and with local habitability regulations.
CAUTION: when a fume exhaust pipe passes through a wall or ceiling, particular installation methods must be applied (protection, thermal insulation, distances from heat sensitive materials, etc.).

- The fireplace connecting tube must never pass through a combustible surface.
- Do not connect this unit to a chimney flue already being used by another device.
- It is also advisable to maintain all combustible elements or flammable material such as beams, wooden furniture, curtains, flammable liquids, etc. outside the radiation area of the furnace and at a distance of at least 1 m from the heating block. .
- In the event that the surrounding space has coverings in combustible or heat-sensitive material, a protective membrane made of non-combustible insulating material must be interposed. If the flooring is made of combustible material, a non-combustible protective material must be provided at the mouth of the furnace.
- For further information, refer to local requirements.

2 SPECIFICATIONS AND TECHNICAL DATA

2.1 Specifications

Stoves and pellet stoves are devices built to work with good quality wood pellets only (see par. 3 fuel). Hydro models **must** be connected to the plumbing system.

2.2 Compliance status

The heaters described in this manual meet the 2020 U.S. Environmental Protection Agency's wood pellet emission limit for wood heaters sold after may 15th 2015.

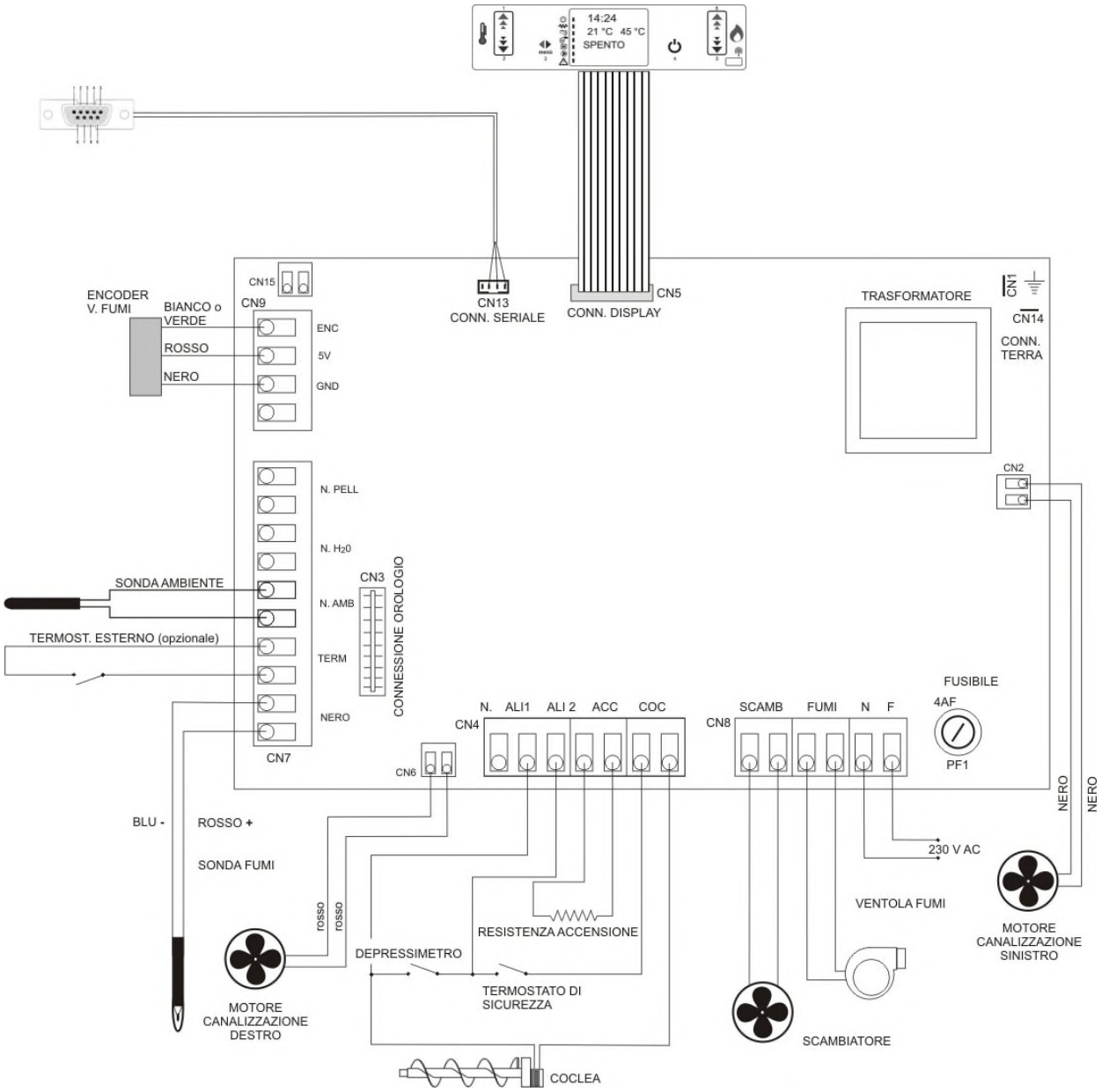
	Emission Rate (g/hr)	**Heating Efficiency (% Overall)**	**1st hour Emission Rate (g/hr)**	**CO emission (gr/h)**
Jessica 11 air	1,62	72,8	3,1	16,8
Veronica 11 air	1,62	72,8	3,1	16,8

2.3 Technical data (see attached sheet)

2.4 Product identification data (see attached sheet)

The technical label shows device data and performance. Tampering with, removing or lack of a technical label makes installation and maintenance operations difficult, due to the lack of product identification. In the event of damage, request a duplicate from our service centre. Given the importance of the data label, we recommend installing the stove at a distance at which it is always visible.

2.5 Wiring diagrams



3 FUEL

3.1 General notes

The pellet stove is designed to burn wood pellets only.
Wood pellets are a fuel obtained from the pressing of sawdust timber, extracted from the processing and transformation residues of dried wood material. The compactness of the product over time is guaranteed by a natural origin substance contained in the wood: lignin. The typical small cylinder form is obtained by extrusion.
Various types of pellets with quality and characteristics that vary depending on the processing and type of wood species used are available on the market.

CAUTION: Always use certified quality wood pellets: i.e. DIN, DIN PLUS, ÖM 7135, Pellet Gold, Catas etc. The company does not guarantee proper stove functioning with the use of low quality pellets.
Stoves and heating stoves are tested and programmed to ensure good performance and perfect quality operation with specific characteristic pellets:

components:	wood
length:	< 30 mm
diameter:	6-6.5 mm
lower calorific value:	≥ 4.8 kWh/kg (≥ 7500 BTU/lb)
humidity rate:	< 8 %
residual ash:	< 0.5 %

GOOD QUALITY pellets are smooth, shiny, slightly dusty and with regular length.
LOW QUALITY pellets are of varied lengths, dusty with vertical and horizontal splits.

Since pellet characteristics and quality greatly influence the autonomy, efficiency and proper operation of the stove, we recommend:

AVOID using pellets with dimensions different from that described by the manufacturer.
AVOID using low quality pellets or pellets containing dispersed sawdust powder, resins or chemicals, additives or adhesives.
AVOID using moist pellets.

The use of unsuitable pellets causes:
- clogging of the brazier and fume discharge ducts
- increased consumption of fuel
- decreased efficiency
- no guarantee of normal stove operation
- dirtying of glass
- production of unburned granules and heavy ash

The presence of moisture in pellets increases the volume of the capsules and crumbles, causing
- feeding system malfunctions
- poor combustion

Pellets should be stored in a dry and sheltered place. Particular attention should be given to the handling of the bags to prevent their crushing, resulting in the formation of sawdust.
Stove operation parameters may have to be altered when using quality pellets with dimensional and calorific characteristics different from those indicated. Contact an authorised service centre if necessary.
THE USE OF POOR QUALITY PELLETS NOT IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS NOT ONLY DAMAGE THE STOVE AND COMPROMISE PERFORMANCE BUT MAY RESULT IN FORFEITURE OF THE WARRANTY AND COMPANY LIABILITY.

4 INSTALLATION

4.1 General notes

WARNING: DO NOT INSTALL IN SLEEPING ROOM

CAUTION: THE STRUCTURAL INTEGRITY OF THE MANUFACTURED HOME FLOOR, WALL, AND CEILING/ROOF MUST BE MAINTAINDED

The stove requires a UL listed pellet vent. So the venting system shall be approved for pellet stoves by a certified testing Laboratory

4.1.1 Installation in the presence of several appliances.

The presence of several appliances powered with different fuels, as well as hoods with or without extractor, must be evaluated during preventive checks and during the start up test in order to detect any variation compared to the design conditions or any aspect that cannot be detected during the design phase. The room must be well-ventilated according to the instructions of every single device. The external air intake vent must meet the requirements of paragraphs 1.3 and 4.4

The stove must not be used simultaneously with other generators that collect air from the environment even if installed in adjoining or communicating rooms

4.1.2 Suitability of the installation rooms

- Installing the device inside garage, store for combustible materials or rooms at risk of fire is prohibited.
- If the flooring is made of wood, provide a floor protection surface in compliance with current national standards
- Outdoor installation is prohibited, as well as exposure to atmospheric agents or humid areas.
- Locating the stove in a room with an explosive athmosphere is prohibited

4.1.3 Fume discharge system

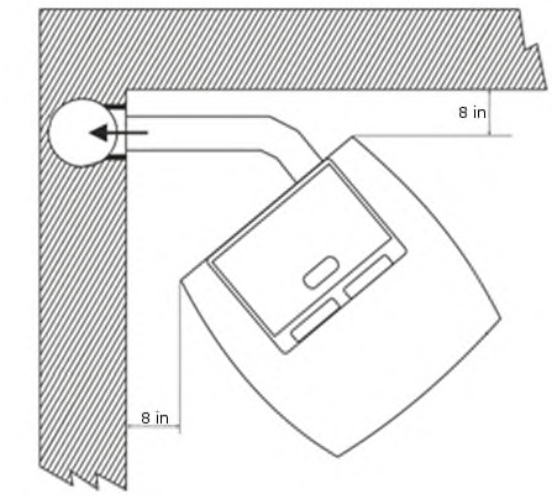
Every device must be connected to a fume discharge system, which ensures dispersion of combustion products into the atmosphere.
The combustion products must be discharged from the roofs. Direct wall discharge or towards closed spaces, even in open air, is prohibited.
The components must be made of material with A1 fire reaction class. In particular, the use of metal extendible and flexible hoses is prohibited.

CAUTION: ensure that the plug for electrical connection remains accessible after the stove installation.

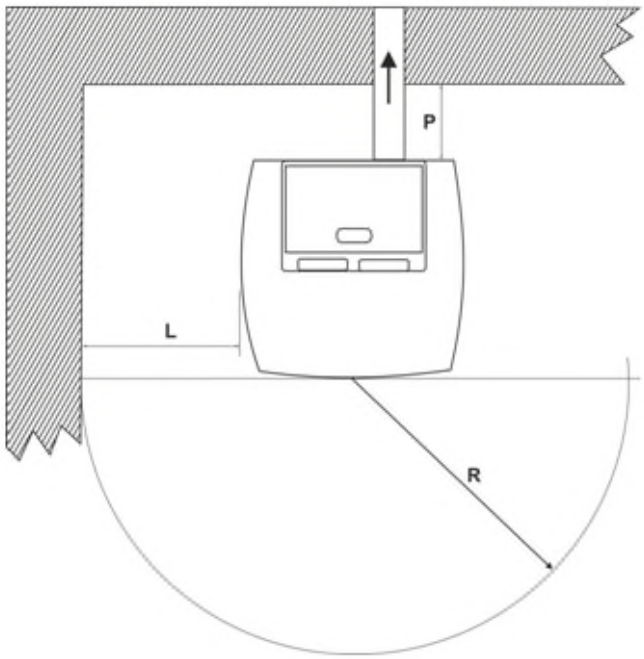
4.2 Minimum safety distances

The following figures show the minimum safety distances, which must always be guaranteed.

4.2.1 Corner installation



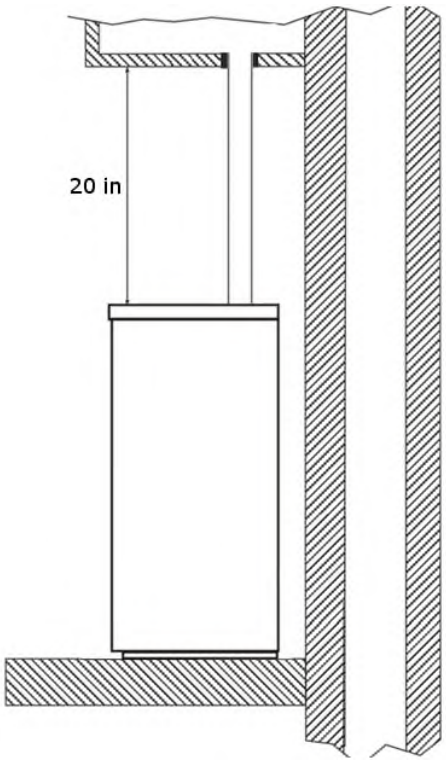
4.2.2 Wall installation



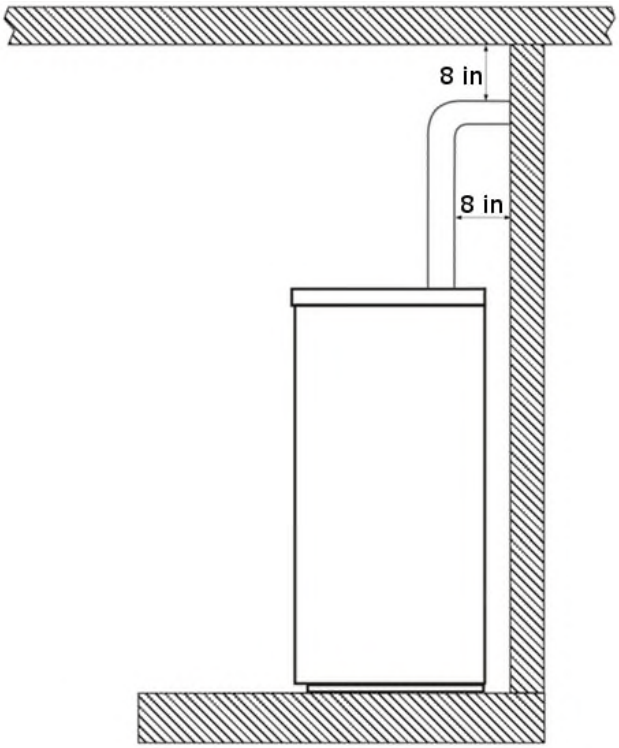
Safety distances from flammable material:

Minimum distance in air from the flammable rear wall	**P**= 8 in
Minimum distance in air from the flammable side wall	**L**= 8 in
Frontal distance from flammable material	**R** = 40 in

4.2.3 Distance from flammable ceilings and false ceilings



4.2.4 Distance of fume exhaust system from flammable walls



4.3 Flooring protection

In the event of valuable flooring or flooring that is sensitive to heat, moisture or is flammable, a floor protection must be used (i.e. sheet steel, marble or tile slabs).

Whichever type of protection selected, it must protrude at least 300 mm from the front, at least 150 mm from the sides of the stove, must withstand the weight of the stove and have a thickness of at least 2 mm (Fig. 5 and 6).

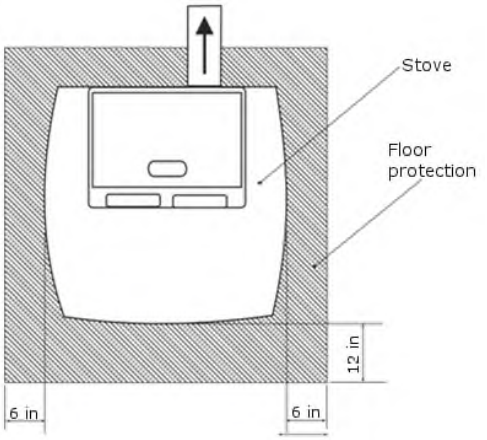


Fig. 5

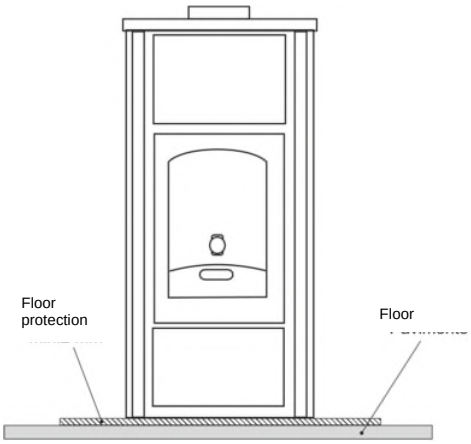


Fig. 6

4.4 Minimum distances for positioning air intake vents

Pellet stove combustion air intake vents cannot be connected to an air distribution system or directly to a wall-mounted air intake vent.

Correct and safe positioning of the air intake vent must comply with the measures and requirements described in paragraph 1.3.

There are distances to be respected in order to avoid that combustion air be removed by another source; for example, a window opening can suck the air outside, making it miss the stove.

The air intake vent must be located at least:		
5 feet (1.5 m)	**Under**	**Doors, windows, fume exhaust outlets, air gaps, etc.**
5 feet (1.5 m)	**Horizontally away**	
1 feet (0.3 m)	**Over**	
5 feet (1.5 m)	**Away from**	**Fume output**

4.5 Vent exhaust duct

4.5.1 General notes

The stove requires a UL listed pellet vent, so the venting system shall be approved for pellet stoves by a certified testing Laboratory

DO NOT INSTALL A FLUE DAMPER IN THE EXHAUST VENTING SYSTEM OF THIS UNIT

DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE

INSTALL VENT AT CLEAREANCES SPECIFIED BY THE VENT MANUFACTURER

CAUTION: the pellet stove is not like other stoves. Fume draft is forced thanks to a fan that maintains the pressure in the combustion chamber and slight pressure around the exhaust duct. Therefore, you must verify that the latter is completely watertight and properly installed, both from the point of view of function and safety.

Draft us the force which moves air from the appliance un throught 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 temperature in the appliance and may damage the appliance.
Inadequate draft may cause back puffing into the room ad ‘plugging’ of the chimney

Construction of the exhaust duct must be done by specialised personnel or companies, as reported in the following manual. Always create the exhaust system so that periodic cleaning is assured without having to dismantle any parts.
Tubes must **ALWAYS** be sealed with silicone (**no cementing**) that maintains resistance and elasticity characteristics at high temperature (480°F)

4.5.2 Tubes and maximum usable lengths

Painted aluminised steel tubes, stainless steel tubes (Aisi 316) or porcelain tubes can be used. Flexible hoses are permitted if they fall within the limits prescribed by law (in stainless steel with smooth inner wall).

TYPE OF SYSTEM	WITH DOUBLE-WALL TUBE
Minimum length	6 feet (2 m)
Maximum length (with 3 90° curves)	26 feet (8 m)
Maximum number of curves	4
Horizontal sections with min. 5% incline	6 feet (2m)

NOTE: load losses of a 90° curve can be equated with those of 1 metre of tube; the serviceable T- connection is to be considered as a 90° curve.

4.5.3 Holes for exhaust tube passage on walls or roof

Once the location of the stove has been decided (section 4.1), you will have to drill the hole for passage of the fume exhaust tube. This varies depending on the type of installation (therefore on the exhaust tube diameter, see 4.5.2) and on the type of wall or roof to be crossed (table 3).
The insulator must be of mineral origin (rock wool, ceramic fibre) with a nominal density greater than 80 kg/m3.

	Insulation thickness	Diameter of holes to be created [mm]
Wooden wall, or wall which is flammable or has flammable parts	4 in	12 in
Concrete wall or roof	2 in	9in
Brick wall or roof	1,5 in	7 in

4.5.4 Using a traditional type chimney flue

If you wish to use an already existing chimney flue, it is advisable to have it checked by a professional chimney sweep to ensure that it is watertight. This is because fumes, being slightly pressurised, could infiltrate cracks in the chimney flue and invade living spaces. If an inspection finds that the chimney flue is not perfectly intact, it is advisable to intubate it with new material. If the existing chimney is large, we recommend inserting a tube with a maximum diameter of 6 in

It is also advisable to insulate the vent exhaust duct. Figs. 7 and 8 demonstrate the solutions to adopt if you want to use an existing chimney flue.

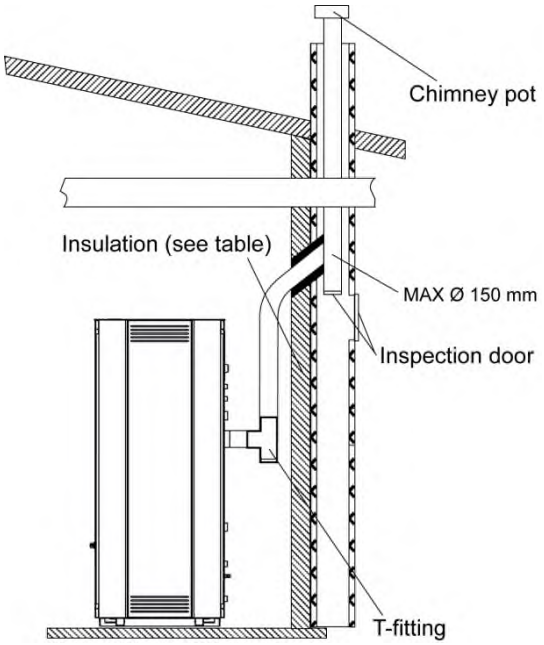

Chimney pot
Insulation (see table)
MAX Ø 150 mm
Inspection door
T-fitting

Fig. 7

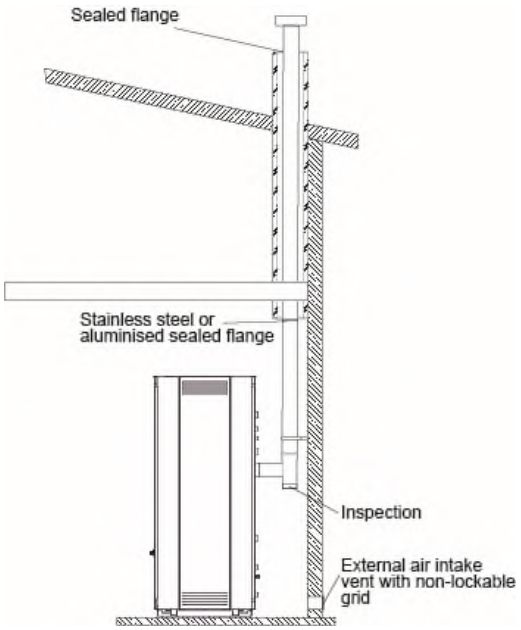

Sealed flange
Stainless steel or
aluminised sealed flange
Inspection
External air intake
vent with non-lockable
grid

Fig. 8

4.6 Using an external fume duct

An external fume duct can be used only if it meets the following requirements:

- Only insulated tubes (double wall) in stainless steel, secured to the building (Fig.9) should be used.
- An inspection area should be created at the base of the duct for performing periodic checks and maintenance.
- It should be equipped with a windproof chimey cap and observe the distance "d" from the ridge of the building as described in par. 1.2.
- Fig. 9 shows the solution to be utilised when using external fume ducts.

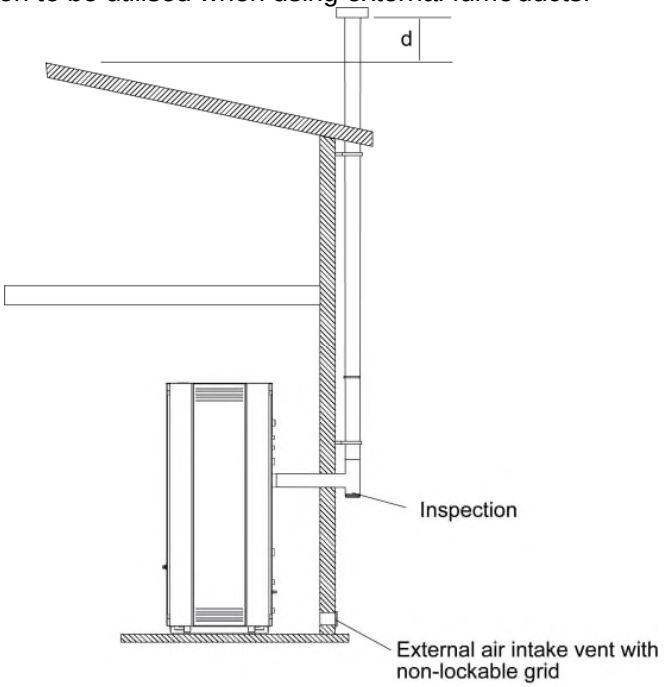


Fig. 9

5 ASSEMBLY

5.1 General notes

Here are some general recommendations to follow in order to prevent accidents or damage to the product:
- Unpacking and installation must be performed by at least two people.
- **All handling operations must be carried out using appropriate means and in full compliance with safety regulations.**
- The positioning of the packed product must be maintained in accordance with the guidelines supplied by pictograms and written on the packaging.
- If using ropes, straps, chains, etc., make sure they are suitable for the weight to be unloaded and are in good condition.
- When moving the package, move with slow and continuous movements to avoid tearing the ropes, chains, etc.
- Do not tilt excessively in order to avoid overturning.
- Do not stand within range of the loading/unloading means (forklifts, cranes, etc.).

5.2 Unpacking

Unpack the product being careful not to damage or scratch it. Remove the accessory package and any pieces of polystyrene or cardboard used to block removable parts, etc. from the stove furnace. Also remember not to leave packaging components (plastic bags, polystyrene, etc.) within the reach of children, as they could be potential sources of danger. Dispose of them according to regulations.

5.3 Electrical connection

The stove is supplied with a power cable that must be plugged into a 120V 60Hz outlet.
Absorbed power is indicated in the "SPECIFICATIONS AND TECHNICAL DATA" chapter of this manual.
By law, the system must be properly grounded and with a differential circuit-breaker.
Make sure that the electrical power cable does not come into contact with hot parts when set in its final position.

CAUTION: ensure that the plug for electrical connection remains accessible after stove installation.

5.4 External thermostat installation

Stove operation can be adjusted to any external room thermostat connected to the circuit board (see electrical diagram).
This operation should be performed by qualified personnel.
The external thermostat works in parallel to the internal thermostat of the stove. To work the external thermostat exclusively, set room temperature to minimum (44° F). At this point, stove modulation will be controlled by the external thermostat.
During the working phase, if the room temperature is lower than the set temperature and the external thermostat is active (closed contact), the stove will operate at the set power level. When the room temperature reaches the set temperature, (external thermostat contact open), the stove will go to minimum power and the display will show the message "MODULATE". This modulation has been completed only if the room temperature returns to being lower than the set temperature in the external thermostat.

6 USE

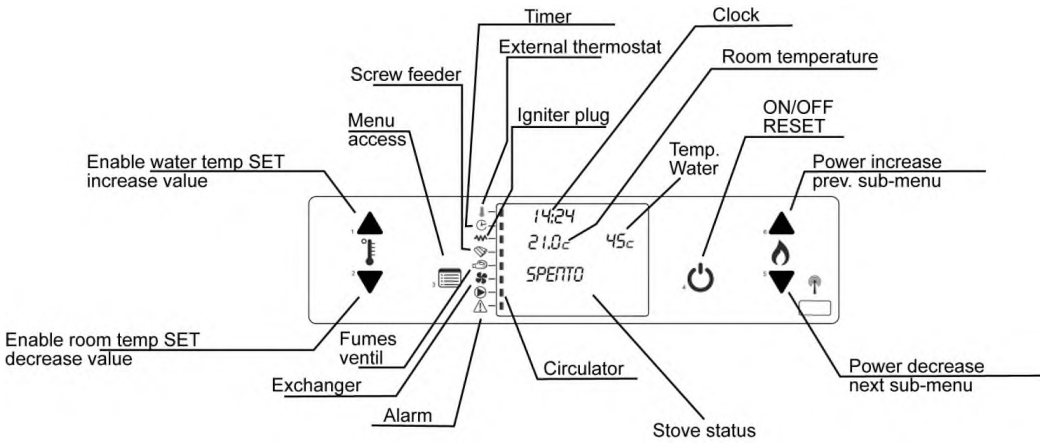
- All local regulations, must be observed when installing the unit.
- Improper installation or use of the device can result in forfeiture of the warranty.
- Do not use the unit as an incinerator or in any other way other than that for which it was designed. No other fuel besides wood pellets must be used.
- Do not use liquid fuels.
- The device, especially the external surfaces, gets very hot to the touch when in use. Handle with care to avoid burns.
- Do not make any unauthorised modifications to the device.
- Only use original replacement parts recommended by the manufacturer.
- This wood heater has a manufacturer-set minimum low burn rate that must not be altered. It is against federal regulation to alter this setting or otherwise operate this wood heater in a manner inconsistent with operating instruction in this manual
- Flues gases contain carbon monoxide (CO), it is reccomended to install smoke monitors and CO monitors for areas that are expected to generated CO. Inspect the the chimney to minimize visible emissions.
- - Soot and Flyash: Formation and Need for Removal—The products of combustion will contain small particles of flyash. The flyash will collect in the exhaust venting system and restrict the flow of the flue gases. Incomplete combustion, such as occurs during startup, shutdown, or incorrect operation of the room heater will lead to some soot formation which will collect in the exhaust venting system. The exhaust venting system should be inspected at least once every year to determine if cleaning is necessary.

In general

- Make sure that the room where the stove is to be installed offers sufficient ventilation (see section "1.3 External air intake vent").
- Make sure that all exhaust system joints are hermetically sealed with silicone (no cementing), are resistant to heat (480 ° F) and are not damaged.
- Periodically check (or have someone check) the cleanliness of exhaust fumes.
- **CAUTION: keep all flammable products well away from the stove when it operating (MINIMUM: 100 cm from the front wall).**
- **CAUTION: to prevent the escape of fumes, the combustion chamber must be kept closed except during cleaning operations, to be carried out with the stove off.**
- **CAUTION: removing the safety guard inside the tank is strictly prohibited.**
- **CAUTION: in the event of pellet supply while the stove is on, make sure that pellets are not finished and that the flame remains present in the brazier. Also avoid the fuel sack from coming into contact with hot surfaces.**
- **CAUTION: remove any residue of unburned pellets caused by failed ignitions before you start the stove again.**
- **CAUTION: if during the ignition phase, the stove does not start and you notice a lot of smoke in the combustion chamber, immediately turn off the stove and replace pellets in use, as these may be too high in moisture. Forcing ignition could make your stove a hazard.**
- **CAUTION: if during cleaning, you find traces of spongy or hard (though not ash) pellets, replace the pellets being used as this residue may come from scraps of low quality sawdust not usable in this type of stove. Forcing ignition can cause a fire or strong production of fumes in the chimney.**
- **CAUTION: monitor proper combustion of the pellets in the brazier. If you should detect accumulations of unburned pellets, IMMEDIATELY TURN OFF the stove and contact the service centre.**
- **CAUTION: exercise extreme caution in the presence of children, to prevent them from standing in front of the stove.**

6.1 Console description

The console displays information about stove operating status. Access the menu to view various types of displays and adjust the settings available depending on the level of access.
Depending on the operating mode, the displays may have different meanings based on their position on the display.



Below is a list of meanings of LEDs found on control panels:

	Room thermostat LED	The LED is on when it is connected to an external room thermostat and it is closed.
	Chrono LED	The LED switches on when the programmable thermostat is activated; meaning, if user parameter 03-01-01 enables chrono, it is different from off.
	Glow plug LED	The LED switches on when the glow plug is powered.
	Feed screw on LED	The LED switches on in the time intervals in which the pellet feed screw is in operation.
	Smoke fan LED	The LED switches on when the smoke fan is on.
	Exchanger LED	The LED switches on when the fan is in operation (air version)
	Pump on LED	The LED switches on when the pump/circulator is in operation (only with Hydro and boiler models)
	Alarms LED	The LED switches on when there is an alarm activated on the stove.

6.1.1 Funzioni dei tasti del display

	BUTTON 4 ON/OFF	• Manual on/off of the stove • Exit from a sub-menu • Exit from a shutdown or alarm (and passage to off status)
	BUTTON 5 POWER REDUCTION	• Reduction in set power value • Passage from a sub-menu to the previous one
	BUTTON 6 POWER INCREASE	• Increase in set power value • Passage from a sub-menu to the next one
	BUTTON 3 MENU SELECTION	• Passage to sub-menus • Passage from programmable thermostat and clock programming • Passage to technical parameters programming
	BUTTON 1 PARAMETER ADJUSTMENT (INCREASE)	• In temperature setting mode, increases the set value. • In technical parameter setting mode, increases the set value.
	BUTTON 2 PARAMETER ADJUSTMENT (DECREASE)	• Passage to room temperature setting mode. • In temperature setting mode, reduces the set value. • In technical parameter setting mode, reduces the set value. • In work mode, activates room temperature setting.

6.2 First ignition

Before igniting the stove, you MUST have a qualified technician perform "FIRST START-UP" and calibration. For this purpose, we advise you to contact personnel part of our network of authorised service centres.

The company assumes no responsibility for malfunctions due to improper installation, failure to install, incorrect first ignition, or improper use.

Make sure that electrical connections have been performed properly.

Before lighting the stove, also check that the brazier is pushed back towards the rear wall of the combustion chamber.

The first few times you light the stove, it may give off odours due to the evaporation of paint or grease. Simply ventilate the room to make the odour go away, avoiding prolonged exposure as vapours can be harmful to people or animals. Do not allow children to stay in the room during this first phase.

When the tank is loaded for the first time, the feed screw must fill up for a given period. During this time, pellets will not be distributed within the combustion chamber. To overcome this difficulty, use the command "initial load" in menu 7 of the control panel (*see further details to follow*).

6.3 Ignition and normal operation

Before igniting the stove:

- **Check that the furnace door is locked.**
- Make sure that the pellet tank is full or contains such enough so that the stove will function for the desired amount of time.
- **Make sure that the brazier is clean**, free of ashes, combustion residue or unburned pellets (if necessary, remove the brazier and thoroughly clean it, then replace it with care in its housing).
- In the event or start-up with the programmable thermostat, make sure that the brazier is in the indicated conditions after last use.

When the stove is connected to the electrical system but not in work mode, the display will show the message "OFF".

6.3.1 Stove start-up

To start up the stove, hold and press the start button (4) for 2 seconds

If you start the stove during the final cleaning phase, the display may show the message "WAIT COOLING." In this case, wait for a minute before retrying ignition.

First phase. Preparation

The message "START" will appear on the display. In this phase, which lasts for about one minute, the pellet glow plug activates and combustion chamber forced ventilation starts along with activation of the fume extraction fan.

Second phase. Ignition

After the preparation phase, the display will show the message "LOAD PELLETS" and ignition will begin. This second phase is divided in two parts: pre-loading and actual ignition. First, the pellet feed screw is activated (the Feed screw ON LED lights up) for a variable time interval, depending on the model, and pellets begin to fall inside the brazier. **(Remember that the brazier must be perfectly clean at this beginning of this stage).** Once this "pre-loading" phase is completed, the pellet feed screw will stop for a variable amount of time depending on the model (from two to three minutes). After this waiting phase, the pellet feed screw will start to switch on at regular intervals and pellets will then continue falling inside the stove brazier, while the glow plug and then fume exhaust fan will both remain activated.
As soon as the pellets cover the glow plug hole, you will notice first a reddening and then the onset of a small flame in the brazier.
If pellets continue to fill the brazier without this happening, manually stop the ignition process without waiting for the stove to set off an alarm: "AL 5 NO START".
This second phase is completed when the stove detects successful triggering of the combustion process, or rather after 4-5 minutes from the triggering of the first flame.
If combustion is not detected within a given amount of time, the no start-up alarm will be activated ("AL 5 NO START" message).

Third phase. Stabilisation

Once combustion triggering has been detected, the third phase will start and the display will show the message "FIRE PRESENT". Pellet feeding is reduced and ventilation increased in order to allow a stabilisation of the flame and disposal of excess pellets accumulated in the brazier during the ignition phase. This phase lasts about 5 minutes.

Once the stabilisation phase has been completed ("FIRE PRESENT"), the stove passes to the normal working phase.

6.3.2 No start-up

As said, if the onset of combustion is not detected, the no start-up alarm will be set off. The display will show the message "AL 5 NO START" and an acoustic signal will be heard at regular intervals (if the buzzer function is active in Menu 6).

To disable the alarm, hold and press the ON-OFF (4) (about 2 seconds) . The acoustic alarm will stop and the stove will return to "FINAL CLEANING" status and then to "OFF."

Before starting another ignition cycle Verify the cause of the alarm. In particular:

- **Verify that the pellet tank is not empty.**
- **Verify that the brazier is in the right position.**
- **Remove the unburned pellets from the brazier (VERY IMPORTANT).**

CAUTION: An excessive quantity of pellets in the brazier, a humid pellet or dirty brazier make the ignition stage difficult. If these critical conditions ar present a dense white smoke capable of causing an explosion in the combustion chamber may form. The explosion can be of such intensity as to break the glass of the dire door. Therefore pay attention to never stay in front of the boiler during ignition stage if the fuel releases a dense smoke.

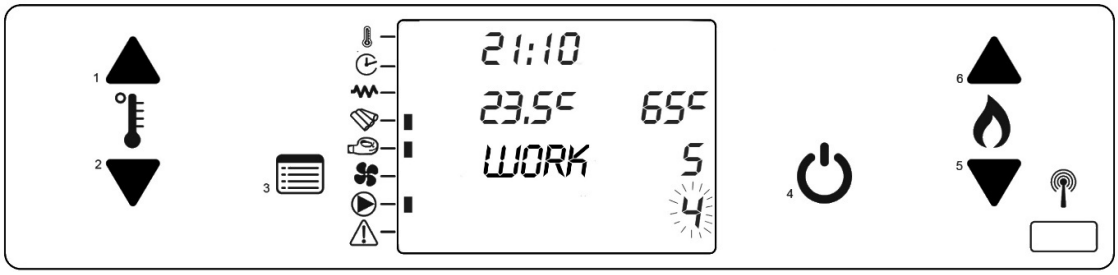
The boiler is however equipped with all safety systems required to minimise this risk.

<u>If the device does not ignite regularly, the main cause may be insufficient maintenance or poor pellet quality</u>**.**

6.3.3 Normal Operation

As soon as the ignition phase is over, the stove will go into normal working mode. During this phase, the display will show the following information:

- The first line shows the time.
- The second line to the left shows the room temperature while the line on the right shows set power (from P1 to P5).
- The third line shows the message "WORKING".
- The fourth line shows the message "MODULATE" when room temperature reaches the set temperature (see corresponding paragraph).



During normal working mode, the following operations can be performed:

- Stove power setting, choosing from one of the five available levels. Power setting is carried out via BUTTONS "5" and "6".
- Programmable thermostat parameter setting (see later section).
- Desired room temperature setting, choosing an interval from 7°C to 40°C. Set the temperature with button "1" to increase and "2" to decrease.

Periodic brazier cleaning is also active during working mode. Brazier cleaning mode is activated at regular intervals of about one hour. In this way, the smoke extractor works at maximum power while pellet feeding is reduced to minimum. This operation is necessary for eliminating ash deposits inside the brazier and for ensuring proper aeration and combustion. During brazier cleaning, the display will show the message "BRAZIER CLEANING".

If you notice excessive accumulation of pellets in the brazier during normal operation, turn off the stove immediately and contact a service centre. Forcing could make your stove a hazard.

6.3.4 Modulation based on room temperature

The stove is equipped with an internal temperature sensor that allows it to modulate its power according to the desired room temperature.
For correct environment sensor operation, verify that the thermostat sensor positioned in the rear of the stove under the outlet is away from the fume exhaust pipe and is not in contact with objects or walls.
Press button "2" to set room temperature. The message " SET ROOM TEMP" will appear on the bottom of the display, while the upper part will show the set temperature.
To modify this value, use buttons "1" and "2" until you reach desired temperature (44°C to 104°C).
If the room temperature reaches the set temperature, the stove goes into minimum power and the last line of the display shows "MODULATE." This modulation has been completed only if the room temperature returns to being lower than the set temperature. In this case, the stove will return to the power set by the user and the display will show the message "MODULATE" and standard working indications will return.

6.3.5 Ventilation

Air models provide ventilation which diffuses the heat generated from by the stove into the surrounding environment. Activation of the ventilation occurs based on the temperature of fumes. Therefore, it starts up after ignition and switches off with a delay compared to stove shutdown. Ventilation speed is proportional to operating power and cannot be modified independently with respect to stove power.

In channelled air models, the stove has two rear hot air outputs, one on the right and the other on the left, under the pellet tank. Each of the two outputs has an independent control menu (see chapter 7 menu).

6.3.6 Brazier cleaning

During normal operation in work mode, "BRAZIER CLEANING" is activated at set intervals for a duration of about 45 seconds. During this time, the display will show the message "BRAZIER CLEANING", stove ventilation increases and the flame lowers in the brazier. This operation is necessary to decrease the likelihood of ash accumulation of ash inside the brazier.
If you notice an excessive accumulation of pellets in the brazier (over half the level of the brazier itself), immediately switch off the stove and clean the brazier. Promptly contact a service centre.

6.3.7 Shutdown

To turn off the stove, hold button 4 for a few seconds .
Once the shutdown signal has been received, the display will show a "FINAL CLEANING" message and the fume exhaust fan will continues to run at full speed for a minimum time of about 10 minutes to ensure complete cooling of the stove. The hot air fan will also continue to run until the stove cools down.

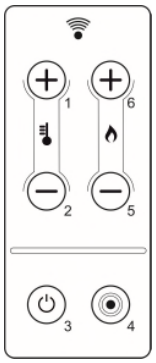
CAUTION: Never disconnect the power supply at this stage, as this may create problems for the stove and compromise the subsequent phases of ignition.

6.3.8 Interruption of power supply

In the event of a brief interruption in the power supply (under 10 seconds), the stove will automatically re-start without any alarms.
If power is lost for a longer time and the stove was in work mode, a "AL 1 - BLACK OUT" alarm will be generated. The stove will therefore not start back up automatically, but first the alarm will need to be manually removed.

6.3.9 Remote control.

The stove control panel has been designed to receive all the functions via remote control. *(Insert a CR 2025 3V battery)*



BUTTON 1	• In temperature setting mode, increases the set value. • In technical parameter setting mode, increases the set value.
BUTTON 2	• Passage to room temperature setting mode. • In temperature setting mode, reduces the set value. • In technical parameter setting mode, reduces the set value. • In work mode, activates room temperature setting.
BUTTON 3	• Passage to sub-menus • Passage from programmable thermostat and clock programming • Passage to technical parameters programming
BUTTON 4	• Manual on/off of the stove • Exit from a sub-menu • Exit from a shutdown or alarm (and passage to off status)
BUTTON 5	• Reduction in set power value • Passage from a sub-menu to the previous one
BUTTON 6	• Increase in set power value • Passage from a sub-menu to the next one

7 MENU

Press button "3" (MENU) to access the menu.
The menu is divided into different items and levels that allow you to access board settings and programming. Menu items that allow you to access technical programming are protected by an access key.

User menu

The following table briefly describes the structure of the menu, focusing only on selections available to the user in this section.
To operate from the menu, follow the guidelines below:

- Use button"3" to enter into the selected menu or sub-menu (you go down a level).
- Use button "4" to do the reverse and exit the menu or sub-menu in which you are located (you go up a level).
- Use buttons "1" and "2" to modify a parameter value (temperature, time, etc.).
- Use buttons "5" and "6" to move horizontally between different menus or sub-menus or parameters.

7.1 Menu 01 "FANS ADJUSTMENT"

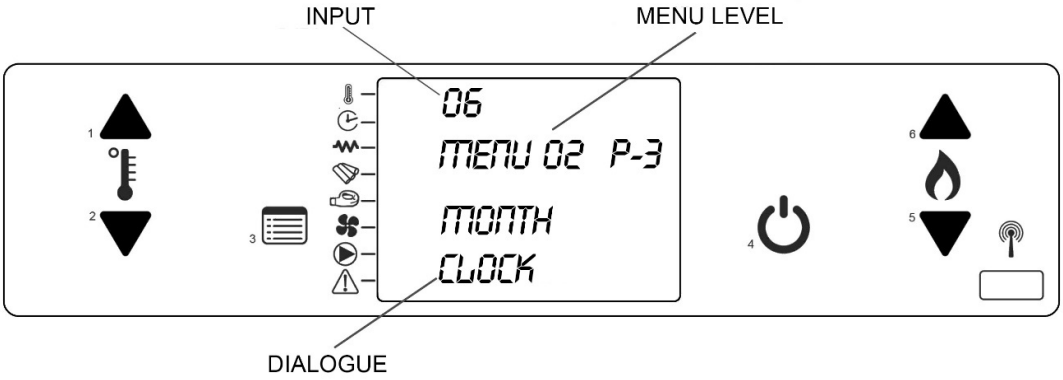
Menu item 01 "FANS ADJUSTMENT" is present only on channelled air models and allows you to modify the ventilation of the two channelled outputs. The choices shown in the table below are possible for each of the two fans. Press button "1" (fan 2) and "2" (fan 3) to select.

Setting	Fan 2	Fan 3
AUTO	corresponding to the selected power	corresponding to selected power
0	fan off	fan off
1	speed 1	speed 1
2	speed 2	speed 2
3	speed 3	speed 3
4	speed 4	speed 4
5	speed 5	speed 5

7.2 Menu 02 "CLOCK SET"

You can set the current time and date in this menu. The board is equipped with a lithium battery that allows internal clock autonomy over 3/5 years.
Enter into MENU and set, in order:

01	Day of the week	(Monday… Sunday)
02	Hour	(0..23)
03	Minutes	(0..59)
04	Day of the month	(1..31)
05	Month of the year	(1..12)
06	Current year	(2000.. 2099)

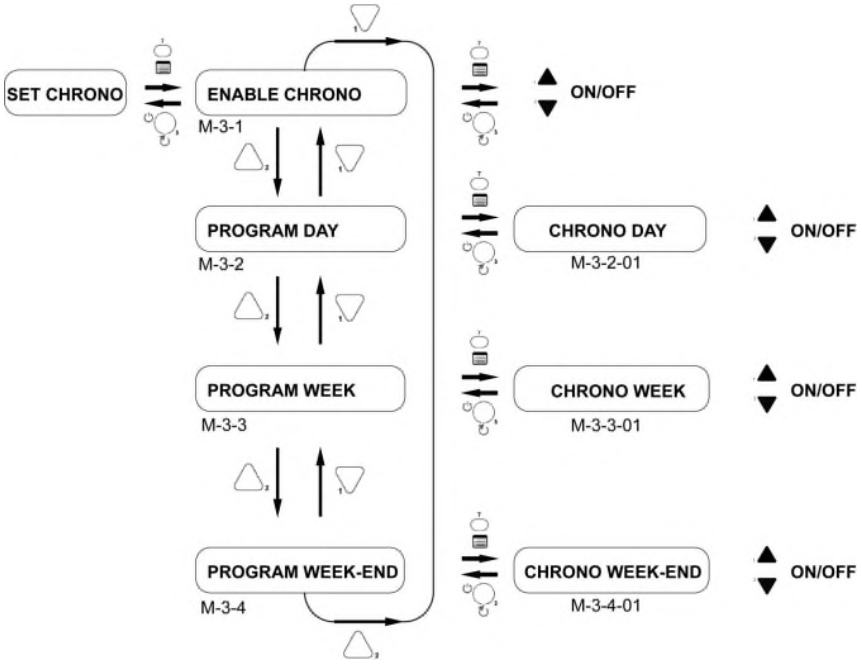


7.3 Menu 03 "CHRONO SET"

Use this menu to enable and programme start-ups and shutdowns. There are eight different possibilities divided into three groups:

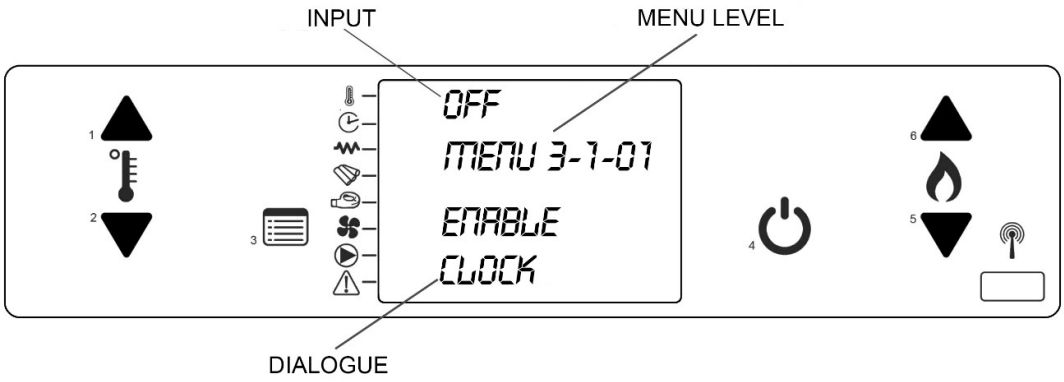
- **Daily programme**: 2 start-ups and shutdowns valid each day
- **Weekly programme**: 4 start-ups and shutdowns, for which you can decide which days of the week they must be active.
- **Weekend programme**: 2 start-ups and shutdowns valid only for Saturday and Sunday.

Below is the diagram of the various Menu levels. Access the menu by pressing “3”, return to the previous menu by pressing “4”, scroll through the menu by pressing “5” and “6” and change the value by using keys “1” and “2”.



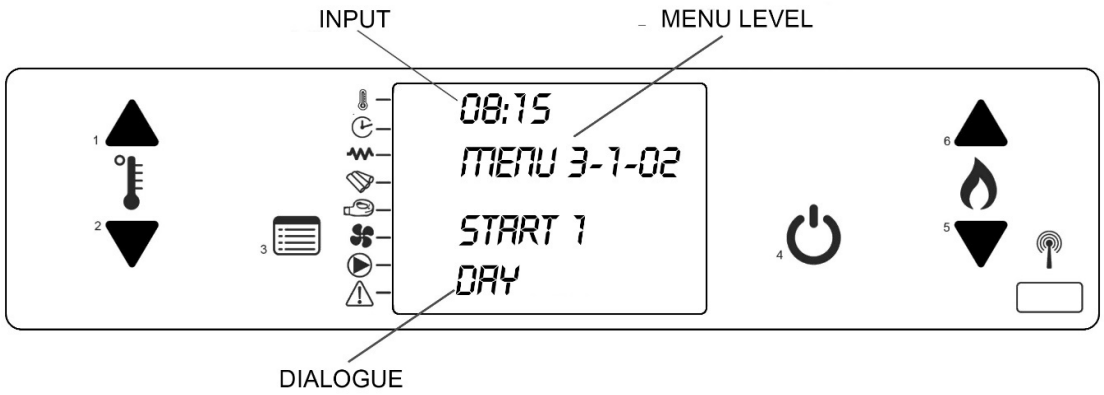
7.3.1 Menu 3-1 “ENABLE CHRONO”

Allows you to enable and disable all programmable thermostat functions. If the value is "off", all set programmes are disabled.



7.3.2 Menu 3-2 “DAILY PROGRAM”

Allows you to enable, disable and set all programmable thermostat functions.

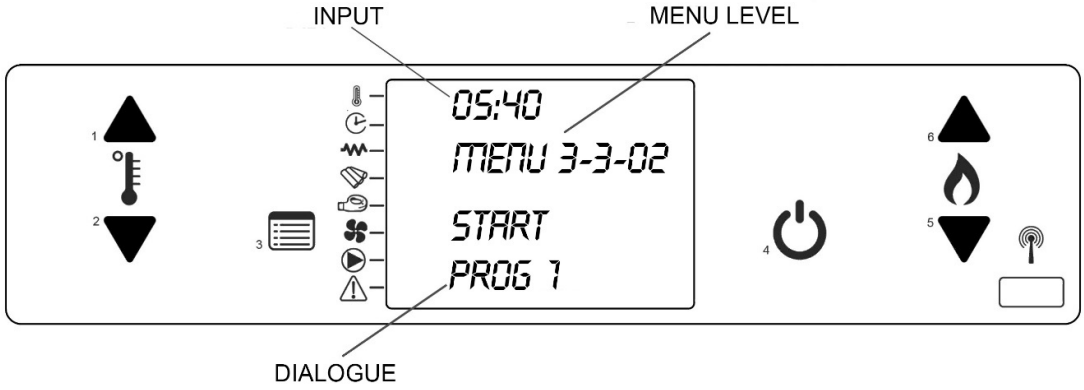


After having set the first parameter (M-3-2-01) “DAILY CHRONO” to "on", you can set two start-ups and two shutdowns. For each parameter, you can either set the value "off", if you do not wish to activate, or the time of start-up or shutdown.

Menu level	*Selection*	*Meaning*	*Possible values*
03-02-02	START 1	Activation time	00:00-23:50 -OFF
03-02-03	STOP 1	Disable time	00:00-23:50 -OFF
03-02-04	START 2	Activation time	00:00-23:50 -OFF
03-02-05	STOP 2	Disable time	00:00-23:50 -OFF

7.3.3 Menu 3-3 “WEEKLY PROG-“

The weekly programming group includes 4 start-ups and 4 shutdowns. For each on-off pair, you can decide which day of the week to activate the corresponding pair controls.
The first parameter, M-3-3-01 “WEEKLY CHRONO”, you can enable or disable all weekly programmable thermostat settings.



After having set the first parameter (M-3-2-01) “WEEKLY CHRONO” to "on", you can set 4 start- ups and 4 shutdowns. For each parameter, you can either set the value "off", if you do not wish to activate, or the time of start-up or shutdown. After each pair of on and off times, there are 7 parameters corresponding to the 7 days of the week. Each of these parameters can be set to "on" or "off" based on which programming you wish to activate corresponding to that day of the week. (See following tables).

PROGRAMME 1			
Menu level	***Selection***	***Meaning***	***Possible values***
03-03-02	START PROG 1	on time	00:00-23:50 -OFF
03-03-03	STOP PROG 1	off time	00:00-23:50 -OFF
03-03-04	MONDAY PROG 1	reference day	on/off
03-03-05	TUESDAY PROG 1		on/off
03-03-06	WEDNES-PROG 1		on/off
03-03-07	THURSDAY PROG 1		on/off
03-03-08	FRIDAY PROG 1		on/off
03-03-09	SATURDAY PROG 1		on/off
03-03-10	SUNDAY PROG 1		on/off

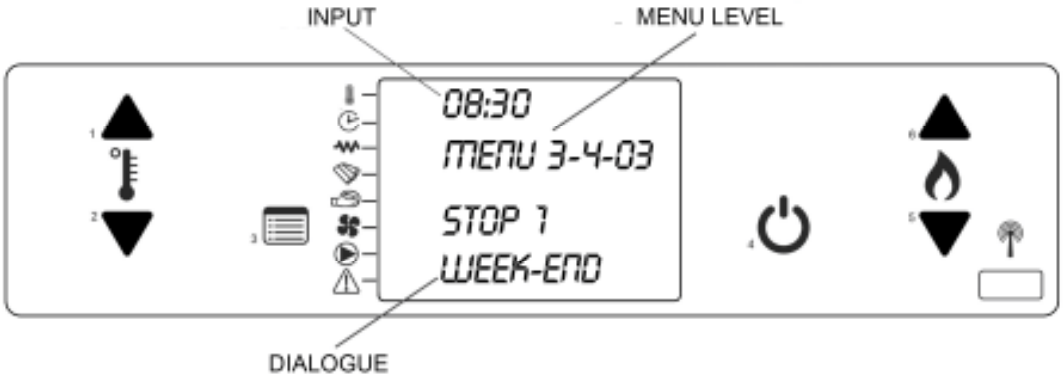
PROGRAMME 2			
Menu level	***Selection***	***Meaning***	***Possible values***
03-03-11	START PROG 2	On time	00:00-23:50 -OFF
03-03-12	STOP PROG 2	Off time	00:00-23:50 -OFF
03-03-13	MONDAY PROG 2	reference day	on/off
03-03-14	TUESDAY PROG 2		on/off
03-03-15	WEDNES-PROG 2		on/off
03-03-16	THURSDAY PROG 2		on/off
03-03-17	FRIDAY PROG 2		on/off
03-03-18	SATURDAY PROG 2		on/off
03-03-19	SUNDAY PROG 2		on/off

PROGRAMME 3			
Menu level	***Selection***	***Meaning***	***Possible values***
03-03-20	START PROG 3	On time	00:00-23:50 -OFF
03-03-21	STOP PROG 3	Off time	00:00-23:50 -OFF
03-03-22	MONDAY PROG 3	reference day	on/off
03-03-23	TUESDAY PROG 3		on/off
03-03-24	WEDNES- PROG 3		on/off
03-03-25	THURSDAY PROG 3		on/off
03-03-26	FRIDAY PROG 3		on/off
03-03-27	SATURDAY PROG 3		on/off
03-03-28	SUNDAY PROG 3		on/off

PROGRAMME 4			
Menu level	***Selection***	***Meaning***	***Possible values***
03-03-29	START PROG 4	On time	00:00-23:50 -OFF
03-03-30	STOP PROG 4	Off time	00:00-23:50 -OFF
03-03-31	MONDAY PROG 4	reference day	on/off
03-03-32	TUESDAY PROG 4		on/off
03-03-33	WEDNES- PROG 4		on/off
03-03-34	THURSDAY PROG 4		on/off
03-03-35	FRIDAY PROG 4		on/off
03-03-36	SATURDAY PROG 4		on/off
03-03-37	SUNDAY PROG 4		on/off

7.3.4 Menu 3-4 “WEEKEND PROG-“

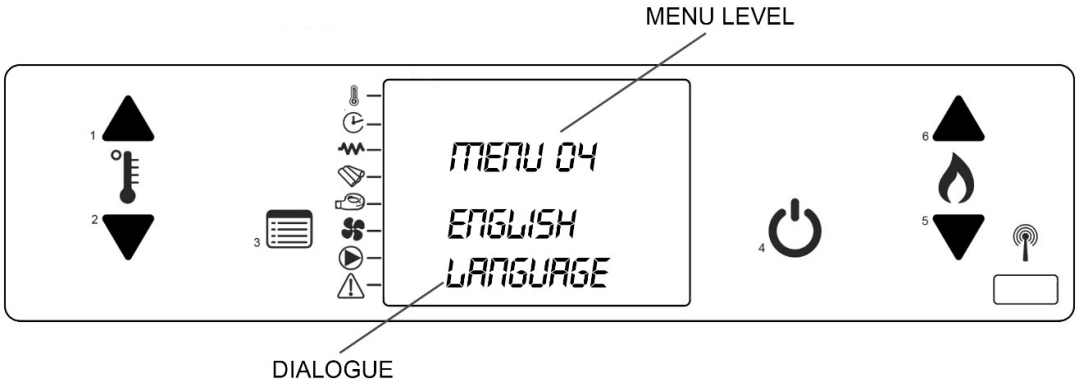
Allows you to enable, disable and set programmable thermostat functions for the weekend (Saturday and Sunday). As per daily programmes, we have an enabling parameter and 2 pairs of start-up and shutdown times. Programming will be active as stated only on Saturday and Sunday.



TIP: to avoid confusion and unwanted start-up and shutdown, activate only one programme at a time if you do not know exactly what your desired programming is.
Disable the daily programme if you want to use weekly programming. Always disable the weekend programme if you are using weekly programmes 1,2,3 and 4.
Activate the weekend programme only after having disabled weekly programming.

7.4 Menu 04 "CHOOSE LANGUAGE"

Allows you to select the dialogue language among those available.



7.5 Menu 05 "STAND-BY MODE"

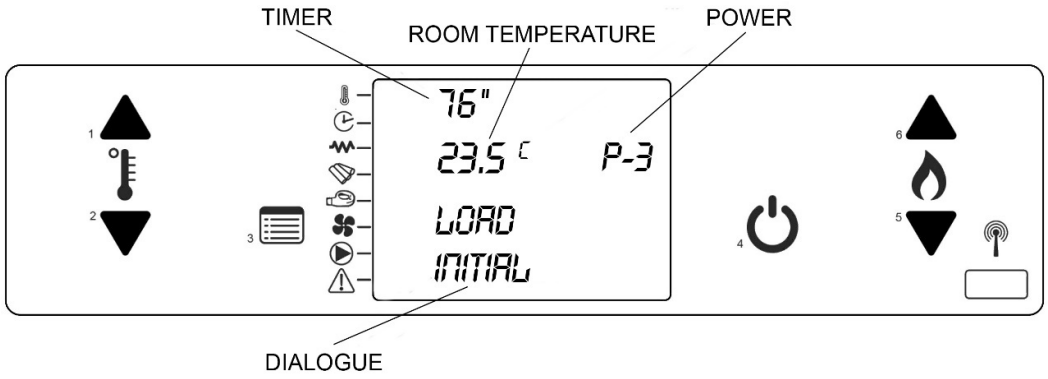
This menu allows you to activate or deactivate "STAND-BY".
Stand-by mode indicates a condition in which the stove shuts off but where it automatically re- ignites as soon as the room temperature and the water temperature fall below the set value and the flue gas temperature drops below its threshold (stove is cold). Default setting is "OFF".
Once the stand-by Menu is set to a value between 1'-120', if the water temperature or room temperature exceed a certain amount, set values (2°F for room temperature and 4°F for water temperature), an alternating message "MODULATE / OK STD BY" appears on the screen. At this point, after a pre-set time, if temperatures do not return under the set values, the stove shuts off and goes into stand-by mode.
During shutdown, the display shows the message "WAIT COOLING." This display message remains until re-lighting conditions are verified.

7.6 Menu 06 "BUZZER MODE"

When "off," acoustic signal disabled in the event of an alarm. When "on," sets off a buzzer when an alarm is activated.

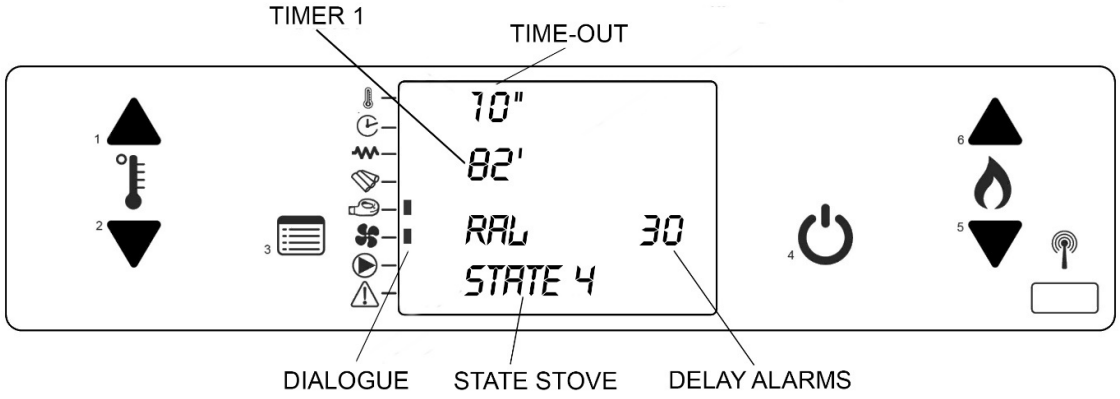
7.7 Menu 07 "INITIAL LOAD"

When the display shows the message "OFF," allows you to preload pellets for a time equal to 90 min. Start by pressing button "1" and stop if desired by pressing button "4." Once preloading is completed, remove the loaded pellets from the brazier.



7.8 Menu 08 “STOVE STATUS”

The stove status menu shows the current state of the stove, showing some sensor values and other variables inside the stove. Four pages displayed in succession are available. This menu is for qualified service personnel use.

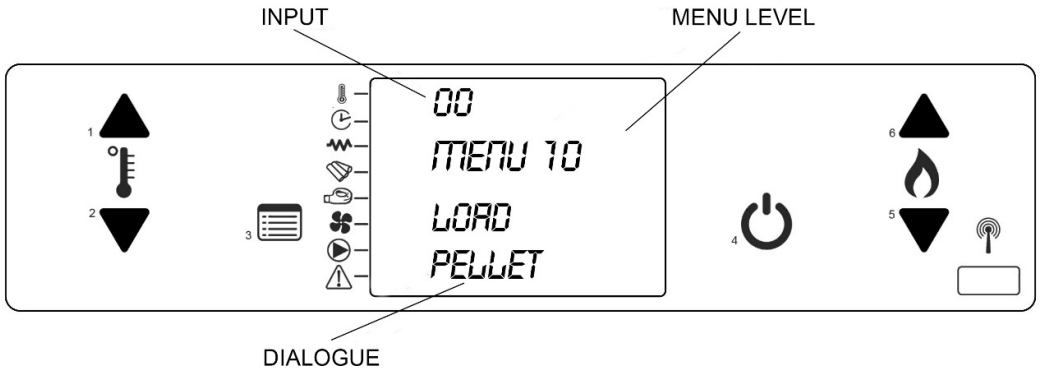


7.9 Menu 09 “TECHNICAL CALIBRATIONS”

This menu is protected by an access key and is intended for qualified service personnel.

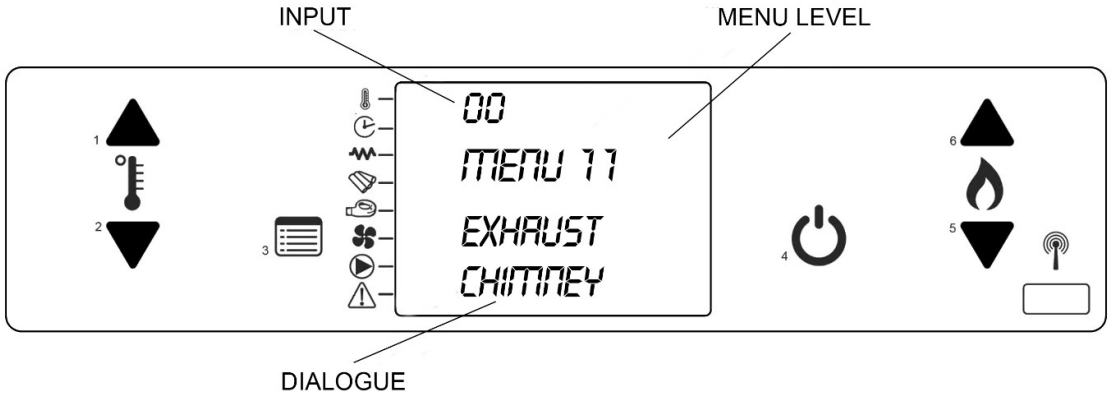
7.10 Menu 10 “PELLET TYPE”

This menu allows you to simultaneously increase or decrease all pellet lowering parameters (quantity of pellets and brazier loading).
The set default value is 00. Press keys (1) and (2) to modify said value from -9 to +9.
For each unit, pellet load times are increased or decreased by 2.5 %.



7.11 Menu 11 “FIREPLACE TYPE”

This menu allows users to simultaneously increase or decrease all smoke fan parameters (draft).
The set default value is 00. Press keys (1) and (2) to modify said value from -9 to +9.
For each unit, smoke motor revs are increased or decreased by 2.5%.



8 SAFETY AND ALARMS

8.1 Safety devices

CAUTION: during operation, some parts of the stove (door, handle, ceramic parts) can reach very high temperatures.
Remember to keep at the previously mentioned safe distance.
Be careful, **use caution** and always follow the instructions.
If during operations any part of the stove or the exhaust pipe leak smoke, immediately turn off the stove **without** removing the power supply and ventilate the room. Then, once cooled down, verify the reason for the leak and, if necessary, call service personnel.
The stove is equipped with several devices which intervene in order to ensure safe operation.
CAUTION: safety devices are designed to eliminate any risk of damage to persons, animals or things, and tampering with or servicing by unauthorised personnel could compromise their safety.
Safety devices on the stove include the following:

8.1.1 Fume exhaust pressure sensor

This sensor is connected to the fume exhaust pressure duct. It controls internal pressure to the duct, monitoring any occlusion of the chimney flue and allowing use of the stove in total safety.

When it activates

If proper operation conditions in the vent exhaust duct are altered (improper installation, the presence of obstacles or impediments in the exhaust tube, negligent maintenance, adverse weather conditions such as persistent wind, etc.), the pressure sensor (pressure gauge) stops electrical power supply to the pellet feed screw, thus blocking pellet feeding to the brazier and sending an alarm signal to the board.
The alarm can also be caused by clogging in the stove, by improper combustion or lack of annual stove cleaning.
When the alarm goes off, the display shows the message **"AL 8 – LOW PRESSURE".**

What to do

- Put the stove in stand-by by pressing the off button for a few seconds (4). (The acoustic alarm stops).
- Wait and make sure that the combustion of pellets left in the brazier has been completed.
- Wait for the stove to cool down, then verify and remove the causes which caused the safety devices to go off. Finally, after having cleaned the brazier, re-start the stove by pressing the ON/OFF button (4).
- In the event of a repeated alarm, call a service centre.

8.1.2 Structure temperature sensor

The stove is equipped with a manual reset bulb thermostat whose function is to preserve the boiler, pellet tank and, consequently, the whole structure from excessive temperature changes.

When it activates

If the pellet loading tube reaches the threshold of 85°C.
In this situation, the thermostat interrupts electrical power to the feed screw, thus blocking pellet feeding to the brazier and sending an alarm signal to the board.
The display will show the message "**AL 7 – Thermal safety**".

What to do

- Put the stove in stand-by by pressing the off button for a few seconds
- Wait and make sure that the combustion of pellets left in the brazier has been completed.
- RESET THE SAFETY THERMOSTAT located on the rear of the stove under the outlet (*see Fig.14)*.

Before resetting the safeties, make sure that the stove is **off and completely cooled down,**

then proceed as follows:

1 Unscrew the cap located on the rear lower right of the stove.
2 Press the red button with slight pressure.
3 Replace the cap in its housing.
4 **After having cleaned the brazier,** re-start the stove by pressing button (4).

8.1.3 Smoke temperature sensor

The smoke sensor is directly connected to the circuit board and keeps operating temperature of exhaust fumes from the stove under constant control, allowing safe use of the stove.

How it works

If fume temperature exceeds the first pre-set temperature limit, the board passes into modulation mode. The display will show the message "**MODULATE / MAX SMOKE**". At the same time if, despite passage to modulation, the fume temperature continues to increase and exceeds the second pre-set safety limit, the stove will pass into alarm mode. Pellet flow is interrupted and fume exhaust speed is set to maximum.
The display will show the message "**AL 3 – SMOKE TEMP**".

What to do

- Put the stove in stand-by by pressing the off button for a few seconds (4).
- Wait and make sure that the combustion of pellets left in the brazier has been completed.
- Verify and remove the causes which caused the safety devices to go off.
- After having cleaned the brazier, re-start the stove by pressing button (4).

8.1.4 Smoke sensor fault

The stove constantly controls smoke sensor functioning.

When it activates

If the sensor is momentarily and/or accidentally removed from its housing, or the connector is not correctly positioned on the circuit board or the sensor fails for any reason. The fault is signalled via display message **AL 2 – "SMOKE SENSOR**".

What to do

1 Put the stove in stand-by by pressing the off button for a few seconds (4).
2 Wait and make sure that the combustion of pellets left in the brazier has been completed.
3 If necessary, call a service centre to replace the sensor.

8.2 Alarms

In the event that an operating anomaly occurs, the board intervenes and signals the irregularities, operating in different modes depending on the type of alarm. The following alarms can occur:

Cause of alarm	Display message
No power	AL1 BLACK-OUT
Smoke temperature sensor	AL2 SMOKE SENSOR
Smoke overtemperature	AL3 SMOKE TEMP
Smoke fan fault	AL4 EXTRACT FAULT
No start-up	AL5 NO START
Shutdown during work mode	AL6 NO PELLET
General safety thermostat	AL7 THERMAL SAFETY
Safety pressure switch	AL8 LOW PRESSURE
No or low water sensor	AL9 WATER SENSOR
Water overtemperature	ALa WATER TEMP
Water press. outside allowed values	ALb WATER PRESS

ALL ALARM CONDITIONS CAUSE IMMEDIATE STOVE SHUTDOWN

To exit from an alarm condition, always press button "4" until the message "FINAL CLEANING" appears. You will also need to take additional steps, depending on the type of alarm generated. If you do not exit from the alarm condition within a given time (a few hours), the alarm will be sent into stove memory and the display will show the message "ALARM MEMORY." To exit from this condition, press button "4" as per above.

AL 1 - Black-out

This alarm is activated when the stove is disconnected from the mains.

What to do

Put the stove in stand-by by pressing the off button for a few seconds (4).

AL 2 - Smoke sensor

This alarm signals breakage of the smoke sensor (see safety devices)

AL 3 – Smoke temp

This alarm signals excessive smoke exhaust temperature (see safety devices)

AL 4 – Extract fault

This alarm indicates a failure to read the revs of the smoke expulsion motor by the control board. It may have been activated due to motor fault or due to a lack of connection between the rev reader (encoder) in the motor and the board.

What to do

Put the stove in stand-by by pressing the off button for a few seconds (4). Try switching the stove back on.

Contact your service centre if the problem persists.

AL 5 – No start

This alarm signals an ignition failure. This alarm is activated when, during the start-up phase, a maximum waiting time (about 20 minutes) is exceeded without the machine switching on successfully. (see ignition)

AL 6 – No pellet

This alarm indicates a flame failure in the brazier during normal stove operation. The main causes are: no pellets in the hopper or blocking of the pellet feed screw.

What to do

Put the stove in stand-by by pressing the off button for a few seconds (4).

Empty the brazier of all unburned accumulated pellets.

In the event of pellet exhaustion in the tank, refuel the stove and ignite it again. Do not insert pellets until the stove has cooled completely. **Pellet refilling must be performed with the stove off** or with the stove working with the flame present.

In the case of a pellet feed screw block, empty the tank and remove any foreign bodies present in the feed screw. Then refill with pellets and start the stove back up.

In the case of repeated feed screw blocks, call a service centre.

AL 7 – Thermal safety

This alarm is activated by intervention of the stove boiler safety thermostat (see safety devices).

AL 8 – Low pressure

This alarm is activated by intervention of the pressure sensor (pressure gauge) (see safety devices).

9 WARNINGS AND MAINTENANCE

WARNING

The maintenance and care must be carried out only with cold device.

You should only use spare parts approved and supplied by laminox idro srl please contact your specialized retailer if you require spare parts. You must not make any changes to the device!!!.

The periodic maintenance, as indicated in this Installation and Operating Instruction, must be performed with the utmost care after reading the instructions, procedures and frequency described in this manual. Check the external air intake, by cleaning it, at least once a year. The flue must be regularly swept by the chimney sweeper. Let your chimney sweeper in charge of your area check the regular installation of the device, the connection to the flue and the aeration.
All maintenance operations (cleaning, replacements, etc.) should be carried out when the fire is out and the stove is cold. In addition, do not use any abrasive substances.

CAUTION: FAILURE TO CLEAN AFFECTS SAFETY

9.1 Opening the door

The door must remain closed during operation. The door should be opened only with the stove off and cooled down to perform maintenance and routine cleaning.

9.2 Ashes cleaning and disposal

Check the ash drawer every two days to see if it needs emptying
The ash collection compartment must be emptied regularly so as to impede combustion residue from arriving at the brazier support

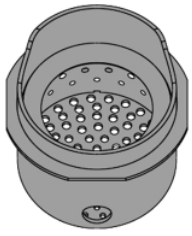
WARNING

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, well away from all combustible materials, pending final disposal. If the ashes are disposed of by burial in soil or otherwise locally dispersed, they should be retained in the closed container until all cinders have thoroughly cooled.

.**CAUTION: ashes keep embers on for a long time!!!**

9.3 Brazier cleaning

When the flame becomes a red colour or is weak accompanied by black smoke, it may mean that there are ash deposits or incrustations which are not allowing correct stove operation and which must be removed.
Every two days, remove the brazier by simply lifting it from its housing, then clean it of ash and any incrustations which could have formed, with particular attention to freeing clogged holes using a pointed tool.
This operation is necessary in particular the first few ignitions, especially when using different quality pellets. The timing of this operation is determined by the frequency of use and the choice of fuel. It is advisable to also check the brazier support, emptying it of any ashes.
CAUTION: before igniting the stove, check that the brazier is pushed back toward the deflector and that the glow plug tube is inserted in the corresponding brazier hole.

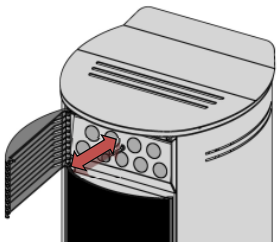


9.4 Combustion chamber cleaning

Clean the combustion chamber weekly, removing ashes accumulated in the chamber using a vacuum cleaner.

Note: Use a vacuum cleaner designed for the suction of ashes for this type of cleaning.

Once a week, open the front grille and pull the cleaner rod knob towards you at least 3 times.



9.5 Smoke chamber cleaning

Generally, clean the smoke chamber once a year (preferably at the beginning of the season) for best stove operation. The frequency of this operation depends on the type of pellet used and the frequency of use. Contact a Technical Assistance Centre for this type of cleaning.

9.6 Exhaust system cleaning

Until you are reasonably experienced regarding operating conditions, it is advisable to perform this service at least monthly. Remove the T-fitting cap and proceed with duct cleaning. If necessary, at least the first few times, request assistance from a qualified technician.

9.7 Cleaning metal and ceramic parts

Use a soft cloth moistened with water to clean metal stove parts.
Never clean metal or ceramic parts with alcohol, thinners, petrol, ketones or other degreasers.
Use of these substances frees the company from all liability. Discolouration of metal parts can be the result of improper use of the stove.

9.8 Cleaning glass

Door glass must be clean (cold) with ammonia-based and non-corrosive degreasers as a diluent. Prevent corrosive substances from coming into contact with the paint on the stove as these can cause damage. If glass is hot, before proceeding with cleaning, keep the door open as long as necessary until it cools down. Do not use any material that can scratch or damage the glass.

9.9 Broken glass

The stove is equipped with 5 mm thick ceramic glass that is resistant to a thermal shock of 1350°F. This glass can break only due to a strong impact or misuse. Do not slam the door or hit the glass. In case of breakage, replace with an original replacement part only. (See paragraph 9.15)

WARNING
Break of glasses: ceramic-based glasses can resist up to a heat shock of 1350°F, therefore they are not affected by thermal shock issues. Their break can be caused by mechanic shocks, such as striking or slamming shut of the door. Therefore, their replacement is not included in the warranty
Do not operate this unit with broken glasses
Broken or damaged glass components shall be removed and reinstalled taking care about using proper gaskets, cushioning devices and other accessories, maintaining edge clearances (See paragraph 7.15)
Replace glass only with glass supplied from the manufacturer or distributor of this appliance

9.10 Replacing the remote control battery

Replace the old battery with a new CR 2025 3V battery, taking care not to invert polarity (polarity is indicated on the remote control data sheet). Then close the remote control and dispose of the used battery in compliance with regulations. The installed battery must be the type specified above. Failure to comply with these instructions may create an explosion hazard.

9.11 Cleaning fans

CAUTION: all cleaning and/or maintenance operations must be performed with the POWER OFF.

The stove is equipped with fans (room and fumes) located at the lower rear of the stove. Any deposits of dust or ash on fan blades lead to an imbalance which causes noise during operation. Fans must

therefore be cleaned at least once annually. As this operation involves the removal of some stove parts, have the fan cleaned by a Technical Assistance Centre or qualified personnel only.

9.12 Stove inactivity

At the end of the season, perform the following operations:

- Remove all pellets from the tank and from the feed screw.
- Thoroughly clean the brazier, the support brazier, the combustion chamber and the ash drawer.
- Thoroughly clean the smoke exhaust system: contact a professional chimney sweep for this purpose.
- Clean all dust, spider webs, etc. from the area behind the panels of the inner cladding once a year.
- Clean fans thoroughly.
- Disconnect the power cable.

9.13 Routine and special maintenance

These operations should be programmed ANNUALLY with a Technical Assistance Centre and are necessary to ensure the maintenance of product efficiency and ensure safe operation.

- Thoroughly clean the combustion chamber and the heat exchanger.
- Smoke motor, dismantling and cleaning of the smoke exhaust duct, new silicone where required.
- Inspection and verification of gaskets, springs and replacement and application of the silicone where required.
- Tank, emptying and cleaning.
- Check of electrical and electronic parts.
- Cleaning and check of the tube and pressure gauge.
- Check and replacement, if necessary, of components that are subject to wear: brazier, resistance, ash drawers, etc.

9.14 Routine maintenance performed by qualified technicians

Using wood as solid fuel, the generator requires annual routine maintenance, which must be performed by a qualified technician, using only original spare parts.

Failure to comply can jeopardise the safety of the appliance and make the warranty null and void.

Respecting the frequencies of cleaning reserved for the user described in the use and maintenance manual, the generator is guaranteed correct combustion over time, preventing any anomalies and/or malfunctioning that could require more interventions of the technician. Requests for routine maintenance are not contemplated in the product warranty.

WARNING
Routine maintenance must be performed at least once a year.
The annual routine maintenance must be performed by a qualified technician.
Using only original spare parts. Failure to comply can jeopardise the safety of the appliance and make the warranty null and void.

9.15 Glass and Gaskets replacement

Use only ceramic type glass

The gaskets guarantee the tightness of the product and its consequent good functioning. They must be controlled periodically. They must be replaced immediately if they are worn or damaged. These operations must be carried out by a qualified technician.

Ceramic Glass dimensions: *306 x239 mm (12" x 9,4");* Thickness 5 mm
Door tricovet gasket: *Diam. 10 mm (0,39"); L. 1570 mm / (62")*

10 GUARANTEE

10.1 Certificate of guarantee

The purchaser are invited to: - examine the instructions for the installation, use and maintenance of the stove.

- examine the conditions of guarantee shown below

10.2 Condition of guarantee

The limited guarantee covers defects of manufacturing materials, on condition that the product has not been broken due to an incorrect use, carelessness, wrong connections or errors of installation.

The following are not covered by guarantee:

- *vermiculite (Firex 600);*
- *the glass of the door;*
- *the fibre gaskets;*
- *the painting;*
- *the fire pot;*
- *ignitor;*
- *the cast majolica;*
- *any damage caused by inappropriate installation and/or handling of the stove and/or shortcomings by the consumer*

. The use of poor quality pellets or of any other material could damage components of the stove causing the termination of their guarantee and the annexed responsibility of the manufacturer.

The pellets which meet the requisites listed in the chapter on them should be used.

All damage caused by transport are not acknowledged, therefore please carefully check the goods on receipt, immediately advising the dealer of any damage.

All the manufacturer's guarantees are shown here and no complaint may be made to the manufacturer according to any other guarantee, report or request.

For guarantee claims and instructions for return shipments please refer to your local dealer.

10.3 Information and problems

For any information or problems, please contact your dealer or service centre, the only people who can meet any request you may have end, if necessary, who can intervene directly

REFERENCES STANDARDS:

ASTM E1509
UL 1482
ULC S627
UL 181
UL 641
ULC S609
Manufactured home and safety standard (HUD), cfr 3280, part 24
NFDA (Fire) 211

PLEASE CONTACT YOUR DEALER FOR ANY SERVIC OR QUESTION

Appliance information:

SERIAL NUMBER _____

DATE PURCHASED _____

DATE INSTALLED _____

Laminox S.r.l. Hydro Division
Zona Industriale Callarella, 261/263 – 62028 SARNANO (MC) Italy Tel.
+39 0733.657.622 – Fax +39 0733.657.494
www.laminox.com e-mail: idro@laminox.com

rev 08/2023

POLYTESTS TESTING THROUGH YOUR REALITY report/rapport PI - 20163

LAMINOX IDRO

Pellet Stove Jessica 11 Air	SERIAL NO. / NUMÉRO DU 000001 - x

Listed Solid Fuel Room Heater/Pellet Type Insert. Also suitable for Mobile Home Installation. This appliance has been tested and listed for use in Manufactured Homes in accordance with OAR 814-23-9000 through 814-23-909.

Appareil de chauffage inséré de combustible solide/de type de boulettes. Accepté dans l'installation dans les maisons mobiles. Cet appareil a été testé et enregistré pour l'usage dans les Maisons Mobiles en accord avec OAR 814-23-9000 jusqu'à 814-23-909.

Tested to: ASTM E1509, ORD-C-1482-M1990 Room Heating Pellet Burning Type, APFI, (UM) 84-HUD FOR USE ONLY WITH PELLETIZED WOOD OR SHELLED FIELD CORN FUEL.

Testé à: ASTM #1509-95, ORD-C 1482-M1990 Room Heating. Pellet Burning Type, APFI, (UM) 84-HUD POUR USAGE AVEC LES BOULETTES DE BOIS OU DE COMBUSTIBLE DE MAIS ÉCOSSÉ DES CHAMPS.

Route power cord away from unit. Do not route cord under or in front of appliance.

DANGER: Risk of electrical shock. Disconnect power supply before servicing. Replace glass only with 5mm ceramic available from your dealer. To start, set thermostat above room temperature, the stove will light automatically. To shutdown, set thermostat to below room temperature. For further instruction refer to owner's manual.Keep viewing and ash removal doors tightly closed during operation.

PREVENT HOUSE FIRES

Install and use only in accordance with manufacturer's installation and operating instructions. Contact local building or fire officials about restrictions and inspection in our area.

WARNING - FOR MOBILE HOMES: Do not install appliance in a sleeping room. An outside combustion air inlet must be provided. The structural integrity of the mobile home floor, ceiling and walls must be maintained. Refer to manufacturer's instructions and local codes for precautions required for passing chimney through a combustible wall or ceiling. Inspect and clean vent system frequently in accordance with manufacturer's instructions.

DO NOT CONNECT THIS UNIT TO A CHIMNEY SERVING ANOTHER APPLIANCE.

Use a 3" or 4" diameter type "L" or "PL" venting system.

Éloignez le fil électrique de l'appareil. Ne pas faire passer le fil électrique au dessus ou en dessous de l'appareil.

DANGER: Il y a risque de décharge électrique. Déconnectez le fil électrique de la prise de contact avant le service. Remplacez la vitre seulement avec une vitre céramique de 5 mm disponible chez votre fournisseur.

Pour allumer, monter la température du thermostat au dessus de la température de la pièce, le poêle s'allumera automatiquement. Pour éteindre, descendre la température du thermostat en dessous de la température de la pièce. Pour des instructions supplémentaires, référez vous au manuel du propriétaire. Gardez la porte d'ouverture et la porte des cendres fermées hermétiquement durant l'opération.

PRÉVENTION DES FEUX DE MAISON

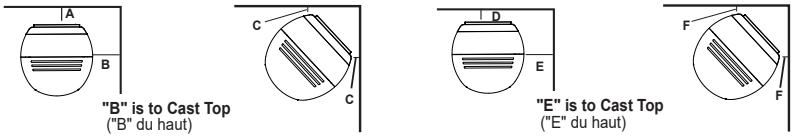
Installez et utilisez en accord avec les instructions d'installation et d'opération du fabricant. Contactez le bureau de la construction ou le bureau des incendies au sujet des restrictions et des inspections d'installation dans votre voisinage. Ne pas obstruez l'espace en dessous de l'appareil.

AVIS - Pour Les Maisons Mobiles: Ne pas installer dans une chambre à coucher. Un tuyau extérieur de combustion d'air doit être installé et ne doit pas être obstrué lorsque l'appareil est en usage. La structure intégrale du plancher, du plafond et des murs de la maison mobile doit être maintenue intacte.

Référez vous aux instructions du fabricant et des codes locaux pour les précautions requises pour passer une cheminée à travers un mur ou un plafond combustibles, et les compensations maximums.

Inspectez et nettoyez la cheminée fréquemment. Ne pas connecter cet appareil à une cheminée servant un autre appareil. Utilisez systèm de ventilation "L" ou "P" diamètre 76mm ou 102mm.

MINIMUM CLEARANCES TO COMBUSTIBLE MATERIALS / ESPACES LIBRES MINIMUM DES MATÉRIAUX COMBUSTIBLES:



"B" is to Cast Top ("B" du haut)

"E" is to Cast Top ("E" du haut)

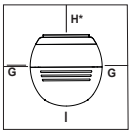
A	Back Wall to stove / Mur Arrière du poêle	8"/200mm
B	Side Wall to Cast Top / Mur De Côté du haut	20"/500mm
CORNER INSTALLATION / NSTALLATION DU COIN :		
C	Side Wall / Mur De Côté	8"/200 mm
VERTICAL 3" - 6" ADAPTER KIT (PART 812-3570) INSTALLATION:		
UN ASSEMBLAGE POUR ADAPTEUR 3" - 6" (PIÈCE 812-3570) POUR INSTALLATION VERTICALE:		
D	Back Wall to Flue Pipe / Mur Arrière tuyau rigide	21"/550mm
E	Side Wall to Cast Top / Mur De Côté du haut	20"/500mm
CORNER INSTALLATION WITH VERTICAL ADAPTER KIT:		
INSTALLATION DU COIN AVEC UN ASSEMBLAGE D'ADAPTEUR VERTICAL:		
F	Side Wall / Mur De Côté	8"/200mm
ALCOVE INSTALLATION / INSTALLATION DE L' ALCÔVE:		
Min. Alcove Height: / Une hauteur minimum de l'alcôve		43"/1092mm
Min. Alcove Side Wall: / Une hauteur minimum mur de côté de l'alcôve		6"/152mm
Max. Alcove Depth: / La profondeur maximum de l'alcôve		36"/914mm

Note 1: In residential installations, when using Parts 811-0890, (3" - 3" Top Vent Adapter) and 812-3570 (3" - 6" Offset Adapter), 24 gauge 6" single wall flue connector may be used.

Note 1: Dans les installations résidentielles, lorsque les pièces 811-0890, (dessus de l'adapteur de ventilation 3" - 3") et 812-3570 (le ressaut de l'adapteur 3" - 6"), un tuyau connecteur de 6" pour mur simple de calibre 24 peut être utilisé.

Note 2: In manufactured home installation, when using Part 811-0890, (3" - 3" Top Vent Adapter) and 812-3570 (3' - 6" Offset Adapter), use listed double wall flue connector. An Outside Air Kit (Part 811-0872), must be used with manufactured home installation.

Note 2: Pour l'installation dans les maisons préfabriquées, lorsque les pièces 811-0860, (dessus de l'adapteur de ventilation 3" - 3") et 812-3570 (le ressaut de l'adapteur 3" - 6"), utilisez un tuyau connecteur enregistré pour mur double. Un assemblage d'air extérieur (pièce 811-0872), doit être utilisé pour l'installation dans les maisons préfabriquées.



G = 8"/200mm
H* = 8"/200mm
I = 40"/1000mm

FLOOR PROTECTION / PROTECTION DU SOL

*Non-combustible floor protection must extend beneath the flue pipe when installed with horizontal venting or under the Top Vent Adapter with vertical installation. **RECOMMENDED IN USA; REQUIRED IN CANADA**

Floor protector must be noncombustible material, extending beneath heater and to the front/sides/rear as indicated. Measure front distance (I) from the surface of the glass door.

*Un protec teur incombustible de plancher doit s'étendre sous le conduit de cheminée pour une installation de ventilation horizontale ou sous un adapteur de ventilation de dessu s pour une installatio n ver tical e. **ÉTATS-UNIS - RECOMMANDÉ; CANADA - REQUIRENT**

Le poêle doit être placé sur une assise non combustible s'étendant tout autour de lui, comme les schémas l'indiquent. Mesurez la distance du de vant (I) de la sur face de la po rte vitrée .

Mfg by:Fabriqué par:

U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using pellet wood

2018	2019	2020	Jan.	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

DO NOT REMOVE THIS LABEL / NE PAS ENLEVER l'ÉTIQUETTE **Made in Italy**

U.S. ENVIROMENTAL PROTECTION AGENCY

Certified to comply with 2020 particulate emission standards using pellet wood.

Emission Rate (g/hr)	Heating Efficiency (% Overall)	1st hour Emission Rate (g/hr)	CO emission (g/hr)
1,62	**72,8**	**3,1**	**16,8**

DO NOT REMOVE THIS LABEL / NE PAS ENLEVER l'ÉTIQUETTE Made in Italy

POLYTESTS TESTING THROUGH YOUR REALITY report/rapport PI - 20163

LAMINOX IDRO

Pellet Stove Veronica 11 Air	SERIAL NO. / NUMÉRO DU 000001 - x

Listed Solid Fuel Room Heater/Pellet Type Insert. Also suitable for Mobile Home Installation. This appliance has been tested and listed for use in Manufactured Homes in accordance with OAR 814-23-9000 through 814-23-909.

Appareil de chauffage inséré de combustible solide/de type de boulettes. Accepté dans l'installation dans les maisons mobiles. Cet appareil a été testé et enregistré pour l'usage dans les Maisons Mobiles en accord avec OAR 814-23-9000 jusqu'à 814-23-909.

Tested to: ASTM E1509, ORD-C-1482-M1990 Room Heating Pellet Burning Type, APFI, (UM) 84-HUD FOR USE ONLY WITH PELLETIZED WOOD OR SHELLED FIELD CORN FUEL.

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Route power cord away from unit. Do not route cord under or in front of appliance.

DANGER: Risk of electrical shock. Disconnect power supply before servicing. Replace glass only with 5mm ceramic available from your dealer. To start, set thermostat above room temperature, the stove will light automatically. To shutdown, set thermostat to below room temperature. For further instruction refer to owner's manual.Keep viewing and ash removal doors tightly closed during operation.

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DO NOT CONNECT THIS UNIT TO A CHIMNEY SERVING ANOTHER APPLIANCE.

Use a 3" or 4" diameter type "L" or "PL" venting system.

Éloignez le fil électrique de l'appareil. Ne pas faire passer le fil électrique au dessus ou en dessous de l'appareil.

DANGER: Il y a risque de décharge électrique. Déconnectez le fil électrique de la prise de contact avant le service. Remplacez la vitre seulement avec une vitre céramique de 5 mm disponible chez votre fournisseur.

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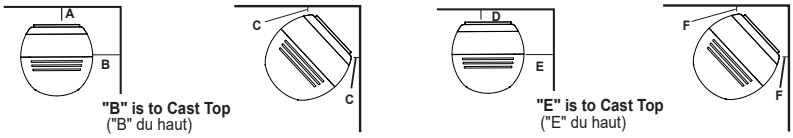

"B" is to Cast Top ("B" du haut)

"E" is to Cast Top ("E" du haut)

A	Back Wall to stove / Mur Arrière du poêle	8"/200mm
B	Side Wall to Cast Top / Mur De Côté du haut	20"/500mm

CORNER INSTALLATION / NSTALLATION DU COIN :

C	Side Wall / Mur De Côté	8"/200 mm

VERTICAL 3" - 6" ADAPTER KIT (PART 812-3570) INSTALLATION:

UN ASSEMBLAGE POUR ADAPTEUR 3" - 6" (PIÈCE 812-3570) POUR INSTALLATION VERTICALE:

D	Back Wall to Flue Pipe / Mur Arrière tuyau rigide	21"/550mm
E	Side Wall to Cast Top / Mur De Côté du haut	20"/500mm

CORNER INSTALLATION WITH VERTICAL ADAPTER KIT:

INSTALLATION DU COIN AVEC UN ASSEMBLAGE D'ADAPTEUR VERTICAL:

F	Side Wall / Mur De Côté	8"/200mm

ALCOVE INSTALLATION / INSTALLATION DE L' ALCÔVE:

Min. Alcove Height: / Une hauteur minimum de l'alcôve	43"/1092mm
Min. Alcove Side Wall: / Une hauteur minimum mur de côté de l'alcôve	6"/152mm
Max. Alcove Depth: / La profondeur maximum de l'alcôve	36"/914mm

Note 1: In residential installations, when using Parts 811-0890, (3" - 3" Top Vent Adapter) and 812-3570 (3" - 6" Offset Adapter), 24 gauge 6" single wall flue connector may be used.

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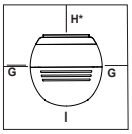

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H* = 8"/200mm
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FLOOR PROTECTION / PROTECTION DU SOL

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Floor protector must be noncombustible material, extending beneath heater and to the front/sides/rear as indicated. Measure front distance (I) from the surface of the glass door.

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Mfg by:Fabriqué par:

U.S. ENVIRONMENTAL PROTECTION AGENCY Certified to comply with 2020 particulate emission standards using pellet wood

2018	2019	2020	Jan.	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

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U.S. ENVIROMENTAL PROTECTION AGENCY

Certified to comply with 2020 particulate emission standards using pellet wood.

Emission Rate (g/hr)	Heating Efficiency (% Overall)	1st hour Emission Rate (g/hr)	CO emission (g/hr)
1,62	**72,8**	**3,1**	**16,8**

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APPENDIX 8: Photographs of test set up

Dilution picture Dia 6 no. EG-030

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=24 inches minimum) velocity ports and 16 inches above downstream Tee. (Requirement 2D=12 inches minimum)

Adjustable damper for flow adjustments

Extraction blower

Total length between hood and sampling port : 22 feet.

POLYTESTS
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60 inches horizontal run between two elbows. Mixing section, No mixing baffle. 6inches diameter pipe

Two 6 inches elbow with horizontal mixing section.

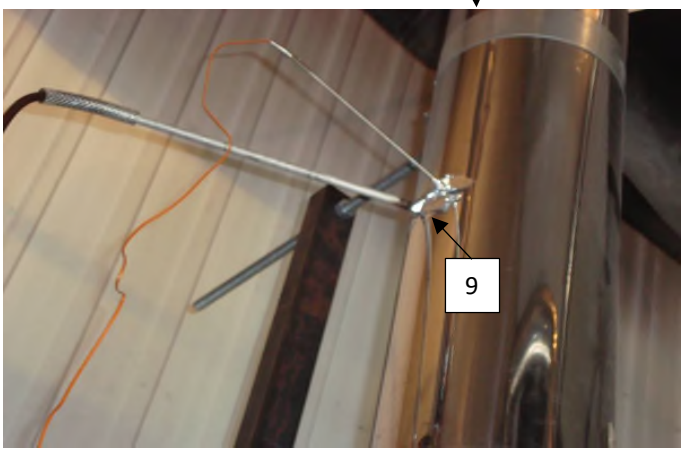
Hood diameter 32 (requirement 4D=24 inches minimum) inches and height of 24 inches (requirement 3D=18 inches minimum)

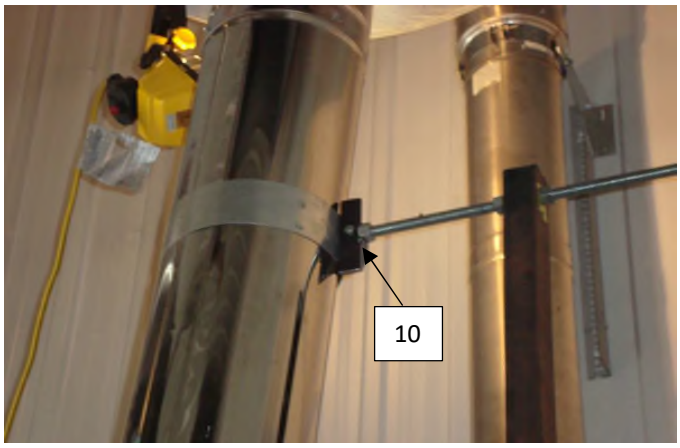
All pipe joints are sealed.

Stack sampling

Gas analysis and temperature probe

chimney support

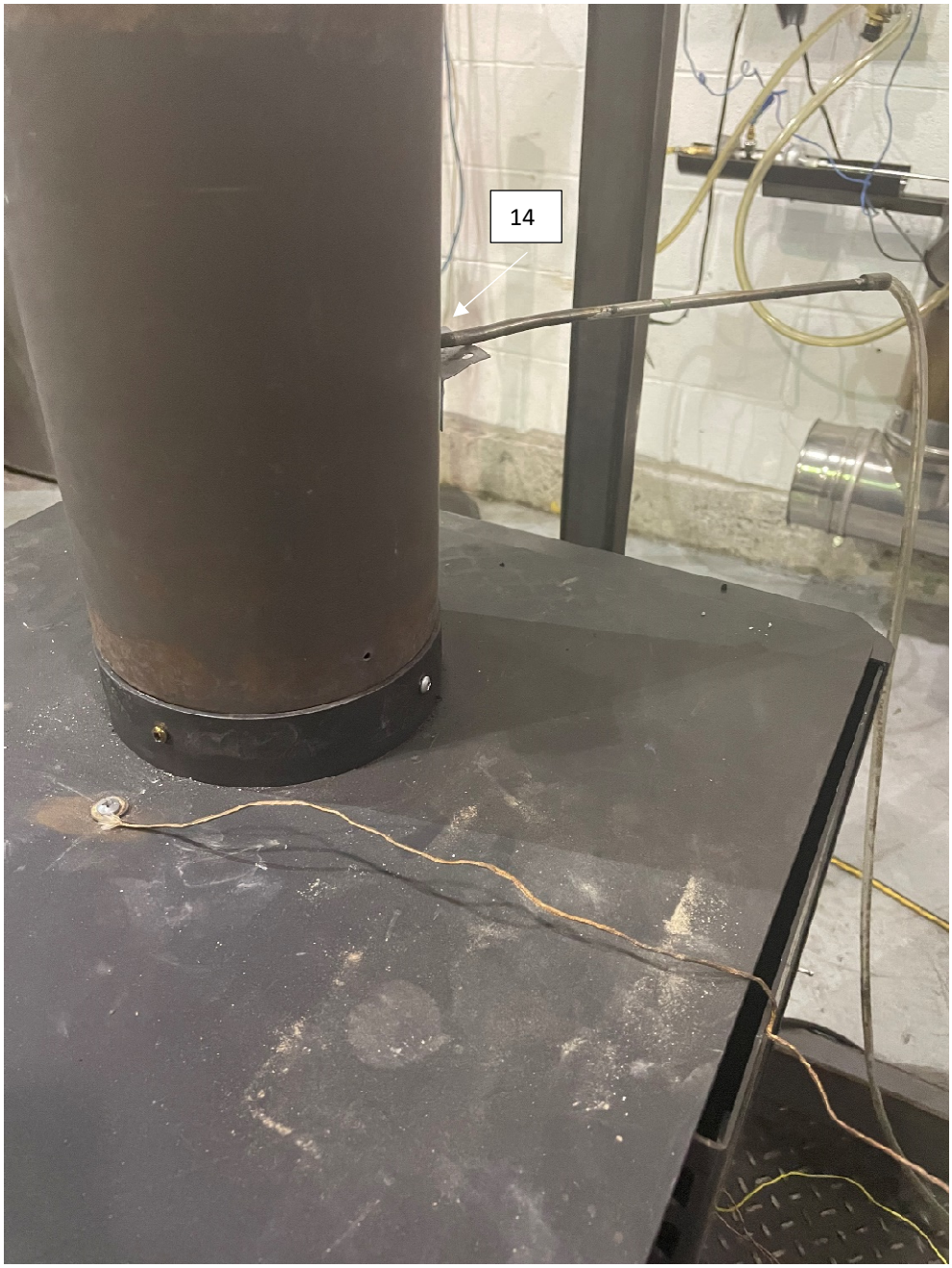




9 : Temperature and gas analyser sampling ports located 9 feet above platform

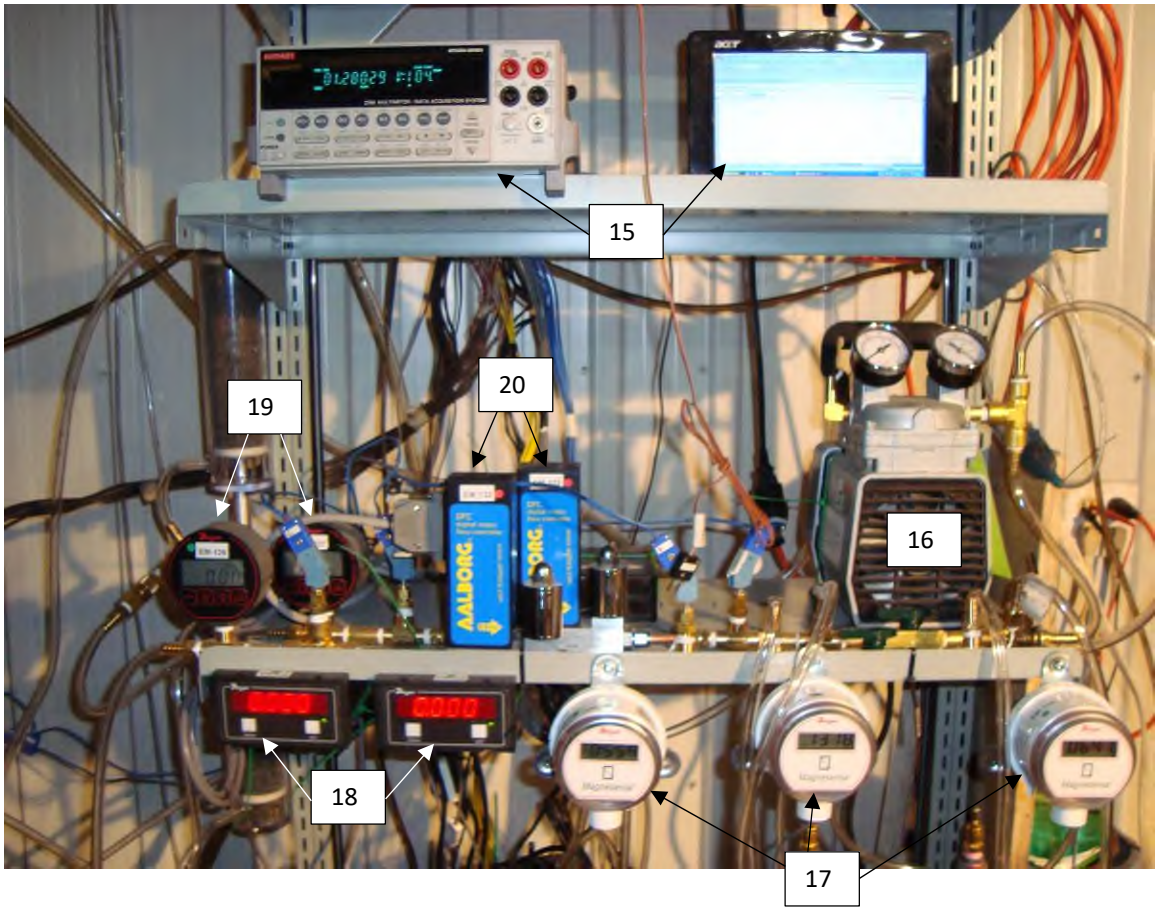
10 : Exhaust system support bracket

Draft sampling



14 : Draft sampling port located 6 in. from the flue outlet

Equipment's



15 : Acquisition system

16 : Vacuum pump

17 : Digital manometer

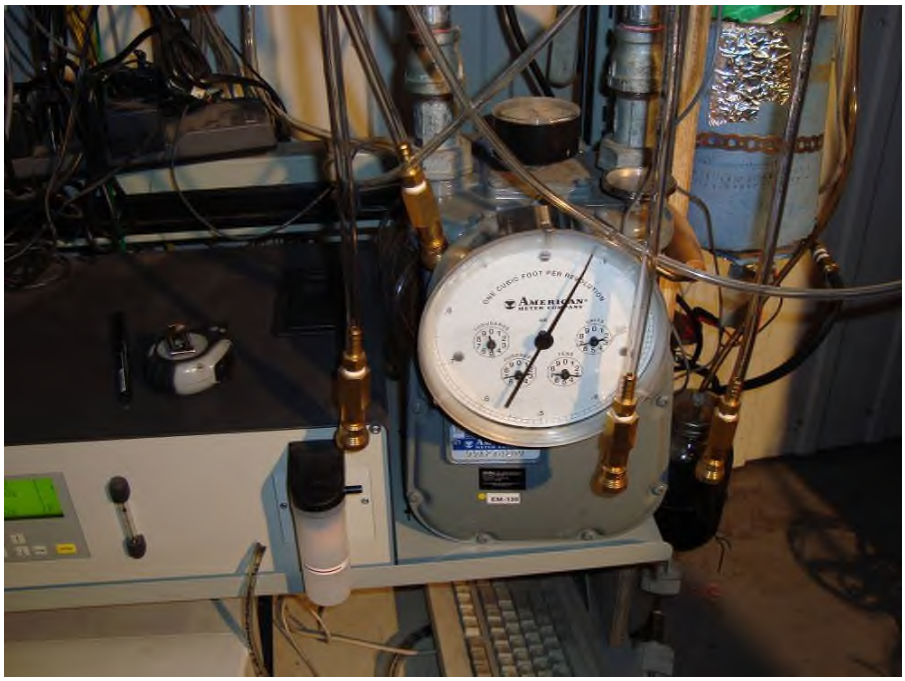
18 : Digital read out for mass flow meter

19 : Digital vacuum gage

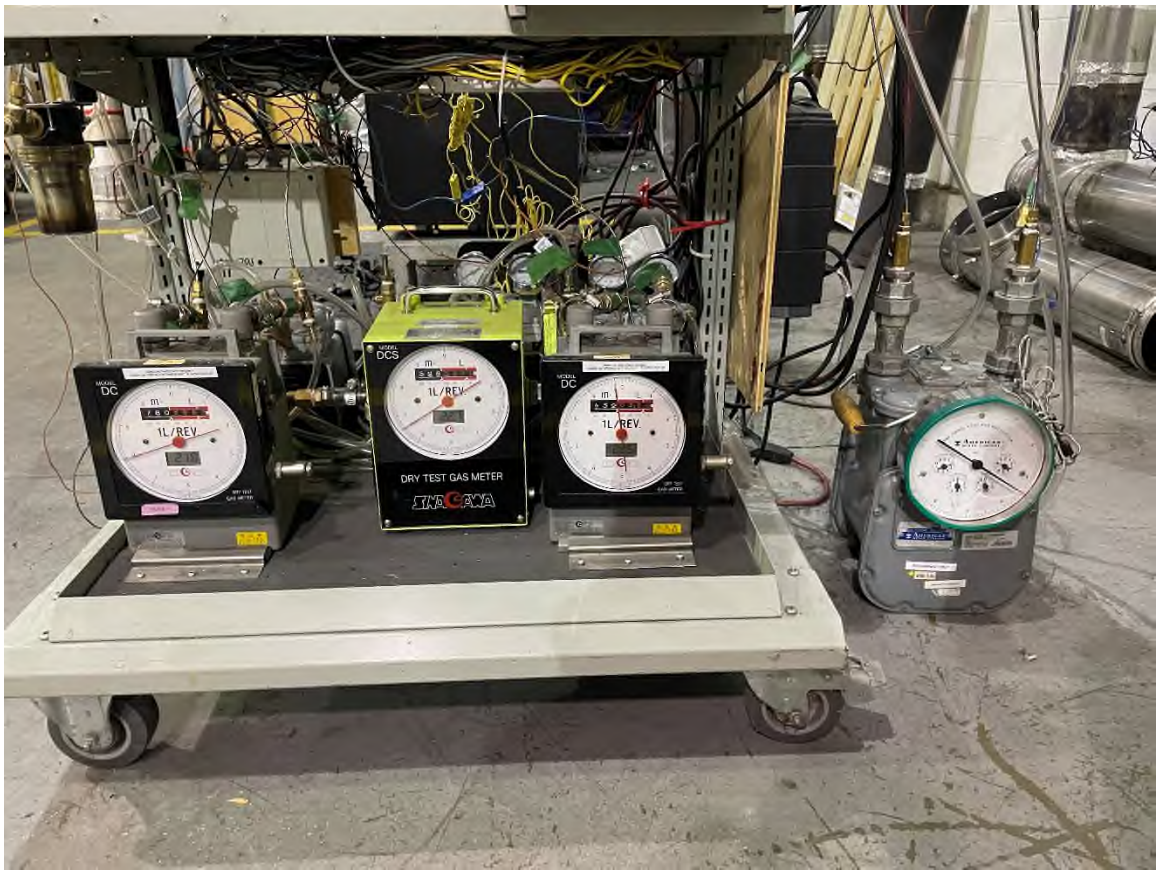
20 : Mass flow meter

Gaz analyser

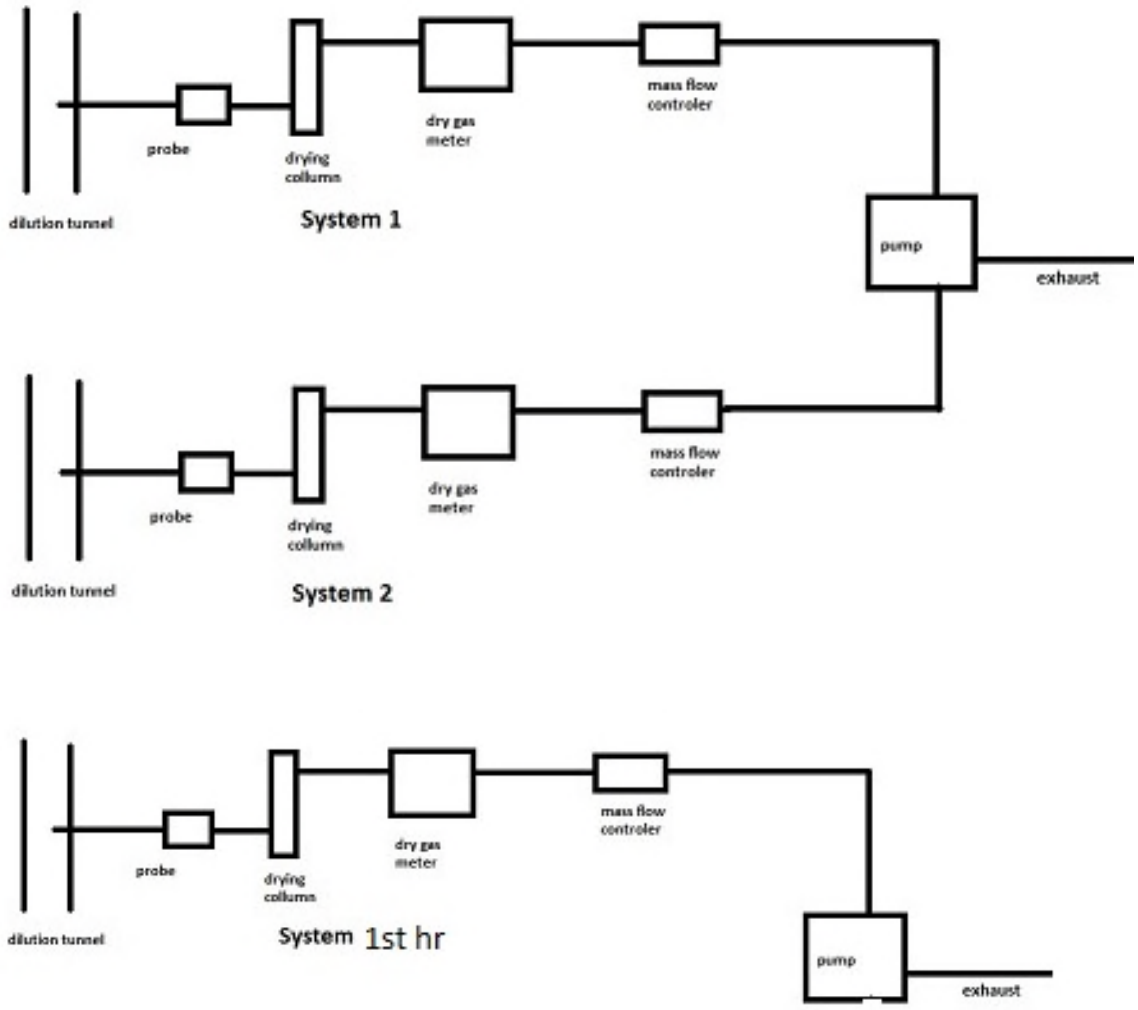
Reference dry gas meter



Dry gas meter for train 1, train 2 and room filter.



Dilution tunnel sample system



Dilution tunnel

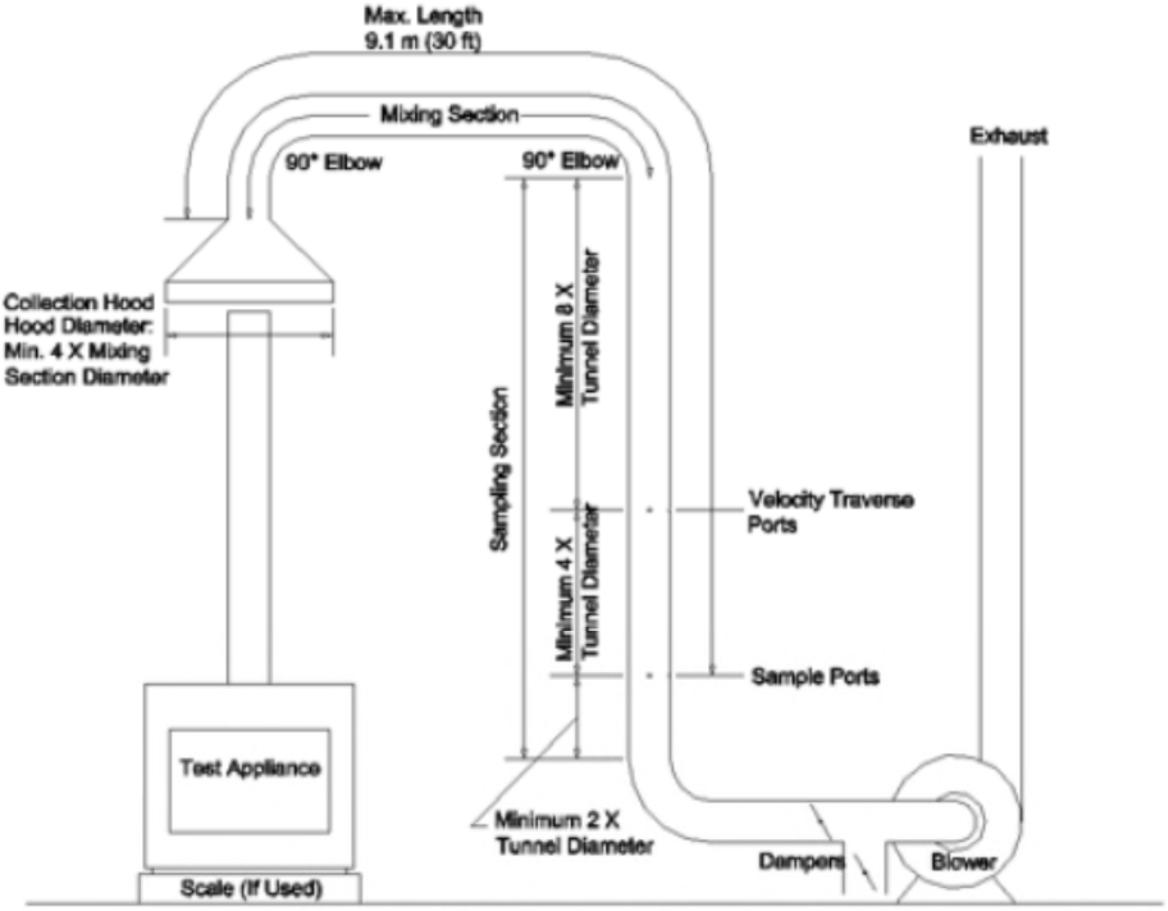


FIG. 3 Steel-Constructed Dilution Tunnel Apparatus

APPENDIX 9: Test load photographs

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Run 1

POLYTESTS
TESTING THROUGH YOUR REALITY

Run 1

	

APPENDIX 10: Laboratory Operating Procedures

POLYTESTS Services inc.

SFBA EMISSIONS AND EFFICIENCY TESTING
LABORATORY OPERATING PROCEDURE

INTRODUCTION

This document provides a step by step guide for the technician conducting tests to EPA standard requirements. Procedures outlined here, when followed, will result in tests in conformance with EPA Methods 28R, ASTME2780, ASTME2515, ASTM E2618, Method 28WHH, Method 28 PTS.

The primary measurements to be made are particulate emissions rates. The technician's duties include the following steps.

1. Incoming inspection of test units.
2. Set-up of test units.
3. Preliminary testing to establish unit operating procedures and familiarity with operating controls.
4. Calibration of test equipment.
5. Set-up, checking and operation of sampling apparatus.
6. Conduct of tests including complete record keeping and data recording for non-automated functions.
7. Operation of hardware and software included in automatic data acquisition system.
8. Review and analysis of data at test completion to ensure test validity.

The technician running this test must be familiar with the following documents, which are to be kept in the laboratory at all, times.

EPA METHODS

1. EPA Methods 28R
2. ASTME2780
3. ASTME2515
4. ASTM E2618
5. Method 28WHH
6. Method 28 PTS

SFBA EMISSIONS AND EFFICIENCY TESTING
LABORATORY OPERATING PROCEDURE

I. APPLIANCE INSPECTION AND SET-UP

A. INCOMING INSPECTION

1. Check for completeness of unit including parts, accessories, installation and operating instructions, drawings and specifications etc. Note any discrepancies or missing parts or information.
2. Check for shipping damage. If damage has occurred, notify the laboratory manager. In some cases, repairs may be made, provided the manufacturer and laboratory manager concur that repairs will not affect the unit's performance. If damage is irrepairable, a new unit will need to be obtained.
3. Note whether unit is catalytic of non-catalytic.
4. Mark unit with manufacturer's name, model number, work order number and date received.
5. If unit is safety listed, note label data including listing agency and serial number. If unit is not listed, mark all data sheets "UNLISTED". Test results will not be released until unit passes safety tests without modification unless authorized by laboratory manager.

B. UNIT SET-UP

1. All new units must be operated for a breaking in period as follows.

    a) Non-catalytic units: Ten (48) hours at medium burn rate with Douglas Fir scrap or cordwood.
    b) Catalytic units: Fifty (50) hours at medium burn rate with Douglas Fir scrap or cordwood.

    During these break-in runs the unit may be connected to a lab chimney and fuel additions noted into the corresponding data acquisition file. For catalytic units, a thermocouple must be installed in the catalyst.

    Record catalyst temperature at 1-hour intervals or on chart recorder. Operating should continue until data shows at least fifty (50) hours of operation with catalyst temperature in excess of 800 degrees Fahrenheit (active range).

    For non-catalytic units a stack thermocouple should be installed and stack temperature recorded at 1-hour intervals. Fourthy-height (48) hours minimum burn time with a stack temperature of at least 250 degrees Fahrenheit is required.

2. Once break-in is completed, allow unit to cool. Clean unit thoroughly.

3. Unit is to be placed on scale for testing. Prior to proceeding with verification process, scale should be turned on and allowed to warm up for one (1) hour minimum. Zero scale and check calibration with standard weights. One (1) 1 kg weight and one (1) 2 kg weight are provided for this purpose. Use scale verification test form no. EPA-7-TP to record results. If scale fails to reproduce weights within tolerance, check with laboratory manager before proceeding.
4. If scale checks out, place unit on scale and align so chimney will be centered in hood.
5. Attach chimney connector and chimney. Be sure all joints are sealed below sampling points. Chimney and connector should be cleaned with a wire brush. Be sure chimney connector terminates and chimney starts at proper level above scale platform. Chimney must be supported from scale so that it does not touch test enclosure or hood walls.
6. Thermocouples should be attached to surfaces of unit prior to testing. EPA requires a thermocouple on the bottom of the firebox. This must be installed prior to putting the unit on the scale. In some cases, the required thermocouple locations will be inaccessible on finished units. These units should have thermocouples installed by the manufacturer during construction. Check with the laboratory manager if problems are encountered in proper thermocouple attachment.
7. Measure firebox dimensions and record on data forms nos. EPA-2-TP. Make a three dimensional sketch of the firebox including firebrick, baffles and obstructions. Calculate firebox volume in cubic feet with both addition and substraction methods using forms nos. EPA-3-TP and EPA-4-TP. See Section 6.2.4 of EPA Method 28 for details of firebox volume determination.
8. If unit is catalytically equipped, additional thermocouples must be installed upstream and downstream of catalyst. Thermocouples should also be placed in the primary and secondary combustion chambers of all units.
9. Plug thermocouples into data acquisition system jacks making a check of locations and jack numbers for each test on data form no. EPA-5-TP.
10. Note that inserts are tested as if they are freestanding stoves.
11. Dilution tunnel should be cleaned prior to each certification test series and at anytime a higher burn rate follows a lower test burn rate.

II. SAMPLING SYSTEM – SET-UP

A. GAS ANALYSIS

1. Instruments should be turned on and allowed to warm up for one (1) hour minimum.

SFBA EMISSIONS AND EFFICIENCY TESTING
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2. Calibrate analyzers as follows:

NOTE : Prior to proceeding with calibration, make sure to use NIST tracable calibration gas bottles. Adjust flow meter if necessary at each instrument to required flow value.

a) Using span gas, adjust span control to values specified on calibration gas label.
b) Using nitrogene, adjust zero controls to provide a 0.00 analyzer readout.

c) Repeat a) and b) until no further adjustment is required.
d) Check readout vs. calibration gases (2) labels.

The CO_2 and CO analyzers are "ZEROED" on nitrogen. The O_2 analyzer is spanned on air and set for 20.9%. It is zeroed on nitrogen as well.

3. Check for response time synchronization.

a) With no fire in unit, allow reading to stabilize (O_2 should be 20.93, CO and CO_2 should equal O).
b) Flow the calibration gas in the unit and start stop watch. Note the time required for each unit to reach .90 of the calibration gas bottle value. If all three analyzers reach this value within 15 seconds of each other, synchronization is adequate. If not, contact the laboratory manager. Synchronization is adjusted by internal instrument setting.

4. Set-up sample clean-up and water collection train as follows.

a) Load impingers as follows:
Impinger #1: 100 ml distilled water and 5 ml H_2SO_4
Impinger #2: 100 ml distilled water and 5 ml H_2SO_4
Impinger #3: Empty
Impinger #4: 200 – 300 grams silica gel (dry)

b) Place impingers in container and connect with "U TUBES". Grease carefully on bottom half of ball joint so that grease will not get into tubes.
c) Connect filter to first impinger and sample line to last impinger.

e. Leak check system as follows.

1) Plug probe.
2) Turn on sample system.
3) Observe sample flow rotometer and vacuum gauge. If necessary, use vacuum; adjust valve to set vacuum to the maximum inches Hg.
4) If the float in rotometer does not stabilize below 10 on scale, system must be resealed.
5) Repeat leak check procedure until satisfactory results are obtained.

f) Just prior to starting test, fill impinger container with water and ice and record ambiant conditions on data form no. EPA-8-TP.

B. DILUTION TUNNEL SAMPLE TRAIN SET-UP

1. Filters and holders.

a) Clean probes and filter holder front housings carefully and desiccate for at least 24 hours prior to use.
b) Filters should be numbered and filter and probe combinations labeled prior to use.
c) Weigh desiccated filters and probe-filter units on analytical balance. Record weights data form no. EPA-10-TP. Note that probe and front half of front filter are to be weighed as a unit.
d) Carefully assemble filter holder units and connect to sampling systems. Check “DRIERITE” columns for adequate dry absorbent (blue).

2. Leak checking.

a) Each sample system is to be checked for leakage prior to inserting probes in tunnel.
b) Plug probes and start samplers, adjust pump bypass valve to produce a vacuum reading of 5 inches Hg. (NOTE: During test, vacuum must not exceed 5 inches unless posttest leak check shows acceptable results.)

c) Allow vacuum indication to stabilize for two (2) minutes, then record time and dry gas (DGM_1) and (DGM_2) meter readings. Wait ten (10) minutes and record dry gas meter readings again (DGM_3, DGM_4). NOTE: If mark, system is leaking too much and all seals should be checked.

d) Calculate leakage rate as follows.

1) System 1: $\frac{(DGM_3 - DGM_1)}{10} = CFM_1$

2) System 2: $\frac{(DGM_4 - DGM_2)}{10} = CFM_2$

If CFM_1 or CFM_2 is greater than .02 CFM, leakage is unacceptable and system must be resealed.

If CFM_1 or CFM_2 is greater than 0.04 X sample rate, leakage is unacceptable. For most tests, the sample rate will be about 0.15 CFM, thus leakage rates in excess of 0.04 X 0.15 = 0.006 CFM are not acceptable. Record leakage rates on form no. EPA-5-TP

e) Once leakage check is satisfactory, unplug probe and set flow to appropriate rate for test. This should be done in the minimum amount of time necessary and with the probes in ambient air. Do not insert probes in tunnel until the start of the test run. When flow is established, replug probes to prevent contamination.

III. TEST CONDUCT

A. FUEL LOAD

1. Determine optimum load weight by multiplying firebox volume in cubic feet by 7. This is the load weight on an as-fired basis.
2. Determine piece size to obtain the requested load configuration and meet the test load weight criteria. The load should consist of the following: **TO BE DETERMINED**
3. Weigh out test load and adjust weight by shortening all pieces equally if necessary. Record individual piece load on form no. EPA-11-TP.

4. Measure and record moisture content of each fuel piece using Delmhorst moisture meter. Determine if fuel load moisture content is in required range. If not, construct new load using wood with required moisture content. All wood in the humidity chamber should be within range. Contact project manager if you cannot find suitable pieces. Record moisture of each individual piece load on form no. EPA-11-TP.

B. UNIT START-UP

1. Before lighting a fire, turn on dilution tunnel and set flow rate to 140 SCFM if burn rate is to be less than 3 kg/hr or to an appropriate rate from table provided in laboratory for higher burn rates. Record readings on data form no. EPA-9-TP.
2. Check draft imposed on cold stove with all inlets closed and a draft gauge in the chimney. If draft is greater than 0.005 inches water column, adjust tunnel to stack gap until draft is less than 0.005.
3. Check for ambient airflow around unit with hot wire anomometer. Must be less than 50 ft/min.
4. Check all equipment for proper operation. Analyzers should be on and in sample mode. Computer should be loaded with test program and awaiting test start command.
5. Zero scale and start fire with uncolored newspaper and kindling representing 10 % of test load with the same type of fuel.
6. Once kindling is burning well after 5 minutes, add splitted pieces having a bottom surface around 4 sq. inches and representing 25% of test load weight. Operate at high fire for 15 minutes. Then adjust settings to intended test run levels as per the manufacturer's.
7. Following addition of pretest fuel load (splitted pieces), start computer for data logging.

8. All fuel additions, air intake settings and operational characteristics shall be noted with associated time stamp on form no. EPA-1-TP.

C. TEST RUN

1. Once the targeted test fuel bed weight is obtained, the test is to be started as follows:

   a) Insert the sample probes into the tunnel being careful not to hit sides of tunnel with probe tip.
   b) Check tunnel pitot tube for proper position. (Pitot should be carefully cleaned prior to each test.)
   c) Turn on probe sample systems and stack sampler.
   d) Open stove door, rake coals and load stove as follows: **TO BE DETERMINED**
   e) Close door or follow manufacturer's start-up procedures. (Five (5) minutes maximum time before all doors and controls must be set to final positions for duration of test.)
   f) An alarm will sound an audible signal at the (10) minutes intervals. This signal a reading interval. You must verify at each interval that the following readings are correctly logged by the data acquisition system and make observations of any unusual or non routine events that could occur.

      1) Rotometer readings.
      2) Tunnel pitot tube reading.

      (Zero regularly between readings)

      3) Gas meter readings.
      4) Temperature readings.
      5) Draft reading
      6) Test laod weight
      7) CO, CO_2 and O_2 readings
      8) Observations of any unusual or non-routine events.

   g) During the test, any condition approaching unacceptable limits will be noted. The filter probes and housings are installed in small holders just outside the tunnel. If the filter temperature gets too high, you will have to increase the water flow through the cooling unit until acceptable temperatures are obtained. In between readings, check on

other equipment. Be sure dryers and filters are working and monitor impinger train for proper water and ice levels etc.

h) When the fuel charge is consumed, it will signal end of test and shut down the sampling systems. When this occurs, remove filter holder and probes from tunnel and impingers from sample line.

IV. POST TEST PROCEDURES

A. SAMPLE RECOVERY – FILTER TRAINS

1. Carefully clean outside of probes and filter housings with alcohol.
2. Disassemble filter holder and transfer filters to clean petri dish. Scrape gasket with scalpel and collect any loose material on filters.
3. Place probe and front half of first filter holders (still assembled) and filters in desiccator. Allow 24-hour desiccation before weighing.
4. Weigh probe filter holder units and filters at six (6) hour intervals until weight change between weighings is less than 0.2 mg. Record all weights taken on data form no. EPA-10-TP.

B. CALCULATION OF RESULTS

The computer program carries out all final calculations. When run, it will ask for data from forms used during the test. Enter data as called for.

GENERAL

This guide cannot cover every possible contingency, which may develop during a particular test program. Many questions, which may arise, can be answered by a complete understanding of the test standards and their intent. When in doubt on any detail, check with the laboratory manager and be sure you understand the procedures involved.

It is critical that all spaces on the data forms be properly filled in. Each test must be represented by a complete record of what was done and when.

APPENDIX 11: Sample calculations

Validation du fichier de calcul avec les équations provenant des normes:
ASTM E2515-11
ASTME2618

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)
θ	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 =

Sample calculation

Data

W_{WD}	10,9	lbs
θ	360	min
$\%M_W$	4,25	%

Calculation

BR	0,789	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, $dscm^3$ (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)
ΔH	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	64,59	dcf
Y	0,98843	
P_{bar}	30,06	in Hg
ΔH	-1,0325	in Hg
T_m	534,2	R

Calculation

$V_{m(std)}$	61,20	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
ΔPF	Post-test weight gain of probe and filter holder assembly, mg

Sample calculation

Data

F_1	0,0095	g
F_2	0,000	g
ΔPF	0,001	g

Calculation

m_n	10,400	mg

Calculation based of train 2 data

Particulate concentration (C_S)

Equation used

ASTM 2515, equation 13

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

Nomenclature

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

Sample calculation

Data

m_n	10,400	mg
$V_{m(std)}$	61,20	dscf

Calculation

C_s	0,000170	g/dscf

Calculation based of train 2 data

Particulate concentration for room air (C_r)

Equation used

ASTM 2515, equation 14

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

Nomenclature

C_r	Concentration of particulate matter in room air, dry basis, corrected to standard conditions, g/dsm^3 (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^3 (dscf)

Sample calculation

Data

m_r	0,000	mg
$V_{mr(std)}$	20,08	dscf

Calculation

C_r	0,000000	g/dscf

Calculation based of train 2 data

Adjustment factor for alternative pitot tube placement (FP)

Equation used

ASTM 2515, equation 1

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

Nomenclature

V_{strav}	Average gas velocity caclulated 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}	0,219797775
V_{scent}	0,231298145

Calculation

F_P	0,950279

Average dilution tunnel gas velocity (V_S)

Equation used

ASTM 2515, equation 9

$$V_S = F_p K_P C_P \left(\sqrt{\Delta P}\right)_{avg} \sqrt{\frac{T_S}{P_S M_S}}$$

Nomenclature

V_S	Average dilution tunnel gas velocity, m/s (ft/s)
K_P	Pitot tube constant For the metric units: $34.97\ m/sec \left[\frac{\left(\frac{g}{g-mole}\right)(mm\ Hg)}{(°K)(mm\ H_2O)}\right]^{1/2}$ For English units: $85.49\ ft/sec \left[\frac{\left(\frac{lb}{lb-mole}\right)(in\ Hg)}{(°R)(in\ H_2O)}\right]^{1/2}$
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
$\left(\sqrt{\Delta P}\right)_{avg}$	Average square root of each individual velocity head (ΔP)
P_{bar}	Barometric pressure at measurement site, mm H_2O (in. H_2O)
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 English units

Sample calculation

Data

K_P	85,49	
C_P	0,99	
F_P	0,950	
$\left(\sqrt{\Delta P}\right)_{avg}$	0,2276	in $H_20^{1/2}$
P_{bar}	30,06	in Hg
P_g	0,23	in H_20
P_S	30,08	in Hg
M_S	28,78	lb/lb-mol
t_S	90,09	F
T_S	550,09	R

Calculation

V_S	14,5945	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^3/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^2 (ft^2)
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	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	14,594	
A	0,196	ft^2
T_{std}	528	R
T_S	550,09	R
P_S	30,078	in Hg
P_{std}	29,92	in Hg

Calculation

Q_{std}	162,59	dscf/min

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^3 (g/dscf)
C_r	Concentration of particulate matter in room air, g/dscm^3 (g/dscf)
Q_{std}	Total gas flow rate, dry basis corrected to standard conditions, dsm^3/min (dscf/min)

Sample calculation

Data

C_S	0,000170	g/dscf
C_r	0,000000	g/dscf
Q_{std}	162,59	dscf/min

Calculation

E	0,03	g/min
E	1,66	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^3 (g/dscf)
C_r	Concentration of particulate matter in room air, g/dscm^3 (g/dscf)
Q_{std}	Total gas flow rate, dry basis corrected to standard conditions, dsm^3/min (dscf/min)
θ	Total sampling time, min

Sample calculation

Data

C_S	0,000170	g/dscf
C_r	0,000000	g/dscf
Q_{std}	162,59	dscf/min
θ	360	min

Calculation

E	9,95	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: $34.97\ m/sec \left[\frac{\left(\frac{g}{g-mole}\right)(mm\ Hg)}{(°K)(mm\ H_2O)}\right]^{1/2}$ For English units: $85.49\ ft/sec \left[\frac{\left(\frac{lb}{lb-mole}\right)(in\ Hg)}{(°R)(in\ H_2O)}\right]^{1/2}$
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)
Δp_i	interval, i, of the test run
T_{Si}	Absolute average gas temperature in the dilution tunnel during the i^{th} minutes
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

Sample calculation

Data

i=1			**i=2**		
F_P	0,950		F_P	0,950	
K_P	85,49		K_P	85,49	
C_P	0,99		C_P	0,99	
Δp_i	0,052	in H_20	Δp_i	0,050	in H_20
T_{Si}	559,6	R	T_{Si}	559,9	R
P_S	30,08	in Hg	P_S	30,08	in Hg
M_S	28,78	lb/lb-mol	M_S	28,78	lb/lb-mol

Calculation

i=1			**i=2**		
v_{si}	14,80	ft/sec	v_{si}	14,43	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 (%)
θ	Total sampling time, min
θ_i	Time of interval, 1 min
V_m	Volume of gas sample measured by the DGM, dsm^3 (dscf)
$V_{mi(std)}$	Volume of gas sample measured by the digital mass flow controller during the i^{th} 1 minutes interval, dsm^3 (dscf)
V_S	Average gas velocity in the dilution tunnel, ft/min
V_{Si}	Average gas velocity in the dilution tunnel during the i^{th} 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^{th} 1 minutes
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^{th} 1 minutes

Sample calculation

Data

train =1			train =2		
θ	360	min	θ	360	min
θ_i	1	min	θ_i	1	min
V_m	59,81	dcf	V_m	61,22	dcf
$V_{mi(std)}$	0,167	cuft	$V_{mi(std)}$	0,1697	cuft
V_S	14,60	ft/sec	V_S	14,60	ft/sec
V_{Si}	14,809	ft/sec	V_{Si}	14,809	ft/sec
T_m	533,8	R	T_m	534,2	R
T_{mi}	532,77	R	T_{mi}	532,90	R
T_S	550,09	R	T_S	550,09	R
T_{Si}	559,6	R	T_{Si}	559,6	R

Calculation

train=1			**train=2**		
PR	101,3	%	PR	100,4	%

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, m2 (ft^2)

Sample calculation

Data

V_{mL}	0,167	dcf
F_A	0,0116	ft^2

Calculation

FV_{max}	14,37	ft/min

Dual train precision

Equation used

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

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	9,50 g
Train 2	9,95 g

Calculation

Dual train precision	2,31 %

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
∆R	The difference between the analyzer response at the end of the test run and the
Span	The upper limit of the instrument range, ppmv or %

Sample calculation

Data

∆R	0,015	%
Span	5	%

Calculation

Drift	0,30	%

Calculated with CO concentration values.

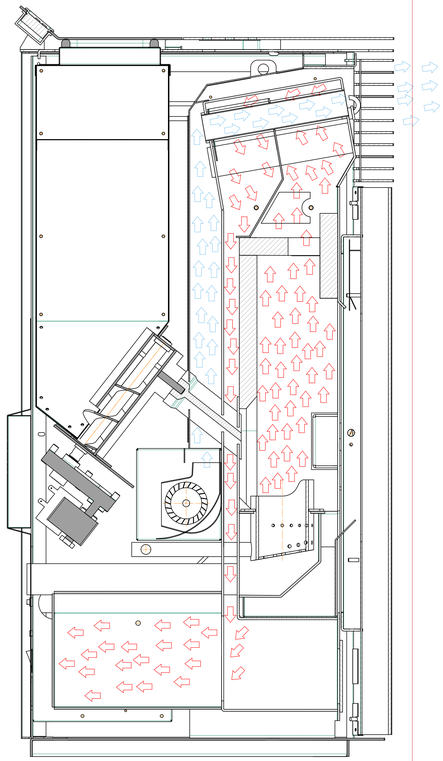
APPENDIX 12: Volume calculations

APPENDIX 13: Operating instruction

EPA Operating instruction Laminox model Jessica Air

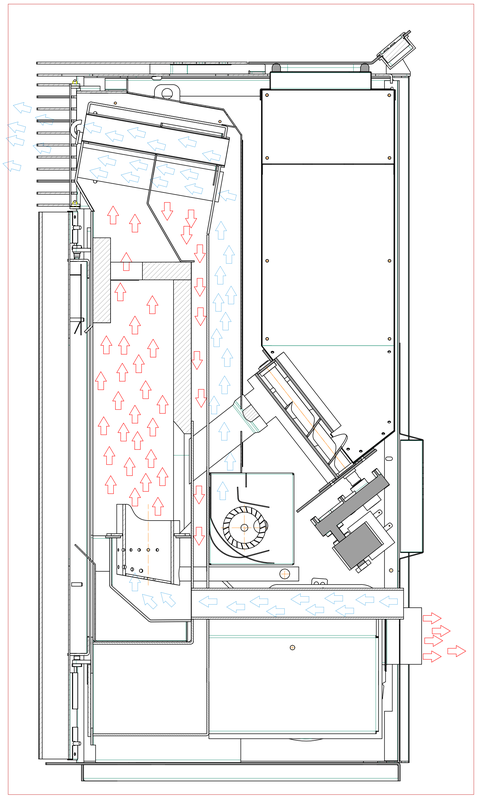
- For maximum output set to power 5
- For medium output set power 2
- For minimum output set to power 1

APPENDIX 14: Drawing Air flow pattern



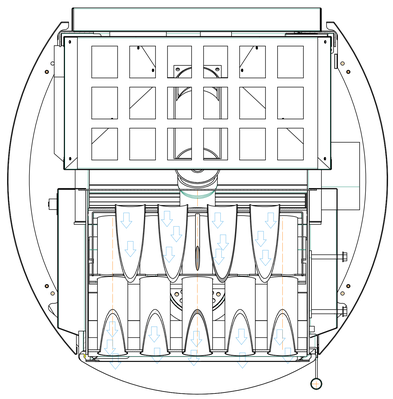
Apertura

A Sinistra
Scala 1:3



Apertura

Da destra
Scala 1:3



Apertura4
In Alto10

Scala 1:3

Articolo	Jessica 11 Air	Quantità	Scala	Sezione Dis.
Particolare	Passaggio fumi e aria		1:3	A0

LAMINOX

Tel-0733-657622
Zona industriale
62028 SARNANO (MC) ITALY

Dis.	Data
Ventura	30/05/2017
Disegno N° :	003

APPENDIX 15: WHA, CoC, 30 days notices, others

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
CERTIFICATION OF CONFORMITY
PURSUANT TO 40 CFR PART 60 SUBPARTS AAA AND QQQQ
2015 STANDARDS OF PERFORMANCE FOR NEW RESIDENTIAL WOOD HEATERS, NEW RESIDENTIAL HYDRONIC HEATERS AND FORCED-AIR FURNACES

Disclaimer: The statutory provisions and the EPA regulations described in this document contain legally binding requirements. This document is not a substitute for those provisions or regulations, nor is it a regulation itself. In the event of a discrepancy, please refer to 40 CFR PART 60 Subparts AAA AND QQQQ, Sections 60.533(b) and 60.5475(b). This document may be revised periodically without public notice. If you have additional questions, please contact Rafael Sanchez at 202-564-7028 or via email at sanchez.rafael@epa.gov.

GENERAL INFORMATION

Manufacturer's Name:

Laminox S.r.l.

Heater Type (Circle One):	Adjustable Burn Rate Wood Heater	Pellet Stove	Single Burn Rate Heater	Hydronic Heater	Forced Air Furnace	Other:
Hydronic Heater Type (Circle ALL that apply):	Full Storage	Partial Storage	Indoor	Outdoor	Other:	
Forced-Air Furnace Type (Circle One):	Small (less than 65,000 BTU/hr heat output)		Large (greater than 65,000 BTU/hr heat output)		Other:	
Fuel Tested:	Crib	Pellet	Cordwood	Wood Chips	Other:	

Model Name(s) (as it appears on test report):

Jessica 11 Air

Model Number(s) (as it appears on test report):

Jessica 11 Air

Catalyst: Yes_____ No___X____

Mailing Address:

Zona Industriale Callarella 261/263

Street Address:

Zona Industriale Callarella 261/263

City: **Samano**	**State:** **Italy**	**ZIP Code:** **62028**
Phone: **+39 0733657622**	**E-Mail:** **idro@laminox.com**	**Web Site:** **www.laminoxidro.com**

Address of Manufacturer:

Zona Industriale Callarella 261/263

City: **Samano**	**State** **Italy**	**ZIP Code:** **62028**

EPA APPROVED THIRD PARTY CERTIFIER

Authorized Representative(s):
Robert J. Zimmerman Jr.

Company:
UL LLC

Phone: **847-664-3129**	**E-mail:** **Robert.J.Zimmermanjr@ul.com**	**Fax:** **847-272-8129**

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
CERTIFICATION OF CONFORMITY
PURSUANT TO 40 CFR PART 60 SUBPARTS AAA AND QQQQ
2015 STANDARDS OF PERFORMANCE FOR NEW RESIDENTIAL WOOD HEATERS, NEW RESIDENTIAL HYDRONIC HEATERS AND FORCED-AIR FURNACES

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City: **Northbrook**	**State:** **Illinois**	**ZIP Code:** **60062**
Position: **Senior Staff Engineering Associate**		
Report Number: **PI-20163**	**Date(s) of Tests:** **2018-04-09**	**Date of Report:** **2018-04-20**
Quality Assurance Plan included?: **Yes ___X_____ No_____**	**Wood Heater/Hydronic Heater/Forced-Air Furnace Application Included:** **Yes _____ No___X_____**	**Remarks:**

Affected Source Data Summary

This affected source has been tested to (select one):
_____2015 NSPS particulate matter emissions limit of 4.5 g/hr
__X___2020 NSPS particulate matter emissions limit of 2.0 g/hr (2.5 g/hr if cordwood)

Wood Burning Heater	**Hydronic Heater**	**Forced-Air Furnace**
Weighted particulate emission average of __1___ test runs: _1.6___ grams per hour	Maximum Output Rating:_____ Weighted particulate emission average: _____ Lbs/MMbtu output	Particulate emission average: _____ Lbs/MMbtu output
Weighted average HHV efficiency of __1___ test runs: __72.8____%	Annual Efficiency Rating:_____	Overall thermal efficiency (HHV): _____%
	Particulate Emissions:_____	Overall Delivered Heat Efficiency: ____%

AFFIRMATIONS

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
CERTIFICATION OF CONFORMITY
PURSUANT TO 40 CFR PART 60 SUBPARTS AAA AND QQQQ
2015 STANDARDS OF PERFORMANCE FOR NEW RESIDENTIAL WOOD HEATERS, NEW RESIDENTIAL HYDRONIC HEATERS AND FORCED-AIR FURNACES

Disclaimer: The statutory provisions and the EPA regulations described in this document contain legally binding requirements. This document is not a substitute for those provisions or regulations, nor is it a regulation itself. In the event of a discrepancy, please refer to 40 CFR PART 60 Subparts AAA AND QQQQ, Sections 60.533(b) and 60.5475(b). This document may be revised periodically without public notice. If you have additional questions, please contact Rafael Sanchez at 202-564-7028 or via email at sanchez.rafael@epa.gov.

- **The above-named affected source has been tested by a laboratory qualified to test and report on the emissions of this type of product under 40 CFR Part 60, Standards of Performance for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced-Air Furnaces (2015 Standards).**
- **The Test Report No. PI-20163, prepared by Danick Power and dated 2018-04-20, has been reviewed by Robert J. Zimmerman Jr. and was found to be complete and to have used the correct procedures in accordance to the 2015 Standards.**
- **The emissions levels listed in the test report and listed above comply with the relevant particulate matter limits established by the 2015 Standards.**
- **The model listed above was tested using the following Test method(s): Method 28R, ASTM 2779, ASTM 2515.**
- **The permanent label and owner's manual meet the requirements of 40 CFR § 60.536 and/or § 60.5478.**
- **The above-named manufacturer, on the effective date of this certificate, was operating under a quality assurance plan, per 40 CFR § 60.533(m) and/or § 60.5475(m), that has been reviewed and approved by Robert J. Zimmerman Jr.**
- **The above-named manufacturer has contracted UL LLC to conduct regular (at least annual) unannounced audits of the manufacturing facility, affected source, and quality assurance plan pursuant to 40 CFR § 60.533(m) and/or § 60.5475(m).**

Robert J. Zimmerman Jr. /Senior Staff Engineering Associate
Print Name and Title

Robert J. Zimmerman Jr.
Signature of Authorized Third-Party Representative

2018-07-23
Date

This is a certification of conformity to certify that the bearer has successfully completed the requirements pursuant to the 2015 Standards.

Third-party EPA approval expiration date: 2020-11-12

V1 5.19.16

Remarks:

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
30-DAY NOTIFICATION FORM
PURSUANT TO 40 CFR PART 60 SUBPARTS AAA AND QQQQ
2015 STANDARDS OF PERFORMANCE FOR NEW RESIDENTIAL WOOD HEATERS, NEW RESIDENTIAL HYDRONIC HEATERS AND FORCED-AIR FURNACES

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- **The manufacturer of an affected wood/pellet heater/central heater model line must notify the Administrator of the date that certification testing is scheduled to begin by email to WoodHeaterReports@epa.gov.**
- **This notice must be received by the EPA at least 30 days before the start of testing.**

GENERAL INFORMATION

Manufacturer's Name:

Laminox

Appliance Type (Circle One):	Adjustable Burn Rate Wood Heater	Pellet Stove	Single Burn Rate Heater	Hydronic Heater	Forced Air Furnace	Other:
Hydronic Heater Type (Circle One):	Traditional	Full Storage	Partial Storage	Indoor/Outdoor	Other:	
Forced-Air Furnace Type (Circle One):	Small (less than 65,000 BTU/hr heat output)		Large (greater than 65,000 BTU/hr heat output)		Other:	
Fuel Type:	Crib	Pellet	Cordwood	Other:		

Model Name and Number:

JESSICA AIR 11 – J11A

TBD

Catalyst: No_X_

Mailing Address:

Zona Industriale Callarella, 261/263 62028 SARNANO (Macerata) Italy
Cod. Fiscale, Partita I.V.A. e Reg. Imp. N. IT 00113180434

Street Address:

Zona Industriale Callarella, 261/263 62028 SARNANO (Macerata) Italy
Cod. Fiscale, Partita I.V.A. e Reg. Imp. N. IT 00113180434

City: Macerata	**State:** Italy	**ZIP Code:** IT 00113180434
Phone: 0733.657622	**Fax:** 0733.657494	**Web Site:** http://www.laminox.com

Address of Manufacturing Facility:

Zona Industriale Callarella, 261/263 62028 SARNANO (Macerata) Italy
Cod. Fiscale, Partita I.V.A. e Reg. Imp. N. IT 00113180434

City: Macerata	**State** Italy	**ZIP Code:** IT 00113180434

EPA APPROVED TEST LABORATORY

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
30-DAY NOTIFICATION FORM
PURSUANT TO 40 CFR PART 60 SUBPARTS AAA AND QQQQ
2015 STANDARDS OF PERFORMANCE FOR NEW RESIDENTIAL WOOD HEATERS, NEW RESIDENTIAL HYDRONIC HEATERS AND FORCED-AIR FURNACES

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- **The manufacturer of an affected wood/pellet heater/central heater model line must notify the Administrator of the date that certification testing is scheduled to begin by email to WoodHeaterReports@epa.gov.**
- **This notice must be received by the EPA at least 30 days before the start of testing.**

Name and Title of Authorized Representative: Danick Power		
Company: Services Polytests inc.		
Phone: 450 741-3636	**E-mail: Dpower@polytests.com**	**Fax: NA**
City: St-jean-sur-richelieu	**State: Canada, Quebec**	**ZIP Code: J3B 7S7**
EPA APPROVED THIRD-PARTY CERTIFIER		
Name and Title of Authorized Representative: Robert J. Zimmerman Jr		
Company: UL LLC		
Phone: 847-664-3129	**E-mail: Robert.j.zimmerman@ul.com**	**Fax: 847-272-8129**
City: Northbrook	**State: IL**	**ZIP Code:60062**
COMPLIANCE TEST INFORMATION		
Test Method(s): Method 28; ASTME2779		
Date(s) of Proposed Test: February 22nd 2018 and after		
Testing Location: Polytests Services Inc. 695 B rue Gaudette, St-Jean-sur-Richelieu Québec, Canada, J3B 7S7 *450.741.3636*		

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
30-DAY NOTIFICATION FORM
PURSUANT TO 40 CFR PART 60 SUBPARTS AAA AND QQQQ
2015 STANDARDS OF PERFORMANCE FOR NEW RESIDENTIAL WOOD HEATERS, NEW RESIDENTIAL HYDRONIC HEATERS AND FORCED-AIR FURNACES

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- **The manufacturer of an affected wood/pellet heater/central heater model line must notify the Administrator of the date that certification testing is scheduled to begin by email to WoodHeaterReports@epa.gov.**
- **This notice must be received by the EPA at least 30 days before the start of testing.**

RAFAIANI LUKEN - PRESIDENT

Print Name and Title of Authorized Official

Signature

10-01-2018

Date

Remarks:

v1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
ENFORCEMENT AND
COMPLIANCE ASSURANCE

August 21, 2023

Ing. Luigi Rafaiani
President
Laminox
Zona Industriale Callarella 261/263
Sarnano, Italy 62028

Re: Request for Revised Certification Test Report to Address Documentation Problems or Irregularities – Jessica 11 Air and Veronica 11 Air Pellet Heater Models; Certificate of Compliance Number 135-18

Dear Mr. Rafaiani:

The United States Environmental Protection Agency has completed a post-certification review of the Laminox certification test report, dated April 20, 2018, and submitted in order to obtain a Certificate of Compliance for the above-referenced pellet heater models. As discussed below, this review found problems or irregularities in the test report documentation. EPA is requesting that you address these problems or irregularities by revising the test report to include all required information pertaining to a valid certification test. If a revised test report is not submitted as requested and within the time allotted, EPA may, at its discretion, determine that the certification test was not valid, which would serve as the basis for revoking the Certificate of Compliance in accordance with the 2015 Wood Heater Rule at 40 CFR § 60.533(l).

The 2015 Wood Heater Rule authorizes EPA to issue a Certificate of Compliance upon a manufacturer submitting all required documentation pertaining to a valid certification test. Such documentation must include a complete test report providing information for all test runs, including raw data sheets, laboratory technician notes, calculations, and test results. In addition, the documentation must include the items specified in the applicable test methods. See 40 CFR § 60.533(b)(5). Upon subsequent review of the certification test report, however, EPA determined that certain required test report information was missing and/or requires clarification. Therefore, EPA requests that you revise the test report to include the following additional information to maintain the Certificate of Compliance for the above-referenced models.

Test Report Problems or Irregularities	Regulatory Citation and/or Test Method	Information Needed to Address Problems or Irregularities
Missing Information - Efficiency Sample Calculations	40 CFR § 60.533(b)(5)	Include in the revised test report required efficiency sample calculations.
Missing or Incomplete Information - Calibration Data	40 CFR § 60.533(b)(5), 40 CFR § 60.535(a)(2)(iii)	Include in the revised test report valid calibration data.
Incomplete Information – Documentation of Run Validity	40 CFR § 60.533(b)(5)	Include in the revised test report discussion of each test run and its appropriateness and validity.
Incomplete Information - Documentation of Run Anomalies	40 CFR § 60.533(b)(5)	Include in the revised test report detailed discussion of all anomalies.
Missing Information – Particulate Matter (PM) Emissions by Run (g/hr) with Uncorrected Negative Weights	40 CFR § 60.533(b)(5)	Include in the revised test report PM emissions with uncorrected negative weights in g/hr for each run.
Missing or Incomplete Information – Train Precision (g/kg)	American Society for Testing and Materials (ASTM) E2515 11.7, 40 CFR § 60.533(b)(5)	Include in the revised test report explicit dual train comparison (precision) data in both % and g/kg.
Incomplete Information – Discussion of Negative Weights Handling Correction	40 CFR § 60.533(b)(5)	Include in the revised test report discussion of negatives handled appropriately with PM emissions reported with negative weights both corrected and uncorrected to zero.
Missing Information in Owner's Manual – Replacement Instructions	40 CFR § 60.536(g)(3)(v)	Include in the revised test report a revised Owner's Manual with instructions for the replacement of parts that are critical to the emissions performance of the unit, and other maintenance and repair instructions.

Test Report Problems or Irregularities	Regulatory Citation and/or Test Method	Information Needed to Address Problems or Irregularities
Missing Information in Owner's Manual - Warranty Rights	40 CFR § 60.536(g)(3)(vi)	Include in the revised test report a revised Owner's Manual with information on how to exercise warranty rights.

We request that you submit both a revised confidential business information (CBI)[1] and non-CBI test report along with a revised Certification of Conformity to EPA within ten (10) business days of receipt of this letter to maintain the Certificate of Compliance for the above-referenced models. The revised test report (both CBI and non-CBI versions) and Certification of Conformity should be clearly identified as revised with a revision date provided. The revised test report and Certification of Conformity should include a summary table indicating what revisions have been made and where the revisions are located in the test report. Concurrently, you must post the revised non-CBI test report and revised Owner's Manual on your website and provide to EPA the web address where they can be found.

Upon receipt, EPA will review the revised test report (CBI and non-CBI versions) to determine if the revisions sufficiently address the identified problems or irregularities and verify that the non-CBI report has been posted on your website. Please submit the revised test report (both CBI and non-CBI versions) to WoodHeaterReports@epa.gov. The subject line of your email should be marked as "Wood Heater Test Report Requested Information."

This request has been coordinated with EPA's Office of Air Quality Planning and Standards and the Office of General Counsel. If you have any questions regarding this letter, please contact the Wood Heater Program at WoodHeaterReports@epa.gov.

Sincerely,

Robert Scinta, Chief
Air Branch
Monitoring, Assistance, and Media Programs Division

[1] Manufacturers who claim that some of the information being submitted is CBI (e.g., design drawings and sensitive, detailed material specifications) must clearly mark the information. Note that emissions data cannot be claimed as CBI, including all information necessary either to determine emission rates in the format of the standard (e.g., g/hr, lb/mmBtu) or to determine whether the source complies with an applicable standard or limitation. See 40 CFR § 2.301(a)(2) https://www.govinfo.gov/content/pkg/CFR-2013-title40-vol1/pdf/CFR-2013-title40-vol1-sec2-301.pdf.

Office of Compliance
Office of Enforcement and Compliance Assurance

cc:

Richard A. Wayland, OAQPS/AQAD
Steffan M. Johnson, OAQPS/MTG
Elizabeth Vizard, OC/MAMPD
Melissa Schefski, OC/MAMPD
Rafael Sanchez, OC/MAMPD
Laura Cottingham, OGC/ARLO

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
2015 Standards of Performance for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced-Air Furnaces Application
40 CFR PART 60 SUBPARTS AAA AND QQQQ

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Contents

Application for us epa wood heater certification pursuant to 40 cfr PART 60 Subparts AAA and QQQQ **1**

Application for A Certificate of Compliance pursuant to 40 cfr PART 60 Subparts AAA and QQQQ **2**

2015 Standards of PerfoRmance for New Residential Wood Heaters, new residential hydronic heaters and forced-air furnaces **2**

General Information 2

Manufacturer's Authorized Representative INFORMATION 2

EPA-Approved Test Laboratory 3

Compliance Statements and Acknowledgements – Sections 60.533(b) and 60.5475(b) 4

Instructions: Please read the below statements and affirmations and address accordingly 4

For emissions data summary tables see attachments 4

Wood Burning Heaters **6**

A. Summary Results – Pellet Heaters 6

APPLICATION FOR A CERTIFICATE OF COMPLIANCE PURSUANT TO 40 CFR PART 60 SUBPARTS AAA AND QQQQ

2015 STANDARDS OF PERFORMANCE FOR NEW RESIDENTIAL WOOD HEATERS, NEW RESIDENTIAL HYDRONIC HEATERS AND FORCED-AIR FURNACES

GENERAL INFORMATION

Manufacturer's Name: Laminox

Heater Type (Circle One):	Adjustable Burn Rate Wood Heater	Pellet Stove	Single Burn Rate Heater	Hydronic Heater	Forced Air Furnace	Other:
Hydronic Heater Type (Circle One):	Traditional	Full Storage	Partial Storage	Indoor/Outdoor	Other:	
Forced-Air Furnace Type (Circle One):	Small (less than 65,000 BTU/hr heat output)		Large (greater than 65,000 BTU/hr heat output)		Other:	
Fuel Tested:	Crib	Pellet	Cordwood	Wood Chips	Other:	

Test Method(s) Method 28, AMST2779, ASMT 2515	**Catalyst: No**

Model Name and Design Number (The model name and design number must clearly distinguish one model from another. The name and design number cannot include the EPA symbol or logo or name or derivatives such as "EPA):

Jessica 11 Air, Veronica 11 Air

Physical Address (Street number and Address, not P.O. Box): **Zona Industriale Callarella 261/263**	**Mailing Address:** **Zona Industriale Callarella 261/263**

City: SARNANO	**State: ITALY**	**ZIP Code: 62028**
Phone: +39 0733657622	**Email: idro@laminox.com**	**Website: www.laminoxidro.com**

EPA Submission Date of 30 day Notice: January 12th 2018

MANUFACTURER'S AUTHORIZED REPRESENTATIVE INFORMATION

Name: Ing. Luigi Rafaiani

Position/Title: President

Address: Zona Industriale Callarella 261/263

City: Sarnano	**State: Italy**	**ZIP Code:62028**
Phone: +39 0733657622	**E-mail: l.rafaiani@laminox.com**	**Website: www.laminoxidro.com**

Remarks:

APPLICATION FOR A CERTIFICATE OF COMPLIANCE PURSUANT TO 40 CFR PART 60 SUBPARTS AAA AND QQQQ

2015 STANDARDS OF PERFORMANCE FOR NEW RESIDENTIAL WOOD HEATERS, NEW RESIDENTIAL HYDRONIC HEATERS AND FORCED-AIR FURNACES

EPA-APPROVED TEST LABORATORY		
Name of Test Laboratory: **Polytests Services inc.**		
Name of Person Authorized or Responsible for Conducting Compliance Test: Danick Power		
Position/Title: VP operation		
Address: 695-B Gaudette,		
City: St-Jean-sur-Richelieu	**State: Quebec, Canada**	**ZIP Code: J3B 7S7**
Phone: 450 741-3636	**Email: dpower@polytests.com**	**Website: www.polytests.com**
Remarks:		

EPA-Approved Third Party Certifier		
Name of Certifier Entity: UL LLC		
Name of Person Authorized or Responsible for Reviewing Test Report and/or Issuing Certification of Conformity: **Robert J. Zimmerman Jr.**		
Position/Title: **Staff Engineering Associate**		
Address:		
City:	**State:**	**ZIP Code: 60062**
Phone: 847-664-3129	**Email:** **Robert.J.Zimmermanjr@ul.com**	**Website: www.UL.com**
Remarks:		

COMPLIANCE STATEMENTS AND ACKNOWLEDGEMENTS – SECTIONS 60.533(B) AND 60.5475(B)

INSTRUCTIONS: PLEASE READ THE BELOW STATEMENTS AND AFFIRMATIONS AND ADDRESS ACCORDINGLY.

FOR EMISSIONS DATA SUMMARY TABLES SEE ATTACHMENTS

1. Engineering Drawings Statement

All drawings are provided into the CBI report

2. Firebox Statement Requirement

Firebox dimensions, materials and specifications are provided in the CBI report.

3. CBI

All data are provided into CBI and not CBI report.

4. Valid Certification Statement

All documentation about the valid certification test, including the summary table with data test, are provided into CBI and not CBI report submitted by Polytests Services Inc.

5. Warranties

A copy of the warranties for the model line which must include a statement that the warranties are void if the unit is used to burn materials for which the unit is not certified by the EPA and void if not operated according to the owner's manual will be provided with each unit.

6. Q/A Statement

The manufacturer (Laminox) will conduct a quality assurance program for the model line that satisfies the requirements of paragraph (m) of this section.

7. Laboratory Sealing of Unit

Such unit will be stored by the manufacturer (Laminox) in the sealed state until 5 years after the certification test.

8. Statements that the wood heaters manufactured under this certificate will be—

(i) similar in all material respects that would affect emissions as defined in § 60.531 to the wood heater submittend for certification testing, and labeled as prescribed in § 60.536 and 60.5478

(ii) accompanied by an owner's manual that meets the requirements in § 60.536 and 60.5478 in addition, a copy of the owner's manual must be submitted to the administrator and be available to the public on the manufacturer's (Laminox) web site.

9. Third Party Certification Statement

The manufacturer (Laminox) has entered into contracts with Politests Services Inc. and UL LLC approved laboratory and approved third party certifier that satisfy the requirements of paragraph (f) of this section.

10. Approved laboratory/third party Statement

The approved laboratory and approved third party certifier are allowed to submit information on behalf of the manufacturer (Laminox) including any claimed to be CBI.

11. Manufacturer's Website Certification Test Reports Availability Statement

The manufacturer (Laminox) will place a copy of the certification test report and summary on the manufacturer's web site available to the public within 30 days after the administrator issues a certificate of compliance.

12. Transferability Acknowledgement Statement

Laminox acknowledges that the certificate of compliance cannot be transferred to another manufacturer or model line without written approval by the Administrator.

13. Statement about Selling Wood Heaters without an EPA Certificate

Laminox acknowledges that is unlawful to sell, distribute or offer to sell or distribute an affected heater without a valid certificate of compliance.

Print Name and Title: ING. LUIGI RAFAIANI - PRESIDENT	**Date: 07/05/2018**

Signature of responsible representative of the manufacturer certifying the accuracy of the above statements:

The authorized or responsible party whose signature is above is certifying that the manufacturer has complied with and will continue to comply with all requirements of the 2015 NSPS for compliance certification and that the manufacturer remains responsible for compliance regardless of any error by the test laboratory or third-party certifier.

Attachments

Instructions: Please complete the section applicable to your certification request. You may substitute your own data tables in lieu of the ones shown below provided that all the information is captured.

WOOD BURNING HEATERS

A. SUMMARY RESULTS – PELLET HEATERS

Run Number	Date	Setting	BR	Run Time (Min.)	Heat Output (Btu/hr)	1st Hour Emissions (g/hr)	Integrated Total (g/hr)	CO Emissions (g/min)	Overall CO Emissions (g/min)	Heating Efficiency (% HHV)	Overall Heating Efficiency (% HHV)
1	April 9th 2018	H	1.5	60	21 400	3.1	1.62	0.32	0.28	75.4	72.8
		M	0.7	120	9 900			0.2		71.9	
		L	0.6	180	7 900			0.32		71.3	
		OA	0.8	360	10 705			0.28		72.8	