TEST REPORT

TEST OF A PELLET STOVE FOR EMISSIONS AND EFFICIENCY

PER: ASTM E2779-10 (section 9.4.1 integrate test run); ASTM E2515-11 as referred into 40 CFR Part 60 Subpart AAA, CSAB415.1-10 (for efficiency only)

Client:
AICO SPA (RAVELLI)
Via Consorzio Agrario, 3/D
Chiari, Italy

Model name:
Francesca 2015, RV80 CERAMICA, NICOLE

Attention: Rafaël Sanchez

TESTED BY:

Services Polytests
695-B Gaudette
St-jean-sur-Richelieu, QC, J3B 7S7

TEST DATES: January 17th 2022
REPORT DATE: January 31st 2022
Revision 1: May 18th 2022
Revision2: October 4th 2022
Project number: PI-20265

Tested:

Sébastien Boulais

written by:

Danick Power, P. Eng

Third party certifier: CSA

SUMMARY

List of revision:

Revision 1 May 18th 2022:

- Appendix 3 updated to included fuel analysis
- Page 12/284 Clarification about the blower is automatic.
- Appendix 13 updated to include Manufacturer's provided Operating instruction
- All thermocouple ISO 17025 calibration can already be found in appendix 3

Revision 2 October 4th 2022:

- Appendix 1 updated to included PM emissions in g/hr with negative weights both corrected to zero and uncorrected for run.
- Manual updated appendix 7 to include replacement parts and the required statement for non-catalytic models all sections are highlighted in the manual.

List of appendices

1 INTRODUCTION

1.1 GENERAL

Laboratory

- Location: Services 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 dates: January 17th 2022
- Test methods used:
  - Particulate emissions: ASTM E2779-10 (section 9.4.1 integrate test run); ASTM E2515-11 as referred into 40 CFR Part 60 Subpart AAA
  - Efficiency: CSA B415.1-10

1.2 TEST UNIT INFORMATION

General

- Manufacturer: Ravelli
- Product type: Pellet stove
- Combustion system: blower
- Unit tested: Nicole

Particularities

- Options: None
- Product line similarities: only esthetical changes for all three models: Francesca 2015, RV80 CERAMICA, NICOLE. All three units have same firebox construction and dimension, same combustion blower and convection. All same electrical components.

1.3 RESULTS

Emission results obtained

- emission rate: 1.00 grams/hour
- 1st hour emission rate: 1.09 grams/hour

Conformity: NSPS Phase 2020

1.4 PRETEST INFORMATION

Unit condition: The unit was received by carrier on January 10th in good shape. The 50hrs of aging was done during week of January 10th 2022.

Set up

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

Break in period

- Duration: the unit received from the manufacturer and run for at least 50 hours at power 2 (medium setting) burn rate with adequate documentation of fuel additions and flue and unit temperatures during the week of January 10th 2022.
- Fuel: hard wood pellet

2 SUMMARY OF TEST RESULTS

2.1 EMISSIONS

Run Number	Date	Setting	Burn Rate	Run Time (Min.)	Heat Output (Btu/hr)	1st Hour Emissions (g/hr)	Integrated Total (g/hr)	CO Emissions (g/hr)	Heating Efficiency (% HHV)
1	January 17th 2022	H	1,97	61	28 231	1,09	1,0	10,70	78,52
		M	1,04	121	15 302			6,85	81,00
		L	0,78	181	11 695			4,46	82,35
		Overall	1,06	363	15 677			6,24	80,73

- 0.104 gr/min overall Co emission rate
- medium burn rate (power2) was above 50% of the maximum burn, but overall found compliant as there is no adjustment between power 1 (minimum) and power2 (medium

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	30,150	30,239	17,5	15,6	0	0

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.)	Number of 2X4's	Number of 4x4's
1	10,00	4,3	na	14,80	na	4,3	na	na	na

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

Average dilution tunnel measurements				Sample Data			
Run Number	Burn Rate (Min)	Volumetry Flow Rate (dscf/min)	Total Temperatures (°R)	Volume sampled (DSCF)		Particulate catch (mg)	
				1	2	1	2
1	363	178,19	546,18	65,003	65,034	6,30	6,20

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	995,09	994,62	6,20	6,10	0,83%	0,02

2.7 GENERAL SUMMARY OF RESULTS

Run Number	Burn Rate (kg/hr)	Average Surface Temperature (F)	Change in surface Temperature (F)	Initial Draft (in. H^2O)	static pressure tunnel (in. H^2O)	Primary Air Setting	Run Time (min)
1	1,06	NA	NA	0,043	0,20	Integrated run	363

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
- Restriction: 3/4 X 10 3/4
- Dimensions: 4 X 10 5/8
- Material: Steel

Bricks

- Location: back and side of the combustion chamber
- Dimensions: 10 1/8 wide X 13 height; Sides: 6 wide X 13 height
- Material: Vermiculite

Flue gas exhaust

- Location: top left of the unit
- Dimensions: 3 inches (inside diameter)
- Material: Steel

Overall unit dimension

- Overall dimension: 18 ½ depth X 17 ¼ wide X 36 ¼ height
- Firebox dimensions: 10 ¾ X 6 ½ X 11 ½
- Burner dimension: 2 3/8 depth X 2 ½ wide X 2 ½ height

Flue fan

- Manufacturer: EBM-PAPST
- Model: M2E 068-BF
- Spec.: certification file: E76226

alternative component A:

- Manufacturer: EBM-PAPST
- Model: G2E152
- Spec.: certification file: E322940

alternative component B:

- Manufacturer: TRIAL SRL
- Model: YJ72-20E
- Spec.: certification file: E357840

Convection fan

- Manufacturer: EBM-PAPST
- Model: EM3030
- Spec.: certification file: E79449

alternative component A:

- Manufacturer: ALLTEMP PRODUCTS CO LTD
- Model: HB-RB64
- Spec.: certification file: E68813

alternative component B:

- Manufacturer: TRIAL SRL
- Model: FA636
- Spec.: certification file: E357840

Safety pressure switch

- Manufacturer: CLEVELAND CONTROLS
- Model: NS2
- Spec.: certification file: 1696470

alternative component:

- Manufacturer: Huba Control AG
- Model: 605
- Spec.: certification file: MH49692

Safety temperature switch

- Manufacturer: IMIT
- Model: LS1
- Spec.: certification file: E83222

alternative component:

- Manufacturer: Foshan Nanhai Tengya electrical Applliance Co.
- Model: WGS100-425-6112-20
- Spec.: certification file: E320875

Auger motor

- Manufacturer: MELLOR ELECTRICS
- Model: SC9-100
- Spec.: certification file: E191425

alternative component:

- Manufacturer: Merkle Korff ind.
- Model: 4415up
- Spec.: certification file: E32533

Gasket

- Refer to appendix 6 for all details

Glass

- in the door: 9 X 11 ¼
- material: Robax
- Thickness: 4mm

3.3 AIR SUPPLY SYSTEM

Model	NICOLE		
Power	rpm blower	air flow (m/s)	Auger setting (feed rate)
1	850	0,40	1.0 sec
2	1000	0,50	1.5 sec
3	1100	0,60	2.0 sec
4	1300	0,75	2.5 sec
5	1750	0,90	3.0 sec

Convection fan automatically adjust with output setting, fan lowest speed when stove is set at power 1 and convection fan at highest when the stove is set at power 5

3.4 OPERATION DURING TEST

Run #1

This run was performed January 17th 2022. It lasted 363 minutes and as ASTM E 2779 section 9.4.1 integrate test run obtained at 1.06 kg/hr & emission at 1.0 gr/hr. The pellet stove is preheated for 81 min. before the beginning of the test. For the first hour of the test the unit was set at power 5, then for the next two hours we set at power 2 for the medium, and for the last portion of the test the pellet stove was set at power 1 for three 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. The medium burn rate (power2) was above 50% of the maximum burn, but overall found compliant as there is no adjustment between power 1 (minimum) and power2 (medium).

- 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 cribs

- Type of wood: hard wood pellet Brand: Ambiance
- Description: The pellet for each test and preburn period was sent to Twin ports testing for test fuel calorific analysis. This laboratory is ISO/IEC 17025 recognize by the Standard council of Canada (ASTM D444-92). For the test fuel property refer to test fuel analysis in the appendix 3 Calibration data.
- sourcing: Polytests
- handling and storage: keep all the bag in the same room (at 20C ambient and 50% humidity) all wrap together to ensure the stability of the moisture.

3.5 STAR-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 10-foot 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 56 inches downstream of the pitot tube and 16 inches upstream from the end of this section.

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 AIE 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 posttest 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 EPA Method ASTM E 2515. The data and results are found in appendix.

APPENDIX 1: Raw data, forms and results

POLYTESTS
TESTING THROUGH YOUR REALITY

Date: 17 JANUARY 2022 Manufacturer: RANELLI Model: NICOLE

Project #: PT-20265 Run: 1 Tech: S.B. Reviewer: [illegible]

→ LINE 139	POWER 5	60 MIN
	POWER 2	120 MIN
	POWER 1	180 MIN

★ UNIT WAS PREHEATED MORE THAN A HOUR BEFORE BEGINNING of TEST. ★

TEST LOAD CONFIGURATION

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE / POST CHECKS

Date: 17 JANVIER 2022 Manufacturer: Ravelli Model: Nicole

Project #: PT-20263 Run: 1 Tech: SB Reviewer: SP

~~Moisture Meter Calibration Check~~: Pellet stove

Equipment #	Time	12%	22%
NA			

Pre-Test **Post-Test**

Facility Conditions:

	Pre-Test	Post-Test
Air Velocity from less than 2 feet	Ø (max50 Fpm)	(max50 Fpm)
Smoke Capture Check (tunnel velocity)	O.K.	NA
Picture	4 sides O.K.	O.K.

Wood Heater Conditions:

Date Wood Heater Stack Cleaned	17-01-2022	
Date Dilution Tunnel Cleaned	17-01-2022	
Induced Draft Check (max 0.005 H2O)	O.K	
Traverse before ignition	O.K.	
Flow Rate 140 cfm ±10%		O.K.

Temperature System:

Ambient (65°-90°F)		O.K. °F
Wood Heater Surface (±125°F)		N/A °F

Proportional Checks:

Thermocouple check	O.K.	
Pitot Clean	O.K.	
Pitot verification	O.K	
Pictures for report	Side	✓
	Coal bed	
	Load	✓
	Load in stove	
	Fuel adjustment	

Load Length approximately 5/6 of firebox Lenght: Pellet stove

POLYTESTS
TESTING THROUGH YOUR REALITY

SAMPLING EQUIPMENT CHECK OUT

Date: 17 JANUARY 2022 Manufacturer: RAVELLI Model: NICOLE

Project #: PT-20265 Run: 1 Tech: S.B. Reviewer: [illegible]

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.)	-10	-10	-10	-10	-10	-10
Final 1minute DGM (Liter)	564481.39	566380.18	564481.63	566380.40	315693.91	317609.76 ~~317409.76~~ SB
Initial 1minute DGM (Liter)	564481.30	566380.11	564481.55	566380.34	315693.90	317609.71 ~~317409.71~~ SB
Change © (Liter)	0.09		0.08	0.06	0.01	0.05
Allowable leakage .04 x Sample rate or 0.28Lpm CSA B415 (0.56)	✓	✓	✓	✓	✓	✓
Check OK	O.K.	O.K.	O.K.	O.K.	O.K.	O.K.

Leakage Checks Flue Gas Sampler

Plugged Probe	Pre Test	Post Test
Vacuum (inches Hg.)	-6	-6
Rotometer Reading (mml/min.)	Ø	Ø
Flow Rate (lpm)	1.5	1.5
Allowable (.02 x Sample Rate)	30	30
Check OK	O.K.	O.K.

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.)	3.201	0.4709	3.374	0.4634
Check OK (no change after 15 sec.)	O.K.	O.K.	O.K.	O.K.

POLYTESTS
TESTING THROUGH YOUR REALITY

PRE-TEST SCALE AUDIT

Date: 17 JANVIER 2022 Manufacturer: RAVELLI Model: NICOLE

Project #: PT-20205 Run: 1 Tech: S.B. Reviewer: DP

Scale Type	Audit		Measured Weight
	Equipment #	Weight	
Platform	EM-090	4.4 lbs, Class F	4.4 lbs
Wood	EM-090	4.40 lbs, Class F	4.40 lbs
Analytical	EM-128	100 mg, Class S	100 mg
Analytical	EM-129	200 g, Class S	200 g
PLATFORM	EM-205	22 lbs	22 lbs

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: 17 JANVIER 2022 Manufacturer: RAVELLI Model: NICOLE

Project #: PI-2265 Run: 1 Tech: S.B. Reviewer: DP

FOR TUNNELS < 12 in

Barometric pressure (P_{bar}) 102,1 (KPa.) Static pressure (P_q) 0.23 (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	0.058	73.32
B - Centroid	3.00	3.50	4	0.059	72.06
A-1	0.40	0.50	0.50	0.044	73.01
A-2	1.50	1.75	2	0.049	73.00
A-3	4.50	5.25	6	0.060	70.02
A-4	5.60	6.5	7.5	0.045	69.04
B-1	0.40	0.50	0.50	0.046	73.52
B-2	1.50	1.75	2	0.058	75.65
B-3	4.50	5.25	6	0.062	77.81
B-4	5.60	6.5	7.5	0.054	72.31
				AVERAGE	72.97

$$v_s = K_p C_p (\sqrt{\Delta p})_{avg} \sqrt{\frac{(T_s)_{avg}}{P_s M_s}}$$

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
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CONTINUOUS ANALYZERS

Date: 17 JANVIER 2020 Manufacturer: RAVELLI Model: NICOLE

Project #: PT - 20265 Run: 1 Tech: S.B. Reviewer: [illegible]

Pre-Test (Adjust and Record)

	ZERO		SPAN		CAL. (Record Only)	
CO	Ø	0	2.947	3.000	1.009	1.000
Tolerance CO	Ø	+/- 0.02	0.053	+/- 0.15	0.009	+/- 0.05
CO_2	Ø	0	18.11	18.00	9.82	10.00
Tolerance CO2	Ø	+/- 0.02	0.11	+/- 0.5	0.18	+/- 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	Ø	2.954	1.018	Ø	0.02	0.007	0.15	0.009	0.05	✓	
CO_2	Ø	18.12	9.83	Ø	0.02	0.01	0.5	0.01	0.5	✓	

POLYTESTS
TESTING THROUGH YOUR REALITY

TEST DATA LOG

Date: 17 JANUARY 2020 Manufacturer: RAVELLI Model: NICOLE

Project #: PT-2265 Run: 1 Tech: S.B. Reviewer: DP

RAW DRY GAS METER READINGS

	System 1	System 2	Blanck
Final (Liter)	566 379.32	317 608.32 ~~317 408.32~~	364 774.53
Initial (Liter)	564 482.64	315694.18	363679.35

AMBIENT CONDITIONS

	Before	After
Barometer (kPa):	102.1	102.4
Dry Bulb (F):	70.8	72.2
Humidity (%):	17.5	15.6

Flow Meter

	Start	End
Flow meter reading	N/A	

Flow Meter Verification

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

POLYTESTS
TESTING THROUGH YOUR REALITY

FUEL DATA

Date: 17 JANVIER 2022 Manufacturer: Ravelli Model: NICOLE
Project #: PI-20265 Run: 1 Tech: S.B Reviewer: DP

FUEL DESCRIPTION:
Type of wood: Pellet

PRE-TEST LOAD

Piece Size	Weight	Meter Moisture Content (% dry)*				
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					
x x in.	lbs.					

N/A S.B

TEST LOAD WEIGHT: ______________ lbs

POLYTESTS
TESTING THROUGH YOUR REALITY

FUEL DATA

Date: ~~24~~ 17 janvier 2020 Manufacturer: Ravelli Model: Nicole
Project #: PP-20205 Run: 1 Tech: S.B. Reviewer: DD

FUEL DESCRIPTION:
Type of wood : Pellet

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.						
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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 SB

TEST LOAD WEIGHT: ____________ lbs Min 20%: .... Max 25%: ____________

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 17 JANVIER 2022 Manufacturer: RAVELLI Model: NICOLE

Project #: PT-20265 Run: 1 Tech: S.B. Reviewer: DP

		SYSTEM 1 – 1st hour				SYSTEM 1				
Pre-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blanck
Date	Time	~~003~~ 004	30	31	5	004	32	33	37	104
16 JAN.	17h00	61.4543	0.1294	0.1289	34.6707	61.3977	0.1278	0.1278	35.1948	0.1303
17 JAN.	8h00	61.4543	0.1294	0.1288	34.6707	61.3978	0.1277	0.1278	35.1948	0.1303

		SYSTEM 1 – 1st hour				SYSTEM 1				
Post-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets	Blanck
Date	Time	3	30	31	5	4	32	33	37	104
17 JAN.	16h00	61.4548	0.1301	0.1286	34.6720	61.3980	0.1327	0.1274	35.1964	0.1305
24 JAN	7h30	61.4546	0.1300	0.1286	34.6712	61.3978	0.1325	0.1273	35.1959	0.1304
25 JAN	7h30	61.4546	0.1300	0.1286	34.6711	61.3978	0.1325	0.1273	35.1958	0.1304

POLYTESTS
TESTING THROUGH YOUR REALITY

DILUTION TUNNEL PARTICULATE SAMPLER DATA

Date: 17 JANVIER 2022 Manufacturer: Ducati Model: NICOLE

Project #: PT-2026S Run: 1 Tech: S.B. Reviewer:

		SYSTEM 2			
Pre-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	009	102	103	44
10 JAN.	12h00	61.4565	0.1303	0.1292	35.4243
17 JAN	8h00	61.4564	0.1302	0.1292	35.4243

		SYSTEM 2			
Post-test Weight Record		Probe & Housing Number	Front Filter Number	Back Filter Number	gaskets
Date	Time	9	102	103	44
17 JAN.	16h00	61.4565	0.1363	0.1293	35.4252
24 JAN	7h30	61.4565 ~~61.4566~~	0.1361	0.1292	35.4247
25 JAN	7h30	61.4565	0.1361	0.1291	35.4247

Paramètres

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

Code verrouillage:	RAV

Description du test

Test standard	EPA	
Run #	1	
Date	17-01-2022	
Technicien	SB	
Project #	PI-20165	

Description de l'unité

Manufacturier	Ravelli	
Modèle	NICOLE	
Combustion system	Pellet	
Appliance type	Pellet stove	
Firebox volume	na	cu ft.
Appliance weight empty	na	lbs
Appliance weight full	na	lbs

Paramètres du test

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

Échantillonnage

Blank sampling rate	0,20	cuft/min
Internal probe diameter	0,18	in.
Calibration Factor (DGM #1):	1,007	Dimensionless
Equipment number (DGM #1):	EM-178	
Calibration Factor (DGM #2):	1,005	Dimensionless
Equipment number (DGM #2):	EM-318	
Calibration Factor (DGM #3):	0,988	
Equipment number (DGM #3):	EM-179	Dimensionless

Tunnel

Targeted tunnel flow rate	200	scfm
Tunnel diameter	6	in.
Molecular weight	29	29 as per ASTM E2515
Pitot tube type	Standard	
Pitot tube coefficient	0,99	Dimensionless

Project nu.	PI-20165
Date	17-01-2022
Technicien	sb

Fuel data

Fuel type		
Fuel specie		
HHV	19232,92	kJ/kg
%C	44,07	
%H	8,09	
%O	42,98	
%Ash	0,36	
HHV	8271,00	Btu/lb
LHV	7915,00	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):	102,1	102,4
Barometer (in.Hg):	30,150119	30,23870862
Dry Bulb (F):	70,8	72,2
Humidity (%):	17,5	15,6
Air velocity (ft/min)	0	0

DGM #1	Final:	20001,497	cuft	Final:	566379,320	Liter
	Initial:	19934,517	cuft	Initial:	564482,640	Liter
DGM #2	Final:	11216,232	cuft	Final:	317608,320	Liter
	Initial:	11148,635	cuft	Initial:	315694,180	Liter
DGM room	Final:	12881,902	cuft	Final:	364774,830	Liter
	Initial:	12843,215	cuft	Initial:	363679,350	Liter

Numéro de la ligne dans "Raw data" à partir duquel les données du VRAI test commencent: 139

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

Project nu.	PI-20165
Date	17-01-2022
Technicien	sb

FUEL LOAD DATA SHEET, CSA B415

Test Load Weight:

Lower	Ideal	Upper
####	#####	#####

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

Load Volume: 0,00 cu. ft

Loading Density: #VALEUR! lbs./ft3

Number of Spaces:

Spacer weight: lbs

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

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

Piece Size (in): Thick	Wide	Length	Weight lbs	Meter Moisture Content Dry Uncorrected %					Ave. MC x Weight	Volume Cubic Inches	Ave. MC %
			14,80	4,30					63,64	0,00	4,3
										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	
								SUM MCx	63,64		4,3 %

Test Load Weight: 14,80 lbs.

Dry Weight: 6,44 kg.

Average Moisture Content: %

Dry: 4,30 Dry(EPA) 4,30

Dry(B415 4,30

4,30
Must be 19-25

Wet: 4,12
must be 15,2-22

Coal Bed Range: 3,0 lbs. to 3,7 lbs.

TEST CHARGE:

Coal bed weight: na lbs.

Project nu.	PI-20165
Date	17-01-2022
Technicien	sboulais

Tunnel Traverse Worksheet (for velocity calculations)

Static Pressure: 0,2 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=
0,955

Pour un tunnel moins de 12", prendre 4 lectures

	TUNNEL VELOCITY	TUNNEL TEMP	SQUARE ROOT
	In. wc	°F	
A center	0,058	73,32	0,2408
B center	0,059	72,06	0,2429
A1	0,044	73,01	0,2098
A2	0,049	73	0,2214
A3	0,060	70,02	0,2449
A4	0,045	69,04	0,2121
B1	0,046	73,520	0,2145
B2	0,058	75,650	0,2408
B3	0,062	77,810	0,2490
B4	0,054	72,310	0,2324
AVERAGE	0,0535	72,9740	0,2309

Project nu.	PI-20165
Date	17-01-2022
Technicien	sb

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	3	30	31	5	4	32	33	37	9	102	103	44	104		
Before (1)	61,4543	0,1294	0,1289	34,6707	61,3977	0,1278	0,1278	35,1948	61,4565	0,1303	0,1292	35,4243	0,1303	16-janv-22	17:00
Before (2)															
Before (3)															
Before (4)															
Before (5)															
Before (6)	61,4543	0,1294	0,1288	34,6707	61,3978	0,1277	0,1278	35,1948	61,4564	0,1302	0,1292	35,4243	0,1303	2022-01-17	8H00
After (1)	61,4548	0,1301	0,1286	34,6720	61,3980	0,1327	0,1274	35,1964	61,4565	0,1363	0,1293	35,4252	0,1305	2022-01-17	16H00
After (2)	61,4546	0,1300	0,1286	34,6712	61,3978	0,1325	0,1273	35,1959	61,4565	0,1361	0,1292	35,4247	0,1304	2022-01-24	7H30
After (3)	61,4546	0,1300	0,1286	34,6711	61,3978	0,1325	0,1273	35,1958	61,4565	0,1361	0,1291	35,4247	0,1304	2022-01-25	7H30
After (4)															
After (5)															
After (6)	61,4546	0,1300	0,1286	34,6711	61,3978	0,1325	0,1273	35,1958	61,4565	0,1361	0,1291	35,4247	0,1304	2022-01-25	7H30
Difference	0,0003	0,0006	-0,0002	0,0004	0,0000	0,0048	-0,0005	0,0010	0,0001	0,0059	-0,0001	0,0004	0,0001		
Total (mg)		1,1				6,4				6,3			0,1		
Total ajusté (mg)		**1,00**				**6,30**				**6,20**					

Project nu.	PI-20165
Date	17-01-2022
Technicien	sb

Demonstration purpose only not the real number filter negative mass corrected to Zero

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	3	30	31	5	4	32	33	37	9	102	103	44	104		
Before (1)	61,4543	0,1294	0,1289	34,6707	61,3977	0,1278	0,1278	35,1948	61,4565	0,1303	0,1292	35,4243	0,1303	2022-01-16	17:00
Before (2)															
Before (3)															
Before (4)															
Before (5)															
Before (6)	61,4543	0,1294	0,1288	34,6707	61,3978	0,1277	0,1278	35,1948	61,4564	0,1302	0,1292	35,4243	0,1303	2022-01-17	8H00
After (1)	61,4548	0,1301	0,1286	34,6720	61,3980	0,1327	0,1274	35,1964	61,4565	0,1363	0,1293	35,4252	0,1305	2022-01-17	16H00
After (2)	61,4546	0,1300	0,1286	34,6712	61,3978	0,1325	0,1273	35,1959	61,4565	0,1361	0,1292	35,4247	0,1304	2022-01-24	7H30
After (3)	61,4546	0,1300	0,1286	34,6711	61,3978	0,1325	0,1273	35,1958	61,4565	0,1361	0,1291	35,4247	0,1304	2022-01-25	7H30
After (4)															
After (5)															
After (6)	61,4546	0,1300	0,1288	34,6711	61,3978	0,1325	0,1278	35,1958	61,4565	0,1361	0,1292	35,4247	0,1304	2022-01-25	7H30
Difference	0,0003	0,0006	0,0000	0,0004	0,0000	0,0048	0,0000	0,0010	0,0001	0,0059	0,0000	0,0004	0,0001		
Total (mg)		1,3				7,1				6,4			0,1		
Total ajusté (mg)		**1,20**				**7,00**				**6,30**					

Project nu.	PI-20165
Date	17-01-2022
Technicien	sb

*		*	*	*	*	*1	*2	*3	Mass flow 1	DGM 1	DGM 1	Filter 1	Mass flow 2	DGM 2	DGM 2	Filter 2	Tunnel Velo	Flue draft
Elapsed		Weight				Flue	Room	Tunnel	Reading	Inlet T	Outlet T	Temp	Reading	Inlet T	Outlet T	Temp	Pressure	Pressure
Time	Raw data row	Remaining	CO	CO_2	O_2	Gas	Temp	Dry Bulb									in wc	in wc
min		lbs	%	%	%	°F	°F	°F	cuft/min	oF	oF	oF	cuft/min	oF	oF	oF	in wc	in wc
0,00	139,00	14,8	0,032	8,7	0,0	317,3	70,3	96,0	0,18	70,39	69,74	73,20	0,18	69,74	69,49	73,14	0,06	0,04
1,0	140,0	14,7	0,035	10,6	0,0	317,7	70,6	95,9	0,18	70,41	69,77	73,57	0,18	69,81	69,62	73,11	0,06	0,04
2,0	141,0	14,7	0,036	9,4	0,0	318,5	70,3	96,1	0,18	70,45	69,75	73,85	0,18	69,93	69,75	73,08	0,06	0,04
3,0	142,0	14,6	0,041	7,1	0,0	318,9	71,0	96,1	0,18	70,48	69,77	74,11	0,18	70,05	69,87	73,08	0,06	0,04
4,0	143,0	14,5	0,032	6,9	0,0	319,0	70,6	96,2	0,18	70,56	69,78	74,32	0,18	70,19	69,98	73,08	0,06	0,04
5,0	144,0	14,4	0,028	7,7	0,0	319,3	70,8	96,2	0,18	70,67	69,79	74,53	0,18	70,41	70,12	73,12	0,06	0,04
6,0	145,0	14,4	0,033	7,9	0,0	319,1	71,0	96,4	0,18	70,79	69,82	74,74	0,18	70,66	70,26	73,19	0,06	0,04
7,0	146,0	14,3	0,032	8,0	0,0	319,0	70,9	96,4	0,18	70,92	69,87	74,96	0,18	70,88	70,37	73,21	0,06	0,04
8,0	147,0	14,2	0,043	9,4	0,0	319,9	70,8	96,5	0,18	71,00	69,89	75,19	0,18	71,10	70,53	73,29	0,06	0,04
9,0	148,0	14,2	0,037	8,5	0,0	320,5	70,9	96,6	0,18	71,13	69,92	75,39	0,18	71,33	70,65	73,39	0,06	0,04
10,0	149,0	14,1	0,041	6,7	0,0	320,3	70,9	96,7	0,18	71,28	69,99	75,59	0,18	71,60	70,81	73,47	0,06	0,04
11,0	150,0	14,0	0,028	9,4	0,0	320,7	71,0	96,7	0,18	71,45	70,06	75,83	0,18	71,87	70,94	73,55	0,06	0,04
12,0	151,0	13,9	0,038	8,4	0,0	320,9	70,9	96,9	0,18	71,53	70,11	76,01	0,18	72,10	71,08	73,66	0,06	0,04
13,0	152,0	13,9	0,028	8,7	0,0	321,0	71,3	96,8	0,18	71,60	70,14	76,17	0,18	72,29	71,22	73,74	0,06	0,04
14,0	153,0	13,8	0,041	6,5	0,0	320,9	70,9	96,8	0,18	71,60	70,16	76,34	0,18	72,41	71,33	73,82	0,06	0,04
15,0	154,0	13,7	0,040	9,0	0,0	321,7	71,1	97,1	0,18	71,59	70,17	76,50	0,18	72,51	71,43	73,95	0,06	0,04
16,0	155,0	13,7	0,047	7,4	0,0	322,4	71,2	97,1	0,18	71,60	70,21	76,66	0,18	72,64	71,56	74,05	0,06	0,04
17,0	156,0	13,6	0,029	7,8	0,0	322,3	71,1	97,3	0,18	71,64	70,23	76,83	0,18	72,74	71,67	74,15	0,06	0,04
18,0	157,0	13,5	0,055	6,7	0,0	321,9	70,8	97,1	0,18	71,67	70,27	76,97	0,18	72,90	71,78	74,23	0,06	0,04
19,0	158,0	13,5	0,026	8,2	0,0	321,3	71,1	96,9	0,18	71,79	70,33	77,10	0,18	73,11	71,89	74,38	0,06	0,04
20,0	159,0	13,4	0,034	10,3	0,0	321,4	71,5	97,0	0,18	71,85	70,39	77,23	0,18	73,28	72,04	74,45	0,06	0,04
21,0	160,0	13,3	0,029	8,8	0,0	321,5	71,4	97,1	0,18	71,85	70,42	77,32	0,18	73,35	72,16	74,52	0,06	0,04
22,0	161,0	13,2	0,040	7,4	0,0	321,3	71,4	97,1	0,18	71,83	70,42	77,42	0,18	73,39	72,25	74,62	0,06	0,04
23,0	162,0	13,2	0,027	9,3	0,0	321,6	71,3	96,9	0,18	71,88	70,47	77,52	0,18	73,49	72,35	74,72	0,06	0,05
24,0	163,0	13,1	0,112	11,1	0,0	321,4	71,5	96,9	0,18	71,93	70,51	77,62	0,18	73,63	72,46	74,80	0,06	0,04
25,0	164,0	13,0	0,045	10,0	0,0	322,1	71,6	96,9	0,18	72,03	70,55	77,73	0,18	73,79	72,57	74,87	0,06	0,04
26,0	165,0	12,9	0,081	10,0	0,0	322,0	71,8	97,1	0,18	72,08	70,61	77,81	0,18	73,89	72,65	74,99	0,06	0,04
27,0	166,0	12,8	0,047	9,1	0,0	323,1	71,6	97,1	0,18	72,16	70,62	77,91	0,18	74,01	72,76	75,06	0,06	0,04
28,0	167,0	12,8	0,035	8,2	0,0	323,6	71,6	97,3	0,18	72,24	70,69	77,99	0,18	74,15	72,88	75,14	0,06	0,04
29,0	168,0	12,7	0,037	7,8	0,0	328,5	71,6	99,0	0,18	72,27	70,74	78,13	0,18	74,26	72,96	75,23	0,06	0,05
30,0	169,0	12,6	0,028	8,8	0,0	328,0	71,8	97,8	0,18	72,26	70,79	78,20	0,18	74,31	73,04	75,31	0,06	0,04
31,0	170,0	12,6	0,044	7,0	0,0	327,6	71,6	97,6	0,18	72,21	70,80	78,26	0,18	74,35	73,10	75,37	0,06	0,05
32,0	171,0	12,5	0,027	8,3	0,0	326,2	71,5	97,4	0,18	72,20	70,84	78,32	0,18	74,38	73,17	75,45	0,06	0,04
33,0	172,0	12,4	0,029	8,9	0,0	325,4	71,6	97,3	0,18	72,17	70,86	78,37	0,18	74,43	73,26	75,51	0,06	0,04
34,0	173,0	12,3	0,027	8,4	0,0	324,8	71,5	97,1	0,18	72,24	70,88	78,41	0,18	74,49	73,30	75,58	0,06	0,05
35,0	174,0	12,3	0,108	11,9	0,0	324,1	71,6	97,1	0,18	72,26	70,92	78,44	0,18	74,58	73,39	75,65	0,06	0,05
36,0	175,0	12,2	0,067	11,5	0,0	324,4	71,5	97,1	0,18	72,28	70,97	78,51	0,18	74,64	73,43	75,73	0,06	0,04
37,0	176,0	12,1	0,052	10,7	0,0	325,3	71,7	97,2	0,18	72,29	71,00	78,58	0,18	74,70	73,49	75,80	0,06	0,05
38,0	177,0	12,0	0,044	7,7	0,0	326,0	71,6	97,1	0,18	72,37	71,03	78,58	0,18	74,82	73,55	75,85	0,06	0,04
39,0	178,0	12,0	0,032	8,3	0,0	326,4	71,7	97,2	0,18	72,32	71,06	78,64	0,18	74,83	73,67	75,88	0,06	0,05
40,0	179,0	11,9	0,029	7,9	0,0	325,9	71,6	97,1	0,18	72,32	71,10	78,66	0,18	74,85	73,73	75,94	0,06	0,05
41,0	180,0	11,8	0,043	6,6	0,0	325,4	71,6	97,1	0,18	72,29	71,11	78,69	0,18	74,89	73,79	75,96	0,06	0,04
42,0	181,0	11,8	0,036	10,1	0,0	325,0	71,7	97,0	0,18	72,33	71,15	78,73	0,18	74,91	73,84	76,04	0,06	0,04
43,0	182,0	11,7	0,044	7,4	0,0	324,8	71,4	97,1	0,18	72,35	71,18	78,78	0,18	74,93	73,91	76,10	0,06	0,05
44,0	183,0	11,6	0,036	10,3	0,0	324,4	71,6	97,0	0,18	72,36	71,22	78,78	0,18	74,97	73,96	76,11	0,06	0,05
45,0	184,0	11,5	0,130	11,7	0,0	324,3	71,8	96,9	0,18	72,35	71,26	78,76	0,18	75,00	73,98	76,16	0,06	0,05
46,0	185,0	11,4	0,043	10,1	0,0	324,6	71,9	96,9	0,18	72,36	71,25	78,82	0,18	75,05	74,04	76,19	0,06	0,05
47,0	186,0	11,3	0,059	10,6	0,0	325,3	71,9	97,0	0,18	72,40	71,28	78,81	0,18	75,06	74,09	76,22	0,06	0,05
48,0	187,0	11,3	0,041	10,7	0,0	326,1	71,6	96,8	0,18	72,49	71,32	78,82	0,18	75,15	74,17	76,22	0,06	0,05
49,0	188,0	11,2	0,032	9,5	0,0	327,0	71,8	97,1	0,18	72,50	71,36	78,81	0,18	75,19	74,23	76,25	0,06	0,05
50,0	189,0	11,1	0,049	7,9	0,0	327,5	71,9	97,1	0,18	72,47	71,37	78,79	0,18	75,19	74,29	76,30	0,06	0,05
51,0	190,0	11,0	0,040	9,9	0,0	327,7	71,9	97,2	0,18	72,44	71,41	78,86	0,18	75,19	74,36	76,34	0,06	0,05
52,0	191,0	11,0	0,039	8,8	0,0	327,6	72,0	97,3	0,18	72,46	71,44	78,89	0,18	75,23	74,39	76,37	0,06	0,05
53,0	192,0	10,9	0,060	9,9	0,0	328,1	72,0	97,0	0,18	72,53	71,47	78,89	0,18	75,31	74,44	76,44	0,06	0,04
54,0	193,0	10,8	0,034	10,5	0,0	328,7	72,1	97,1	0,18	72,53	71,52	78,90	0,18	75,33	74,49	76,46	0,06	0,05
55,0	194,0	10,7	0,081	9,1	0,0	329,3	71,5	97,5	0,18	72,63	71,56	78,89	0,18	75,40	74,54	76,49	0,06	0,05
56,0	195,0	10,7	0,056	8,3	0,0	329,3	71,8	97,3	0,18	72,77	71,62	78,93	0,18	75,59	74,65	76,51	0,06	0,05
57,0	196,0	10,6	0,034	9,8	0,0	329,1	71,8	97,1	0,18	72,88	71,70	79,00	0,18	75,70	74,73	76,56	0,06	0,05
58,0	197,0	10,5	0,037	9,5	0,0	329,2	72,4	97,2	0,18	72,96	71,74	79,03	0,18	75,82	74,82	76,57	0,06	0,05
59,0	198,0	10,4	0,036	9,5	0,0	329,7	72,2	97,3	0,18	72,97	71,79	79,05	0,18	75,85	74,87	76,58	0,06	0,05
60,0	199,0	10,3	0,067	11,0	0,0	329,5	72,3	97,3	0,18	72,98	71,81	79,07	0,18	75,88	74,95	76,62	0,06	0,05
61,0	200,0	10,2	0,062	11,4	0,0	329,2	72,3	96,2	0,18	72,95	71,85	72,16	0,18	75,84	75,04	76,61	0,06	0,05
62,0	201,0	10,2	0,043	9,7	0,0	319,5	72,2	93,7	0,18	72,98	71,91	72,31	0,18	75,89	75,12	76,64	0,06	0,05
63,0	202,0	10,1	0,062	8,1	0,0	309,2	72,1	92,3	0,18	72,96	71,92	72,39	0,18	75,89	75,17	76,64	0,06	0,05
64,0	203,0	10,1	0,045	7,8	0,0	301,3	71,9	91,6	0,18	72,99	71,95	72,45	0,18	75,91	75,24	76,65	0,06	0,05
65,0	204,0	10,1	0,052	7,3	0,0	294,8	72,1	91,2	0,18	73,00	71,98	72,53	0,18	75,94	75,31	76,62	0,06	0,05
66,0	205,0	10,0	0,062	7,0	0,0	289,9	72,2	90,8	0,18	73,09	72,02	72,63	0,18	76,00	75,33	76,60	0,06	0,04
67,0	206,0	10,0	0,070	5,8	0,0	286,2	72,1	90,4	0,18	73,03	72,04	72,72	0,18	75,99	75,37	76,59	0,06	0,05
68,0	207,0	9,9	0,045	7,2	0,0	282,1	71,9	90,1	0,18	73,11	72,06	72,81	0,18	76,03	75,44	76,59	0,06	0,04
69,0	208,0	9,9	0,031	6,9	0,0	278,5	71,9	89,9	0,18	73,09	72,11	72,91	0,18	76,07	75,48	76,59	0,06	0,04
70,0	209,0	9,9	0,028	8,2	0,0	275,0	71,8	89,5	0,18	73,09	72,12	73,01	0,18	76,12	75,52	76,56	0,06	0,04
71,0	210,0	9,8	0,056	10,5	0,0	272,2	71,9	89,3	0,18	73,10	72,15	73,11	0,18	76,11	75,57	76,56	0,06	0,04
72,0	211,0	9,8	0,045	9,7	0,0	269,9	71,3	89,0	0,18	73,01	72,16	73,20	0,18	76,04	75,57	76,53	0,06	0,04
73,0	212,0	9,7	0,047	7,4	0,0	267,8	71,7	89,0	0,18	72,96	72,15	73,30	0,18	76,00	75,60	76,51	0,06	0,04

74,0	213,0	9,7	0,034	9,5	0,0	266,0	71,8	88,7	0,18	73,00	72,19	73,39	0,18	76,05	75,61	76,47	0,06	0,04
75,0	214,0	9,7	0,054	7,6	0,0	264,1	71,2	88,4	0,18	72,97	72,21	73,47	0,18	76,06	75,60	76,44	0,06	0,04
76,0	215,0	9,6	0,051	8,0	0,0	261,8	71,9	88,3	0,18	72,99	72,25	73,58	0,18	76,10	75,63	76,44	0,06	0,04
77,0	216,0	9,5	0,074	11,2	0,0	260,0	71,9	88,0	0,18	73,01	72,29	73,67	0,18	76,16	75,67	76,41	0,06	0,04
78,0	217,0	9,5	0,132	11,2	0,0	258,9	71,7	87,7	0,18	73,05	72,28	73,74	0,18	76,17	75,68	76,38	0,06	0,04
79,0	218,0	9,5	0,173	5,6	0,0	258,7	71,7	89,0	0,18	73,03	72,31	73,82	0,18	76,18	75,75	76,35	0,06	0,03
80,0	219,0	9,4	0,071	5,2	0,0	266,2	71,6	89,3	0,18	73,00	72,33	73,93	0,18	76,15	75,79	76,34	0,06	0,04
81,0	220,0	9,4	0,044	10,5	0,0	262,7	71,7	88,4	0,18	73,09	72,32	74,02	0,18	76,21	75,83	76,29	0,06	0,04
82,0	221,0	9,4	0,029	9,2	0,0	259,7	71,9	88,1	0,18	73,17	72,38	74,08	0,18	76,28	75,86	76,29	0,06	0,04
83,0	222,0	9,3	0,062	7,0	0,0	257,5	72,1	87,9	0,18	73,20	72,38	74,18	0,18	76,35	75,92	76,29	0,06	0,04
84,0	223,0	9,3	0,041	9,8	0,0	255,6	71,8	87,9	0,18	73,37	72,45	74,25	0,18	76,44	75,96	76,28	0,06	0,04
85,0	224,0	9,2	0,032	7,7	0,0	253,8	72,1	87,7	0,18	73,51	72,51	74,32	0,18	76,53	75,99	76,25	0,06	0,04
86,0	225,0	9,2	0,086	6,4	0,0	251,8	72,3	87,7	0,18	73,59	72,54	74,41	0,18	76,59	76,03	76,24	0,06	0,04
87,0	226,0	9,2	0,034	10,0	0,0	250,4	72,2	87,8	0,18	73,61	72,58	74,49	0,18	76,66	76,09	76,22	0,06	0,04
88,0	227,0	9,1	0,033	8,8	0,0	249,6	71,9	87,8	0,18	73,56	72,62	74,57	0,18	76,59	76,14	76,21	0,06	0,04
89,0	228,0	9,1	0,044	8,4	0,0	248,3	72,2	87,8	0,18	73,45	72,62	74,64	0,18	76,54	76,16	76,20	0,06	0,04
90,0	229,0	9,0	0,035	9,1	0,0	247,7	71,9	87,7	0,18	73,32	72,62	74,67	0,18	76,44	76,13	76,19	0,07	0,04
91,0	230,0	9,0	0,087	11,0	0,0	246,8	72,1	87,8	0,18	73,24	72,60	74,70	0,18	76,38	76,14	76,15	0,06	0,04
92,0	231,0	8,9	0,058	7,3	0,0	246,1	72,0	87,9	0,18	73,25	72,61	74,78	0,18	76,36	76,15	76,15	0,06	0,04
93,0	232,0	8,9	0,038	7,5	0,0	245,2	71,8	87,9	0,18	73,35	72,65	74,81	0,18	76,42	76,19	76,14	0,06	0,04
94,0	233,0	8,9	0,032	7,9	0,0	244,6	71,9	87,8	0,18	73,41	72,66	74,89	0,18	76,47	76,21	76,13	0,06	0,04
95,0	234,0	8,8	0,051	9,1	0,0	244,0	72,1	88,0	0,18	73,44	72,71	74,93	0,18	76,49	76,24	76,12	0,06	0,04
96,0	235,0	8,8	0,031	8,1	0,0	243,3	72,3	88,1	0,18	73,45	72,72	74,98	0,18	76,51	76,27	76,12	0,06	0,04
97,0	236,0	8,7	0,050	6,2	0,0	242,8	72,2	88,1	0,18	73,42	72,73	75,02	0,18	76,52	76,27	76,12	0,06	0,04
98,0	237,0	8,7	0,035	7,5	0,0	242,2	72,3	88,2	0,18	73,41	72,73	75,08	0,18	76,47	76,27	76,09	0,06	0,04
99,0	238,0	8,6	0,026	8,6	0,0	241,8	71,9	88,1	0,18	73,41	72,76	75,12	0,18	76,51	76,30	76,08	0,06	0,04
100,0	239,0	8,6	0,033	7,9	0,0	241,0	71,9	88,0	0,18	73,46	72,79	75,15	0,18	76,54	76,32	76,08	0,06	0,04
101,0	240,0	8,6	0,041	6,3	0,0	240,2	72,2	87,9	0,18	73,45	72,81	75,17	0,18	76,54	76,34	76,06	0,06	0,04
102,0	241,0	8,6	0,041	6,0	0,0	239,6	72,1	88,0	0,18	73,45	72,82	75,22	0,18	76,53	76,36	76,06	0,06	0,04
103,0	242,0	8,5	0,047	7,4	0,0	239,0	72,5	88,0	0,18	73,48	72,83	75,28	0,18	76,50	76,37	76,07	0,06	0,04
104,0	243,0	8,5	0,024	9,5	0,0	238,3	72,0	87,9	0,18	73,60	72,85	75,31	0,18	76,61	76,43	76,05	0,06	0,04
105,0	244,0	8,4	0,026	7,5	0,0	237,7	72,2	87,9	0,18	73,60	72,88	75,33	0,18	76,60	76,47	76,04	0,06	0,04
106,0	245,0	8,4	0,072	5,0	0,0	237,5	71,9	87,9	0,18	73,60	72,89	75,35	0,18	76,62	76,48	76,02	0,06	0,04
107,0	246,0	8,4	0,071	5,2	0,0	236,3	71,7	87,9	0,18	73,59	72,90	75,39	0,18	76,63	76,51	76,01	0,06	0,04
108,0	247,0	8,4	0,031	7,1	0,0	236,2	72,1	87,8	0,18	73,56	72,92	75,43	0,18	76,63	76,56	76,00	0,06	0,04
109,0	248,0	8,3	0,031	7,6	0,0	235,5	72,1	87,7	0,18	73,59	72,95	75,45	0,18	76,65	76,57	76,00	0,06	0,04
110,0	249,0	8,3	0,026	9,4	0,0	235,2	71,9	87,8	0,18	73,72	72,99	75,52	0,18	76,73	76,65	76,00	0,06	0,04
111,0	250,0	8,3	0,033	8,3	0,0	235,1	72,3	87,7	0,18	73,75	73,02	75,56	0,18	76,79	76,68	76,01	0,06	0,04
112,0	251,0	8,2	0,027	7,8	0,0	235,0	72,2	87,8	0,18	73,80	73,05	75,58	0,18	76,86	76,73	75,99	0,06	0,04
113,0	252,0	8,2	0,039	9,8	0,0	234,4	72,0	87,8	0,18	73,90	73,10	75,63	0,18	76,93	76,76	76,02	0,07	0,04
114,0	253,0	8,1	0,033	7,4	0,0	234,4	72,3	87,9	0,18	73,97	73,16	75,66	0,18	76,98	76,82	76,01	0,06	0,04
115,0	254,0	8,1	0,049	6,6	0,0	233,9	72,4	87,9	0,18	73,92	73,17	75,71	0,18	76,93	76,85	76,01	0,06	0,04
116,0	255,0	8,0	0,027	7,6	0,0	233,6	72,5	87,9	0,18	73,89	73,18	75,73	0,18	76,87	76,84	76,01	0,06	0,04
117,0	256,0	8,0	0,026	7,6	0,0	233,5	72,3	88,0	0,18	73,84	73,18	75,75	0,18	76,87	76,84	76,02	0,06	0,04
118,0	257,0	7,9	0,038	7,5	0,0	233,3	72,2	88,1	0,18	73,82	73,19	75,76	0,18	76,85	76,83	76,01	0,06	0,04
119,0	258,0	7,9	0,051	10,2	0,0	233,8	72,2	88,0	0,18	73,81	73,24	75,78	0,18	76,90	76,84	76,02	0,06	0,04
120,0	259,0	7,9	0,064	6,3	0,0	233,1	72,0	88,0	0,18	73,81	73,29	75,81	0,18	76,92	76,83	76,00	0,06	0,04
121,0	260,0	7,8	0,030	8,0	0,0	232,6	72,3	88,0	0,18	73,81	73,30	75,82	0,18	76,93	76,83	76,02	0,06	0,04
122,0	261,0	7,8	0,026	8,5	0,0	232,5	72,5	88,0	0,18	73,85	73,31	75,84	0,18	76,97	76,85	76,02	0,06	0,04
123,0	262,0	7,7	0,058	8,1	0,0	232,1	72,7	88,0	0,18	73,97	73,34	75,86	0,18	77,06	76,89	76,02	0,06	0,04
124,0	263,0	7,7	0,051	6,5	0,0	231,4	72,4	87,9	0,18	74,07	73,37	75,87	0,18	77,15	76,91	76,01	0,06	0,04
125,0	264,0	7,7	0,039	6,7	0,0	232,1	72,4	88,1	0,18	74,18	73,43	75,92	0,18	77,24	76,97	76,04	0,06	0,04
126,0	265,0	7,6	0,022	7,8	0,0	232,0	72,4	88,1	0,18	74,14	73,44	75,93	0,18	77,21	76,98	76,03	0,06	0,04
127,0	266,0	7,6	0,127	4,6	0,0	230,6	72,2	88,2	0,18	74,04	73,46	75,95	0,18	77,14	76,97	76,05	0,06	0,04
128,0	267,0	7,6	0,034	7,5	0,0	230,6	72,3	88,1	0,18	73,99	73,50	75,96	0,18	77,13	77,00	76,05	0,06	0,04
129,0	268,0	7,5	0,073	10,0	0,0	230,8	72,3	88,0	0,18	73,94	73,53	75,99	0,18	77,10	76,99	76,05	0,07	0,03
130,0	269,0	7,5	0,038	9,4	0,0	239,0	72,2	92,3	0,18	73,94	73,54	76,02	0,18	77,14	77,00	76,07	0,06	0,04
131,0	270,0	7,4	0,157	4,2	0,0	238,1	72,5	89,1	0,18	74,02	73,59	76,02	0,18	77,18	77,04	76,08	0,06	0,04
132,0	271,0	7,4	0,029	8,0	0,0	236,5	72,2	88,8	0,18	73,98	73,60	76,04	0,18	77,19	77,03	76,07	0,06	0,04
133,0	272,0	7,4	0,027	8,9	0,0	235,1	72,1	88,6	0,18	73,95	73,61	76,09	0,18	77,17	77,02	76,10	0,06	0,04
134,0	273,0	7,3	0,051	5,8	0,0	233,7	72,6	88,5	0,18	73,90	73,63	76,12	0,18	77,18	77,04	76,10	0,06	0,04
135,0	274,0	7,3	0,042	6,1	0,0	233,0	72,0	88,6	0,18	73,90	73,63	76,15	0,18	77,17	77,05	76,11	0,06	0,04
136,0	275,0	7,2	0,028	9,8	0,0	232,7	72,4	88,4	0,18	73,87	73,63	76,14	0,18	77,12	77,06	76,11	0,06	0,04
137,0	276,0	7,2	0,032	7,2	0,0	231,9	71,8	88,5	0,18	73,80	73,59	76,13	0,18	77,07	77,01	76,10	0,06	0,04
138,0	277,0	7,1	0,041	8,1	0,0	231,6	72,4	88,4	0,18	73,83	73,62	76,18	0,18	77,09	77,03	76,13	0,06	0,04
139,0	278,0	7,1	0,037	9,7	0,0	231,2	72,4	88,4	0,18	73,86	73,61	76,20	0,18	77,07	77,02	76,13	0,06	0,04
140,0	279,0	7,0	0,049	9,8	0,0	230,9	72,3	88,3	0,18	73,86	73,58	76,22	0,18	77,09	77,02	76,14	0,06	0,03
141,0	280,0	7,0	0,039	8,9	0,0	230,4	72,2	88,2	0,18	73,99	73,59	76,20	0,18	77,15	77,05	76,15	0,06	0,03
142,0	281,0	7,0	0,027	8,5	0,0	230,6	72,6	88,2	0,18	74,04	73,62	76,24	0,18	77,17	77,08	76,16	0,06	0,04
143,0	282,0	6,9	0,044	7,5	0,0	230,1	72,3	88,2	0,18	74,07	73,64	76,26	0,18	77,22	77,08	76,16	0,06	0,04
144,0	283,0	6,9	0,061	6,1	0,0	229,7	72,6	88,2	0,18	74,16	73,66	76,26	0,18	77,33	77,14	76,15	0,06	0,04
145,0	284,0	6,8	0,043	6,7	0,0	229,4	72,5	88,3	0,18	74,31	73,69	76,29	0,18	77,43	77,20	76,20	0,06	0,04
146,0	285,0	6,8	0,028	7,4	0,0	229,7	72,1	88,1	0,18	74,13	73,71	76,30	0,18	77,36	77,21	76,20	0,06	0,03
147,0	286,0	6,8	0,025	7,9	0,0	229,4	72,5	88,0	0,18	73,93	73,67	76,27	0,18	77,22	77,20	76,17	0,06	0,03
148,0	287,0	6,7	0,031	7,2	0,0	229,1	72,5	88,2	0,18	73,90	73,64	76,29	0,18	77,18	77,21	76,16	0,06	0,03
149,0	288,0	6,7	0,037	5,9	0,0	228,7	72,4	88,1	0,18	73,87	73,63	76,27	0,18	77,12	77,23	76,15	0,06	0,03
150,0	289,0	6,6	0,047	6,5	0,0	228,5	72,0	88,1	0,18	73,80	73,64	76,27	0,18	77,06	77,18	76,13	0,06	0,03
151,0	290,0	6,6	0,028	6,1	0,0	228,2	72,2	87,9	0,18	73,76	73,62	76,30	0,18	77,04	77,19	76,16	0,06	0,04

152,0	291,0	6,6	0,033	5,9	0,0	227,5	72,0	87,9	0,18	73,76	73,63	76,29	0,18	77,03	77,15	76,15	0,06	0,03
153,0	292,0	6,5	0,022	7,8	0,0	227,1	72,2	87,8	0,18	73,77	73,65	76,31	0,18	77,03	77,16	76,15	0,06	0,03
154,0	293,0	6,5	0,024	7,3	0,0	227,3	72,1	87,7	0,18	73,71	73,65	76,32	0,18	77,02	77,17	76,14	0,07	0,03
155,0	294,0	6,4	0,043	10,1	0,0	227,4	72,3	87,6	0,18	73,66	73,63	76,27	0,18	77,00	77,14	76,11	0,06	0,03
156,0	295,0	6,4	0,071	10,4	0,0	227,5	72,4	87,5	0,18	73,66	73,64	76,28	0,18	77,01	77,16	76,11	0,07	0,03
157,0	296,0	6,4	0,068	6,0	0,0	226,7	72,4	87,7	0,18	73,64	73,63	76,30	0,18	76,96	77,16	76,13	0,06	0,03
158,0	297,0	6,3	0,028	8,0	0,0	226,3	72,4	87,6	0,18	73,59	73,63	76,30	0,18	76,93	77,16	76,11	0,06	0,03
159,0	298,0	6,3	0,041	7,1	0,0	225,9	72,6	87,6	0,18	73,61	73,64	76,30	0,18	76,95	77,17	76,12	0,06	0,03
160,0	299,0	6,2	0,057	8,8	0,0	226,3	72,2	87,5	0,18	73,61	73,64	76,29	0,18	76,95	77,15	76,14	0,06	0,03
161,0	300,0	6,2	0,036	9,0	0,0	226,0	72,4	87,6	0,18	73,69	73,65	76,29	0,18	76,97	77,18	76,14	0,06	0,03
162,0	301,0	6,2	0,039	7,0	0,0	225,5	72,2	87,3	0,18	73,70	73,66	76,30	0,18	76,98	77,17	76,13	0,06	0,04
163,0	302,0	6,1	0,034	6,5	0,0	225,5	72,3	87,4	0,18	73,69	73,63	76,28	0,18	76,97	77,16	76,14	0,06	0,03
164,0	303,0	6,1	0,036	9,3	0,0	225,8	72,5	87,4	0,18	73,73	73,66	76,33	0,18	77,02	77,15	76,12	0,06	0,03
165,0	304,0	6,0	0,035	9,6	0,0	225,5	72,3	87,4	0,18	73,74	73,67	76,30	0,18	77,03	77,17	76,13	0,06	0,03
166,0	305,0	6,0	0,022	8,5	0,0	226,1	72,2	87,4	0,18	73,71	73,67	76,28	0,18	77,03	77,17	76,09	0,06	0,03
167,0	306,0	5,9	0,036	7,8	0,0	226,4	72,2	87,4	0,18	73,69	73,67	76,29	0,18	77,00	77,18	76,10	0,06	0,04
168,0	307,0	5,9	0,027	6,3	0,0	226,0	72,5	87,3	0,18	73,68	73,67	76,28	0,18	77,03	77,19	76,11	0,06	0,03
169,0	308,0	5,9	0,034	6,5	0,0	225,7	72,4	87,4	0,18	73,79	73,68	76,27	0,18	77,05	77,22	76,13	0,06	0,03
170,0	309,0	5,8	0,029	5,8	0,0	225,6	72,0	87,3	0,18	73,82	73,69	76,26	0,18	77,05	77,23	76,11	0,06	0,03
171,0	310,0	5,8	0,016	8,5	0,0	225,8	72,2	87,3	0,18	73,77	73,67	76,27	0,18	77,03	77,23	76,09	0,06	0,03
172,0	311,0	5,8	0,027	7,2	0,0	225,6	72,3	87,2	0,18	73,79	73,71	76,26	0,18	77,06	77,25	76,10	0,06	0,03
173,0	312,0	5,7	0,033	6,4	0,0	225,0	72,4	87,0	0,18	73,98	73,72	76,25	0,18	77,15	77,29	76,08	0,06	0,03
174,0	313,0	5,7	0,035	7,7	0,0	225,0	72,3	87,0	0,18	74,03	73,78	76,28	0,18	77,23	77,30	76,06	0,06	0,03
175,0	314,0	5,7	0,056	5,1	0,0	224,5	72,2	86,8	0,18	74,00	73,79	76,25	0,18	77,22	77,32	76,08	0,06	0,03
176,0	315,0	5,6	0,033	8,7	0,0	224,1	72,4	86,9	0,18	73,93	73,79	76,23	0,18	77,21	77,31	76,06	0,06	0,03
177,0	316,0	5,6	0,039	9,3	0,0	224,5	72,4	86,7	0,18	73,88	73,82	76,23	0,18	77,20	77,30	76,05	0,06	0,03
178,0	317,0	5,6	0,037	9,3	0,0	224,5	72,5	86,7	0,18	73,82	73,81	76,21	0,18	77,19	77,28	76,04	0,06	0,03
179,0	318,0	5,5	0,047	5,8	0,0	224,1	72,5	86,8	0,18	73,89	73,81	76,24	0,18	77,18	77,31	76,05	0,06	0,03
180,0	319,0	5,5	0,024	8,5	0,0	224,1	72,4	86,6	0,18	73,96	73,83	76,21	0,18	77,18	77,32	76,05	0,06	0,03
181,0	320,0	5,4	0,067	5,1	0,0	233,3	72,4	89,3	0,18	74,03	73,83	76,24	0,18	77,21	77,33	76,05	0,06	0,04
182,0	321,0	5,4	0,033	6,6	0,0	231,5	72,4	87,2	0,18	74,06	73,82	76,22	0,18	77,26	77,32	76,03	0,06	0,03
183,0	322,0	5,4	0,056	6,3	0,0	229,5	72,6	86,9	0,18	74,04	73,82	76,20	0,18	77,27	77,35	76,03	0,06	0,03
184,0	323,0	5,3	0,029	8,6	0,0	225,0	72,4	86,4	0,18	74,10	73,81	76,18	0,18	77,36	77,38	76,01	0,06	0,03
185,0	324,0	5,3	0,061	5,5	0,0	222,1	72,3	85,8	0,18	74,01	73,81	76,20	0,18	77,33	77,36	76,01	0,06	0,03
186,0	325,0	5,3	0,024	6,3	0,0	219,8	72,2	86,0	0,18	74,02	73,81	76,15	0,18	77,28	77,35	75,96	0,06	0,03
187,0	326,0	5,2	0,026	6,2	0,0	218,0	72,4	85,7	0,18	73,99	73,80	76,15	0,18	77,26	77,37	75,97	0,06	0,03
188,0	327,0	5,2	0,033	5,7	0,0	216,6	72,4	85,6	0,18	74,04	73,82	76,15	0,18	77,25	77,36	75,97	0,06	0,03
189,0	328,0	5,2	0,028	6,5	0,0	215,1	72,2	85,3	0,18	73,98	73,80	76,12	0,18	77,24	77,36	75,94	0,06	0,03
190,0	329,0	5,2	0,068	5,0	0,0	213,8	72,4	85,2	0,18	73,98	73,82	76,11	0,18	77,20	77,37	75,93	0,06	0,03
191,0	330,0	5,1	0,027	8,7	0,0	212,9	72,3	85,1	0,18	73,93	73,80	76,05	0,18	77,16	77,37	75,91	0,06	0,03
192,0	331,0	5,1	0,033	5,9	0,0	212,1	72,4	84,9	0,18	73,90	73,80	76,04	0,18	77,15	77,35	75,90	0,06	0,03
193,0	332,0	5,1	0,121	3,7	0,0	210,6	72,2	84,9	0,18	73,95	73,82	76,02	0,18	77,19	77,34	75,89	0,06	0,03
194,0	333,0	5,1	0,028	6,5	0,0	209,6	72,1	84,7	0,18	73,94	73,82	76,01	0,18	77,18	77,34	75,87	0,06	0,03
195,0	334,0	5,0	0,025	6,4	0,0	209,1	72,2	84,6	0,18	73,94	73,84	75,99	0,18	77,20	77,33	75,88	0,06	0,03
196,0	335,0	5,0	0,035	8,3	0,0	208,8	71,9	84,5	0,18	73,86	73,82	75,94	0,18	77,19	77,31	75,83	0,06	0,03
197,0	336,0	5,0	0,032	7,6	0,0	208,1	72,2	84,5	0,18	73,80	73,80	75,87	0,18	77,15	77,31	75,80	0,06	0,03
198,0	337,0	4,9	0,039	7,8	0,0	207,7	72,1	84,4	0,18	73,74	73,79	75,86	0,18	77,09	77,29	75,75	0,06	0,03
199,0	338,0	4,9	0,093	4,1	0,0	207,3	72,1	84,4	0,18	73,66	73,73	75,80	0,18	77,03	77,27	75,71	0,06	0,03
200,0	339,0	4,9	0,073	10,1	0,0	206,9	71,8	84,2	0,18	73,63	73,71	75,76	0,18	77,01	77,23	75,70	0,06	0,03
201,0	340,0	4,8	0,037	6,7	0,0	206,4	71,8	84,2	0,18	73,63	73,71	75,74	0,18	76,98	77,23	75,64	0,06	0,03
202,0	341,0	4,8	0,031	6,1	0,0	205,8	72,1	84,2	0,18	73,62	73,69	75,69	0,18	76,98	77,24	75,62	0,06	0,03
203,0	342,0	4,8	0,068	4,8	0,0	204,9	72,0	84,1	0,18	73,62	73,69	75,67	0,18	76,99	77,24	75,61	0,06	0,03
204,0	343,0	4,8	0,037	6,7	0,0	204,4	71,8	84,0	0,18	73,60	73,71	75,66	0,18	76,98	77,24	75,56	0,06	0,03
205,0	344,0	4,7	0,017	6,7	0,0	204,3	72,3	83,9	0,18	73,66	73,70	75,62	0,18	77,03	77,26	75,53	0,06	0,03
206,0	345,0	4,7	0,014	6,8	0,0	203,9	71,7	83,8	0,18	73,70	73,69	75,58	0,18	77,03	77,29	75,50	0,06	0,03
207,0	346,0	4,7	0,030	5,8	0,0	203,6	72,0	83,7	0,18	73,62	73,65	75,54	0,18	77,00	77,28	75,46	0,06	0,03
208,0	347,0	4,6	0,027	6,8	0,0	203,3	71,8	83,7	0,18	73,58	73,63	75,49	0,18	76,94	77,28	75,44	0,06	0,03
209,0	348,0	4,6	0,034	6,4	0,0	203,7	72,0	83,6	0,18	73,56	73,61	75,45	0,18	76,90	77,26	75,37	0,06	0,03
210,0	349,0	4,6	0,043	5,3	0,0	203,2	72,1	83,4	0,18	73,62	73,62	75,42	0,18	76,95	77,28	75,35	0,06	0,03
211,0	350,0	4,5	0,016	6,3	0,0	202,5	72,1	83,2	0,18	73,57	73,62	75,38	0,18	76,94	77,29	75,34	0,06	0,03
212,0	351,0	4,5	0,021	6,7	0,0	202,4	72,1	83,3	0,18	73,71	73,62	75,35	0,18	77,03	77,33	75,30	0,06	0,03
213,0	352,0	4,5	0,045	5,9	0,0	201,6	72,0	83,2	0,18	73,61	73,57	75,34	0,18	76,95	77,31	75,28	0,06	0,03
214,0	353,0	4,5	0,023	6,3	0,0	201,1	72,0	83,1	0,18	73,51	73,57	75,31	0,18	76,86	77,30	75,23	0,06	0,03
215,0	354,0	4,4	0,021	6,3	0,0	200,9	71,7	83,1	0,18	73,43	73,55	75,23	0,18	76,81	77,28	75,20	0,06	0,03
216,0	355,0	4,4	0,088	4,1	0,0	200,6	72,0	83,1	0,18	73,41	73,55	75,20	0,18	76,81	77,23	75,19	0,06	0,03
217,0	356,0	4,4	0,029	5,7	0,0	200,0	71,4	83,1	0,18	73,38	73,53	75,19	0,18	76,84	77,25	75,16	0,06	0,03
218,0	357,0	4,4	0,025	6,3	0,0	199,6	72,0	82,9	0,18	73,26	73,50	75,12	0,18	76,75	77,25	75,12	0,06	0,03
219,0	358,0	4,4	0,018	6,0	0,0	199,5	71,9	82,8	0,18	73,28	73,49	75,10	0,18	76,77	77,25	75,10	0,06	0,03
220,0	359,0	4,3	0,031	5,6	0,0	198,9	71,9	82,7	0,18	73,41	73,48	75,10	0,18	76,83	77,27	75,07	0,06	0,03
221,0	360,0	4,3	0,032	5,0	0,0	198,3	71,7	82,6	0,18	73,32	73,45	75,07	0,18	76,77	77,25	75,04	0,06	0,03
222,0	361,0	4,3	0,049	5,0	0,0	197,8	71,5	82,6	0,18	73,25	73,43	75,04	0,18	76,68	77,24	75,05	0,06	0,03
223,0	362,0	4,2	0,026	8,8	0,0	197,8	71,6	82,5	0,18	73,23	73,40	74,98	0,18	76,64	77,22	75,00	0,06	0,03
224,0	363,0	4,2	0,027	7,7	0,0	197,5	71,7	82,5	0,18	73,25	73,41	74,96	0,18	76,66	77,21	74,97	0,06	0,03
225,0	364,0	4,2	0,018	7,7	0,0	196,9	72,1	82,4	0,18	73,19	73,39	74,90	0,18	76,66	77,18	74,93	0,06	0,03
226,0	365,0	4,2	0,079	4,0	0,0	196,6	71,7	82,4	0,18	73,34	73,40	74,89	0,18	76,80	77,18	74,88	0,06	0,03
227,0	366,0	4,2	0,026	5,6	0,0	196,3	71,9	82,4	0,18	73,35	73,40	74,86	0,18	76,82	77,17	74,86	0,06	0,03
228,0	367,0	4,1	0,020	6,4	0,0	196,2	71,8	82,2	0,18	73,32	73,39	74,83	0,18	76,76	77,16	74,83	0,06	0,03
229,0	368,0	4,1	0,023	7,0	0,0	196,2	71,8	82,3	0,18	73,38	73,39	74,81	0,18	76,83	77,17	74,81	0,06	0,03

230,0	369,0	4,0	0,027	8,3	0,0	195,8	71,6	82,1	0,18	73,37	73,38	74,78	0,18	76,89	77,15	74,77	0,06	0,03
231,0	370,0	4,0	0,031	7,4	0,0	195,4	71,8	82,1	0,18	73,35	73,39	74,74	0,18	76,85	77,16	74,74	0,06	0,02
232,0	371,0	4,0	0,045	4,9	0,0	205,3	71,6	83,4	0,18	73,28	73,38	74,73	0,18	76,76	77,14	74,73	0,06	0,03
233,0	372,0	4,0	0,049	5,2	0,0	203,6	71,8	82,6	0,18	73,24	73,35	74,70	0,18	76,70	77,12	74,68	0,06	0,03
234,0	373,0	3,9	0,029	7,2	0,0	202,3	71,7	82,4	0,18	73,22	73,35	74,66	0,18	76,69	77,12	74,63	0,06	0,03
235,0	374,0	3,9	0,039	5,3	0,0	200,8	71,8	82,2	0,18	73,26	73,32	74,64	0,18	76,72	77,12	74,62	0,06	0,03
236,0	375,0	3,9	0,016	7,3	0,0	199,9	71,6	82,0	0,18	73,14	73,32	74,62	0,18	76,69	77,09	74,60	0,06	0,03
237,0	376,0	3,8	0,026	6,8	0,0	198,6	71,6	81,9	0,18	73,12	73,29	74,58	0,18	76,63	77,09	74,59	0,06	0,03
238,0	377,0	3,8	0,035	7,2	0,0	198,0	72,0	82,0	0,18	73,15	73,27	74,55	0,18	76,64	77,10	74,57	0,06	0,03
239,0	378,0	3,8	0,032	6,0	0,0	197,3	72,3	81,8	0,18	73,40	73,31	74,53	0,18	76,90	77,12	74,53	0,06	0,03
240,0	379,0	3,8	0,032	7,6	0,0	196,8	72,1	81,8	0,18	73,41	73,35	74,49	0,18	76,95	77,13	74,51	0,06	0,03
241,0	380,0	3,7	0,033	5,2	0,0	195,9	71,9	81,5	0,18	73,29	73,31	74,43	0,18	76,88	77,11	74,48	0,06	0,03
242,0	381,0	3,7	0,020	7,8	0,0	195,8	72,2	81,6	0,18	73,33	73,32	74,40	0,18	76,85	77,13	74,47	0,06	0,03
243,0	382,0	3,7	0,026	8,0	0,0	195,4	71,9	81,5	0,18	73,26	73,28	74,39	0,18	76,78	77,11	74,45	0,06	0,03
244,0	383,0	3,6	0,035	7,4	0,0	194,8	71,7	81,4	0,18	73,20	73,26	74,37	0,18	76,69	77,11	74,43	0,06	0,03
245,0	384,0	3,6	0,033	5,0	0,0	194,3	71,6	81,5	0,18	73,12	73,23	74,33	0,18	76,64	77,06	74,37	0,06	0,03
246,0	385,0	3,5	0,041	5,2	0,0	193,6	71,1	81,4	0,18	73,00	73,22	74,28	0,18	76,50	77,05	74,36	0,06	0,03
247,0	386,0	3,5	0,016	7,0	0,0	193,2	71,4	81,3	0,18	72,94	73,16	74,26	0,18	76,40	77,05	74,32	0,06	0,03
248,0	387,0	3,5	0,016	7,8	0,0	193,2	71,5	81,4	0,18	72,91	73,12	74,24	0,18	76,35	77,03	74,29	0,06	0,03
249,0	388,0	3,5	0,021	6,7	0,0	193,1	71,4	81,4	0,18	72,94	73,11	74,23	0,18	76,37	76,99	74,26	0,06	0,03
250,0	389,0	3,4	0,020	6,3	0,0	193,3	71,4	81,4	0,18	72,94	73,10	74,21	0,18	76,38	76,95	74,24	0,06	0,03
251,0	390,0	3,4	0,017	6,6	0,0	193,3	72,3	81,4	0,18	73,08	73,14	74,16	0,18	76,45	76,96	74,19	0,06	0,03
252,0	391,0	3,4	0,021	7,8	0,0	192,9	72,6	81,1	0,18	73,40	73,19	74,14	0,18	76,80	77,00	74,17	0,06	0,03
253,0	392,0	3,3	0,041	6,7	0,0	192,5	72,1	81,2	0,18	73,36	73,23	74,13	0,18	76,82	76,98	74,17	0,06	0,03
254,0	393,0	3,3	0,025	7,1	0,0	192,5	72,3	81,2	0,18	73,25	73,20	74,10	0,18	76,72	76,98	74,13	0,06	0,03
255,0	394,0	3,3	0,021	7,6	0,0	192,7	71,7	81,2	0,18	73,23	73,19	74,06	0,18	76,73	76,97	74,10	0,06	0,03
256,0	395,0	3,2	0,020	7,6	0,0	192,7	71,6	81,1	0,18	73,15	73,16	74,05	0,18	76,67	76,99	74,08	0,06	0,03
257,0	396,0	3,2	0,063	9,2	0,0	192,6	71,8	81,0	0,18	73,18	73,16	74,00	0,18	76,69	76,97	74,05	0,06	0,03
258,0	397,0	3,2	0,092	4,8	0,0	192,6	71,8	80,9	0,18	73,15	73,16	74,00	0,18	76,65	76,95	74,03	0,06	0,03
259,0	398,0	3,2	0,039	6,6	0,0	192,3	71,6	80,9	0,18	73,17	73,16	73,97	0,18	76,68	76,95	74,02	0,06	0,03
260,0	399,0	3,1	0,033	6,3	0,0	191,8	72,1	80,7	0,18	73,26	73,18	73,94	0,18	76,75	76,93	73,99	0,06	0,03
261,0	400,0	3,1	0,026	8,0	0,0	191,5	72,5	80,8	0,18	73,46	73,22	73,91	0,18	76,99	76,91	73,93	0,06	0,03
262,0	401,0	3,1	0,025	6,8	0,0	191,2	72,0	80,8	0,18	73,48	73,26	73,89	0,18	77,05	76,94	73,96	0,06	0,03
263,0	402,0	3,1	0,074	4,1	0,0	190,6	71,7	80,6	0,18	73,36	73,23	73,85	0,18	76,95	76,90	73,92	0,06	0,03
264,0	403,0	3,0	0,034	5,8	0,0	190,5	71,5	80,5	0,18	73,19	73,21	73,79	0,18	76,77	76,85	73,90	0,06	0,03
265,0	404,0	3,0	0,020	6,9	0,0	190,4	71,7	80,4	0,18	73,07	73,15	73,74	0,18	76,65	76,82	73,84	0,06	0,03
266,0	405,0	3,0	0,027	8,3	0,0	190,0	71,3	80,4	0,18	73,02	73,12	73,68	0,18	76,61	76,78	73,81	0,06	0,03
267,0	406,0	2,9	0,018	6,7	0,0	190,1	71,3	80,3	0,18	72,92	73,08	73,61	0,18	76,54	76,74	73,79	0,06	0,03
268,0	407,0	2,9	0,022	7,9	0,0	190,9	71,6	80,5	0,18	72,85	73,06	73,59	0,18	76,49	76,73	73,75	0,06	0,03
269,0	408,0	2,9	0,023	6,8	0,0	191,0	71,6	80,4	0,18	72,69	73,01	73,57	0,18	76,33	76,69	73,74	0,06	0,03
270,0	409,0	2,8	0,032	6,4	0,0	190,6	71,5	80,4	0,18	72,80	72,98	73,53	0,18	76,43	76,71	73,70	0,06	0,03
271,0	410,0	2,8	0,045	3,9	0,0	190,2	71,3	80,4	0,18	72,83	72,97	73,51	0,18	76,46	76,69	73,70	0,06	0,03
272,0	411,0	2,8	0,035	6,7	0,0	190,0	71,2	80,4	0,18	72,75	72,95	73,51	0,18	76,39	76,70	73,67	0,06	0,03
273,0	412,0	2,7	0,106	9,5	0,0	190,2	71,2	80,4	0,18	72,67	72,92	73,47	0,18	76,31	76,71	73,62	0,06	0,03
274,0	413,0	2,7	0,045	6,3	0,0	189,7	71,3	80,3	0,18	72,60	72,89	73,44	0,18	76,25	76,67	73,64	0,06	0,03
275,0	414,0	2,7	0,018	7,1	0,0	189,9	71,4	80,4	0,18	72,68	72,88	73,41	0,18	76,30	76,66	73,58	0,06	0,03
276,0	415,0	2,6	0,017	6,8	0,0	190,0	71,0	80,2	0,18	72,69	72,90	73,42	0,18	76,31	76,66	73,59	0,06	0,03
277,0	416,0	2,6	0,084	10,7	0,0	189,9	71,0	80,2	0,18	72,65	72,87	73,39	0,18	76,25	76,65	73,56	0,06	0,03
278,0	417,0	2,5	0,095	9,6	0,0	190,0	71,2	80,2	0,18	72,64	72,83	73,36	0,18	76,17	76,63	73,52	0,06	0,03
279,0	418,0	2,5	0,120	9,9	0,0	190,0	70,7	80,1	0,18	72,55	72,77	73,30	0,18	76,07	76,60	73,48	0,06	0,03
280,0	419,0	2,5	0,068	6,2	0,0	190,3	71,0	80,0	0,18	72,48	72,73	73,27	0,18	76,00	76,54	73,46	0,06	0,03
281,0	420,0	2,5	0,055	8,9	0,0	190,5	70,9	80,1	0,18	72,54	72,73	73,23	0,18	76,02	76,53	73,43	0,06	0,03
282,0	421,0	2,4	0,048	5,4	0,0	196,9	71,2	83,3	0,18	72,56	72,68	73,21	0,18	76,05	76,49	73,43	0,06	0,02
283,0	422,0	2,4	0,041	4,6	0,0	199,2	71,3	81,1	0,18	72,49	72,67	73,18	0,18	75,97	76,45	73,40	0,06	0,03
284,0	423,0	2,4	0,017	6,1	0,0	197,7	71,1	80,7	0,18	72,48	72,66	73,16	0,18	75,96	76,46	73,37	0,06	0,03
285,0	424,0	2,4	0,019	6,1	0,0	196,3	71,2	80,7	0,18	72,42	72,63	73,11	0,18	75,91	76,41	73,36	0,06	0,03
286,0	425,0	2,3	0,057	4,6	0,0	194,9	71,2	80,5	0,18	72,46	72,60	73,10	0,18	75,92	76,40	73,33	0,06	0,03
287,0	426,0	2,3	0,049	4,4	0,0	193,2	71,0	80,4	0,18	72,47	72,58	73,10	0,18	75,92	76,40	73,33	0,06	0,03
288,0	427,0	2,3	0,045	6,1	0,0	192,2	71,4	80,4	0,18	72,68	72,62	73,11	0,18	76,13	76,40	73,29	0,06	0,03
289,0	428,0	2,2	0,014	6,5	0,0	191,4	71,3	80,4	0,18	72,76	72,64	73,10	0,18	76,21	76,43	73,29	0,06	0,03
290,0	429,0	2,2	0,027	7,9	0,0	190,7	71,3	80,3	0,18	72,72	72,63	73,12	0,18	76,22	76,44	73,29	0,06	0,03
291,0	430,0	2,2	0,018	7,9	0,0	190,2	71,5	80,2	0,18	72,67	72,64	73,11	0,18	76,17	76,41	73,29	0,06	0,03
292,0	431,0	2,1	0,018	7,8	0,0	189,7	71,9	80,1	0,18	72,84	72,67	73,09	0,18	76,37	76,46	73,28	0,06	0,03
293,0	432,0	2,1	0,098	9,5	0,0	189,7	71,4	80,1	0,18	72,81	72,66	73,09	0,18	76,36	76,44	73,28	0,06	0,03
294,0	433,0	2,1	0,032	7,4	0,0	189,0	71,1	80,0	0,18	72,68	72,67	73,04	0,18	76,24	76,40	73,28	0,06	0,03
295,0	434,0	2,1	0,029	5,7	0,0	189,1	71,2	79,8	0,18	72,57	72,62	73,03	0,18	76,08	76,36	73,26	0,06	0,03
296,0	435,0	2,0	0,023	6,2	0,0	188,4	71,1	79,7	0,18	72,57	72,62	73,02	0,18	76,04	76,35	73,23	0,06	0,03
297,0	436,0	2,0	0,020	6,7	0,0	188,2	71,3	79,8	0,18	72,57	72,60	72,97	0,18	75,99	76,34	73,21	0,06	0,03
298,0	437,0	2,0	0,022	8,4	0,0	188,1	71,0	79,7	0,18	72,57	72,56	72,93	0,18	76,00	76,32	73,18	0,06	0,03
299,0	438,0	1,9	0,028	7,9	0,0	188,3	70,8	79,8	0,18	72,54	72,56	72,90	0,18	75,95	76,30	73,14	0,06	0,03
300,0	439,0	1,9	0,041	5,2	0,0	188,8	71,0	79,9	0,18	72,42	72,54	72,87	0,18	75,90	76,24	73,15	0,06	0,03
301,0	440,0	1,9	0,035	2,0	0,0	188,7	71,1	79,9	0,18	72,43	72,51	72,86	0,18	75,90	76,25	73,13	0,06	0,03
302,0	441,0	1,8	0,035	6,4	0,0	188,3	71,2	79,8	0,18	72,45	72,49	72,85	0,18	75,96	76,24	73,12	0,06	0,03
303,0	442,0	1,8	0,022	6,0	0,0	187,8	71,0	79,8	0,18	72,41	72,48	72,85	0,18	75,94	76,24	73,10	0,06	0,03
304,0	443,0	1,8	0,029	5,7	0,0	187,8	71,1	79,8	0,18	72,37	72,46	72,86	0,18	75,88	76,25	73,10	0,06	0,03
305,0	444,0	1,8	0,026	5,6	0,0	187,7	71,0	80,0	0,18	72,39	72,45	72,84	0,18	75,84	76,23	73,08	0,06	0,03
306,0	445,0	1,7	0,022	6,4	0,0	187,3	71,0	79,8	0,18	72,40	72,46	72,85	0,18	75,86	76,26	73,06	0,06	0,03
307,0	446,0	1,7	0,033	5,5	0,0	187,2	70,7	79,8	0,18	72,37	72,45	72,83	0,18	75,81	76,25	73,05	0,06	0,03

308,0	447,0	1,7	0,024	7,1	0,0	187,5	70,6	79,7	0,18	72,28	72,42	72,82	0,18	75,73	76,19	73,03	0,06	0,03
309,0	448,0	1,6	0,026	7,1	0,0	187,9	70,4	79,5	0,18	72,21	72,38	72,77	0,18	75,67	76,16	73,02	0,06	0,03
310,0	449,0	1,6	0,019	7,6	0,0	187,9	70,5	79,5	0,18	72,17	72,35	72,75	0,18	75,61	76,11	73,01	0,07	0,03
311,0	450,0	1,6	0,027	6,0	0,0	187,7	70,7	79,6	0,18	72,18	72,34	72,73	0,18	75,59	76,09	72,97	0,06	0,03
312,0	451,0	1,6	0,029	7,1	0,0	187,6	70,6	79,4	0,18	72,10	72,28	72,67	0,18	75,54	76,06	72,97	0,06	0,03
313,0	452,0	1,5	0,027	6,5	0,0	187,3	70,4	79,5	0,18	72,10	72,29	72,67	0,18	75,57	76,04	72,95	0,06	0,03
314,0	453,0	1,5	0,017	6,7	0,0	187,3	70,8	79,5	0,18	72,15	72,27	72,64	0,18	75,60	76,04	72,92	0,06	0,03
315,0	454,0	1,5	0,018	7,0	0,0	187,6	71,0	79,6	0,18	72,07	72,24	72,64	0,18	75,56	75,99	72,91	0,06	0,03
316,0	455,0	1,4	0,031	7,1	0,0	187,0	71,4	79,6	0,18	72,08	72,23	72,61	0,18	75,58	76,02	72,93	0,06	0,03
317,0	456,0	1,4	0,033	5,6	0,0	186,5	71,3	79,3	0,18	72,19	72,24	72,60	0,18	75,63	76,03	72,89	0,06	0,03
318,0	457,0	1,4	0,050	8,3	0,0	186,6	71,4	79,4	0,18	72,37	72,26	72,59	0,18	75,85	76,03	72,86	0,06	0,03
319,0	458,0	1,3	0,051	9,4	0,0	186,7	71,1	79,2	0,18	72,42	72,28	72,59	0,18	75,93	76,03	72,87	0,06	0,03
320,0	459,0	1,3	0,035	7,7	0,0	186,3	70,9	79,2	0,18	72,33	72,30	72,55	0,18	75,85	76,03	72,85	0,06	0,03
321,0	460,0	1,3	0,037	7,5	0,0	186,3	70,6	79,2	0,18	72,24	72,26	72,56	0,18	75,72	76,01	72,82	0,06	0,03
322,0	461,0	1,3	0,060	5,1	0,0	186,3	70,3	79,1	0,18	72,10	72,23	72,52	0,18	75,61	75,98	72,81	0,06	0,03
323,0	462,0	1,2	0,035	6,0	0,0	186,2	70,3	79,1	0,18	72,04	72,20	72,48	0,18	75,53	75,95	72,78	0,06	0,03
324,0	463,0	1,2	0,031	6,9	0,0	185,9	70,6	79,1	0,18	72,06	72,18	72,47	0,18	75,51	75,93	72,75	0,06	0,03
325,0	464,0	1,2	0,048	5,1	0,0	186,2	70,2	79,1	0,18	71,97	72,14	72,45	0,18	75,43	75,89	72,75	0,06	0,03
326,0	465,0	1,1	0,027	5,5	0,0	186,0	70,2	79,1	0,18	71,90	72,10	72,41	0,18	75,35	75,86	72,72	0,06	0,03
327,0	466,0	1,1	0,022	5,9	0,0	186,3	70,3	79,1	0,18	71,87	72,06	72,36	0,18	75,26	75,84	72,70	0,06	0,03
328,0	467,0	1,1	0,022	6,8	0,0	186,2	70,3	79,0	0,18	71,84	72,03	72,35	0,18	75,20	75,83	72,67	0,06	0,03
329,0	468,0	1,1	0,022	6,5	0,0	186,2	70,6	79,2	0,18	71,80	72,00	72,30	0,18	75,16	75,82	72,64	0,06	0,03
330,0	469,0	1,0	0,022	6,7	0,0	186,3	70,7	79,3	0,18	71,81	72,00	72,32	0,18	75,19	75,78	72,65	0,06	0,03
331,0	470,0	1,0	0,022	6,5	0,0	186,0	70,8	79,4	0,18	71,92	72,01	72,33	0,18	75,27	75,79	72,64	0,06	0,03
332,0	471,0	1,0	0,027	6,2	0,0	185,7	70,9	79,3	0,18	72,00	72,03	72,36	0,18	75,39	75,81	72,61	0,06	0,03
333,0	472,0	0,9	0,028	6,9	0,0	197,6	70,7	81,9	0,18	72,08	72,03	72,38	0,18	75,46	75,84	72,60	0,06	0,03
334,0	473,0	0,9	0,029	7,0	0,0	195,6	70,5	80,0	0,18	72,05	72,05	72,36	0,18	75,43	75,81	72,59	0,06	0,03
335,0	474,0	0,9	0,031	6,2	0,0	193,7	70,6	79,5	0,18	71,99	72,04	72,34	0,18	75,37	75,81	72,57	0,06	0,03
336,0	475,0	0,9	0,030	6,3	0,0	192,0	70,6	79,3	0,18	71,91	72,01	72,29	0,18	75,29	75,79	72,55	0,06	0,03
337,0	476,0	0,8	0,054	5,2	0,0	191,0	70,5	79,3	0,18	71,95	72,01	72,28	0,18	75,30	75,78	72,55	0,06	0,03
338,0	477,0	0,8	0,047	5,4	0,0	189,8	70,5	79,2	0,18	71,92	72,00	72,27	0,18	75,27	75,77	72,54	0,06	0,03
339,0	478,0	0,8	0,039	5,9	0,0	188,8	70,6	79,1	0,18	71,92	71,97	72,24	0,18	75,29	75,76	72,51	0,06	0,03
340,0	479,0	0,7	0,039	5,4	0,0	188,4	70,6	79,2	0,18	71,94	71,96	72,23	0,18	75,31	75,75	72,50	0,06	0,03
341,0	480,0	0,7	0,034	5,6	0,0	188,0	70,3	79,1	0,18	71,84	71,94	72,18	0,18	75,21	75,70	72,49	0,06	0,03
342,0	481,0	0,7	0,031	5,9	0,0	187,6	70,3	79,0	0,18	71,77	71,92	72,15	0,18	75,15	75,70	72,49	0,06	0,03
343,0	482,0	0,6	0,032	6,2	0,0	187,4	70,5	79,1	0,18	71,69	71,89	72,12	0,18	75,07	75,66	72,45	0,06	0,03
344,0	483,0	0,6	0,036	6,7	0,0	186,9	70,1	79,1	0,18	71,64	71,86	72,11	0,18	75,04	75,65	72,45	0,06	0,03
345,0	484,0	0,6	0,039	7,2	0,0	186,8	70,4	79,2	0,18	71,69	71,83	72,11	0,18	75,08	75,66	72,42	0,06	0,03
346,0	485,0	0,5	0,041	7,1	0,0	186,5	70,4	79,3	0,18	71,80	71,86	72,12	0,18	75,19	75,66	72,41	0,06	0,03
347,0	486,0	0,5	0,039	6,5	0,0	186,3	70,2	79,2	0,18	71,82	71,84	72,14	0,18	75,18	75,68	72,42	0,06	0,03
348,0	487,0	0,5	0,022	6,1	0,0	185,7	70,6	79,0	0,18	71,81	71,84	72,11	0,18	75,17	75,70	72,38	0,06	0,03
349,0	488,0	0,4	0,039	7,5	0,0	186,0	70,4	79,1	0,18	71,99	71,86	72,14	0,18	75,34	75,72	72,36	0,06	0,03
350,0	489,0	0,4	0,029	7,1	0,0	185,9	70,4	79,0	0,18	72,02	71,91	72,14	0,18	75,41	75,73	72,36	0,06	0,03
351,0	490,0	0,4	0,038	8,0	0,0	185,4	70,4	79,0	0,18	71,99	71,91	72,13	0,18	75,40	75,74	72,36	0,07	0,03
352,0	491,0	0,4	0,033	4,6	0,0	185,1	70,2	79,0	0,18	71,95	71,89	72,12	0,18	75,35	75,73	72,36	0,06	0,03
353,0	492,0	0,3	0,028	8,2	0,0	185,4	70,1	78,9	0,18	71,86	71,86	72,14	0,18	75,29	75,73	72,32	0,06	0,03
354,0	493,0	0,3	0,043	6,1	0,0	185,4	70,4	79,0	0,18	71,79	71,84	72,12	0,18	75,20	75,72	72,34	0,06	0,03
355,0	494,0	0,3	0,053	9,2	0,0	185,1	70,4	78,9	0,18	71,75	71,82	72,10	0,18	75,20	75,73	72,34	0,06	0,03
356,0	495,0	0,2	0,033	5,3	0,0	184,9	69,8	78,8	0,18	71,67	71,79	72,11	0,18	75,12	75,71	72,32	0,06	0,03
357,0	496,0	0,2	0,024	5,5	0,0	184,4	70,4	78,9	0,18	71,60	71,75	72,12	0,18	75,04	75,71	72,33	0,06	0,03
358,0	497,0	0,2	0,022	5,9	0,0	184,6	70,4	79,1	0,18	71,56	71,75	72,09	0,18	75,00	75,69	72,30	0,06	0,03
359,0	498,0	0,1	0,028	9,4	0,0	184,8	70,4	79,2	0,18	71,60	71,74	72,11	0,18	74,99	75,66	72,31	0,06	0,03
360,0	499,0	0,1	0,031	7,5	0,0	184,8	70,2	79,3	0,18	71,72	71,74	72,12	0,18	75,07	75,69	72,29	0,06	0,03
361,0	500,0	0,1	0,019	7,1	0,0	184,6	70,5	79,3	0,18	71,75	71,75	72,15	0,18	75,06	75,68	72,32	0,06	0,03
362,0	501,0	0,1	0,037	7,9	0,0	184,1	70,6	79,1	0,18	71,75	71,72	72,11	0,18	75,05	75,65	72,30	0,06	0,03
363,0	502,0	0,0	0,038	5,5	0,0	184,2	70,8	79,0	0,18	71,81	71,73	72,16	0,18	75,13	75,67	72,30	0,06	0,03

SFBA EPA EMISSION RESULTS

Test Duration: **363** min

PRESSURE FACTOR:	DGM 1	0,97283	
	DGM 2	0,97129	
	DGM 3	1,00917	
TEMPERATURE FACTORS	DGM 1	0,99108	
	DGM 2	0,98515	
	DGM 3	0,99318	
VOLUMES SAMPLED	DGM 1	65,003	SCft
	DGM 2	65,034	Scft
	DGM 3	38,316	SCft

TOTAL TUNNEL VOLUME : 64684

SAMPLE RATIOS

Sample Train 1:	995,093
Sample Train 2:	994,619

Paticulate concentration

Sample Train 1	**0,000098**	g/dscf
Sample Train 2	**0,000097**	g/dscf
Room	**0,000003**	g/dscf

TOTAL EMISSIONS

Sample Train 1	**6,20**	g
Sample Train 2	**6,10**	g

EMISSION RATES

Sample Train 1	**1,02**	g/hr
Sample Train 2	**1,01**	g/hr

1st hour emission rate **1,09** g/hr

	Train 1	Train 2
Cs	9,846E-05	9,68728E-05

RESULTS

Average emission rate: 1,0 g/hr

Burn Rate : 1,064 Dry kg/hr

BAROMETRIC PRESSURE

Average:	30,1944136	in Hg
Start:	30,1501187	in Hg
End:	30,2387086	in Hg

DGM CONTROLLER VALUES

DGM 1	Final:	20001,497	Cuft
	Initial:	19934,517	Cuft
DGM 2	Final:	11216,232	Cuft
	Initial:	11148,635	Cuft
DGM #3	Final:	12881,902	Cuft
	Initial:	12843,215	Cuft

TEMPERATURES

DGM 1	532,754	°R
DGM 2	535,960	°R

CALIBRATION FACTORS

DGM 1	1,0066
DGM 2	1,0054
DGM #3	0,9882

TUNNEL FLOW RATE: 178,192 Dscfm

PARTICULATE CATCH

Total Sample Train 1:	6,40	mg
Total Sample Train 2:	6,30	mg
Total Sample Train 1 1st hour:	1,10	mg

DEVIATION: 0,83%

Manufacturer: Ravelli
Model: NICOLE

Run: 1
Project #: PI-20165
Test Duration: 363 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	80,73%	88,78%
Comb Eff	99,50%	99,50%
HT Eff	81,13%	89,22%
Output	16 526	kJ/h
Burn Rate	1,06	kg/h
Grams CO	38	g
Input	20 472	kJ/h
MC wet	4,12	

Ultimate CO_2
$CO_{2\text{-ult}}$ 18,29
F_0
1,139

Overall Heating Efficiency: 80,73%
Combustion Efficiency: 99,50%
Heat Transfer Efficiency: 81,13%

Heat Output: 15 677 Btu/h
Heat Input: 19 420 Btu/h
Burn Duration: 6,05 h
Burn Rate: 2,35 lb/h
Stack Temp: 231,7 Deg. F

Averages	0,04	7,40	1,59	19,86	12,44	111,07	22,02	1,00	0,82	#DIV/0!
INPUT DATA			Oxygen Calculation			Input Data		Combust	Heat	Net
Elapsed	Weight	%	%	Excess	Total	Calc. %	Flue	Room	Eff	Transfer	Eff
Time	Remaining (kg)	CO [e]	CO_2 [d]	Air EA	O_2	O_2 [g]	Gas (ºC)	Temp (ºC)	%	%	%
0,00	6,72	0,03	8,74	108,4%	19,67	10,91	158,5	21,3	100,1%	79,2%	79,2%
1,00	6,67	0,03	10,55	72,8%	19,41	8,84	158,7	21,4	100,0%	80,7%	80,7%
2,00	6,67	0,04	9,42	93,4%	19,57	10,13	159,2	21,3	100,0%	79,8%	79,8%
3,00	6,63	0,04	7,12	155,6%	19,90	12,77	159,4	21,7	100,1%	77,0%	77,1%
4,00	6,58	0,03	6,85	165,6%	19,94	13,07	159,4	21,5	100,2%	76,6%	76,8%
5,00	6,54	0,03	7,71	136,5%	19,82	12,10	159,6	21,6	100,2%	77,9%	78,0%
6,00	6,54	0,03	7,85	132,0%	19,80	11,93	159,5	21,7	100,1%	78,1%	78,2%
7,00	6,49	0,03	7,95	129,1%	19,78	11,81	159,5	21,6	100,1%	78,2%	78,3%
8,00	6,44	0,04	9,37	94,3%	19,58	10,18	160,0	21,6	100,0%	79,7%	79,7%
9,00	6,44	0,04	8,46	115,2%	19,71	11,23	160,3	21,6	100,0%	78,8%	78,8%
10,00	6,40	0,04	6,68	172,1%	19,97	13,26	160,1	21,6	100,1%	76,2%	76,3%
11,00	6,35	0,03	9,44	93,2%	19,57	10,11	160,4	21,7	100,1%	79,7%	79,8%
12,00	6,31	0,04	8,40	116,8%	19,72	11,30	160,5	21,6	100,0%	78,7%	78,7%
13,00	6,31	0,03	8,74	108,5%	19,67	10,91	160,6	21,8	100,1%	79,1%	79,2%
14,00	6,26	0,04	6,54	177,8%	19,99	13,42	160,5	21,6	100,1%	75,9%	76,0%
15,00	6,22	0,04	9,01	102,2%	19,63	10,60	161,0	21,7	100,0%	79,3%	79,3%
16,00	6,22	0,05	7,41	145,3%	19,86	12,43	161,3	21,8	100,0%	77,3%	77,3%
17,00	6,17	0,03	7,76	134,8%	19,81	12,04	161,3	21,7	100,2%	77,8%	78,0%
18,00	6,13	0,06	6,74	169,2%	19,96	13,19	161,1	21,6	99,9%	76,2%	76,2%
19,00	6,13	0,03	8,18	123,0%	19,75	11,56	160,7	21,7	100,2%	78,4%	78,5%
20,00	6,08	0,03	10,32	76,7%	19,44	9,11	160,8	21,9	100,0%	80,5%	80,5%
21,00	6,04	0,03	8,76	108,1%	19,67	10,89	160,8	21,9	100,1%	79,1%	79,1%
22,00	5,99	0,04	7,37	146,7%	19,87	12,47	160,7	21,9	100,1%	77,3%	77,4%
23,00	5,99	0,03	9,29	96,3%	19,59	10,29	160,9	21,9	100,1%	79,6%	79,7%
24,00	5,95	0,11	11,11	63,1%	19,31	8,15	160,8	21,9	99,4%	81,0%	80,5%
25,00	5,90	0,04	9,97	82,7%	19,49	9,50	161,1	22,0	99,9%	80,2%	80,1%
26,00	5,85	0,08	9,99	81,6%	19,48	9,45	161,1	22,1	99,6%	80,2%	79,9%
27,00	5,81	0,05	9,09	100,2%	19,62	10,50	161,7	22,0	99,9%	79,3%	79,3%
28,00	5,81	0,04	8,18	122,6%	19,75	11,55	162,0	22,0	100,1%	78,3%	78,4%
29,00	5,76	0,04	7,82	132,7%	19,80	11,96	164,7	22,0	100,1%	77,6%	77,7%
30,00	5,72	0,03	8,81	106,9%	19,66	10,83	164,5	22,1	100,1%	78,8%	78,9%
31,00	5,72	0,04	6,96	161,3%	19,93	12,95	164,2	22,0	100,1%	76,3%	76,4%
32,00	5,67	0,03	8,26	120,6%	19,74	11,46	163,4	22,0	100,2%	78,3%	78,4%
33,00	5,63	0,03	8,89	105,1%	19,65	10,74	163,0	22,0	100,1%	79,0%	79,1%
34,00	5,58	0,03	8,40	117,2%	19,72	11,31	162,7	22,0	100,2%	78,5%	78,6%
35,00	5,58	0,11	11,95	51,7%	19,19	7,19	162,3	22,0	99,4%	81,4%	80,9%
36,00	5,54	0,07	11,47	58,6%	19,27	7,77	162,4	22,0	99,7%	81,1%	80,9%
37,00	5,49	0,05	10,65	70,9%	19,39	8,71	162,9	22,0	99,8%	80,6%	80,4%
38,00	5,45	0,04	7,69	136,5%	19,82	12,11	163,3	22,0	100,0%	77,6%	77,6%
39,00	5,45	0,03	8,32	119,1%	19,73	11,40	163,5	22,1	100,1%	78,4%	78,4%
40,00	5,40	0,03	7,89	131,0%	19,79	11,89	163,3	22,0	100,2%	77,8%	78,0%
41,00	5,35	0,04	6,56	177,1%	19,98	13,40	163,0	22,0	100,1%	75,8%	75,8%
42,00	5,35	0,04	10,12	80,1%	19,47	9,33	162,8	22,1	100,0%	80,2%	80,2%
43,00	5,31	0,04	7,44	144,3%	19,86	12,39	162,6	21,9	100,0%	77,3%	77,3%
44,00	5,26	0,04	10,25	77,8%	19,45	9,18	162,4	22,0	100,0%	80,3%	80,3%
45,00	5,22	0,13	11,70	54,6%	19,23	7,46	162,4	22,1	99,3%	81,3%	80,7%
46,00	5,17	0,04	10,07	80,9%	19,47	9,38	162,6	22,2	99,9%	80,2%	80,1%
47,00	5,13	0,06	10,65	70,8%	19,39	8,71	162,9	22,2	99,8%	80,6%	80,4%
48,00	5,13	0,04	10,69	70,5%	19,39	8,68	163,4	22,0	99,9%	80,6%	80,5%
49,00	5,08	0,03	9,52	91,4%	19,56	10,02	163,9	22,1	100,0%	79,6%	79,6%
50,00	5,04	0,05	7,92	129,5%	19,79	11,84	164,2	22,2	100,0%	77,8%	77,8%
51,00	4,99	0,04	9,92	83,6%	19,50	9,56	164,3	22,2	100,0%	79,9%	79,9%
52,00	4,99	0,04	8,80	107,0%	19,66	10,84	164,2	22,2	100,0%	78,9%	78,9%
53,00	4,95	0,06	9,88	84,1%	19,50	9,60	164,5	22,2	99,8%	79,9%	79,7%
54,00	4,90	0,03	10,51	73,5%	19,41	8,88	164,8	22,3	100,0%	80,4%	80,3%
55,00	4,86	0,08	9,10	99,2%	19,61	10,47	165,2	21,9	99,6%	79,1%	78,7%
56,00	4,86	0,06	8,30	118,8%	19,73	11,40	165,2	22,1	99,9%	78,2%	78,1%
57,00	4,81	0,03	9,84	85,2%	19,51	9,65	165,1	22,1	100,0%	79,8%	79,8%
58,00	4,76	0,04	9,52	91,3%	19,55	10,01	165,1	22,5	100,0%	79,5%	79,5%
59,00	4,72	0,04	9,51	91,7%	19,56	10,03	165,4	22,4	100,0%	79,5%	79,5%
60,00	4,67	0,07	10,98	65,6%	19,34	8,33	165,3	22,4	99,7%	80,7%	80,4%
61,00	4,63	0,06	11,35	60,2%	19,29	7,90	165,1	22,4	99,8%	80,9%	80,7%
62,00	4,63	0,04	9,66	88,6%	19,53	9,86	159,7	22,3	99,9%	80,0%	80,0%
63,00	4,58	0,06	8,05	125,3%	19,76	11,68	154,0	22,3	99,8%	78,8%	78,7%
64,00	4,58	0,04	7,84	132,0%	19,80	11,94	149,6	22,2	100,0%	79,0%	79,0%
65,00	4,58	0,05	7,28	149,5%	19,88	12,57	146,0	22,3	99,9%	78,6%	78,5%
66,00	4,54	0,06	7,01	158,7%	19,92	12,88	143,3	22,3	99,8%	78,4%	78,3%
67,00	4,54	0,07	5,82	210,6%	20,09	14,23	141,2	22,3	99,8%	76,6%	76,4%
68,00	4,49	0,04	7,19	152,7%	19,89	12,67	138,9	22,2	100,0%	79,1%	79,1%
69,00	4,49	0,03	6,90	163,8%	19,94	13,02	137,0	22,2	100,2%	78,9%	79,1%
70,00	4,49	0,03	8,23	121,6%	19,74	11,50	135,0	22,1	100,2%	80,6%	80,7%
71,00	4,45	0,06	10,51	73,2%	19,41	8,88	133,5	22,2	99,8%	82,4%	82,3%
72,00	4,45	0,04	9,71	87,6%	19,53	9,80	132,2	21,8	99,9%	82,0%	81,9%
73,00	4,40	0,05	7,36	146,9%	19,87	12,48	131,0	22,0	100,0%	80,0%	80,0%
74,00	4,40	0,03	9,46	92,7%	19,56	10,09	130,0	22,1	100,0%	82,0%	82,0%
75,00	4,40	0,05	7,61	138,6%	19,83	12,19	128,9	21,8	99,9%	80,5%	80,4%
76,00	4,35	0,05	8,05	125,8%	19,77	11,69	127,7	22,2	99,9%	81,0%	81,0%
77,00	4,31	0,07	11,21	62,1%	19,31	8,06	126,6	22,2	99,7%	83,2%	83,0%
78,00	4,31	0,13	11,20	61,5%	19,30	8,04	126,1	22,1	99,2%	83,2%	82,6%
79,00	4,31	0,17	5,59	217,4%	20,11	14,43	126,0	22,0	98,2%	77,8%	76,4%
80,00	4,27	0,07	5,23	244,9%	20,17	14,90	130,1	22,0	99,8%	76,6%	76,4%
81,00	4,27	0,04	10,46	74,2%	19,42	8,94	128,2	22,0	99,9%	82,7%	82,7%
82,00	4,27	0,03	9,20	98,1%	19,60	10,39	126,5	22,1	100,1%	82,1%	82,2%
83,00	4,22	0,06	6,97	160,3%	19,92	12,93	125,3	22,3	99,8%	80,1%	79,9%
84,00	4,22	0,04	9,81	85,7%	19,51	9,69	124,2	22,1	100,0%	82,6%	82,6%
85,00	4,17	0,03	7,69	136,9%	19,82	12,12	123,2	22,3	100,1%	81,1%	81,2%
86,00	4,17	0,09	6,37	183,4%	20,01	13,60	122,1	22,4	99,5%	79,6%	79,2%
87,00	4,17	0,03	9,96	83,1%	19,49	9,52	121,3	22,3	100,0%	82,9%	83,0%
88,00	4,13	0,03	8,78	107,5%	19,66	10,87	120,9	22,2	100,1%	82,2%	82,3%
89,00	4,13	0,04	8,37	117,5%	19,72	11,33	120,1	22,3	100,0%	81,9%	81,9%
90,00	4,08	0,03	9,13	99,6%	19,61	10,47	119,8	22,2	100,0%	82,5%	82,6%
91,00	4,08	0,09	11,04	64,5%	19,33	8,25	119,3	22,3	99,6%	83,6%	83,2%
92,00	4,04	0,06	7,32	147,9%	19,87	12,52	119,0	22,2	99,9%	81,1%	81,0%

93,00	4,04	0,04	7,46	143,9%	19,85	12,37	118,4	22,1	100,1%	81,3%	81,3%
94,00	4,04	0,03	7,87	131,5%	19,80	11,91	118,1	22,2	100,1%	81,7%	81,8%
95,00	3,99	0,05	9,10	100,0%	19,61	10,49	117,8	22,3	99,9%	82,7%	82,6%
96,00	3,99	0,03	8,07	125,9%	19,77	11,69	117,4	22,4	100,1%	81,9%	82,0%
97,00	3,95	0,05	6,21	192,1%	20,03	13,80	117,1	22,4	100,0%	79,9%	79,9%
98,00	3,95	0,03	7,54	141,3%	19,84	12,28	116,8	22,4	100,1%	81,5%	81,6%
99,00	3,90	0,03	8,57	112,9%	19,70	11,12	116,6	22,2	100,2%	82,4%	82,5%
100,00	3,90	0,03	7,89	130,8%	19,79	11,89	116,1	22,2	100,1%	81,9%	82,0%
101,00	3,90	0,04	6,29	188,8%	20,02	13,71	115,7	22,3	100,1%	80,2%	80,3%
102,00	3,90	0,04	5,98	203,7%	20,07	14,07	115,3	22,3	100,2%	79,8%	79,9%
103,00	3,86	0,05	7,36	146,8%	19,87	12,48	115,0	22,5	100,0%	81,5%	81,5%
104,00	3,86	0,02	9,50	92,0%	19,56	10,04	114,6	22,2	100,1%	83,2%	83,3%
105,00	3,81	0,03	7,46	144,2%	19,85	12,38	114,3	22,4	100,2%	81,7%	81,8%
106,00	3,81	0,07	5,03	258,4%	20,20	15,13	114,2	22,2	99,7%	78,2%	78,0%
107,00	3,81	0,07	5,19	247,5%	20,18	14,95	113,5	22,0	99,8%	78,6%	78,4%
108,00	3,81	0,03	7,10	156,6%	19,91	12,79	113,4	22,3	100,2%	81,4%	81,5%
109,00	3,76	0,03	7,63	138,9%	19,83	12,19	113,1	22,3	100,2%	81,9%	82,0%
110,00	3,76	0,03	9,36	94,8%	19,58	10,20	112,9	22,2	100,1%	83,2%	83,3%
111,00	3,76	0,03	8,25	120,7%	19,74	11,47	112,8	22,4	100,1%	82,5%	82,5%
112,00	3,72	0,03	7,76	134,9%	19,81	12,04	112,8	22,3	100,2%	82,1%	82,2%
113,00	3,72	0,04	9,79	86,2%	19,52	9,71	112,4	22,2	100,0%	83,5%	83,4%
114,00	3,68	0,03	7,36	147,5%	19,87	12,50	112,4	22,4	100,2%	81,7%	81,9%
115,00	3,68	0,05	6,57	176,2%	19,98	13,38	112,1	22,4	100,0%	80,9%	80,9%
116,00	3,63	0,03	7,64	138,5%	19,83	12,17	112,0	22,5	100,2%	82,0%	82,2%
117,00	3,63	0,03	7,64	138,5%	19,83	12,17	112,0	22,4	100,2%	82,0%	82,2%
118,00	3,58	0,04	7,46	143,9%	19,85	12,37	111,8	22,3	100,1%	81,9%	81,9%
119,00	3,58	0,05	10,19	78,6%	19,46	9,24	112,1	22,3	99,9%	83,7%	83,6%
120,00	3,58	0,06	6,33	185,9%	20,01	13,65	111,7	22,2	99,8%	80,6%	80,5%
121,00	3,54	0,03	7,99	128,1%	19,78	11,77	111,4	22,4	100,2%	82,4%	82,5%
122,00	3,54	0,03	8,52	114,1%	19,70	11,17	111,4	22,5	100,2%	82,8%	82,9%
123,00	3,49	0,06	8,10	124,1%	19,76	11,62	111,2	22,6	99,8%	82,5%	82,4%
124,00	3,49	0,05	6,51	179,0%	19,99	13,46	110,8	22,4	100,0%	81,0%	80,9%
125,00	3,49	0,04	6,69	171,9%	19,97	13,26	111,2	22,5	100,1%	81,1%	81,2%
126,00	3,45	0,02	7,78	134,6%	19,81	12,02	111,1	22,5	100,3%	82,2%	82,4%
127,00	3,45	0,13	4,62	285,0%	20,25	15,56	110,4	22,3	98,8%	77,8%	76,8%
128,00	3,45	0,03	7,48	143,5%	19,85	12,36	110,4	22,4	100,1%	82,0%	82,1%
129,00	3,40	0,07	9,96	82,2%	19,49	9,49	110,4	22,4	99,7%	83,7%	83,4%
130,00	3,40	0,04	9,43	93,3%	19,57	10,12	115,0	22,3	100,0%	83,1%	83,1%
131,00	3,36	0,16	4,18	322,0%	20,31	16,06	114,5	22,5	98,1%	76,0%	74,5%
132,00	3,36	0,03	7,97	128,6%	19,78	11,79	113,6	22,3	100,2%	82,2%	82,3%
133,00	3,36	0,03	8,87	105,7%	19,65	10,77	112,8	22,3	100,1%	82,9%	83,0%
134,00	3,31	0,05	5,85	210,0%	20,09	14,21	112,1	22,5	100,0%	79,9%	80,0%
135,00	3,31	0,04	6,09	198,4%	20,05	13,94	111,6	22,2	100,1%	80,3%	80,4%
136,00	3,27	0,03	9,81	85,9%	19,51	9,69	111,5	22,5	100,1%	83,6%	83,6%
137,00	3,27	0,03	7,25	151,3%	19,89	12,62	111,1	22,1	100,2%	81,7%	81,9%
138,00	3,22	0,04	8,14	123,7%	19,76	11,60	110,9	22,5	100,0%	82,5%	82,5%
139,00	3,22	0,04	9,72	87,4%	19,53	9,79	110,7	22,4	100,0%	83,6%	83,6%
140,00	3,18	0,05	9,77	86,2%	19,52	9,72	110,5	22,4	99,9%	83,6%	83,5%
141,00	3,18	0,04	8,92	104,1%	19,64	10,70	110,2	22,3	100,0%	83,1%	83,1%
142,00	3,18	0,03	8,52	114,1%	19,70	11,17	110,4	22,6	100,2%	82,9%	83,0%
143,00	3,13	0,04	7,46	143,8%	19,85	12,37	110,1	22,4	100,0%	82,0%	82,0%
144,00	3,13	0,06	6,13	195,7%	20,04	13,89	109,8	22,5	99,9%	80,6%	80,5%
145,00	3,08	0,04	6,75	169,3%	19,96	13,19	109,7	22,5	100,1%	81,4%	81,4%
146,00	3,08	0,03	7,41	145,8%	19,86	12,44	109,8	22,3	100,2%	82,0%	82,2%
147,00	3,08	0,03	7,94	129,7%	19,79	11,84	109,7	22,5	100,2%	82,5%	82,7%
148,00	3,04	0,03	7,20	153,1%	19,89	12,68	109,5	22,5	100,2%	81,8%	82,0%
149,00	3,04	0,04	5,87	209,9%	20,08	14,20	109,3	22,4	100,2%	80,3%	80,5%
150,00	2,99	0,05	6,49	180,0%	19,99	13,48	109,2	22,2	100,1%	81,1%	81,1%
151,00	2,99	0,03	6,14	196,4%	20,05	13,89	109,0	22,3	100,3%	80,7%	81,0%
152,00	2,99	0,03	5,90	208,4%	20,08	14,17	108,6	22,2	100,3%	80,4%	80,6%
153,00	2,95	0,02	7,76	135,1%	19,81	12,05	108,4	22,3	100,3%	82,4%	82,6%
154,00	2,95	0,02	7,31	149,3%	19,88	12,55	108,5	22,3	100,3%	82,0%	82,2%
155,00	2,90	0,04	10,12	80,0%	19,47	9,33	108,6	22,4	99,9%	83,9%	83,9%
156,00	2,90	0,07	10,41	74,4%	19,42	8,97	108,6	22,4	99,7%	84,0%	83,8%
157,00	2,90	0,07	5,98	202,6%	20,06	14,05	108,2	22,4	99,8%	80,5%	80,4%
158,00	2,86	0,03	7,96	129,1%	19,78	11,81	107,9	22,5	100,2%	82,6%	82,8%
159,00	2,86	0,04	7,13	155,1%	19,90	12,75	107,7	22,6	100,1%	81,9%	82,0%
160,00	2,81	0,06	8,78	107,0%	19,66	10,85	107,9	22,3	99,8%	83,2%	83,1%
161,00	2,81	0,04	9,01	102,2%	19,63	10,60	107,8	22,4	100,0%	83,4%	83,4%
162,00	2,81	0,04	6,97	161,1%	19,93	12,94	107,5	22,3	100,1%	81,8%	81,9%
163,00	2,77	0,03	6,52	179,3%	19,99	13,46	107,5	22,4	100,2%	81,3%	81,5%
164,00	2,77	0,04	9,34	95,0%	19,58	10,22	107,7	22,5	100,0%	83,6%	83,6%
165,00	2,72	0,03	9,61	89,7%	19,54	9,92	107,5	22,4	100,0%	83,7%	83,7%
166,00	2,72	0,02	8,50	114,6%	19,71	11,19	107,8	22,3	100,2%	83,0%	83,2%
167,00	2,68	0,04	7,79	133,7%	19,81	12,00	108,0	22,3	100,1%	82,5%	82,6%
168,00	2,68	0,03	6,28	190,1%	20,03	13,74	107,8	22,5	100,3%	81,0%	81,3%
169,00	2,68	0,03	6,47	181,2%	20,00	13,51	107,6	22,4	100,2%	81,2%	81,4%
170,00	2,63	0,03	5,83	212,2%	20,09	14,25	107,6	22,2	100,4%	80,4%	80,7%
171,00	2,63	0,02	8,48	115,2%	19,71	11,22	107,7	22,3	100,3%	83,0%	83,3%
172,00	2,63	0,03	7,16	154,5%	19,90	12,72	107,5	22,4	100,3%	82,0%	82,2%
173,00	2,59	0,03	6,42	183,3%	20,00	13,57	107,2	22,5	100,2%	81,2%	81,4%
174,00	2,59	0,04	7,69	136,7%	19,82	12,11	107,2	22,4	100,1%	82,5%	82,6%
175,00	2,59	0,06	5,08	256,1%	20,20	15,09	106,9	22,4	100,0%	79,2%	79,2%
176,00	2,54	0,03	8,75	108,3%	19,67	10,90	106,7	22,5	100,1%	83,3%	83,4%
177,00	2,54	0,04	9,28	96,3%	19,59	10,29	106,9	22,4	100,0%	83,6%	83,6%
178,00	2,54	0,04	9,31	95,7%	19,59	10,26	107,0	22,5	100,0%	83,6%	83,6%
179,00	2,49	0,05	5,80	213,0%	20,09	14,27	106,7	22,5	100,1%	80,5%	80,5%
180,00	2,49	0,02	8,46	115,7%	19,71	11,24	106,7	22,5	100,2%	83,1%	83,3%
181,00	2,45	0,07	5,09	254,5%	20,19	15,07	111,9	22,4	99,8%	78,6%	78,5%
182,00	2,45	0,03	6,59	176,2%	19,98	13,38	110,8	22,4	100,2%	81,1%	81,2%
183,00	2,45	0,06	6,27	189,0%	20,02	13,72	109,7	22,6	99,9%	80,8%	80,7%
184,00	2,40	0,03	8,65	110,8%	19,68	11,02	107,2	22,4	100,1%	83,2%	83,3%
185,00	2,40	0,06	5,48	230,0%	20,14	14,63	105,6	22,4	99,9%	80,1%	80,0%
186,00	2,40	0,02	6,34	187,4%	20,02	13,67	104,4	22,3	100,4%	81,4%	81,7%
187,00	2,36	0,03	6,16	195,7%	20,04	13,87	103,3	22,4	100,4%	81,3%	81,6%
188,00	2,36	0,03	5,67	220,9%	20,11	14,43	102,5	22,4	100,3%	80,7%	81,0%
189,00	2,36	0,03	6,49	180,7%	20,00	13,49	101,7	22,3	100,3%	81,8%	82,1%
190,00	2,36	0,07	4,98	262,4%	20,21	15,20	101,0	22,4	99,8%	79,8%	79,6%
191,00	2,31	0,03	8,68	110,0%	19,68	10,98	100,5	22,4	100,1%	83,7%	83,8%
192,00	2,31	0,03	5,86	210,2%	20,09	14,21	100,1	22,4	100,3%	81,3%	81,5%
193,00	2,31	0,12	3,66	384,2%	20,39	16,68	99,2	22,3	98,7%	76,8%	75,7%
194,00	2,31	0,03	6,52	179,3%	19,99	13,46	98,7	22,3	100,3%	82,2%	82,4%
195,00	2,27	0,03	6,39	185,2%	20,01	13,61	98,4	22,3	100,3%	82,1%	82,4%
196,00	2,27	0,03	8,34	118,5%	19,73	11,37	98,2	22,2	100,1%	83,7%	83,7%
197,00	2,27	0,03	7,63	138,8%	19,83	12,19	97,8	22,3	100,2%	83,2%	83,4%
198,00	2,22	0,04	7,81	133,1%	19,80	11,98	97,6	22,3	100,1%	83,4%	83,4%
199,00	2,22	0,09	4,10	336,8%	20,33	16,19	97,4	22,3	99,3%	78,3%	77,8%
200,00	2,22	0,07	10,08	80,2%	19,47	9,36	97,2	22,1	99,7%	84,6%	84,4%
201,00	2,18	0,04	6,72	170,7%	19,96	13,22	96,9	22,1	100,2%	82,5%	82,7%
202,00	2,18	0,03	6,06	200,2%	20,06	13,98	96,6	22,3	100,3%	81,9%	82,1%
203,00	2,18	0,07	4,83	273,2%	20,23	15,36	96,1	22,2	99,8%	80,1%	80,0%
204,00	2,18	0,04	6,70	171,3%	19,96	13,24	95,8	22,1	100,2%	82,6%	82,7%
205,00	2,13	0,02	6,73	170,9%	19,96	13,22	95,7	22,4	100,4%	82,7%	83,0%
206,00	2,13	0,01	6,79	169,0%	19,95	13,16	95,5	22,1	100,4%	82,7%	83,1%

207,00	2,13	0,03	5,78	214,7%	20,10	14,30	95,3	22,2	100,3%	81,7%	82,0%
208,00	2,09	0,03	6,75	169,8%	19,96	13,19	95,2	22,1	100,3%	82,7%	83,0%
209,00	2,09	0,03	6,42	183,4%	20,00	13,57	95,4	22,2	100,2%	82,4%	82,6%
210,00	2,09	0,04	5,33	240,6%	20,16	14,81	95,1	22,3	100,2%	81,1%	81,2%
211,00	2,04	0,02	6,29	189,9%	20,03	13,72	94,7	22,3	100,5%	82,3%	82,7%
212,00	2,04	0,02	6,69	172,7%	19,97	13,27	94,7	22,3	100,4%	82,7%	83,0%
213,00	2,04	0,05	5,92	206,8%	20,08	14,14	94,2	22,2	100,1%	82,0%	82,0%
214,00	2,04	0,02	6,33	188,1%	20,02	13,68	93,9	22,2	100,4%	82,5%	82,8%
215,00	2,00	0,02	6,31	189,0%	20,02	13,70	93,8	22,1	100,4%	82,4%	82,8%
216,00	2,00	0,09	4,09	337,9%	20,33	16,20	93,6	22,2	99,4%	78,9%	78,4%
217,00	2,00	0,03	5,68	220,1%	20,11	14,41	93,4	21,9	100,4%	81,7%	82,0%
218,00	2,00	0,02	6,31	188,9%	20,02	13,70	93,1	22,2	100,4%	82,5%	82,8%
219,00	2,00	0,02	6,05	201,6%	20,06	14,01	93,0	22,1	100,5%	82,2%	82,6%
220,00	1,95	0,03	5,59	225,6%	20,13	14,52	92,7	22,2	100,4%	81,7%	82,0%
221,00	1,95	0,03	5,03	261,1%	20,21	15,16	92,4	22,0	100,4%	80,9%	81,3%
222,00	1,95	0,05	4,98	263,5%	20,21	15,20	92,1	22,0	100,1%	80,9%	81,0%
223,00	1,90	0,03	8,78	107,7%	19,66	10,87	92,1	22,0	100,1%	84,4%	84,5%
224,00	1,90	0,03	7,75	135,3%	19,81	12,05	92,0	22,0	100,2%	83,8%	84,0%
225,00	1,90	0,02	7,71	136,8%	19,82	12,11	91,6	22,3	100,3%	83,8%	84,1%
226,00	1,90	0,08	4,03	345,6%	20,35	16,28	91,5	22,0	99,6%	79,0%	78,7%
227,00	1,90	0,03	5,62	223,8%	20,12	14,49	91,3	22,2	100,4%	81,9%	82,3%
228,00	1,86	0,02	6,36	186,9%	20,02	13,65	91,2	22,1	100,4%	82,7%	83,1%
229,00	1,86	0,02	7,00	160,5%	19,92	12,91	91,2	22,1	100,3%	83,3%	83,6%
230,00	1,81	0,03	8,25	120,9%	19,74	11,47	91,0	22,0	100,2%	84,2%	84,3%
231,00	1,81	0,03	7,38	146,8%	19,87	12,47	90,8	22,1	100,2%	83,7%	83,8%
232,00	1,81	0,05	4,85	273,5%	20,23	15,36	96,3	22,0	100,2%	80,1%	80,3%
233,00	1,81	0,05	5,20	248,6%	20,18	14,96	95,4	22,1	100,1%	80,8%	80,9%
234,00	1,77	0,03	7,18	153,7%	19,90	12,70	94,6	22,0	100,2%	83,1%	83,3%
235,00	1,77	0,04	5,26	245,2%	20,17	14,89	93,8	22,1	100,3%	81,1%	81,3%
236,00	1,77	0,02	7,25	151,6%	19,89	12,63	93,3	22,0	100,4%	83,3%	83,6%
237,00	1,72	0,03	6,77	169,2%	19,96	13,17	92,6	22,0	100,3%	83,0%	83,2%
238,00	1,72	0,04	7,16	154,1%	19,90	12,72	92,2	22,2	100,1%	83,4%	83,5%
239,00	1,72	0,03	6,04	201,1%	20,06	14,00	91,8	22,4	100,3%	82,4%	82,6%
240,00	1,72	0,03	7,62	138,9%	19,83	12,19	91,5	22,3	100,2%	83,8%	83,9%
241,00	1,68	0,03	5,24	246,7%	20,18	14,92	91,1	22,2	100,4%	81,4%	81,7%
242,00	1,68	0,02	7,82	133,3%	19,80	11,97	91,0	22,3	100,3%	84,0%	84,2%
243,00	1,68	0,03	8,02	127,3%	19,77	11,74	90,8	22,1	100,2%	84,1%	84,3%
244,00	1,63	0,04	7,36	147,3%	19,87	12,49	90,4	22,0	100,1%	83,7%	83,8%
245,00	1,63	0,03	4,99	264,3%	20,21	15,21	90,2	22,0	100,4%	81,1%	81,5%
246,00	1,59	0,04	5,23	247,2%	20,18	14,93	89,8	21,7	100,2%	81,5%	81,7%
247,00	1,59	0,02	6,97	162,0%	19,93	12,95	89,6	21,9	100,4%	83,4%	83,8%
248,00	1,59	0,02	7,81	133,8%	19,81	11,99	89,6	21,9	100,3%	84,0%	84,3%
249,00	1,59	0,02	6,65	174,1%	19,97	13,31	89,5	21,9	100,4%	83,2%	83,5%
250,00	1,54	0,02	6,32	188,4%	20,02	13,69	89,6	21,9	100,4%	82,9%	83,2%
251,00	1,54	0,02	6,64	174,9%	19,98	13,33	89,6	22,4	100,4%	83,2%	83,6%
252,00	1,54	0,02	7,76	135,1%	19,81	12,05	89,4	22,5	100,3%	84,1%	84,3%
253,00	1,50	0,04	6,67	172,6%	19,97	13,28	89,2	22,3	100,1%	83,2%	83,3%
254,00	1,50	0,02	7,10	156,8%	19,91	12,80	89,2	22,4	100,3%	83,6%	83,9%
255,00	1,50	0,02	7,58	140,7%	19,84	12,25	89,3	22,1	100,3%	83,9%	84,2%
256,00	1,45	0,02	7,58	140,8%	19,84	12,25	89,3	22,0	100,3%	83,9%	84,2%
257,00	1,45	0,06	9,24	96,5%	19,59	10,32	89,2	22,1	99,8%	84,8%	84,6%
258,00	1,45	0,09	4,81	273,1%	20,23	15,37	89,2	22,1	99,4%	80,9%	#DIV/0!
259,00	1,45	0,04	6,60	175,6%	19,98	13,36	89,1	22,0	100,1%	83,2%	83,3%
260,00	1,41	0,03	6,31	188,5%	20,02	13,70	88,8	22,3	100,2%	83,0%	83,2%
261,00	1,41	0,03	7,99	128,2%	19,78	11,78	88,6	22,5	100,2%	84,3%	84,4%
262,00	1,41	0,02	6,82	167,2%	19,95	13,12	88,5	22,2	100,3%	83,4%	83,7%
263,00	1,41	0,07	4,15	333,4%	20,33	16,15	88,1	22,0	99,7%	79,8%	79,6%
264,00	1,36	0,03	5,82	212,7%	20,09	14,26	88,1	21,9	100,3%	82,5%	82,7%
265,00	1,36	0,02	6,87	165,6%	19,94	13,07	88,0	22,0	100,4%	83,5%	83,8%
266,00	1,36	0,03	8,31	119,4%	19,73	11,41	87,8	21,8	100,2%	84,5%	84,6%
267,00	1,31	0,02	6,66	173,7%	19,97	13,30	87,8	21,8	100,4%	83,3%	83,7%
268,00	1,31	0,02	7,87	131,7%	19,80	11,91	88,3	22,0	100,3%	84,2%	84,4%
269,00	1,31	0,02	6,78	168,7%	19,95	13,16	88,3	22,0	100,3%	83,4%	83,7%
270,00	1,27	0,03	6,41	183,7%	20,01	13,58	88,1	21,9	100,3%	83,1%	83,3%
271,00	1,27	0,05	3,90	363,9%	20,37	16,45	87,9	21,9	100,4%	79,3%	79,6%
272,00	1,27	0,04	6,70	171,5%	19,96	13,24	87,8	21,8	100,2%	83,4%	83,5%
273,00	1,22	0,11	9,52	89,9%	19,54	9,97	87,9	21,8	99,4%	85,0%	84,5%
274,00	1,22	0,04	6,31	187,9%	20,02	13,69	87,6	21,9	100,1%	83,0%	83,1%
275,00	1,22	0,02	7,15	155,3%	19,90	12,75	87,7	21,9	100,4%	83,7%	84,0%
276,00	1,18	0,02	6,82	167,6%	19,95	13,12	87,8	21,6	100,4%	83,5%	83,8%
277,00	1,18	0,08	10,66	70,2%	19,38	8,68	87,7	21,6	99,6%	85,4%	85,1%
278,00	1,13	0,09	9,60	88,7%	19,54	9,89	87,8	21,8	99,5%	85,1%	84,6%
279,00	1,13	0,12	9,87	83,1%	19,49	9,56	87,8	21,5	99,3%	85,1%	84,5%
280,00	1,13	0,07	6,19	192,2%	20,03	13,81	87,9	21,7	99,8%	82,8%	82,7%
281,00	1,13	0,06	8,93	103,6%	19,64	10,68	88,0	21,6	99,9%	84,7%	84,6%
282,00	1,09	0,05	5,41	235,3%	20,15	14,72	91,6	21,8	100,1%	81,5%	81,6%
283,00	1,09	0,04	4,60	294,1%	20,27	15,65	92,9	21,8	100,3%	80,1%	80,4%
284,00	1,09	0,02	6,14	196,9%	20,05	13,90	92,1	21,7	100,5%	82,4%	82,8%
285,00	1,09	0,02	6,13	197,6%	20,05	13,91	91,3	21,8	100,5%	82,5%	82,9%
286,00	1,04	0,06	4,62	290,7%	20,26	15,61	90,5	21,8	100,0%	80,4%	80,5%
287,00	1,04	0,05	4,42	309,7%	20,29	15,85	89,6	21,6	100,2%	80,2%	80,3%
288,00	1,04	0,04	6,07	198,9%	20,05	13,96	89,0	21,9	100,1%	82,7%	82,7%
289,00	1,00	0,01	6,52	179,8%	19,99	13,46	88,5	21,8	100,5%	83,2%	83,6%
290,00	1,00	0,03	7,86	132,0%	19,80	11,93	88,2	21,8	100,2%	84,2%	84,3%
291,00	1,00	0,02	7,87	131,8%	19,80	11,91	87,9	22,0	100,3%	84,2%	84,5%
292,00	0,95	0,02	7,79	134,2%	19,81	12,01	87,6	22,2	100,3%	84,2%	84,5%
293,00	0,95	0,10	9,53	89,9%	19,54	9,96	87,6	21,9	99,5%	85,0%	84,6%
294,00	0,95	0,03	7,37	147,1%	19,87	12,48	87,2	21,7	100,2%	83,9%	84,1%
295,00	0,95	0,03	5,70	219,1%	20,11	14,39	87,3	21,8	100,4%	82,4%	82,7%
296,00	0,91	0,02	6,24	192,2%	20,03	13,79	86,9	21,7	100,4%	83,0%	83,4%
297,00	0,91	0,02	6,72	171,4%	19,96	13,24	86,8	21,8	100,4%	83,5%	83,8%
298,00	0,91	0,02	8,39	117,6%	19,72	11,33	86,7	21,7	100,2%	84,6%	84,8%
299,00	0,86	0,03	7,91	130,5%	19,79	11,87	86,9	21,6	100,2%	84,3%	84,4%
300,00	0,86	0,04	5,19	249,4%	20,18	14,97	87,1	21,7	100,3%	81,8%	82,0%
301,00	0,86	0,03	2,02	791,2%	20,64	18,61	87,0	21,7	101,5%	70,6%	71,6%
302,00	0,82	0,04	6,36	186,2%	20,01	13,64	86,8	21,8	100,2%	83,2%	83,3%
303,00	0,82	0,02	5,96	205,7%	20,07	14,10	86,6	21,7	100,5%	82,8%	83,2%
304,00	0,82	0,03	5,71	218,5%	20,11	14,38	86,5	21,7	100,4%	82,5%	82,8%
305,00	0,82	0,03	5,62	224,1%	20,12	14,49	86,5	21,7	100,4%	82,4%	82,8%
306,00	0,77	0,02	6,38	185,9%	20,01	13,63	86,3	21,7	100,4%	83,2%	83,6%
307,00	0,77	0,03	5,49	231,4%	20,14	14,64	86,2	21,5	100,3%	82,3%	82,5%
308,00	0,77	0,02	7,13	155,5%	19,90	12,76	86,4	21,5	100,3%	83,8%	84,1%
309,00	0,72	0,03	7,07	157,9%	19,91	12,83	86,6	21,3	100,3%	83,7%	84,0%
310,00	0,72	0,02	7,64	138,8%	19,83	12,18	86,6	21,4	100,3%	84,1%	84,4%
311,00	0,72	0,03	5,99	203,9%	20,07	14,06	86,5	21,5	100,4%	82,8%	83,1%
312,00	0,72	0,03	7,10	156,6%	19,91	12,79	86,5	21,4	100,2%	83,8%	84,0%
313,00	0,68	0,03	6,50	180,0%	19,99	13,48	86,3	21,3	100,3%	83,3%	83,6%
314,00	0,68	0,02	6,67	173,5%	19,97	13,29	86,3	21,6	100,4%	83,5%	83,8%
315,00	0,68	0,02	6,99	160,8%	19,92	12,92	86,4	21,7	100,4%	83,7%	84,0%
316,00	0,63	0,03	7,06	158,1%	19,91	12,84	86,1	21,9	100,2%	83,8%	84,0%
317,00	0,63	0,03	5,60	224,8%	20,12	14,51	85,8	21,9	100,3%	82,5%	82,7%
318,00	0,63	0,05	8,34	118,1%	19,73	11,36	85,9	21,9	99,9%	84,6%	84,6%
319,00	0,59	0,05	9,44	92,6%	19,56	10,10	85,9	21,7	99,9%	85,1%	85,0%
320,00	0,59	0,04	7,74	135,2%	19,81	12,05	85,7	21,6	100,1%	84,3%	84,4%

321,00	0,59	0,04	7,53	141,8%	19,84	12,30	85,7	21,5	100,1%	84,1%	84,2%
322,00	0,59	0,06	5,07	256,2%	20,20	15,09	85,7	21,3	99,9%	81,7%	81,7%
323,00	0,54	0,04	5,98	204,2%	20,07	14,07	85,7	21,3	100,2%	82,9%	83,1%
324,00	0,54	0,03	6,85	165,8%	19,94	13,08	85,5	21,4	100,2%	83,7%	83,9%
325,00	0,54	0,05	5,09	256,0%	20,20	15,08	85,7	21,2	100,1%	81,8%	81,9%
326,00	0,50	0,03	5,51	230,1%	20,14	14,61	85,6	21,2	100,4%	82,3%	82,7%
327,00	0,50	0,02	5,94	206,7%	20,08	14,12	85,7	21,3	100,4%	82,8%	83,2%
328,00	0,50	0,02	6,75	170,0%	19,96	13,20	85,7	21,3	100,3%	83,6%	83,9%
329,00	0,50	0,02	6,51	180,2%	19,99	13,48	85,7	21,4	100,4%	83,4%	83,7%
330,00	0,45	0,02	6,72	171,4%	19,96	13,23	85,7	21,5	100,4%	83,6%	83,9%
331,00	0,45	0,02	6,52	179,5%	19,99	13,46	85,6	21,6	100,4%	83,4%	83,7%
332,00	0,45	0,03	6,23	192,5%	20,03	13,80	85,4	21,6	100,3%	83,2%	83,5%
333,00	0,41	0,03	6,88	164,6%	19,94	13,04	92,0	21,5	100,3%	83,1%	83,3%
334,00	0,41	0,03	7,03	159,2%	19,92	12,88	90,9	21,4	100,2%	83,3%	83,5%
335,00	0,41	0,03	6,21	193,1%	20,04	13,81	89,8	21,4	100,3%	82,7%	82,9%
336,00	0,41	0,03	6,32	187,9%	20,02	13,68	88,9	21,5	100,3%	82,9%	83,1%
337,00	0,36	0,05	5,24	245,3%	20,17	14,90	88,3	21,4	100,0%	81,7%	81,7%
338,00	0,36	0,05	5,41	235,5%	20,15	14,72	87,7	21,4	100,1%	82,0%	82,1%
339,00	0,36	0,04	5,90	208,2%	20,08	14,16	87,1	21,5	100,2%	82,6%	82,8%
340,00	0,32	0,04	5,42	234,9%	20,15	14,71	86,9	21,5	100,3%	82,1%	82,3%
341,00	0,32	0,03	5,60	224,5%	20,12	14,50	86,6	21,3	100,3%	82,3%	82,6%
342,00	0,32	0,03	5,92	207,6%	20,08	14,15	86,4	21,3	100,3%	82,7%	83,0%
343,00	0,27	0,03	6,18	194,6%	20,04	13,85	86,4	21,4	100,3%	83,0%	83,2%
344,00	0,27	0,04	6,70	171,4%	19,96	13,24	86,1	21,1	100,2%	83,5%	83,6%
345,00	0,27	0,04	7,23	151,6%	19,89	12,64	86,0	21,3	100,1%	83,9%	84,0%
346,00	0,23	0,04	7,10	156,1%	19,91	12,79	85,8	21,3	100,1%	83,8%	83,9%
347,00	0,23	0,04	6,46	181,6%	20,00	13,52	85,7	21,2	100,2%	83,3%	83,4%
348,00	0,23	0,02	6,12	197,9%	20,05	13,92	85,4	21,4	100,4%	83,1%	83,4%
349,00	0,18	0,04	7,48	143,3%	19,85	12,35	85,6	21,4	100,1%	84,1%	84,2%
350,00	0,18	0,03	7,08	157,2%	19,91	12,81	85,5	21,3	100,2%	83,8%	84,0%
351,00	0,18	0,04	7,97	128,3%	19,78	11,79	85,2	21,3	100,1%	84,4%	84,5%
352,00	0,18	0,03	4,57	297,1%	20,27	15,68	85,1	21,2	100,5%	81,0%	81,4%
353,00	0,13	0,03	8,24	121,3%	19,74	11,49	85,2	21,2	100,2%	84,6%	84,7%
354,00	0,13	0,04	6,13	196,4%	20,05	13,90	85,2	21,3	100,1%	83,1%	83,2%
355,00	0,13	0,05	9,23	97,0%	19,60	10,34	85,1	21,3	99,9%	85,1%	85,0%
356,00	0,09	0,03	5,33	241,3%	20,16	14,82	85,0	21,0	100,4%	82,1%	82,4%
357,00	0,09	0,02	5,53	229,4%	20,14	14,59	84,6	21,3	100,5%	82,5%	82,9%
358,00	0,09	0,02	5,85	211,5%	20,09	14,23	84,8	21,3	100,5%	82,8%	83,2%
359,00	0,04	0,03	9,38	94,5%	19,58	10,19	84,9	21,3	100,1%	85,2%	85,2%
360,00	0,04	0,03	7,49	143,1%	19,85	12,34	84,9	21,2	100,2%	84,2%	84,3%
361,00	0,04	0,02	7,12	156,3%	19,91	12,78	84,8	21,4	100,4%	83,9%	84,2%
362,00	0,04	0,04	7,86	131,6%	19,80	11,92	84,5	21,4	100,1%	84,5%	84,5%
363,00	0,00	0,04	5,54	227,7%	20,13	14,57	84,5	21,5	100,3%	82,5%	82,7%

Data 2022-01-17 EPA RUN OFF 1 PI-20265
unit pre burn

Temps acquisition minutes	Flue temp °F	Room temp °F	Tunnel dry bulb °F	scale lbs	Tunnel Velocity Pressure in. Wc	Flue draft Pressure in. Wc	CO %	CO2 %
1	76,59	65,08	74,42	15,41	0,0578	0,00	0,00	0,10
2	92,78	65,51	75,09	15,31	0,0586	0,00	0,00	0,05
3	110,25	65,63	76,43	15,21	0,0585	0,01	0,00	0,01
4	124,18	65,80	77,20	16,31	0,0590	0,01	0,00	0,00
5	136,08	65,98	77,91	15,01	0,0628	0,01	0,00	0,00
6	145,91	65,92	78,46	14,91	0,0594	0,01	0,00	0,00
7	152,71	66,08	78,88	14,91	0,0590	0,02	0,01	1,90
8	159,34	65,97	79,29	14,91	0,0578	0,02	0,21	2,03
9	167,96	66,18	80,10	14,81	0,0592	0,02	0,10	2,93
10	170,25	66,15	78,52	14,81	0,0563	0,02	0,03	5,12
11	170,38	66,38	78,66	14,71	0,0575	0,02	0,06	4,63
12	173,65	66,23	79,79	14,71	0,0597	0,02	0,04	5,39
13	184,73	65,90	81,73	14,61	0,0575	0,02	0,01	8,25
14	194,77	66,51	82,77	14,51	0,0584	0,02	0,02	6,99
15	203,16	66,51	83,55	14,51	0,0573	0,02	0,03	6,21
16	210,35	66,54	84,25	14,41	0,0555	0,03	0,03	5,93
17	217,14	66,58	84,85	14,31	0,0591	0,03	0,02	7,25
18	223,26	66,64	85,47	14,31	0,0601	0,03	0,02	1,40
19	228,24	66,71	85,93	14,21	0,0597	0,03	0,07	1,18
20	233,36	67,11	86,48	14,11	0,0590	0,03	0,04	6,09
21	238,10	67,06	86,78	14,11	0,0592	0,03	0,03	7,78
22	242,95	67,06	87,03	14,01	0,0578	0,03	0,03	8,02
23	247,14	67,06	87,36	13,91	0,0562	0,03	0,03	7,27
24	250,18	66,96	87,70	13,91	0,0560	0,03	0,03	6,50
25	254,30	66,80	87,90	13,81	0,0559	0,03	0,05	6,97
26	257,18	66,87	88,24	13,71	0,0565	0,03	0,03	6,78
27	260,33	67,18	88,40	13,61	0,0585	0,03	0,03	7,71
28	263,16	67,14	88,65	13,61	0,0578	0,03	0,04	6,70
29	266,00	67,38	88,86	13,51	0,0556	0,03	0,03	6,85
30	268,88	67,26	89,17	13,41	0,0582	0,04	0,02	7,09
31	271,32	67,34	89,15	13,41	0,0594	0,04	0,03	7,57
32	273,71	67,68	89,45	13,31	0,0578	0,04	0,03	7,42
33	276,92	67,61	89,74	13,21	0,0609	0,04	0,03	10,19
34	279,85	67,86	90,01	13,11	0,0574	0,04	0,03	8,19
35	281,70	67,77	90,17	13,01	0,0560	0,04	0,03	7,87
36	282,92	68,00	90,59	13,01	0,0589	0,04	0,07	5,67
37	284,73	67,63	90,61	12,91	0,0568	0,04	0,03	6,70
38	286,69	67,95	90,82	12,91	0,0578	0,04	0,02	7,29
39	288,73	68,28	91,27	12,80	0,0587	0,04	0,03	8,30
40	290,04	68,11	91,35	12,71	0,0553	0,04	0,07	6,26
41	291,94	68,46	91,69	12,61	0,0578	0,04	0,03	8,94
42	293,14	68,54	91,67	12,51	0,0590	0,04	0,03	7,02
43	295,21	68,43	92,05	12,51	0,0578	0,04	0,03	8,66
44	296,36	68,56	92,36	12,41	0,0587	0,04	0,03	7,03
45	296,97	68,51	92,56	12,31	0,0573	0,04	0,06	5,28
46	297,54	68,73	92,85	12,31	0,0574	0,04	0,04	6,61
47	297,85	68,66	92,85	12,20	0,0604	0,04	0,03	6,89
48	298,91	68,64	92,95	12,10	0,0594	0,04	0,03	7,28
49	299,72	69,07	93,19	12,10	0,0606	0,04	0,03	7,07
50	300,71	69,17	93,21	12,01	0,0594	0,04	0,03	9,27
51	301,80	68,72	93,69	11,91	0,0594	0,04	0,04	6,89
52	302,42	68,95	93,62	11,91	0,0573	0,04	0,04	6,37
53	303,03	68,95	93,94	11,81	0,0558	0,04	0,03	6,30
54	303,36	69,10	93,91	11,81	0,0572	0,04	0,03	7,25
55	303,50	68,77	93,64	11,71	0,0565	0,04	0,03	7,45
56	304,26	68,94	93,89	11,60	0,0582	0,04	0,04	10,16
57	305,88	69,07	94,19	11,50	0,0604	0,04	0,03	9,29
58	306,96	69,12	94,36	11,41	0,0581	0,04	0,08	6,25
59	307,61	69,09	94,33	11,41	0,0558	0,04	0,04	7,58
60	311,97	68,98	97,37	11,31	0,0592	0,04	0,02	7,36
61	312,65	68,96	95,20	11,21	0,0604	0,04	0,04	5,94
62	311,76	68,88	94,89	11,21	0,0590	0,04	0,04	6,20
63	311,36	69,49	94,98	11,11	0,0594	0,04	0,02	9,59
64	311,87	69,61	94,71	11,00	0,0578	0,04	0,03	8,66
65	311,62	69,22	94,93	11,00	0,0594	0,04	0,04	6,25
66	311,66	69,80	94,90	11,00	0,0604	0,04	0,06	7,10
67	311,57	69,83	94,75	16,00	0,0585	0,04	0,05	6,60
68	311,55	69,78	94,80	15,90	0,0578	0,04	0,03	6,92
69	311,46	69,16	94,72	15,81	0,0592	0,04	0,03	8,83
70	312,13	69,44	94,71	15,71	0,0581	0,04	0,03	9,13
71	312,69	69,33	95,06	15,71	0,0594	0,04	0,03	8,80
72	313,76	69,61	95,32	15,60	0,0582	0,04	0,03	8,78
73	314,55	69,51	95,35	15,50	0,0585	0,04	0,03	7,92
74	314,71	69,84	95,40	15,40	0,0585	0,04	0,03	7,81
75	314,84	69,73	95,33	15,40	0,0578	0,04	0,04	7,15
76	314,90	70,29	95,48	15,30	0,0565	0,04	0,03	10,48
77	315,81	69,96	95,86	15,21	0,0590	0,04	0,04	7,19
78	316,04	70,22	95,65	15,11	0,0587	0,04	0,03	7,46
79	316,28	70,21	96,22	15,10	0,0597	0,04	0,03	8,38
80	316,64	70,20	96,08	15,01	0,0573	0,04	0,02	9,24
81	316,86	70,18	96,29	14,90	0,0592	0,04	0,04	7,54

APPENDIX 2: Proportionality results

Average	Average	Average						Average
15,81	Inlet +	Inlet +						0,248
	Outlet	Outlet	Average	Average	#1	#2		
Tunnel	Temp.	Temp.	100,24	100,09	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
15,749	530,1	529,6			0,181	0,180	0	0,2445922
15,308	530,1	529,7	105,44	106,00	0,181	0,180	1	0,2377716
15,789	530,1	529,8	102,35	102,85	0,181	0,181	2	0,2452024
15,560	530,1	530,0	103,96	104,22	0,181	0,180	3	0,2416423
15,644	530,2	530,1	103,41	103,91	0,181	0,181	4	0,2429204
15,899	530,2	530,3	101,80	102,28	0,181	0,181	5	0,2468688
15,795	530,3	530,5	102,50	103,07	0,181	0,181	6	0,245204
15,673	530,4	530,6	103,25	103,74	0,181	0,181	7	0,243325
15,695	530,4	530,8	103,12	103,51	0,181	0,181	8	0,2436488
15,675	530,5	531,0	103,35	103,74	0,181	0,181	9	0,2433136
15,772	530,6	531,2	102,68	103,28	0,181	0,181	10	0,2447867
15,893	530,8	531,4	101,89	102,18	0,181	0,181	11	0,2466699
15,801	530,8	531,6	102,32	102,86	0,181	0,180	12	0,2452031
15,542	530,9	531,8	103,95	104,55	0,181	0,180	13	0,2411988
15,982	530,9	531,9	101,39	101,48	0,181	0,180	14	0,2480246
15,966	530,9	532,0	101,49	101,84	0,181	0,180	15	0,2477053
15,547	530,9	532,1	104,31	104,63	0,181	0,180	16	0,2412029
16,101	530,9	532,2	100,56	101,01	0,181	0,180	17	0,2497635
15,641	531,0	532,3	103,59	103,72	0,181	0,180	18	0,2426691
15,840	531,1	532,5	102,20	102,59	0,181	0,180	19	0,2457984
15,680	531,1	532,7	103,35	103,17	0,181	0,180	20	0,2433164
16,052	531,1	532,8	100,79	100,96	0,181	0,180	21	0,2490541
15,682	531,1	532,8	103,41	103,46	0,181	0,180	22	0,243317
16,188	531,2	532,9	100,12	100,22	0,181	0,180	23	0,2511986
15,691	531,2	533,0	103,28	103,38	0,181	0,180	24	0,2434904
15,701	531,3	533,2	103,02	103,32	0,181	0,180	25	0,2436539
15,682	531,3	533,3	103,39	103,13	0,181	0,180	26	0,243319
15,750	531,4	533,4	102,80	103,06	0,181	0,180	27	0,2443704
15,848	531,5	533,5	102,32	102,07	0,181	0,180	28	0,2458344
15,947	531,5	533,6	101,93	102,00	0,181	0,180	29	0,2470097
16,134	531,5	533,7	100,45	100,63	0,181	0,180	30	0,2501753
15,785	531,5	533,7	102,66	102,80	0,181	0,180	31	0,2447899
15,931	531,5	533,8	101,71	101,77	0,181	0,180	32	0,2471074
15,753	531,5	533,8	102,73	102,97	0,181	0,180	33	0,244371
15,804	531,6	533,9	102,64	102,45	0,181	0,180	34	0,245209
15,686	531,6	534,0	103,15	103,24	0,181	0,180	35	0,2433767
16,058	531,6	534,0	100,85	100,75	0,181	0,180	36	0,2491497
15,588	531,6	534,1	103,89	103,91	0,181	0,180	37	0,2418404
15,966	531,7	534,2	101,51	101,32	0,181	0,180	38	0,2477072
15,683	531,7	534,3	103,24	103,25	0,181	0,180	39	0,2432975
16,164	531,7	534,3	100,05	99,89	0,181	0,179	40	0,2507959
15,778	531,7	534,3	102,69	102,51	0,181	0,179	41	0,2447922
15,646	531,7	534,4	103,49	103,26	0,181	0,179	42	0,2427737
15,911	531,8	534,4	101,80	101,89	0,181	0,180	43	0,2468778
16,030	531,8	534,5	100,87	100,97	0,181	0,180	44	0,2487405
15,706	531,8	534,5	103,10	103,03	0,181	0,180	45	0,2437362
15,962	531,8	534,5	101,48	101,31	0,181	0,180	46	0,2477054
15,708	531,8	534,6	103,02	103,11	0,181	0,180	47	0,2437425
16,028	531,9	534,7	101,07	100,96	0,181	0,180	48	0,2487394
15,713	531,9	534,7	103,00	102,85	0,181	0,180	49	0,2437937
15,547	531,9	534,7	104,30	104,13	0,181	0,180	50	0,241217
15,967	531,9	534,8	101,49	101,16	0,181	0,179	51	0,247708
16,319	531,9	534,8	99,41	99,28	0,181	0,180	52	0,2531543
15,872	532,0	534,9	101,89	101,87	0,181	0,180	53	0,2462755

15,871	532,0	534,9	102,03	102,00	0,181	0,180	54	0,2462549
15,917	532,1	535,0	101,69	101,58	0,181	0,180	55	0,2468788
15,807	532,2	535,1	102,49	102,19	0,181	0,179	56	0,2452126
15,845	532,3	535,2	102,30	102,00	0,181	0,179	57	0,245841
15,778	532,3	535,3	102,50	102,56	0,181	0,179	58	0,2447928
15,913	532,4	535,4	101,71	101,69	0,181	0,180	59	0,2468406
16,183	532,4	535,4	99,87	99,81	0,181	0,179	60	0,2510481
15,859	532,4	535,4	101,90	101,91	0,181	0,179	61	0,2462551
15,661	532,4	535,5	102,43	102,42	0,181	0,179	62	0,243743
16,085	532,4	535,5	99,61	99,53	0,180	0,179	63	0,2506495
15,886	532,5	535,6	100,79	100,44	0,181	0,179	64	0,2477074
15,693	532,5	535,6	101,91	101,63	0,181	0,179	65	0,2447922
16,033	532,6	535,7	99,73	99,76	0,181	0,179	66	0,2501688
15,815	532,5	535,7	100,91	100,77	0,181	0,179	67	0,2468797
15,705	532,6	535,7	101,57	101,61	0,181	0,179	68	0,2452126
16,001	532,6	535,8	99,73	99,50	0,181	0,179	69	0,2498806
15,988	532,6	535,8	99,71	99,47	0,181	0,179	70	0,2497715
15,545	532,6	535,8	102,54	102,17	0,181	0,179	71	0,2429008
15,981	532,6	535,8	99,67	99,45	0,181	0,179	72	0,2497708
15,756	532,6	535,8	101,06	100,95	0,181	0,179	73	0,2462577
16,068	532,6	535,8	99,15	98,81	0,181	0,179	74	0,2512035
15,725	532,6	535,8	101,31	101,20	0,181	0,179	75	0,2458972
16,229	532,6	535,9	98,20	98,12	0,181	0,180	76	0,2538031
15,966	532,7	535,9	99,62	99,59	0,181	0,180	77	0,249769
15,671	532,7	535,9	101,63	101,08	0,181	0,179	78	0,2452117
15,501	532,7	536,0	102,86	102,60	0,181	0,179	79	0,2422703
15,855	532,7	536,0	100,75	100,63	0,181	0,179	80	0,2477306
15,813	532,7	536,0	100,85	100,49	0,181	0,179	81	0,2472948
15,906	532,8	536,1	99,98	99,75	0,181	0,179	82	0,2488025
15,741	532,8	536,1	100,93	100,68	0,181	0,179	83	0,2462556
15,619	532,9	536,2	101,66	101,41	0,180	0,179	84	0,2443753
16,148	533,0	536,3	98,28	98,28	0,180	0,179	85	0,2526764
15,916	533,1	536,3	99,85	99,66	0,180	0,179	86	0,2490452
15,645	533,1	536,4	101,61	101,46	0,181	0,179	87	0,244795
15,963	533,1	536,4	99,68	99,46	0,181	0,179	88	0,2497713
15,834	533,0	536,3	100,43	100,32	0,181	0,179	89	0,2477498
16,300	533,0	536,3	97,48	97,40	0,181	0,179	90	0,2550548
15,963	532,9	536,3	99,66	99,41	0,181	0,179	91	0,2497709
16,023	532,9	536,3	99,30	98,95	0,181	0,179	92	0,2506705
15,646	533,0	536,3	101,57	101,50	0,181	0,179	93	0,2447934
15,832	533,0	536,3	100,36	100,24	0,181	0,179	94	0,2477107
16,059	533,1	536,4	99,04	98,80	0,181	0,179	95	0,2512046
16,119	533,1	536,4	98,55	98,61	0,181	0,179	96	0,2521492
16,034	533,1	536,4	99,05	99,26	0,180	0,179	97	0,2507977
15,784	533,1	536,4	100,77	100,65	0,180	0,179	98	0,2468821
15,798	533,1	536,4	100,51	100,45	0,180	0,179	99	0,2471125
15,927	533,1	536,4	99,78	99,61	0,180	0,179	100	0,2491554
15,580	533,1	536,4	101,92	101,86	0,180	0,179	101	0,2437446
15,680	533,1	536,4	101,44	101,10	0,181	0,179	102	0,245293
15,900	533,2	536,4	99,92	99,81	0,181	0,179	103	0,2487429
15,965	533,2	536,5	99,50	99,36	0,180	0,179	104	0,249771
15,586	533,2	536,5	101,86	101,63	0,180	0,179	105	0,2438457
16,122	533,2	536,6	98,56	98,50	0,180	0,179	106	0,252232
15,807	533,2	536,6	100,47	100,21	0,180	0,179	107	0,2472973
15,964	533,2	536,6	99,45	99,19	0,180	0,179	108	0,2497729
15,792	533,3	536,6	100,62	100,52	0,180	0,179	109	0,2471129
16,054	533,4	536,7	98,80	98,61	0,180	0,179	110	0,2512032
16,031	533,4	536,7	99,11	98,82	0,180	0,179	111	0,2508527
16,119	533,4	536,8	98,45	98,27	0,180	0,179	112	0,2522142
16,301	533,5	536,8	97,35	97,22	0,180	0,179	113	0,2550527
15,925	533,6	536,9	99,60	99,41	0,180	0,179	114	0,2491558

15,765	533,5	536,9	100,59	100,66	0,180	0,179	115	0,2466441
15,991	533,5	536,9	99,24	99,06	0,180	0,179	116	0,2501832
16,032	533,5	536,9	99,01	98,80	0,180	0,179	117	0,2507974
15,836	533,5	536,8	100,25	100,25	0,180	0,179	118	0,2477105
15,831	533,5	536,9	100,36	100,23	0,180	0,179	119	0,2476467
16,058	533,5	536,9	98,80	98,96	0,180	0,179	120	0,2512059
16,240	533,6	536,9	97,77	97,71	0,180	0,179	121	0,2540495
16,149	533,6	536,9	98,48	98,18	0,181	0,179	122	0,2526261
15,928	533,7	537,0	99,72	99,53	0,181	0,179	123	0,2491558
15,674	533,7	537,0	101,30	100,93	0,180	0,179	124	0,245215
15,718	533,8	537,1	100,87	100,84	0,180	0,179	125	0,2458764
16,033	533,8	537,1	99,06	98,80	0,180	0,179	126	0,250796
15,677	533,7	537,1	101,30	101,25	0,180	0,179	127	0,2452142
15,928	533,7	537,1	99,74	99,41	0,180	0,179	128	0,2491559
16,367	533,7	537,0	97,07	96,90	0,180	0,179	129	0,2560269
15,894	533,7	537,1	100,59	100,59	0,180	0,179	130	0,247674
15,818	533,8	537,1	100,49	100,30	0,180	0,179	131	0,2472069
15,976	533,8	537,1	99,62	99,50	0,180	0,179	132	0,2497516
16,093	533,8	537,1	98,85	98,54	0,181	0,179	133	0,2516166
15,974	533,8	537,1	99,51	99,41	0,180	0,179	134	0,2497722
15,800	533,8	537,1	100,69	100,41	0,180	0,179	135	0,2470269
15,934	533,8	537,1	99,66	99,57	0,180	0,179	136	0,249162
15,841	533,7	537,0	100,31	100,26	0,180	0,179	137	0,2477105
15,834	533,7	537,1	100,38	100,28	0,180	0,179	138	0,2476029
15,753	533,7	537,0	100,91	100,76	0,180	0,179	139	0,2463439
16,062	533,7	537,1	99,05	98,81	0,181	0,179	140	0,2512073
15,904	533,8	537,1	99,92	99,89	0,181	0,179	141	0,2487439
16,042	533,8	537,1	99,15	98,92	0,181	0,179	142	0,2509135
16,035	533,9	537,1	99,24	98,92	0,181	0,179	143	0,2507975
16,107	533,9	537,2	98,70	98,66	0,181	0,179	144	0,2519258
15,856	534,0	537,3	100,29	100,09	0,181	0,179	145	0,2479643
16,034	533,9	537,3	99,12	99,09	0,181	0,179	146	0,2507982
16,123	533,8	537,2	98,58	98,24	0,181	0,179	147	0,2522259
15,772	533,8	537,2	100,64	100,71	0,180	0,179	148	0,2466944
16,124	533,7	537,2	98,53	98,44	0,180	0,179	149	0,2522239
15,812	533,7	537,1	100,70	100,04	0,181	0,179	150	0,2473319
16,186	533,7	537,1	97,98	97,87	0,181	0,179	151	0,2532334
15,741	533,7	537,1	100,96	100,95	0,180	0,179	152	0,2462576
16,029	533,7	537,1	98,99	98,94	0,180	0,179	153	0,2507985
16,306	533,7	537,1	97,14	97,33	0,180	0,179	154	0,2551678
15,987	533,6	537,1	99,50	99,10	0,180	0,179	155	0,2501817
16,361	533,7	537,1	97,04	96,91	0,181	0,179	156	0,2560587
15,886	533,6	537,1	99,91	99,90	0,180	0,179	157	0,2485905
16,144	533,6	537,0	98,55	98,22	0,181	0,179	158	0,2526326
15,670	533,6	537,1	101,31	101,21	0,181	0,179	159	0,2452159
15,894	533,6	537,0	99,86	99,80	0,180	0,179	160	0,2487429
16,051	533,7	537,1	99,00	98,77	0,181	0,179	161	0,2511933
16,178	533,7	537,1	98,10	97,83	0,181	0,179	162	0,253242
15,707	533,7	537,1	100,93	100,98	0,180	0,179	163	0,2458418
16,077	533,7	537,1	98,59	98,56	0,180	0,179	164	0,2516291
15,961	533,7	537,1	99,31	99,02	0,180	0,179	165	0,2498201
15,732	533,7	537,1	100,78	100,64	0,180	0,179	166	0,2462573
15,483	533,7	537,1	102,46	102,20	0,180	0,179	167	0,2423464
15,773	533,7	537,1	100,41	100,33	0,180	0,179	168	0,246914
15,640	533,7	537,1	101,48	101,20	0,180	0,179	169	0,2448007
15,544	533,8	537,1	102,13	101,67	0,181	0,179	170	0,2433242
16,047	533,7	537,1	98,94	98,66	0,181	0,179	171	0,2511921
15,916	533,7	537,2	99,64	99,36	0,180	0,179	172	0,2491581
15,701	533,8	537,2	100,91	100,73	0,180	0,179	173	0,2458414
16,100	533,9	537,3	98,37	98,00	0,180	0,179	174	0,2520993
16,015	533,9	537,3	98,89	98,76	0,180	0,179	175	0,2507982

15,885	533,9	537,3	99,70	99,67	0,180	0,179	176	0,2487451
15,697	533,8	537,3	100,91	100,59	0,180	0,179	177	0,2458421
15,789	533,8	537,2	100,37	100,06	0,180	0,179	178	0,2472875
15,631	533,9	537,2	101,32	101,05	0,180	0,179	179	0,2447967
15,695	533,9	537,2	100,80	100,73	0,180	0,179	180	0,2458409
15,572	533,9	537,3	102,21	101,88	0,180	0,179	181	0,2433245
16,021	533,9	537,3	98,77	98,69	0,180	0,179	182	0,2507989
15,836	533,9	537,3	100,04	99,93	0,180	0,179	183	0,2479768
15,871	534,0	537,4	99,84	99,43	0,180	0,179	184	0,2486436
15,750	533,9	537,3	100,30	100,12	0,180	0,179	185	0,2468824
15,498	533,9	537,3	102,03	101,68	0,180	0,179	186	0,2429019
15,927	533,9	537,3	99,22	99,08	0,180	0,179	187	0,2496771
16,000	533,9	537,3	98,81	98,71	0,180	0,179	188	0,2508521
15,773	533,9	537,3	100,08	99,86	0,180	0,179	189	0,2473677
16,017	533,9	537,3	98,62	98,52	0,180	0,179	190	0,2512049
15,540	533,9	537,3	101,60	101,56	0,180	0,179	191	0,2437401
15,578	533,9	537,2	101,41	101,13	0,180	0,179	192	0,2443773
15,668	533,9	537,3	100,79	100,62	0,180	0,179	193	0,2458018
15,979	533,9	537,3	98,81	98,64	0,180	0,179	194	0,2507308
15,759	533,9	537,3	100,22	99,95	0,180	0,179	195	0,2472966
15,576	533,8	537,3	101,29	101,07	0,180	0,179	196	0,244438
15,945	533,8	537,2	99,02	98,80	0,180	0,179	197	0,2502507
16,006	533,8	537,2	98,60	98,57	0,180	0,179	198	0,2512103
15,874	533,7	537,1	99,36	99,01	0,180	0,179	199	0,2491562
15,983	533,7	537,1	98,57	98,72	0,180	0,179	200	0,2508972
15,977	533,7	537,1	98,63	98,69	0,180	0,179	201	0,2508126
15,910	533,7	537,1	99,12	98,97	0,180	0,179	202	0,2497722
15,789	533,7	537,1	99,80	99,72	0,180	0,179	203	0,2478798
15,907	533,7	537,1	98,98	98,90	0,180	0,179	204	0,249773
15,841	533,7	537,1	99,55	99,15	0,180	0,179	205	0,2487439
15,874	533,7	537,2	99,24	98,85	0,180	0,179	206	0,2493006
15,777	533,6	537,1	99,81	99,67	0,180	0,179	207	0,2477805
15,969	533,6	537,1	98,53	98,31	0,180	0,179	208	0,2507942
15,619	533,6	537,1	100,95	100,46	0,180	0,179	209	0,2453159
15,581	533,6	537,1	101,07	100,99	0,180	0,179	210	0,2447742
16,014	533,6	537,1	98,16	97,86	0,180	0,179	211	0,2516154
16,079	533,7	537,2	97,78	97,65	0,180	0,179	212	0,2526301
15,713	533,6	537,1	100,20	99,92	0,180	0,179	213	0,2468801
15,959	533,5	537,1	98,54	98,14	0,180	0,179	214	0,2507958
16,076	533,5	537,0	98,08	97,70	0,181	0,179	215	0,2526298
15,956	533,5	537,0	98,58	98,47	0,181	0,179	216	0,2507453
15,960	533,5	537,0	98,64	98,39	0,180	0,179	217	0,2507972
15,549	533,4	537,0	101,25	101,05	0,180	0,179	218	0,2443768
15,872	533,4	537,0	99,08	98,84	0,180	0,179	219	0,2494879
15,916	533,4	537,1	98,71	98,72	0,180	0,179	220	0,2501805
15,544	533,4	537,0	101,10	101,08	0,180	0,179	221	0,2443744
15,914	533,3	537,0	98,89	98,85	0,180	0,179	222	0,2501814
15,764	533,3	536,9	99,58	99,79	0,180	0,179	223	0,2478507
15,543	533,3	536,9	101,11	100,93	0,180	0,179	224	0,244374
15,819	533,3	536,9	99,47	99,25	0,180	0,179	225	0,2487418
15,443	533,4	537,0	101,83	101,77	0,181	0,179	226	0,2428389
15,850	533,4	537,0	99,20	98,87	0,180	0,179	227	0,2492282
15,881	533,4	537,0	98,96	98,77	0,180	0,179	228	0,2497659
15,948	533,4	537,0	98,65	98,23	0,181	0,179	229	0,2507959
15,631	533,4	537,0	100,49	100,24	0,180	0,179	230	0,2458576
15,537	533,4	537,0	101,00	100,89	0,180	0,179	231	0,2443749
15,768	533,3	536,9	99,84	99,99	0,180	0,179	232	0,2477072
15,881	533,3	536,9	98,99	98,77	0,180	0,179	233	0,2496635
15,635	533,3	536,9	100,69	100,32	0,181	0,179	234	0,2458423
15,539	533,3	536,9	100,97	100,80	0,180	0,179	235	0,2443732
15,722	533,2	536,9	99,99	99,70	0,180	0,179	236	0,2472928

15,767	533,2	536,9	99,76	99,47	0,181	0,179	237	0,2480326
15,878	533,2	536,9	98,96	98,77	0,181	0,179	238	0,2497685
16,057	533,4	537,0	97,81	97,54	0,180	0,179	239	0,2526278
15,698	533,4	537,0	100,11	99,79	0,181	0,179	240	0,2469787
15,621	533,3	537,0	100,46	100,42	0,180	0,179	241	0,2458286
15,689	533,3	537,0	100,04	99,84	0,180	0,179	242	0,2468776
15,936	533,3	536,9	98,65	98,36	0,181	0,179	243	0,2507936
15,646	533,2	536,9	100,53	100,13	0,181	0,179	244	0,246248
15,936	533,2	536,9	98,46	98,32	0,181	0,179	245	0,2507935
15,326	533,1	536,8	102,56	102,23	0,181	0,179	246	0,2412035
15,906	533,1	536,7	98,67	98,57	0,181	0,179	247	0,2503646
15,686	533,0	536,7	99,98	99,81	0,180	0,179	248	0,2468843
15,986	533,0	536,7	98,20	98,25	0,180	0,179	249	0,2515912
15,718	533,0	536,7	99,87	99,70	0,180	0,179	250	0,2473627
15,619	533,1	536,7	100,49	100,31	0,180	0,179	251	0,2458382
15,983	533,3	536,9	98,14	97,90	0,180	0,179	252	0,25161
15,884	533,3	536,9	98,96	98,43	0,181	0,179	253	0,2500444
15,710	533,2	536,9	99,99	99,81	0,181	0,179	254	0,2472921
16,048	533,2	536,8	97,78	97,50	0,181	0,179	255	0,2526272
15,930	533,2	536,8	98,54	98,09	0,181	0,179	256	0,2507925
15,549	533,2	536,8	100,96	100,68	0,181	0,179	257	0,244816
15,979	533,2	536,8	98,29	98,04	0,181	0,179	258	0,2516083
15,888	533,2	536,8	98,67	98,44	0,181	0,179	259	0,2501786
15,637	533,2	536,8	100,29	100,01	0,180	0,179	260	0,246252
15,795	533,3	537,0	99,26	99,00	0,180	0,179	261	0,2487402
15,571	533,4	537,0	100,73	100,62	0,181	0,179	262	0,2452088
15,475	533,3	536,9	101,25	101,04	0,180	0,179	263	0,2437413
15,420	533,2	536,8	101,67	101,35	0,181	0,179	264	0,2429063
15,880	533,1	536,7	98,69	98,34	0,181	0,179	265	0,2501773
15,678	533,1	536,7	99,90	99,89	0,180	0,179	266	0,2469835
15,815	533,0	536,6	98,96	98,92	0,180	0,179	267	0,2491509
15,258	533,0	536,6	102,89	102,63	0,181	0,179	268	0,2403505
15,472	532,8	536,5	101,45	101,19	0,181	0,179	269	0,2437396
15,446	532,9	536,6	101,62	101,08	0,181	0,179	270	0,2433219
15,945	532,9	536,6	98,31	98,15	0,181	0,179	271	0,2511992
15,725	532,9	536,5	99,77	99,57	0,181	0,179	272	0,2477084
15,919	532,8	536,5	98,46	98,43	0,181	0,179	273	0,2507751
15,631	532,7	536,5	100,26	100,05	0,181	0,179	274	0,2462507
15,920	532,8	536,5	98,43	98,14	0,181	0,179	275	0,2507917
15,917	532,8	536,5	98,50	98,30	0,181	0,179	276	0,2507918
15,594	532,8	536,4	100,52	100,33	0,181	0,179	277	0,2457081
15,443	532,7	536,4	101,40	101,45	0,181	0,179	278	0,2433203
15,843	532,7	536,3	98,92	98,65	0,181	0,179	279	0,2496476
15,915	532,6	536,3	98,42	98,31	0,181	0,179	280	0,2507914
15,693	532,6	536,3	99,87	99,57	0,181	0,179	281	0,2472911
15,859	532,6	536,3	99,29	99,17	0,181	0,179	282	0,2491529
16,133	532,6	536,2	97,27	97,06	0,180	0,179	283	0,2539831
15,977	532,6	536,2	98,40	98,11	0,181	0,179	284	0,2516151
15,516	532,5	536,2	101,20	100,92	0,181	0,179	285	0,2443677
15,817	532,5	536,2	99,18	98,86	0,181	0,179	286	0,2491497
15,879	532,5	536,2	98,92	98,64	0,181	0,179	287	0,2501452
15,790	532,7	536,3	99,38	99,14	0,181	0,179	288	0,2487398
15,971	532,7	536,3	98,11	98,13	0,181	0,179	289	0,251608
15,690	532,7	536,3	99,86	99,70	0,181	0,179	290	0,247201
15,787	532,7	536,3	99,33	99,28	0,181	0,179	291	0,2487368
15,915	532,8	536,4	98,59	98,25	0,181	0,179	292	0,2507914
15,561	532,7	536,4	100,70	100,31	0,181	0,179	293	0,2452085
15,783	532,7	536,3	99,26	98,84	0,181	0,179	294	0,2487369
15,437	532,6	536,2	101,50	101,25	0,181	0,179	295	0,2433187
15,871	532,6	536,2	98,73	98,52	0,181	0,179	296	0,2501756
15,623	532,6	536,2	100,32	99,90	0,181	0,179	297	0,2462499

15,624	532,6	536,2	100,35	99,99	0,181	0,179	298	0,246271
15,689	532,5	536,1	99,91	99,49	0,181	0,179	299	0,2472892
15,664	532,5	536,1	100,01	99,84	0,181	0,179	300	0,246873
15,913	532,5	536,1	98,50	98,13	0,181	0,179	301	0,2507932
15,557	532,5	536,1	100,63	100,31	0,181	0,179	302	0,2452108
15,623	532,4	536,1	100,18	99,93	0,181	0,179	303	0,2462495
15,623	532,4	536,1	100,24	99,92	0,181	0,179	304	0,246252
15,940	532,4	536,0	98,32	97,99	0,181	0,179	305	0,2511983
15,531	532,4	536,1	100,75	100,68	0,181	0,179	306	0,2447885
15,530	532,4	536,0	100,92	100,44	0,181	0,179	307	0,2447868
15,528	532,3	536,0	100,69	100,72	0,181	0,179	308	0,2447818
15,685	532,3	535,9	99,87	99,62	0,181	0,179	309	0,2472882
16,418	532,3	535,9	95,20	95,13	0,181	0,179	310	0,2588392
15,961	532,3	535,8	98,01	98,01	0,180	0,179	311	0,2516282
15,906	532,2	535,8	98,44	98,08	0,181	0,179	312	0,2507896
15,500	532,2	535,8	100,97	100,76	0,181	0,179	313	0,2443694
15,655	532,2	535,8	99,86	99,71	0,180	0,179	314	0,2468296
15,686	532,2	535,8	99,79	99,39	0,180	0,179	315	0,2472926
15,959	532,2	535,8	98,07	97,91	0,181	0,179	316	0,2516068
15,774	532,2	535,8	99,32	98,89	0,181	0,179	317	0,2487368
15,457	532,3	535,9	101,18	100,96	0,181	0,179	318	0,2437377
15,654	532,3	536,0	99,87	99,58	0,180	0,179	319	0,2468723
15,495	532,3	535,9	101,04	100,63	0,181	0,179	320	0,2443697
15,599	532,2	535,9	100,28	100,01	0,181	0,179	321	0,2460077
15,705	532,2	535,8	99,60	99,63	0,181	0,179	322	0,2477089
15,705	532,1	535,7	99,78	99,65	0,181	0,180	323	0,247705
15,520	532,1	535,7	100,97	100,87	0,181	0,180	324	0,2447879
15,797	532,1	535,7	99,07	98,99	0,181	0,179	325	0,2491588
15,927	532,0	535,6	98,43	97,96	0,181	0,179	326	0,2511968
15,239	532,0	535,6	102,76	102,48	0,181	0,179	327	0,240347
15,751	531,9	535,5	99,42	99,21	0,181	0,179	328	0,2484403
15,773	531,9	535,5	99,50	99,23	0,181	0,179	329	0,2487363
15,773	531,9	535,5	99,29	99,14	0,181	0,179	330	0,2487358
15,710	532,0	535,5	99,81	99,40	0,181	0,179	331	0,2477043
15,707	532,0	535,6	99,72	99,44	0,181	0,179	332	0,2477026
16,097	532,1	535,7	97,93	97,62	0,181	0,179	333	0,2532297
15,533	532,1	535,6	101,13	100,86	0,181	0,179	334	0,2447865
15,514	532,0	535,6	101,13	100,77	0,181	0,179	335	0,2446008
15,904	532,0	535,5	98,49	98,22	0,181	0,179	336	0,2507898
15,839	532,0	535,5	98,98	98,90	0,181	0,179	337	0,2497638
15,902	532,0	535,5	98,48	98,24	0,181	0,179	338	0,2507892
15,725	531,9	535,5	99,62	99,47	0,181	0,179	339	0,2480029
15,902	532,0	535,5	98,35	98,09	0,181	0,179	340	0,2507894
15,684	531,9	535,5	99,83	99,71	0,181	0,179	341	0,2473795
15,834	531,8	535,4	98,87	98,87	0,181	0,180	342	0,2497584
15,520	531,8	535,4	101,02	100,82	0,181	0,180	343	0,2447853
15,587	531,8	535,3	100,55	100,36	0,181	0,179	344	0,2458334
15,623	531,8	535,4	100,17	100,03	0,181	0,179	345	0,2463765
15,865	531,8	535,4	98,80	98,48	0,181	0,179	346	0,2501737
15,200	531,8	535,4	103,06	102,90	0,181	0,179	347	0,2397059
15,546	531,8	535,4	100,65	100,63	0,181	0,179	348	0,2452055
15,808	531,9	535,5	99,12	98,79	0,181	0,179	349	0,249322
15,492	532,0	535,6	101,01	100,88	0,181	0,179	350	0,244368
16,169	531,9	535,6	96,77	96,58	0,181	0,179	351	0,255045
15,425	531,9	535,5	101,50	101,16	0,181	0,179	352	0,2433156
15,434	531,9	535,5	101,41	101,29	0,181	0,179	353	0,2434741
15,452	531,8	535,5	101,21	101,21	0,181	0,179	354	0,243733
15,517	531,8	535,5	100,99	100,80	0,181	0,179	355	0,2447859
15,486	531,7	535,4	101,05	100,80	0,181	0,179	356	0,2443082
15,695	531,7	535,4	99,80	99,31	0,181	0,179	357	0,2475963
15,613	531,7	535,3	100,34	100,26	0,181	0,179	358	0,2462469

15,797	531,7	535,3	99,28	99,09	0,181	0,180	359	0,2491473
15,681	531,7	535,4	99,79	99,57	0,181	0,179	360	0,2472871
15,929	531,7	535,4	98,51	98,14	0,181	0,179	361	0,2511972
15,520	531,7	535,3	101,05	100,74	0,181	0,179	362	0,2447859
15,426	531,8	535,4	101,69	101,37	0,181	0,179	363	0,2433162

APPENDIX 3: Calibration data

Calibration equipment for ASTM E2515 (8.1), (8.2), (8.3), (8.4) ASTM E2779 (8.1), (8.2)

EQUIPMENT TYPE	EQUIPMENT #	CALIBRATION DATE	COMPLIES WITH STANDARD REQUIREMENTS
Digital Manometer	EM-006	2021 April	Y
Digital Manometer	EM-249	2021 April	Y
Data acquisition System	EM-147	2021 November	Y
analytical scale 200gr.	EM-051	2021 September	Y
Weight 2kg	EM-090	2018 Jan.	Y
Pitot tube	EM-296	Verification before use	Y
Scale 0-1000lbs Rough Deck	EM-114 / EM-137	2021 December	Y
Vacuum gauge	EM-126	2021 April	Y
Vacuum gauge	EM-127	2021 April	Y
Calibration weight 100mg	EM-128	2018	y
Calibration weight 200g	EM-129	2018	Y
Temperature humidity meter	EM-136	2021 April	Y
Digital manometer	EM 313	2021 April	Y
Measuring tape	EM-224	2021 April	Y
Chronometer	EM-175	2021 December	Y
Dry gas meter	EM-178	2022 January	Y
Dry gas meter	EM-179	2022 January	Y
Thermometer	EM-001	2021 April	Y
20 channel card / temperature sensor	EM-015/2	2021 November	Y
20 channel card / temperature sensor	EM-154/2	2021 November	Y
Dry gas meter	EM-318	2022 January	Y
Barometre	EM 333	2021 September	Y
Hot wire	EM 332	2021-September	Y
Weight 10kg	EM-205	2016 Feb.	Y

Instrumentation
Saint•Laurent inc.
Certified ISO 17025

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CLAS 2010-02

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Fax: (450) 473-5207
Email: inst.st-laurent@videotron.ca

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-015/2 2021-11-22

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

CALIBRATION SPECIFICATION	
Service Procedure:	4IN9101
Required Precision:	+\- 4.0°F
Calibration Frequency:(days)	181

INSTRUMENT SPECIFICATION			
Instrument Type:	Recorder	**Input Type:**	Temp
Manufacturer:	Keithley	**Output Type:**	Digitale
Model #:	7700	**Measurement Type:**	Temperature
Serial #:	1213648	**Range:**	Divers
Location:	N/A	**Machine #:**	N.A.

SPÉCIFICATION DES ÉTALONS			
Calibrator:	Fluke 744	**Certification #:**	2021007430
Serial #:	8180008	**Certification Date:**	2021-10-13
Certified by:	Alpha Controls	**Next Certification:**	2022-01-13
Comments:			
Calibrator:	TC Type N	**Certification #:**	TCN-16
Serial #:	TCN-16	**Certification Date:**	2021-11-10
Certified by:	inst.st-laurent	**Next Certification:**	2022-02-08
Comments:	interne		

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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-015/2 2021-11-22

CALIBRATION RESULTS

Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Tolerance	Uncertainty
Conformity	Comment					
662.0 °F	662.0 °F	665.3 °F	+3.3 °F	665.3 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 201 (Flue) en type "K" En Loop avec EM-015					
482.0 °F	482.0 °F	481.7 °F	-0.3 °F	481.7 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 202 (Right) en type "K" En Loop avec EM-015					
482.0 °F	482.0 °F	482.2 °F	+0.2 °F	482.2 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 203 (Back) en type "K" En Loop avec EM-015					
482.0 °F	482.0 °F	482.4 °F	+0.4 °F	482.4 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 204 (Bottom) en type "K" En Loop avec EM-015					
482.0 °F	482.0 °F	482.3 °F	+0.3 °F	482.3 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 205 (Top) en type "K" En Loop avec EM-015					
482.0 °F	482.0 °F	481.4 °F	-0.6 °F	481.4 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 206 (Left) en type "K" En Loop avec EM-015					
662.0 °F	662.0 °F	662.4 °F	+0.4 °F	662.4 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 208 (Catalyst down) en type "K" En Loop avec EM-015					
77.0 °F	77.0 °F	77.2 °F	+0.2 °F	77.2 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 215 (DGM 1 In) en type "J" En Loop avec EM-015					
77.0 °F	77.0 °F	77.1 °F	+0.1 °F	77.1 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 216 (DGM 1 Out) en type "J" En Loop avec EM-015					
77.0 °F	77.0 °F	77.2 °F	+0.2 °F	77.2 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 217 (DGM 2 In) en type "J" En Loop avec EM-015					
77.0 °F	77.0 °F	77.2 °F	+0.2 °F	77.2 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 218 (DGM 2 Out) en type "J" En Loop avec EM-015					

Environmental Conditions: Temperature: N.A. Humidity: N.A.

Comments:

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2021-11-22
Next Calibration:	2022-05-22
Certificate Date:	2021-11-22

CALIBRATION CONFORMITY		
	Before	**After**
Compliant:	X	X
Non Compliant:		

¤ Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO 17025 :2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
¤ Reported uncertainties represent a 95 % of confidence level assuming a normal distribution k=2.
¤ The declaration of conformity does not include Instrumentation St-Laurent Inc. uncertainty measurement. Decision rule is based on binary statement for simple acceptance rule against ILAC G8 standard and test tolerance limits are based on customer specifications, unless otherwise specified.
¤ The results presented in this certificate relate only to objects subject to calibration.
¤ It is the customer's responsibility to ensure that calibrated equipment meets its intended use.
¤ The date format used in this certificate is: YYYY-MM-DD.

2021-11-22

Version 1

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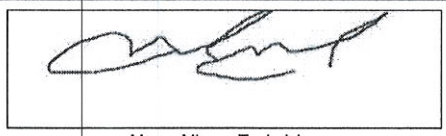
CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-015/2 2021-11-22

Assessment Service Calibration Laboratory (ASCL) of the National Research Council of Canada (NRC) has assessed and certified calibration laboratory's ability and traceability to the International System of Units (SI) or to standards acceptable according to ASCL. This calibration certificate is issued in accordance with the terms of ASCL certification and accreditation requirements of the Standards Council of Canada (SCC). SCC accreditation number: # 669. ASCL and SCC does not guarantee the accuracy of individual calibrations by accredited laboratories.



Marco Miron - Technicien

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CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-154/2 2021-11-22

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

CALIBRATION SPECIFICATION	
Service Procedure:	4IN9101
Required Precision:	+\- 4.0°F
Calibration Frequency:(days)	181

INSTRUMENT SPECIFICATION			
Instrument Type:	Recorder	**Input Type:**	Temp
Manufacturer:	Keithley	**Output Type:**	Digitale
Model #:	7700	**Measurement Type:**	Temperature
Serial #:	1306774	**Range:**	Divers
Location:	N/A	**Machine #:**	N.A.

SPÉCIFICATION DES ÉTALONS			
Calibrator:	Fluke 744	**Certification #:**	2021007430
Serial #:	8180008	**Certification Date:**	2021-10-13
Certified by:	Alpha Controls	**Next Certification:**	2022-01-13
Comments:			
Calibrator:	TC Type N	**Certification #:**	TCN-16
Serial #:	TCN-16	**Certification Date:**	2021-11-10
Certified by:	inst.st-laurent	**Next Certification:**	2022-02-08
Comments:	interne		

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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
Phone: (450) 473-6169
Fax: (450) 473-5207
Email: inst.st-laurent@videotron.ca

CALIBRATION CERTIFICATE

CERTIFICATE #	CE-EM-154/2 2021-11-22

CALIBRATION RESULTS

Entry Source	Given Value	Actual Value	Deviation Error	After Calib Value	Tolerance	Uncertainty
Conformity	**Comment**					
77.0 °F	77.0 °F	76.8 °F	-0.2 °F	76.8 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 111 (Filtre 1) en type "T" En Loop8 avec EM-154					
77.0 °F	77.0 °F	76.9 °F	-0.1 °F	76.9 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 112 (Filtre 2) en type "T" En Loop avec EM-154					
140.0 °F	140.0 °F	139.5 °F	-0.5 °F	139.5 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 113 (Tunnel) en type "J" En Loop avec EM-154					
68.0 °F	68.0 °F	67.9 °F	-0.1 °F	67.9 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 114 (Room) en type "J" En Loop avec EM-154					
77.0 °F	77.0 °F	76.5 °F	-0.5 °F	76.5 °F	+/- 4.0 °F	+/- 0.5 °F
Compliant	ID. No. 115 (Analyzer gaz) en type "J" En Loop avec EM-154					

Environmental Conditions: Temperature: N.A. Humidity: N.A.

Comments:

CALIBRATION DATE/ISSUANCE OF CERTIFICATE	
Calibration Date:	2021-11-22
Next Calibration:	2022-05-22
Certificate Date:	2021-11-22

CALIBRATION CONFORMITY	Before	After
Compliant:	X	X
Non Compliant:		

¤ Instrumentation St. Laurent Inc. Certify that the above instrument, meets or exceeds the specifications established by the manufacturer. The company's quality system complies with the requirements of ISO 17025 :2017 and the standards used to perform the calibration is traceable to NRC and / or NIST.
¤ Reported uncertainties represent a 95 % of confidence level assuming a normal distribution k=2.
¤ The declaration of conformity does not include Instrumentation St-Laurent Inc. uncertainty measurement. Decision rule is based on binary statement for simple acceptance rule against ILAC G8 standard and test tolerance limits are based on customer specifications, unless otherwise specified.
¤ The results presented in this certificate relate only to objects subject to calibration.
¤ It is the customer's responsibility to ensure that calibrated equipment meets its intended use.
¤ The date format used in this certificate is: YYYY-MM-DD.

Assessment Service Calibration Laboratory (ASCL) of the National Research Council of Canada (NRC) has assessed and certified calibration laboratory's ability and traceability to the International System of Units (SI) or to standards acceptable according to ASCL. This calibration certificate is issued in accordance with the terms of ASCL certification and accreditation requirements of the Standards Council of Canada (SCC). SCC accreditation number: # 669. ASCL and SCC does not guarantee the accuracy of individual calibrations by accredited laboratories.

Marco Miron - Technicien

2021. 11. 22

Version 1

Instrumentation
Saïnt•Laurent inc.
Accrédité ISO 17025

CLAS
NRC·CNRC
CLAS 2010-02

LAB
Accrédité CCN
N°669

66 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 2021-04-20

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 DES ÉTALONS			
Étalon Utilisé:	Fluke Pression	**No. du certificat d'étalonnage:**	2020007634
No. Série:	3330050	**Dernière date d'étalonnage:**	2020-10-30
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	2021-10-30
Commentaire:			

28 Avr/21

5F09106 Version 1

Instrumentation Saint•Laurent inc.
Accrédité ISO 17025

CLAS 2010-02

LAB Accrédité CCN N°669

66 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 2021-04-20

RÉSULTAT D'ÉTALONNAGE

Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Tolérance	Incertitude Élargie
Conformité	**Commentaire**					
0.0000 "H2O	0.000 "H2O	0.012 "H2O	+0.012 "H2O	0.012 "H2O	+\-0.25 "H2O	0.25 "H2O
Conforme	Vérification indicateur					
0.2500 "H2O	0.250 "H2O	0.249 "H2O	-0.001 "H2O	0.249 "H2O	+\-0.25 "H2O	0.25 "H2O
Conforme	Vérification indicateur					
0.5000 "H2O	0.500 "H2O	0.503 "H2O	+0.003 "H2O	0.503 "H2O	+\-0.25 "H2O	0.25 "H2O
Conforme	Vérification indicateur					
0.7500 "H2O	0.750 "H2O	0.754 "H2O	+0.004 "H2O	0.754 "H2O	+\-0.25 "H2O	0.25 "H2O
Conforme	Vérification indicateur					
1.0000 "H2O	1.000 "H2O	0.995 "H2O	-0.005 "H2O	0.995 "H2O	+\-0.25 "H2O	0.25 "H2O
Conforme	Vérification indicateur					
0.0000 "H2O	0.0000 V.DC.	0.0002 V.DC.	+0.0002 V.DC.	0.0002 V.DC.	+\-0.25 V.DC.	0.5 V.DC.
Conforme	Vérification sortie analogique					
0.2500 "H2O	2.5000 V.DC.	2.4089 V.DC.	-0.0911 V.DC.	2.4089 V.DC.	+\-0.25 V.DC.	0.5 V.DC.
Conforme	Vérification sortie analogique					
0.5000 "H2O	5.0000 V.DC.	4.8995 V.DC.	-0.1005 V.DC.	4.8995 V.DC.	+\-0.25 V.DC.	0.5 V.DC.
Conforme	Vérification sortie analogique					
0.7500 "H2O	7.5000 V.DC.	7.4139 V.DC.	-0.0861 V.DC.	7.4139 V.DC.	+\-0.25 V.DC.	0.5 V.DC.
Conforme	Vérification sortie analogique					
1.0000 "H2O	10.0000 V.DC.	9.8323 V.DC.	-0.1677 V.DC.	9.8323 V.DC.	+\-0.25 V.DC.	0.5 V.DC.
Conforme	Vérification sortie analogique					

Conditions Environnementales: Température: N.A. Humidité: N.A.

Type d'Étalonnage:

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT

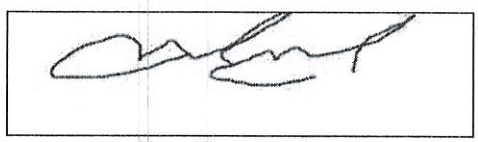
Date d'Étalonnage:	2021-04-20
Date du prochain Étalonnage:	2022-04-20
Date d'émission du certificat:	2021-04-20

CONFORMITÉ D'ÉTALONNAGE

	Avant	Après
Conforme:	X	X
Non Conforme:		

¤ 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 :2017 et les étalons utilisés pour effectuer l'étalonnage est retraçables au CNRC et/ou au NIST.
¤ Les incertitudes rapportées représentent 95% du niveau de confiance en supposant une distribution normale k = 2.
¤ La déclaration de conformité ne comprend pas la mesure d'incertitude d'instrumentation St-Laurent INC. La règle de décision est basée sur l'acceptation simple de l'instruction binaire ILAC G8 et Les limites de tolérance de test sont basées sur les spécifications du client, sauf sur indication contraire.
¤ Les résultats présentés dans ce certificat ne se rapportent qu'aux objets soumis à l'étalonnage.
¤ C'est la responsabilité du client de s'assurer que l'équipement étalonné répond à l'utilisation qu'il prévoit.
¤ Le format de la date utilisé dans ce certificat correspond à: AAAA-MM-JJ.

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.



Marco Miron - Technicien

Version 1

Calibration Certificate ID
CA0214-006-090121-ACC

METTLER TOLEDO

Mettler-Toledo Inc.
Service Division
1900 Polaris Parkway
Columbus, OH, 43240
1-800-METTLER

Accuracy Calibration Certificate

Customer

Company:	Services Polytests		
Address:	695-B Rue Gaudette		
City:	Saint-Jean-Sur-Richelieu	Contact:	Danick Power
Zip / Postal:	J3B 7S7	Order Number:	0332242969
State / Province:	Quebec		

Weighing Device

Manufacturer:	Ohaus	Instrument Type:	Weighing Instrument
Model:	AR2140	Asset Number:	EM-051
Serial No.:	M3658329010091	Terminal Model:	N/A
Building:	N/A	Terminal Serial No.:	N/A
Floor:	N/A	Terminal Asset No.:	N/A
Room:	N/A	Alternate Asset No.:	N/A

Range	Max. Capacity	Readability (d)
1	210 g	0.0001 g

Procedure

Calibration Guideline:	EURAMET cg-18 v. 4.0 (11/2015)
METTLER TOLEDO Work Instruction:	30260953

This calibration certificate contains measurements for As Found and As Left calibrations.

The sensitivity/span of the weighing instrument was adjusted before As Left calibration with an external weight.

As Found Calibration Date:	01-09-2021	Service Technician:	Maxime Levac
As Left Calibration Date:	01-09-2021		
Issue Date:	01-09-2021		
Next Calibration Date:	30-09-2022		

Sept 2nd 2021

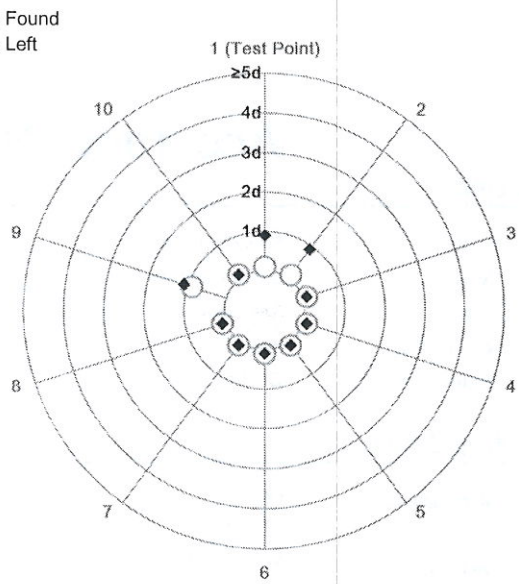
Measurement Results

Repeatability

Test Load: 100 g

	As Found	As Left
1	100.0014 g	100.0002 g
2	100.0014 g	100.0002 g
3	100.0014 g	100.0001 g
4	100.0014 g	100.0001 g
5	100.0014 g	100.0001 g
6	100.0014 g	100.0001 g
7	100.0014 g	100.0001 g
8	100.0014 g	100.0001 g
9	100.0013 g	100.0000 g
10	100.0014 g	100.0001 g

Standard Deviation	0.00003 g	0.00006 g



The "d" in the graph represents the readability of the range/interval in which the test was performed.

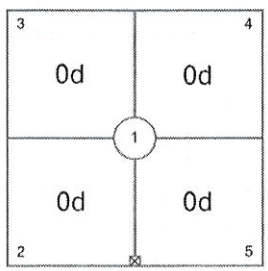
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

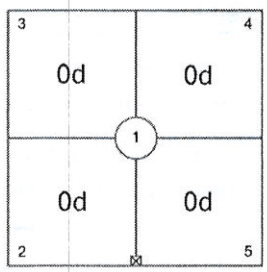
Test Load: 100 g

Position	As Found	As Left
1	0.0000 g	0.0000 g
2	0.0000 g	0.0000 g
3	0.0000 g	0.0000 g
4	0.0000 g	0.0000 g
5	0.0000 g	0.0000 g

Maximum Deviation	0.0000 g	0.0000 g



As Found



As Left

The "d" in the graph represents the readability of the range/interval in which the test was performed.

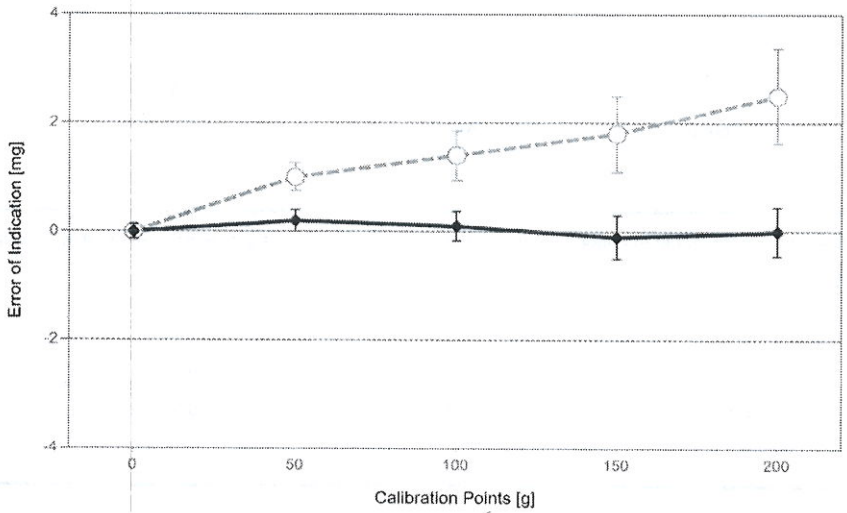
Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.09 mg	2
2	50.0001 g	50.0011 g	0.0010 g	0.26 mg	2
3	100.0001 g	100.0015 g	0.0014 g	0.46 mg	2
4	150.0002 g	150.0020 g	0.0018 g	0.70 mg	2
5	200.0000 g	200.0025 g	0.0025 g	0.88 mg	2

As Left

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0.0000 g	0.0000 g	0.0000 g	0.13 mg	2
2	50.0001 g	50.0003 g	0.0002 g	0.20 mg	2
3	100.0001 g	100.0002 g	0.0001 g	0.27 mg	2
4	150.0002 g	150.0001 g	-0.0001 g	0.40 mg	2
5	200.0000 g	200.0000 g	0.0000 g	0.45 mg	2



For improved legibility of the graphics only increasing measurement points are shown and measurement points close to zero are not displayed.

The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k – which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with k=2 in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: $3.0 \cdot 10^{-6}$ / K

Temperature range on site for the evaluation of the measurement uncertainty in use: 4 K

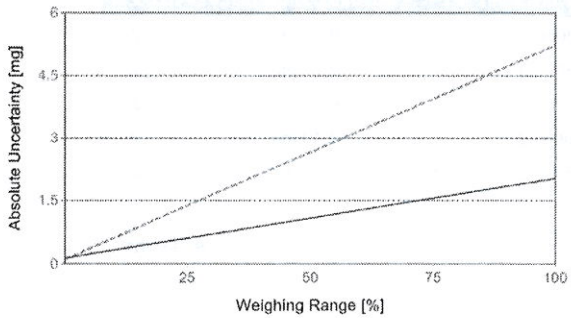
Linearization of Uncertainty Equation

	Range		As Found	As Left
	d	Max		
1	0.0001 g	210 g	$U_1 = 0.10$ mg + 0.0244 mg/g · R	$U_1 = 0.14$ mg + 0.00901 mg/g · R

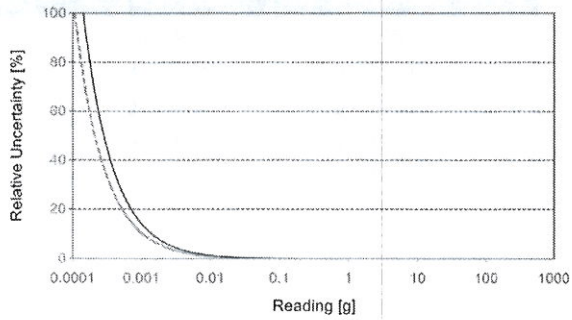
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found		As Left	
0.0210 g	0.10 mg	0.48%	0.14 mg	0.67%
0.2100 g	0.11 mg	0.050%	0.14 mg	0.068%
2.1000 g	0.15 mg	0.0072%	0.16 mg	0.0076%
21.0000 g	0.61 mg	0.0029%	0.33 mg	0.0016%
210.0000 g	5.2 mg	0.0025%	2.0 mg	0.00097%



As Found



As Left

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2

Weight Set No.:	427	Date of Issue:	18-02-2021
Certificate Number:	01183988-1	Calibration Due Date:	28-02-2022

Remarks

The balance is within manufacturer specification

This document is issued to record completion of the work performed by METTLER TOLEDO on the subject device in accordance with agreed standards. It does not guarantee the continued performance of the subject device. Any measurements recorded are based on the subject device's performance at a given time as tested by METTLER TOLEDO and, except where explicitly stated otherwise, do not express an opinion as to the sufficiency of any customer designed procedures used to test the device. This document is not a warranty, either implied or express. METTLER TOLEDO expressly disclaims any liability arising from the use of the information in this document for any purpose other than as specified herein.

METTLER TOLEDO Service

Custom Tolerance Assessment

Assessment done without considering measurement uncertainty.

One or more of the measurements from the attached calibration certificate were assessed against customer-defined tolerances.

	As Found	As Left
Overall	✗	✓
Repeatability	✓	✓
Eccentricity	✓	✓
Error of Indication	✗	✓

Measurement Results

Repeatability

Test Load: 100 g

	As Found	As Left
1	100.0014 g	100.0002 g
2	100.0014 g	100.0002 g
3	100.0014 g	100.0001 g
4	100.0014 g	100.0001 g
5	100.0014 g	100.0001 g
6	100.0014 g	100.0001 g
7	100.0014 g	100.0001 g
8	100.0014 g	100.0001 g
9	100.0013 g	100.0000 g
10	100.0014 g	100.0001 g

Standard Deviation	0.00003 g	0.00006 g
Tolerance	0.00020 g ✓	0.00020 g ✓

Eccentricity

Test Load: 100 g

Position	As Found	As Left
1	0.0000 g	0.0000 g
2	0.0000 g	0.0000 g
3	0.0000 g	0.0000 g
4	0.0000 g	0.0000 g
5	0.0000 g	0.0000 g

Maximum Deviation	**0.0000 g**	**0.0000 g**
Tolerance	**0.0003 g** ✓	**0.0003 g** ✓

Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Tolerance	
1	0.0000 g	0.0000 g	0.0000 g	0.0002 g	✓
2	50.0001 g	50.0011 g	0.0010 g	0.0002 g	✗
3	100.0001 g	100.0015 g	0.0014 g	0.0004 g	✗
4	150.0002 g	150.0020 g	0.0018 g	0.0006 g	✗
5	200.0000 g	200.0025 g	0.0025 g	0.0010 g	✗

As Left

	Reference Value	Indication	Error of Indication	Tolerance	
1	0.0000 g	0.0000 g	0.0000 g	0.0002 g	✓
2	50.0001 g	50.0003 g	0.0002 g	0.0002 g	✓
3	100.0001 g	100.0002 g	0.0001 g	0.0004 g	✓
4	150.0002 g	150.0001 g	-0.0001 g	0.0006 g	✓
5	200.0000 g	200.0000 g	0.0000 g	0.0010 g	✓

DISPERSION
Laboratoire • Laboratory DIVISION • TRANSCAT CANADA

CLAS
NRC 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

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 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

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	**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 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.

S.P

CERTIFICAT D'ÉTALONNAGE

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

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

Calibration Certificate ID
CA0206-112-122021-ACC-USI

METTLER TOLEDO

Mettler-Toledo Inc.
Service Division
1900 Polaris Parkway
Columbus, OH 43240
1-800-METTLER

Accredited by the American Association for Laboratory Accreditation (A2LA)
CALIBRATION CERT #1902.01
ISO 17025 Registered
ANSI/NCSL Z540-1 Accredited

Accuracy Calibration Certificate

Customer

Company:	Services Polytests		
Address:	695-B Rue Gaudette		
City:	Saint-Jean-Sur-Richelieu	**Contact:**	Danick Power
Zip / Postal:	J3B 7S7		
State / Province:	Quebec		

Weighing Device

Manufacturer:	RICE LAKE	**Instrument Type:**	Weighing Instrument
Model:	4X4HP-10K	**Asset Number:**	EM-114 EM-137
Serial No.:	C18395	**Terminal Model:**	IQ+355
Building:	N/A	**Terminal Serial No.:**	164851
Floor:	N/A	**Terminal Asset No.:**	N/A
Room:	N/A		

Range	Max. Capacity	Readability (d)
1	400 kg	0.05 kg

Procedure

Calibration Guideline: ASTM E898 - 20
METTLER TOLEDO Work Instruction: 30260953

This calibration certificate including procedures and uncertainty estimation also complies with EURAMET cg-18 v 4.0.

This calibration certificate contains measurements for As Found and As Left calibrations.

The sensitivity/span of the weighing instrument was adjusted before As Left calibration with an external weight.

The calibration was agreed with the user below the maximum capacity of the balance.

	Temperature	
As Found	Start: 20.0 °C	End: 20.0 °C
As Left	Start: 20.0 °C	End: 20.0 °C

Environmental conditions have been verified to ensure the accuracy of the calibration.

This certificate is issued in accordance with the conditions of accreditation granted by A2LA, which is based on ISO/IEC 17025. A2LA has assessed the measurement capability of the laboratory and its traceability to recognized national standards.

As Found Calibration Date:	20-12-2021
As Left Calibration Date:	20-12-2021
Issue Date:	20-12-2021

Authorized A2LA Signatory:

Marc-Andre Chouinard

20 dec 2021

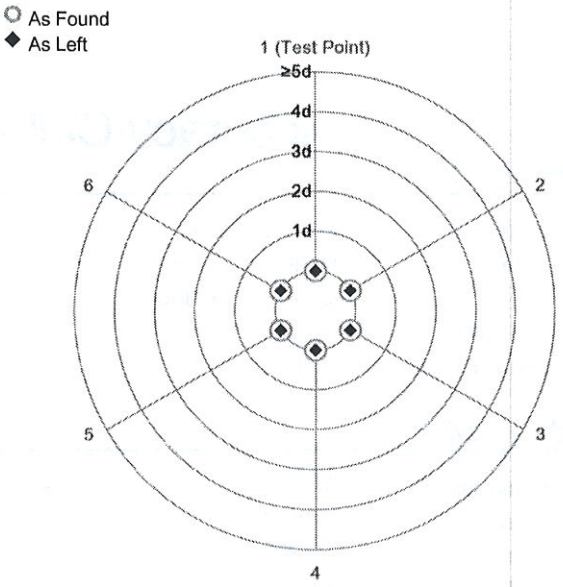
Measurement Results

Repeatability

Test Load: 70 kg

	As Found	As Left
1	70.10 kg	70.00 kg
2	70.10 kg	70.00 kg
3	70.10 kg	70.00 kg
4	70.10 kg	70.00 kg
5	70.10 kg	70.00 kg
6	70.10 kg	70.00 kg

Standard Deviation	**0.000 kg**	**0.000 kg**



The "d" in the graph represents the readability of the range/interval in which the test was performed.

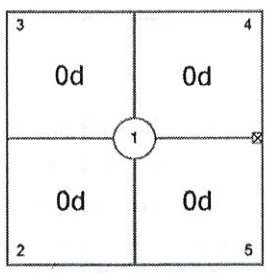
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

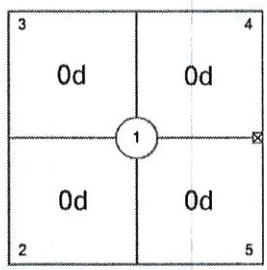
Test Load: 50 kg

Position	As Found	As Left
1	50.05 kg	50.00 kg
2	50.05 kg	50.00 kg
3	50.05 kg	50.00 kg
4	50.05 kg	50.00 kg
5	50.05 kg	50.00 kg

Maximum Deviation	**0.00 kg**	**0.00 kg**



As Found



As Left

The "d" in the graph represents the readability of the range/interval in which the test was performed.

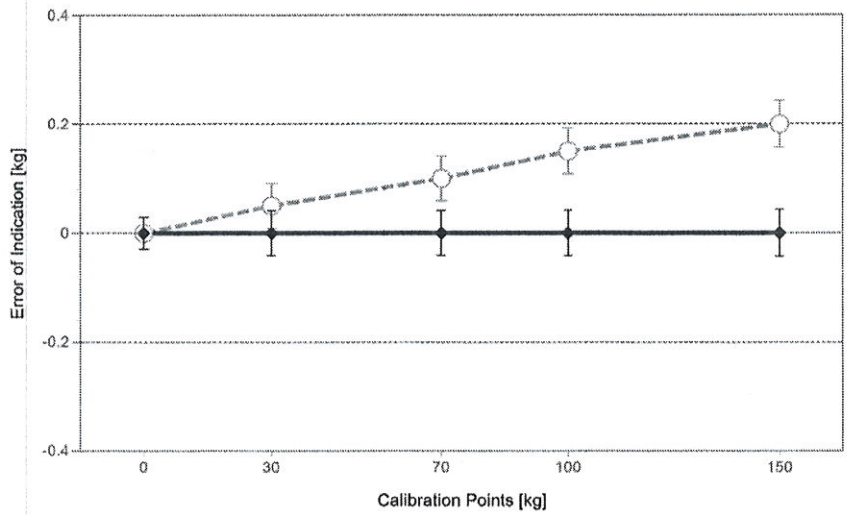
Error of Indication

As Found

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0 kg	0.00 kg	0.00 kg	0.029 kg	2
2	30 kg	30.05 kg	0.05 kg	0.041 kg	2
3	70 kg	70.10 kg	0.10 kg	0.041 kg	2
4	100 kg	100.15 kg	0.15 kg	0.042 kg	2
5	150 kg	150.20 kg	0.20 kg	0.043 kg	2
6	100 kg	100.15 kg	0.15 kg	0.042 kg	2
7	70 kg	70.10 kg	0.10 kg	0.041 kg	2
8	30 kg	30.05 kg	0.05 kg	0.041 kg	2
9	0 kg	0.00 kg	0.00 kg	0.029 kg	2

As Left

	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	0 kg	0.00 kg	0.00 kg	0.029 kg	2
2	30 kg	30.00 kg	0.00 kg	0.041 kg	2
3	70 kg	70.00 kg	0.00 kg	0.041 kg	2
4	100 kg	100.00 kg	0.00 kg	0.042 kg	2
5	150 kg	150.00 kg	0.00 kg	0.043 kg	2
6	100 kg	100.00 kg	0.00 kg	0.042 kg	2
7	70 kg	70.00 kg	0.00 kg	0.041 kg	2
8	30 kg	30.00 kg	0.00 kg	0.041 kg	2
9	0 kg	0.00 kg	0.00 kg	0.029 kg	2



For improved legibility of the graphics only increasing measurement points are shown and measurement points close to zero are not displayed.

The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k - which can be larger than 2 according to ASTM E898 and EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML M1

Weight Set No.:	92294	Date of Issue:	23-09-2021
Certificate Number:	M21-0283	Calibration Due Date:	23-09-2022

Weight Set 2: OIML M1

Weight Set No.:	T-100	Date of Issue:	12-05-2021
Certificate Number:	1412861	Calibration Due Date:	12-05-2022

Remarks

N/A

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with k=2 in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: $10.0 \cdot 10^{-6}$ / K

Temperature range on site for the evaluation of the measurement uncertainty in use: 20 K

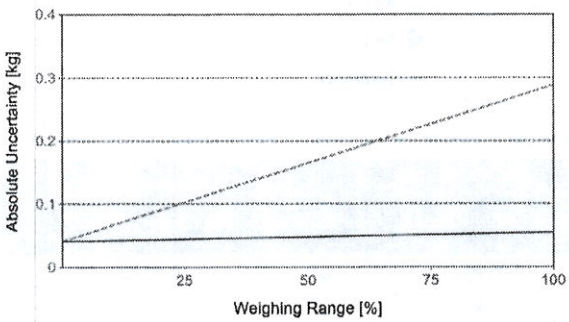
Linearization of Uncertainty Equation

	Range		As Found	As Left
	d	Max		
1	0.05 kg	150 kg	U_1 = 41 g + 1.66 g/kg · R	U_1 = 41 g + 0.0938 g/kg · R

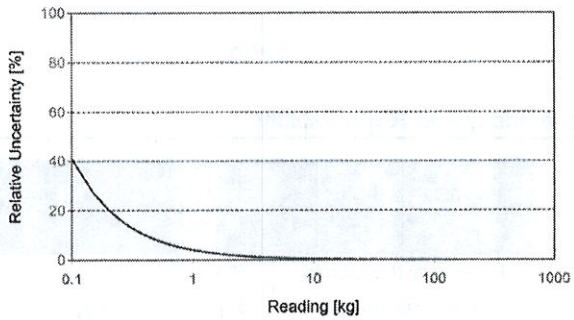
To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found		As Left	
1.50 kg	0.043 kg	2.9%	0.041 kg	2.7%
15.00 kg	0.066 kg	0.44%	0.042 kg	0.28%
30.00 kg	0.091 kg	0.30%	0.044 kg	0.15%
75.00 kg	0.17 kg	0.22%	0.048 kg	0.064%
150.00 kg	0.29 kg	0.19%	0.055 kg	0.037%



As Found



As Left

METTLER TOLEDO Service

Handbook 44 Tolerance Assessment (Maintenance)

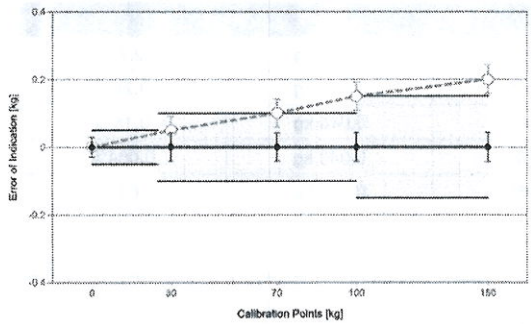
Assessment done without considering measurement uncertainty.
The measurements from the attached calibration certificate were assessed against the Tolerances defined by NIST Handbook 44.
The range of measurements for both Eccentricity and Repeatability (if performed) tests is assessed against Maintenance Tolerances.

	As Found	As Left
Overall	✗	✓

✓ = Passed
✗ = Failed

Weighing Device

Range	Max. Capacity	Readability (d)	Verification Scale Interval (e)	Class
1	400 kg	0.05 kg	0.05 kg	III



Tolerances according to NIST Handbook 44

Test Load		Tolerance
From	To	
0.00 kg	0.00 kg	0.0125 kg
0.05 kg	25.00 kg	0.05 kg
25.05 kg	100.00 kg	0.1 kg
100.05 kg	150.00 kg	0.15 kg

○ As Found
◆ As Left
— Tolerance

Eccentricity and Repeatability

Test	Test Load	Tolerance	As Found		As Left	
			Max. Error / Range	Result	Max. Error / Range	Result
Eccentricity (Max. Error)	50 kg	0.10 kg	0.05 kg	✓	0.00 kg	✓
Eccentricity (Range)	50 kg	0.1 kg	0.00 kg	✓	0.00 kg	✓
Repeatability (Max. Error)	70 kg	0.1 kg	0.10 kg	✓	0.00 kg	✓
Repeatability (Range)	70 kg	0.10 kg	0.00 kg	✓	0.00 kg	✓

Max. Error: Maximum of the absolute values of the individual errors.
Range: Difference between largest and smallest measurement value.

Error of Indication

	Reference Value	Tolerance	As Found		As Left	
			Error of Indication	Result	Error of Indication	Result
1	0 kg	0.05 kg	0.00 kg	✓	0.00 kg	✓
2	30 kg	0.10 kg	0.05 kg	✓	0.00 kg	✓
3	70 kg	0.10 kg	0.10 kg	✓	0.00 kg	✓
4	100 kg	0.10 kg	0.15 kg	✗	0.00 kg	✓
5	150 kg	0.15 kg	0.20 kg	✗	0.00 kg	✓
6	100 kg	0.10 kg	0.15 kg	✗	0.00 kg	✓
7	70 kg	0.10 kg	0.10 kg	✓	0.00 kg	✓
8	30 kg	0.10 kg	0.05 kg	✓	0.00 kg	✓
9	0 kg	0.05 kg	0.00 kg	✓	0.00 kg	✓

Instrumentation
Saint•Laurent inc.
Accrédité ISO 17025

CLAS 2010-02

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-126 2021-04-20

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 DES ÉTALONS			
Étalon Utilisé:	Crystal XP2i 300	**No. du certificat d'étalonnage:**	2020008238
No. Série:	870437	**Dernière date d'étalonnage:**	2020-11-02
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	2021-11-02
Commentaire:			

Instrumentation
Saint•Laurent inc.
Accrédité ISO 17025

CLAS
NRC·CNRC
CLAS 2010-02

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80 rue de la Montagne
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Email: inst.st-laurent@videotron.ca

CERTIFICAT D'ÉTALONNAGE

NO. CERTIFICAT	CE-EM-126 2021-04-20

RÉSULTAT D'ÉTALONNAGE

Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Tolérance	Incertitude Élargie
Conformité	**Commentaire**					
0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	+\- 1 "Hg	1 "Hg
Conforme	Vérification indicateur					
-7.50 "Hg	-7.50 "Hg	-7.65 "Hg	-0.11 "Hg	-7.61 "Hg	+\- 1 "Hg	1 "Hg
Conforme	Vérification indicateur					
-15.00 "Hg	-15.00 "Hg	-15.24 "Hg	-0.24 "Hg	-15.24 "Hg	+\- 1 "Hg	1 "Hg
Conforme	Vérification indicateur					
-22.50 "Hg	-22.50 "Hg	-22.84 "Hg	-0.34 "Hg	-22.84 "Hg	+\- 1 "Hg	1 "Hg
Conforme	Vérification indicateur					
-28.00 "Hg	-28.00 "Hg	-28.47 "Hg	-0.47 "Hg	-28.47 "Hg	+\- 1 "Hg	1 "Hg
Conforme	Vérification indicateur					
0.00 "Hg	10.0000 V.DC.	10.0066 V.DC.	+0.0066 V.DC.	10.0066 V.DC.	+\- 0.5 V.DC.	0.5 V.DC.
Conforme	Vérification sortie analogique					
-7.50 "Hg	8.0000 V.DC.	8.0311 V.DC.	+0.0366 V.DC.	8.0366 V.DC.	+\- 0.5 V.DC.	0.5 V.DC.
Conforme	Vérification sortie analogique					
-15.00 "Hg	6.0000 V.DC.	6.0068 V.DC.	+0.0068 V.DC.	6.0068 V.DC.	+\- 0.5 V.DC.	0.5 V.DC.
Conforme	Vérification sortie analogique					
-22.50 "Hg	4.0000 V.DC.	3.9723 V.DC.	-0.0277 V.DC.	3.9723 V.DC.	+\- 0.5 V.DC.	0.5 V.DC.
Conforme	Vérification sortie analogique					
-28.00 "Hg	2.5333 V.DC.	2.4845 V.DC.	-0.0488 V.DC.	2.4630 V.DC.	+\- 0.5 V.DC.	0.5 V.DC.
Conforme	Vérification sortie analogique					

Conditions Environnementales:	Température: N.A.	Humidité: N.A.
Type d'Étalonnage:		

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	2021-04-20
Date du prochain Étalonnage:	2022-04-20
Date d'émission du certificat:	2021-04-20

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

¤ 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 :2017 et les étalons utilisés pour effectuer l'étalonnage est retraçables au CNRC et/ou au NIST.
¤ Les incertitudes rapportées représentent 95% du niveau de confiance en supposant une distribution normale k = 2.
¤ La déclaration de conformité ne comprend pas la mesure d'incertitude d'instrumentation St-Laurent INC. La règle de décision est basée sur l'acceptation simple de l'instruction binaire ILAC G8 et Les limites de tolérance de test sont basées sur les spécifications du client, sauf sur indication contraire.
¤ Les résultats présentés dans ce certificat ne se rapportent qu'aux objets soumis à l'étalonnage.
¤ C'est la responsabilité du client de s'assurer que l'équipement étalonné répond à l'utilisation qu'il prévoit.
¤ Le format de la date utilisé dans ce certificat correspond à: AAAA-MM-JJ.

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.

28 Avril 21

Marco Miron - Technicien

Version 1

Instrumentation
Saint•Laurent inc.
Accrédité ISO 17025

CLAS
NRC·CNRC
CLAS 2010-02

LAB
Accrédité CCN
N°669

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CERTIFICAT D'ÉTALONNAGE

NO. CERTIFICAT	CE-EM-127 2021-04-20

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 DES ÉTALONS			
Étalon Utilisé:	Crystal XP2i 300	**No. du certificat d'étalonnage:**	2020008238
No. Série:	870437	**Dernière date d'étalonnage:**	2020-11-02
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	2021-11-02
Commentaire:			

Instrumentation Saint•Laurent inc.
Accrédité ISO 17025

CLAS NRC·CNRC CLAS 2010-02

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CERTIFICAT D'ÉTALONNAGE

NO. CERTIFICAT	CE-EM-127 2021-04-20

RÉSULTAT D'ÉTALONNAGE

Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Tolérance	Incertitude Élargie
Conformité	**Commentaire**					
0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	0.00 "Hg	+/-1 "Hg	1 "Hg
Conforme	Vérification indicateur					
-7.50 "Hg	-7.50 "Hg	-7.53 "Hg	-0.03 "Hg	-7.53 "Hg	+/- 1 "Hg	1 "Hg
Conforme	Vérification indicateur					
-15.00 "Hg	-15.00 "Hg	-15.03 "Hg	-0.03 "Hg	-15.03 "Hg	+/- 1 "Hg	1 "Hg
Conforme	Vérification indicateur					
-22.50 "Hg	-22.50 "Hg	-22.54 "Hg	-0.04 "Hg	-22.54 "Hg	+/- 1 "Hg	1 "Hg
Conforme	Vérification indicateur					
-28.00 "Hg	-28.00 "Hg	-28.10 "Hg	-0.10 "Hg	-28.10 "Hg	+/- 1 "Hg	1 "Hg
Conforme	Vérification indicateur					
0.00 "Hg	10.0000 V.DC.	9.9990 V.DC.	-0,0010 V.DC.	9,9990 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Conforme	Vérification sortie analogique					
-7.50 "Hg	8.0000 V.DC.	8.0171 V.DC.	+0.0171 V.DC.	8.0171 V.DC.	+\- 0.5 V.DC.	0.5 V.DC.
Conforme	Vérification sortie analogique					
-15.00 "Hg	6.0000 V.DC.	6.0212 V.DC.	+0.0212 V.DC.	6.0212 V.DC.	+\- 0.5 V.DC.	0.5 V.DC.
Conforme	Vérification sortie analogique					
-22.50 "Hg	4.0000 V.DC.	3.9880 V.DC.	-0.0220 V.DC.	3.9880 V.DC.	+\- 0.5 V.DC.	0.5 V.DC.
Conforme	Vérification sortie analogique					
-28.00 "Hg	2.5333 V.DC.	2.5164 V.DC.	-0.0169 V.DC.	2.5164 V.DC.	+\- 0.5 V.DC.	0.5 V.DC.
Conforme	Vérification sortie analogique					

Conditions Environnementales:	Température: N.A.	Humidité: N.A.
Type d'Étalonnage:		

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	2021-04-20
Date du prochain Étalonnage:	2022-04-20
Date d'émission du certificat:	2021-04-20

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

¤ 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 :2017 et les étalons utilisés pour effectuer l'étalonnage est retraçables au CNRC et/ou au NIST.
¤ Les incertitudes rapportées représentent 95% du niveau de confiance en supposant une distribution normale k = 2.
¤ La déclaration de conformité ne comprend pas la mesure d'incertitude d'instrumentation St-Laurent INC. La règle de décision est basée sur l'acceptation simple de l'instruction binaire ILAC G8 et Les limites de tolérance de test sont basées sur les spécifications du client, sauf sur indication contraire.
¤ Les résultats présentés dans ce certificat ne se rapportent qu'aux objets soumis à l'étalonnage.
¤ C'est la responsabilité du client de s'assurer que l'équipement étalonné répond à l'utilisation qu'il prévoit.
¤ Le format de la date utilisé dans ce certificat correspond à: AAAA-MM-JJ.

28 Avril 21

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.

Marco Miron - Technicien

Version 1

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

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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.

DISPERSION
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CLAS 2010-01

CERTIFICAT D'ÉTALONNAGE

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www.dispersion.ca 1.866.390.5066

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.

B.P.

DISPERSION
Laboratoire • Laboratory DIVISION • TRANSCAT CANADA

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CLAS 2010-01

CERTIFICAT D'ÉTALONNAGE

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www.dispersion.ca 1.866.390.5066

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
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CLAS 2010-02

LAB
Accrédité CCN
N°669

60 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 2021-04-30

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 DES ÉTALONS			
Étalon Utilisé:	Vaisala HM141-HMP46	**No. du certificat d'étalonnage:**	2020006676
No. Série:	V0820123-U4840010	**Dernière date d'étalonnage:**	2020-09-10
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	2021-09-10
Commentaire:			
Étalon Utilisé:	Probe etalon Hart	**No. du certificat d'étalonnage:**	2021000790
No. Série:	A26317/00361	**Dernière date d'étalonnage:**	2021-02-02
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	2022-02-02
Commentaire:	Meet the requirement as Secondary Standard Instrument (AMS17025F)		

Version 1

Instrumentation
Saint•Laurent inc.
Accrédité ISO 17025

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LAB
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St-Joseph du lac
(Québec), J0N 1M0
Tél: (450) 473-6169
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Email: inst.st-laurent@videotron.ca

CERTIFICAT D'ÉTALONNAGE

NO. CERTIFICAT	CE-EM-136 2021-04-30

RÉSULTAT D'ÉTALONNAGE

Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Tolérance	Incertitude Élargie
Conformité	**Commentaire**					
25.0 °C	25.0 °C	25.1 °C	+0.1 °C	25.1 °C	+/- 2.0 °C	1.0 °C
40.0 °C	40.0 °C	40.1 °C	+0.1 °C	40.1 °C	+/- 2.0 °C	1.0 °C
30.0 %RH	30.0 %RH	31.3 %RH	+1.3 %RH	31.3 %RH	+/- 3.0 %RH	-- %RH
55.0 %RH	55.0 %RH	55.7 %RH	+0.7 %RH	55.7 %RH	+/- 3.0 %RH	-- %RH
75.0 %RH	75.0 %RH	75.3 %RH	+0.3 %RH	75.3 %RH	+/- 3.0 %RH	-- %RH

Conditions Environnementales: Température: 22 °C Humidité: 37 %RH

Type d'Étalonnage:

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT

Date d'Étalonnage:	2021-04-30
Date du prochain Étalonnage:	2022-04-30
Date d'émission du certificat:	2021-04-30

CONFORMITÉ D'ÉTALONNAGE

	Avant	Après
Conforme:	X	X
Non Conforme:		

¤ 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 :2017 et les étalons utilisés pour effectuer l'étalonnage est retraçables au CNRC et/ou au NIST.
¤ Les incertitudes rapportées représentent 95% du niveau de confiance en supposant une distribution normale k = 2.
¤ La déclaration de conformité ne comprend pas la mesure d'incertitude d'instrumentation St-Laurent INC. La règle de décision est basée sur l'acceptation simple de l'instruction binaire ILAC G8 et Les limites de tolérance de test sont basées sur les spécifications du client, sauf sur indication contraire.
¤ Les résultats présentés dans ce certificat ne se rapportent qu'aux objets soumis à l'étalonnage.
¤ C'est la responsabilité du client de s'assurer que l'équipement étalonné répond à l'utilisation qu'il prévoit.
¤ Le format de la date utilisé dans ce certificat correspond à: AAAA-MM-JJ.

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

5 MAI 21

Version 1

Instrumentation
Saint•Laurent inc.
Accrédité ISO 17025

CLAS
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CLAS 2010-02

LAB
Accrédité CCN
N°669

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-147 2021-04-20

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:	+\- 2.0C
Fréquence d'étalonnage: (jours)	365

SPÉCIFICATION DE L'INSTRUMENT			
Type d'instrument:	Enregistreur	**Type d'entrée:**	Divers
Manufacturier:	Keithley	**Type de sortie:**	Digital
No. Model:	2700	**Type de mesure:**	Température
No. Série:	1349443	**Gamme:**	Divers
Emplacement:	N.A.	**No. Machine:**	N.A.

SPÉCIFICATION DES ÉTALONS			
Étalon Utilisé:	Fluke 744	**No. du certificat d'étalonnage:**	2021001945
No. Série:	8180008	**Dernière date d'étalonnage:**	2021-03-10
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	2021-06-10
Commentaire:			

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FAX : (514) 329-3750
info.canada@trescal.com

2022.01.17

Certificat d'Étalonnage / Certificate of Calibration

CLIENT :
SERVICES POLYTESTS INC.
695-B GAUDETTE
ST-JEAN-SUR-RICHELIEU, QC J3B7S7

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

CERTIFICAT No / Certificate No: 347561

PROCÉDURE / Procedure : TRESCAL - EXTECH_365510

Date étalonnage/ Calibration Performed : aaaa - mm - jj 2021-12-24

Echéance/ Due Date : 2022-12-24

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

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

Conditions de mesure / Measurement conditions

TEMPÉRATURE / Temp. : 23.0°C

HUMIDITÉ / Humidity : 36% RH

Usage restreint/ *Restricted use* : ☐

Réparation effectuée / *Repair performed* : ☐

Ajustement effectué / *Adjustment performed* : ☐

ÉTALONS UTILISÉS/ Standards Used:

Identification	Manuf.	Model	Description	Ser. #	Étalonné/ Cal.	Échéance/ Due
PR0313	H-P	53132A	UNIVERSAL COUNTER	3546A03142	2021-08-25	2022-08-25
PR0392	AGILENT	33250A	FUNCTION/ARBITRARY WAVEFORM GENERATOR	MY40008014	2021-06-11	2023-06-11

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 :

Technicien :
Technician M. BARRAK

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.

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Certificat d'Étalonnage
Certificate of Calibration

	347561
CLIENT / Customer :	SERVICES POLYTESTS INC.
DESCRIPTION / Description :	STOPWATCH
MANUFACTURIER / Manufacturer :	EXTECH
MODÈLE / Model :	365510

DESCRIPTION Description	LIMITES Limits	LECTURES Readings	LIMITES Limits
	Min	Comptes / Counts Chronomètre/timer 162444	Max

Temps écoulé, chronomètre sous test / Elapsed time on test stopwatch

Minutes	Seconds	1/100 sec
27	4	44

Total au compteur / Reference timer: 162447,4 comptes/counts

(Δt) Deviation (1/100sec): -3,40

Deviation Par jour/ Per day (%): -0,0021 %

Deviation Par jour/ Per day (sec): **-1,81 sec**

* Secondes	Deviation 24hrs	* Secondes
-3,00	**-1,81**	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.

POLYCONTROLS
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CLAS 2009-02

#655

CALIBRATION CERTIFICATE # 15752

Calibration date : 2022/01/03
Certificate issued : 2022/01/04

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

Calibration of
Shinigawa DCDa-2c S/N : 23544

QUALITY PROGRAM CONFORMANCE

All calibrations are performed in accordance with Polycontrols Laboratory Quality Assurance Manual and conform to ISO/IEC 17025: 2017, ISO 9001 – 2015 and/or other quality requirements defined in customers purchase descriptions. The results are strictly valid for the device under test or calibration. If applicable, the decision rule is described in the certificate.

TRACEABILITY

The traceability for flow standard to the National Institute of Standards and Technology, NIST, is maintained by Fluke Corporation of Phoenix, Arizona and conform to ISO/IEC 17025, ANSI/NCSL Z540-1-1994, ISO-10012-1 and MIL-STD 45662A.

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

CALIBRATION AND MEASUREMENT CAPABILITY

Calibration measurement capabilities have an uncertainty of ±0.2% of reading for a flow range between 5 SCCM to 10 SLPM, ±0.3% of reading for a flow range between 10 SLPM to 30 SLPM, ±0.2% of reading for a flow range between 30 SLPM to 3000 SLPM, ±0.3% of reading for a flow range above 3000 SLPM to 6000 SLPM and ±0.5% of reading for a flow range under 5 SCCM down to 1 SCCM, air or nitrogen equivalent. The reported uncertainty is expanded using a coverage factor k=2 for a level of confidence of approximately 95%, assuming a normal distribution including resolution of the instrument. The test uncertainty ratio (TUR) of this calibration is at least 4:1 unless otherwise stated.

CONDITION SUMMARY OF THE DEVICE UNDER TEST

Initial conditions	In good condition
Work done	Calibration of the instrument Initial readings = Final readings, no adjustment
Results	Final readings in tolerance with K factor = 0.98
Remarks	Calibration frequency every 12 months

Olivier Duchesne Bamber
Metrologist

Laboratory Manager

3650, Matte blvd. (Unit A-1), Brossard (Quebec), Canada, J4Y 2Z2
Tel: (450) 444-3600 Fax: (450) 444-1088 www.polycontrols.com

POLYCONTROLS
INTEGRATION • CALIBRATION • INSTRUMENTATION

CLAS NRC·CNRC CLAS 2009-02

SCC Accredited LAB #655

Calibration certificate # 15752

Serial Number:	23544	Test stand:	1
Calibration Date:	2022/01/03	Procedure:	POS-CAL-005
Instrument ID:	EM-178	Decision rule:	Method #3

Standard equipment used for final calibration

Description	Model	Serial #	Traceability	Due date
Fluke molbloc_30 slpm	3E4-VCR-V-Q	2403	1500308202	2022/06/03
Fluke molbox1	Molbox1	755	1500311473	2022/07/02
RTD Mist	M22	2208102	2020003043	2021/04/23
Module 44.5 PSI avec Baro 163671	Module 30	160659	2021003409	2022/05/04

Final specifications of the device under test		Calibration conditions	
Gas	Air	Gas	Air
Operation temperature		Ambient temperature	24 °C
Inlet pressure		Ambient pressure	1026.11 mbar
Outlet pressure		Orientation	Horizontal
Reference temperature		Seals	Viton
Reference pressure		Valve	
Range	10-2000 ALH		
Input/Output Signals	-		
Supply			
Accuracy ±2 %O.R.			

Final readings

Test Flow ALH	Device under test L	Measured values Pressure PSIA	Temperature °C	Reference L	Calculated Reference L	Calculated Error L	Acceptable Error L	Uncertainty k = 2 L	TUR
191.6813	31.7373	14.8912	21.32	32.3469	31.9453	-0.2080	0.6389	0.1060	>4
963.3374	160.6832	14.9054	21.36	162.5214	160.3710	0.3122	3.2074	0.5321	>4
1761.9667	292.1086	14.9135	21.50	297.3725	293.4193	-1.3107	5.8684	0.9737	>4

POLYCONTROLS
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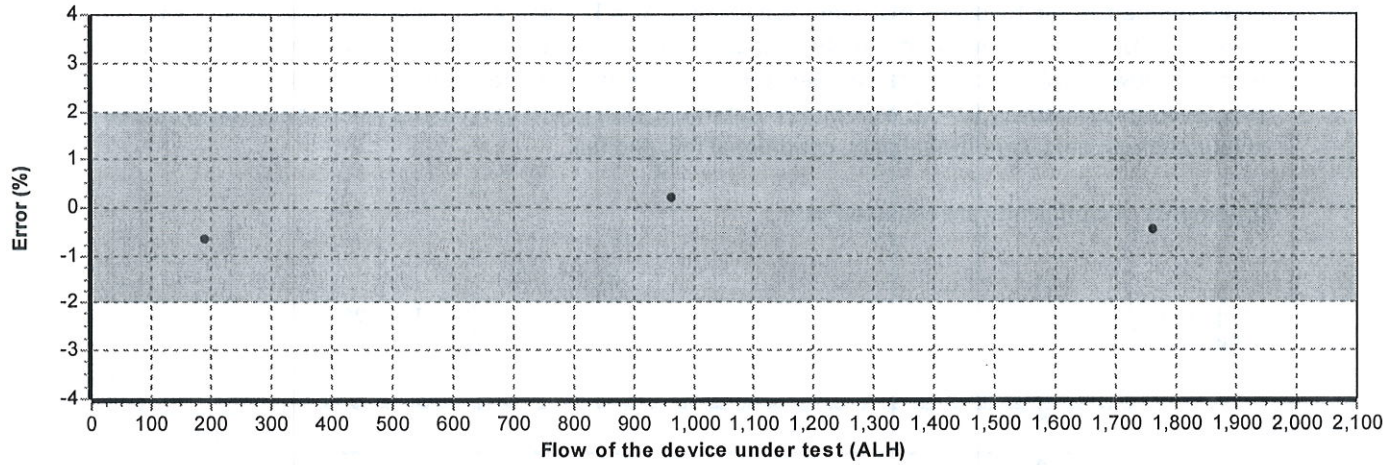
CLAS NRC-CRC CLAS 2009-02

SCC Accredited LAB LAB Accredité CCN #655

Calibration certificate # 15752

Serial Number:	23544	Test stand:	1
Calibration Date:	2022/01/03	Procedure:	POS-CAL-005
Instrument ID:	EM-178	Decision rule:	Method #3

Final results



See the appendix for the guideline of decision rule

2021-01-11

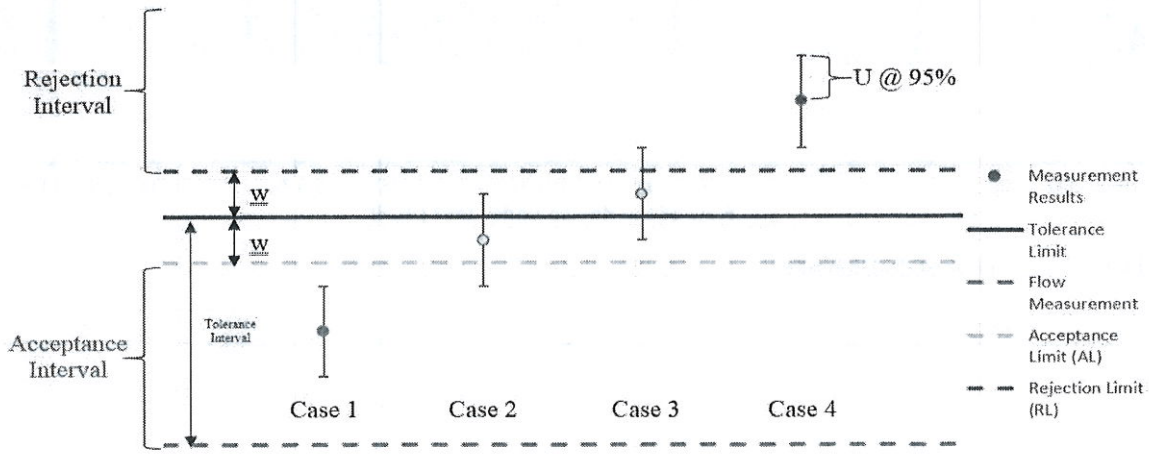
Fc : 1.006554

Appendix for the decision rule

Method #3 Non-binary Statement with Guard Band, uncertainty directly taken into account

This decision rule uses a guard band to define the acceptance and rejection interval. The acceptance limit is defined by the following mathematical formula AL = TL – w and the rejection limit RL = TL + w, where w = rU. The multiple r that is multiplied by the expanded measurement uncertainty U can be defined following ILAC G8: 2019 table 1 section 5.2. The expanded measurement uncertainty U has a 95% coverage probability (k = 2). Non-binary statement with guard band exists when the result is limited to four choices: pass, conditional pass, conditional fail, and fail.

Statements of conformity are reported as:



Graphical representation of a Non-Binary Statement with a Guard Band

Case 1 – *Below acceptance limit AL,* ***Status: In tolerance.***

- The result is inside the acceptance interval. However, assuming a normal distribution, the risk that the result is outside the tolerance limit could be up to 2.5%. Uncertainty is directly taken into account. Green.

Case 2 – *Below tolerance limit TL, greater than acceptance limit AL,* ***Status: In tolerance-Conditional.***

- The result is outside the acceptance interval but below tolerance limit. However, the observed value is inside the guard band w = TL – AL and the status is conditional on the customer's risk assessment. Uncertainty is directly taken into account. Yellow.

Case 3 – *Greater than tolerance limit, below rejection limit RL,* ***Status: Out of tolerance-Conditional.***

- Le result is greater than tolerance limit but outside the rejection interval. However, the observed value is inside the guard band w = TL – RL and the status is conditional on the customer's risk assessment. Uncertainty is directly taken into account. Yellow.

Case 4 – *Greater than rejection limit RL,* ***Status: Out of tolerance.***

- The result is inside the rejection interval. Uncertainty is directly taken into account. Red.

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Instrumentation
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Accrédité ISO 17025

CLAS 2010-02

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CERTIFICAT D'ÉTALONNAGE

NO. CERTIFICAT	CE-EM-224 2021-04-20

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 DES ÉTALONS			
Étalon Utilisé:	Tape mesure-2	**No. du certificat d'étalonnage:**	2880456
No. Série:	20068976	**Dernière date d'étalonnage:**	2020-02-18
Certificat fait par:	Starrett	**Prochaine date d'étalonnage:**	2022-02-18
Commentaire:			

Version 1

Instrumentation Saint•Laurent inc.
Accrédité ISO 17025

CLAS NRC·CNRC CLAS 2010-02

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CERTIFICAT D'ÉTALONNAGE

NO. CERTIFICAT	CE-EM-224 2021-04-20

RÉSULTAT D'ÉTALONNAGE

Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Tolérance	Incertitude Élargie
Conformité	**Commentaire**					
1.00 "	1.00 "	1.00 "	0.00 "	1.00 "	+/- 1/32 "	-- "
Conforme						
36.00 "	36.00 "	36.00 "	0.00 "	36.00 "	+/- 1/32 "	-- "
Conforme						
72.00 "	72.00 "	72.00 "	0.00 "	72.00 "	+/- 1/32 "	-- "
Conforme						
108.00 "	108.00 "	108.00 "	0.00 "	108.00 "	+/- 1/32 "	-- "
Conforme						
132.00 "	132.00 "	132.00 "	0.00 "	132.00 "	+/- 1/32 "	-- "
Conforme						

Conditions Environnementales: Température: N.A. Humidité: N.A.

Type d'Étalonnage:

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT	
Date d'Étalonnage:	2021-04-20
Date du prochain Étalonnage:	2022-04-20
Date d'émission du certificat:	2021-04-20

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

¤ 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 :2017 et les étalons utilisés pour effectuer l'étalonnage est retraçables au CNRC et/ou au NIST.
¤ Les incertitudes rapportées représentent 95% du niveau de confiance en supposant une distribution normale k = 2.
¤ La déclaration de conformité ne comprend pas la mesure d'incertitude d'instrumentation St-Laurent INC. La règle de décision est basée sur l'acceptation simple de l'instruction binaire ILAC G8 et Les limites de tolérance de test sont basées sur les spécifications du client, sauf sur indication contraire.
¤ Les résultats présentés dans ce certificat ne se rapportent qu'aux objets soumis à l'étalonnage.
¤ C'est la responsabilité du client de s'assurer que l'équipement étalonné répond à l'utilisation qu'il prévoit.
¤ Le format de la date utilisé dans ce certificat correspond à: AAAA-MM-JJ.

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.

Marco Miron - Technicien

28 Avr. 21

Version 1

Instrumentation
Saint•Laurent inc.
Accrédité ISO 17025

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CERTIFICAT D'ÉTALONNAGE

NO. CERTIFICAT	CE-EM-249 2021-04-20

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:**	Voltage
No. Model:	MS-321-LCD	**Type de mesure:**	Pression
No. Série:	N/A	**Gamme:**	0 à 0.10 "H2O
Emplacement:	Banc de test	**No. Machine:**	N/A

SPÉCIFICATION DES ÉTALONS			
Étalon Utilisé:	Fluke 744	**No. du certificat d'étalonnage:**	2021001945
No. Série:	8180008	**Dernière date d'étalonnage:**	2021-03-10
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	2021-06-10
Commentaire:			
Étalon Utilisé:	Fluke Pression	**No. du certificat d'étalonnage:**	2020007634
No. Série:	3330050	**Dernière date d'étalonnage:**	2020-10-30
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	2021-10-30
Commentaire:			

Instrumentation Saint•Laurent inc.
Accrédité ISO 17025

CLAS 2010-02

LAB Accrédité CCN N°669

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CERTIFICAT D'ÉTALONNAGE

NO. CERTIFICAT	CE-EM-249 2021-04-20

RÉSULTAT D'ÉTALONNAGE

Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Tolérance	Incertitude Élargie
Conformité	**Commentaire**					
0.0000 "H2O	0.0000 "H2O	-0.0002 "H2O	-0.0002 "H2O	-0.0002 "H2O	+/- 0.25 "H2O	0.25 "H2O
Conforme	Vérification indicateur					
0.0250 "H2O	0.0250 "H2O	0.0227 "H2O	-0.0023 "H2O	0.0228 "H2O	+/- 0.25 "H2O	0.25 "H2O
Conforme	Vérification indicateur					
0.0500 "H2O	0.0500 "H2O	0.0466 "H2O	0.0034 "H2O	0.0474 "H2O	+/- 0.25 "H2O	0.25 "H2O
Conforme	Vérification indicateur					
0.0750 "H2O	0.0750 "H2O	0.0720 "H2O	-0.0030 "H2O	0.0727 "H2O	+/- 0.25 "H2O	0.25 "H2O
Conforme	Vérification indicateur					
0.1000 "H2O	0.1000 "H2O	0.0957 "H2O	-0.0043 "H2O	0.0968 "H2O	+/- 0.25 "H2O	0.25 "H2O
Conforme	Vérification indicateur					
0.0000 "H2O	0.0000 V.DC.	0.0004 V.DC.	+0.0004 V.DC.	0.0004 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Conforme	Vérification sortie analogique					
0.0250 "H2O	2.5000 V.DC.	2.2107 V.DC.	-0.2893 V.DC.	2.2645 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Conforme	Vérification sortie analogique					
0.0500 "H2O	5.0000 V.DC.	4.6286 V.DC.	0.3714 V.DC.	4.7207 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Conforme	Vérification sortie analogique					
0.0750 "H2O	7.5000 V.DC.	7.1936 V.DC.	-0.3064 V.DC.	7.2341 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Conforme	Vérification sortie analogique					
0.1000 "H2O	10.0000 V.DC.	9.5346 V.DC.	-0.4654 V.DC.	9.7210 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Conforme	Vérification sortie analogique					

Conditions Environnementales:	Température: N.A.	Humidité: N.A.
Type d'Étalonnage:		

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT

Date d'Étalonnage:	2021-04-20
Date du prochain Étalonnage:	2022-04-20
Date d'émission du certificat:	2021-04-20

CONFORMITÉ D'ÉTALONNAGE

	Avant	Après
Conforme:		X
Non Conforme:	X	

¤ 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 :2017 et les étalons utilisés pour effectuer l'étalonnage est retraçables au CNRC et/ou au NIST.
¤ Les incertitudes rapportées représentent 95% du niveau de confiance en supposant une distribution normale k = 2.
¤ La déclaration de conformité ne comprend pas la mesure d'incertitude d'instrumentation St-Laurent INC. La règle de décision est basée sur l'acceptation simple de l'instruction binaire ILAC G8 et Les limites de tolérance de test sont basées sur les spécifications du client, sauf sur indication contraire.
¤ Les résultats présentés dans ce certificat ne se rapportent qu'aux objets soumis à l'étalonnage.
¤ C'est la responsabilité du client de s'assurer que l'équipement étalonné répond à l'utilisation qu'il prévoit.
¤ Le format de la date utilisé dans ce certificat correspond à: AAAA-MM-JJ.

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.

Marco Miron - Technicien

28 Avr / 21

Version 1

Instrumentation
Saint•Laurent inc.
Accrédité ISO 17025

CLAS
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CLAS 2010-02

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CERTIFICAT D'ÉTALONNAGE

NO. CERTIFICAT	CE-EM-313 2021-04-20

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:**	Voltage
No. Model:	MS-321-LCD	**Type de mesure:**	Pression
No. Série:	N.A.	**Gamme:**	0 a 0.1 inchh20
Emplacement:	N.A.	**No. Machine:**	N.A.

SPÉCIFICATION DES ÉTALONS			
Étalon Utilisé:	Fluke Pression	**No. du certificat d'étalonnage:**	2020007634
No. Série:	3330050	**Dernière date d'étalonnage:**	2020-10-30
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	2021-10-30
Commentaire:			
Étalon Utilisé:	Fluke 744	**No. du certificat d'étalonnage:**	2021001945
No. Série:	8180008	**Dernière date d'étalonnage:**	2021-03-10
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	2021-06-10
Commentaire:			

Instrumentation
Saint•Laurent inc.
Accrédité ISO 17025

CLAS 2010-02

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CERTIFICAT D'ÉTALONNAGE

NO. CERTIFICAT	CE-EM-313 2021-04-20

RÉSULTAT D'ÉTALONNAGE

Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Tolérance	Incertitude Élargie
Conformité	**Commentaire**					
0.0000 "H2O	0.0000 "H2O	+0.0002 "H2O	0.0002 "H2O	+0.0002 "H2O	+/- 0.25 "H2O	0.25 "H2O
Conforme	Vérification indicateur					
0.1250 "H2O	0.1250 "H2O	0.1243 "H2O	-0.0007 "H2O	0.1243 "H2O	+/- 0.25 "H2O	0.25 "H2O
Conforme	Vérification indicateur					
0.2500 "H2O	0.2500 "H2O	0.2483 "H2O	-0.0017 "H2O	0.2483 "H2O	+/- 0.25 "H2O	0.25 "H2O
Conforme	Vérification indicateur					
0.3750 "H2O	0.3750 "H2O	0.3733 "H2O	-0.0017 "H2O	0.3733 "H2O	+/- 0.25 "H2O	0.25 "H2O
Conforme	Vérification indicateur					
0.5000 "H2O	0.5000 "H2O	0.4985 "H2O	-0.0015 "H2O	0.4985 "H2O	+/- 0.25 "H2O	0.25 "H2O
Conforme	Vérification indicateur					
0.0000 "H2O	0.0000 V.DC.	0.0003 V.DC.	+0.0003 V.DC.	0.0003 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Conforme	Vérification sortie analogique					
0.1250 "H2O	2.5000 V.DC.	2.4577 V.DC.	-0.0423 V.DC.	2.4577 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Conforme	Vérification sortie analogique					
0.2500 "H2O	5.0000 V.DC.	4.9493 V.DC.	-0.0507 V.DC.	4.9493 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Conforme	Vérification sortie analogique					
0.3750 "H2O	7.5000 V.DC.	7.4441 V.DC.	-0.0559 V.DC.	7.4441 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Conforme	Vérification sortie analogique					
0.5000 "H2O	10.0000 V.DC.	9.9524 V.DC.	-0.0476 V.DC.	9.9524 V.DC.	+/- 0.5 V.DC.	0.5 V.DC.
Conforme	Vérification sortie analogique					

Conditions Environnementales:	Température: N.A.	Humidité: N.A.
Type d'Étalonnage:		

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT

Date d'Étalonnage:	2021-04-20
Date du prochain Étalonnage:	2022-04-20
Date d'émission du certificat:	2021-04-20

CONFORMITÉ D'ÉTALONNAGE

	Avant	Après
Conforme:	X	X
Non Conforme:		

28 Avril 21

¤ 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 :2017 et les étalons utilisés pour effectuer l'étalonnage est retraçables au CNRC et/ou au NIST.
¤ Les incertitudes rapportées représentent 95% du niveau de confiance en supposant une distribution normale k = 2.
¤ La déclaration de conformité ne comprend pas la mesure d'incertitude d'instrumentation St-Laurent INC. La règle de décision est basée sur l'acceptation simple de l'instruction binaire ILAC G8 et Les limites de tolérance de test sont basées sur les spécifications du client, sauf sur indication contraire.
¤ Les résultats présentés dans ce certificat ne se rapportent qu'aux objets soumis à l'étalonnage.
¤ C'est la responsabilité du client de s'assurer que l'équipement étalonné répond à l'utilisation qu'il prévoit.
¤ Le format de la date utilisé dans ce certificat correspond à: AAAA-MM-JJ.

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.

Marco Miron - Technicien

Version 1

Instrumentation
Saint•Laurent inc.
Accrédité ISO 17025

CLAS 2010-02

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CERTIFICAT D'ÉTALONNAGE

NO. CERTIFICAT	CE-EM-001 2021-04-20

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:	Indicateur	**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 DES ÉTALONS			
Étalon Utilisé:	Fluke 744	**No. du certificat d'étalonnage:**	2021001945
No. Série:	8180008	**Dernière date d'étalonnage:**	2021-03-10
Certificat fait par:	Alpha Controls	**Prochaine date d'étalonnage:**	2021-06-10
Commentaire:			

Instrumentation
Saint•Laurent inc.
Accrédité ISO 17025

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CLAS 2010-02

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CERTIFICAT D'ÉTALONNAGE

NO. CERTIFICAT	CE-EM-001 2021-04-20

RÉSULTAT D'ÉTALONNAGE

Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Tolérance	Incertitude Élargie
Conformité	**Commentaire**					
0.0 °C	0.0 °C	0.1 °C	+0.1 °C	0.1 °C	+/- 2.0 °C	1.0 °C
Conforme	T1 typeJ					
125.0 °C	125.0 °C	125.0 °C	0.0 °C	125.0 °C	+/- 2.0 °C	1.0 °C
Conforme	T1 typeJ					
250.0 °C	250.0 °C	250 °C	0.0 °C	250.0 °C	+/- 2.0 °C	1.0 °C
Conforme	T1 typeJ					
375.0 °C	375.0 °C	375.0 °C	0.0 °C	375.0 °C	+/- 2.0 °C	1.0 °C
Conforme	T1 typeJ					
500.0 °C	500.0 °C	500.0 °C	0.0 °C	500.0 °C	+/- 2.0 °C	1.0 °C
Conforme	T1 typeJ					
0.0 °C	0.0 °C	0.1 °C	+0.1 °C	0.1 °C	+/- 2 °C	1.0 °C
Conforme	T2 typeJ					
125.0 °C	125.0 °C	125.1 °C	+0.1 °C	125.1 °C	+/- 2 °C	1.0 °C
Conforme	T2 typeJ					
250.0 °C	250.0 °C	250.0 °C	0.0 °C	250.0 °C	+/- 2.0 °C	1.0 °C
Conforme	T2 typeJ					
375.0 °C	375.0 °C	375.0 °C	0.0 °C	375.0 °C	+/- 2.0 °C	1.0 °C
Conforme	T2 typeJ					
500.0 °C	500.0 °C	500.0 °C	0.0 °C	500.0 °C	+/- 2.0 °C	1.0 °C
Conforme	T2 typeJ					
0.0 °C	0.0 °C	0.2 °C	+0.2 °C	0.2 °C	+/- 2.0 °C	1.0 °C
Conforme	T1 typeK					
125.0 °C	125.0 °C	125.1 °C	+0.1 °C	125.1 °C	+/- 2.0 °C	1.0 °C
Conforme	T1 typeK					
250.0 °C	250.0 °C	250.0 °C	0.0 °C	250.0 °C	+/- 2.0 °C	1.0 °C
Conforme	T1 typeK					
375.0 °C	375.0 °C	375.0 °C	0.0 °C	375.0 °C	+/- 2.0 °C	1.0 °C
Conforme	T1 typeK					
500.0 °C	500.0 °C	500.0 °C	0.0 °C	500.0 °C	+/- 2.0 °C	1.0 °C
Conforme	T1 typeK					
0.0 °C	0.0 °C	0.2 °C	+0.2 °C	0.2 °C	+/- 2.0 °C	1.0 °C
Conforme	T2 typeK					
125.0 °C	125.0 °C	125.1 °C	+0.1 °C	125.1 °C	+/- 2.0 °C	1.0 °C
Conforme	T2 typeK					
250.0 °C	250.0 °C	250.0 °C	0.0 °C	250.0 °C	+/- 2.0 °C	1.0 °C
Conforme	T2 typeK					
375.0 °C	375.0 °C	375.0 °C	0.0 °C	375.0 °C	+/- 2.0 °C	1.0 °C
Conforme	T2 typeK					

Instrumentation Saint•Laurent inc.
Accrédité ISO 17025

CLAS 2010-02

LAB Accrédité CCN N°669

60 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 2021-04-20

RÉSULTAT D'ÉTALONNAGE

Entrée Source	Valeur Donnée	Valeur Actuelle	Erreur de Déviation	Valeur après Étalonnage	Tolérance	Incertitude Élargie
Conformité	**Commentaire**					
500.0 °C	500.0 °C	500.0 °C	0.0 °C	500.0 °C	+/- 2.0 °C	1.0 °C
Conforme	T2 typeK					

Conditions Environnementales: Température: N.A. Humidité: N.A.

Type d'Étalonnage:

DATE D'ÉTALONNAGE / ÉMISSION DU CERTIFICAT

Date d'Étalonnage:	2021-04-20
Date du prochain Étalonnage:	2022-04-20
Date d'émission du certificat:	2021-04-20

CONFORMITÉ D'ÉTALONNAGE

	Avant	Après
Conforme:	X	X
Non Conforme:		

¤ 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 :2017 et les étalons utilisés pour effectuer l'étalonnage est retraçables au CNRC et/ou au NIST.
¤ Les incertitudes rapportées représentent 95% du niveau de confiance en supposant une distribution normale k = 2.
¤ La déclaration de conformité ne comprend pas la mesure d'incertitude d'instrumentation St-Laurent INC. La règle de décision est basée sur l'acceptation simple de l'instruction binaire ILAC G8 et Les limites de tolérance de test sont basées sur les spécifications du client, sauf sur indication contraire.
¤ Les résultats présentés dans ce certificat ne se rapportent qu'aux objets soumis à l'étalonnage.
¤ C'est la responsabilité du client de s'assurer que l'équipement étalonné répond à l'utilisation qu'il prévoit.
¤ Le format de la date utilisé dans ce certificat correspond à: AAAA-MM-JJ.

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.

Marc Gingras - Technicien

28 Avr. 21

5F09101 Version 1

POLYCONTROLS
INTEGRATION • CALIBRATION • INSTRUMENTATION

CLAS MC-CNRC
CLAS 2009-02

SCC Accredited LAB
LAB Accredité CCN
#655

CALIBRATION CERTIFICATE # 15754

Calibration date : 2022/01/03
Certificate issued : 2022/01/04

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

Calibration of
Shinigawa DCDa-2c S/N : 23543

QUALITY PROGRAM CONFORMANCE

All calibrations are performed in accordance with Polycontrols Laboratory Quality Assurance Manual and conform to ISO/IEC 17025: 2017, ISO 9001 – 2015 and/or other quality requirements defined in customers purchase descriptions. The results are strictly valid for the device under test or calibration. If applicable, the decision rule is described in the certificate.

TRACEABILITY

The traceability for flow standard to the National Institute of Standards and Technology, NIST, is maintained by Fluke Corporation of Phoenix, Arizona and conform to ISO/IEC 17025, ANSI/NCSL Z540-1-1994, ISO-10012-1 and MIL-STD 45662A.

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

CALIBRATION AND MEASUREMENT CAPABILITY

Calibration measurement capabilities have an uncertainty of ±0.2% of reading for a flow range between 5 SCCM to 10 SLPM, ±0.3% of reading for a flow range between 10 SLPM to 30 SLPM, ±0.2% of reading for a flow range between 30 SLPM to 3000 SLPM, ±0.3% of reading for a flow range above 3000 SLPM to 6000 SLPM and ±0.5% of reading for a flow range under 5 SCCM down to 1 SCCM, air or nitrogen equivalent. The reported uncertainty is expanded using a coverage factor k=2 for a level of confidence of approximately 95%, assuming a normal distribution including resolution of the instrument. The test uncertainty ratio (TUR) of this calibration is at least 4:1 unless otherwise stated.

CONDITION SUMMARY OF THE DEVICE UNDER TEST

Initial conditions	In good condition
Work done	Initial readings = Final readings, no adjustment Calibration of the instrument
Results	Final readings in tolerance
Remarks	Calibration frequency every 12 months

Olivier Duchesne Bamber
Metrologist

Laboratory Manager

3650, Matte blvd. (Unit A-1), Brossard (Quebec), Canada, J4Y 2Z2
Tel: (450) 444-3600 Fax: (450) 444-1088 www.polycontrols.com

POLYCONTROLS
INTEGRATION • CALIBRATION • INSTRUMENTATION

CLAS ARC-CARC CLAS 2009-02

SCC Accredited LAB #655

Calibration certificate # 15754

Serial Number:	23543	Test stand:	3
Calibration Date:	2022/01/03	Procedure:	POS-CAL-005
Instrument ID:	EM-179	Decision rule:	Method #3

Standard equipment used for final calibration

Description	Model	Serial #	Traceability	Due date
Fluke molbloc_30 slpm	3E4-VCR-V-Q	2403	1500308202	2022/06/03
Fluke molbox1	Molbox1	755	1500311473	2022/07/02
RTD Mist	M22	2208102	2020003043	2021/04/23
Module 44.5 PSI avec Baro 163671	Module 30	160659	2021003409	2022/05/04

Final specifications of the device under test		Calibration conditions	
Gas	Air	Gas	Air
Operation temperature		Ambient temperature	23.5 °C
Inlet pressure		Ambient pressure	1024.68 mbar
Outlet pressure		Orientation	Horizontal
Reference temperature		Seals	Viton
Reference pressure		Valve	
Range	10-2000 ALH		
Input/Output Signals	-		
Supply			
Accuracy ±2 %O.R.			

Final readings

Test Flow ALH	Device under test L	Measured values Pressure PSIA	Temperature °C	Reference L	Calculated Reference L	Calculated Error L	Acceptable Error L	Uncertainty k = 2 L	TUR
337.6703	56.9625	14.8927	21.40	56.9866	56.2889	0.6736	1.1258	0.1868	>4
993.5699	168.1100	14.9008	21.41	167.6884	165.5494	2.5606	3.3110	0.5493	>4
1714.5316	288.1350	14.9140	21.58	288.7148	284.9453	3.1897	5.6989	0.9457	>4

POLYCONTROLS
INTEGRATION • CALIBRATION • INSTRUMENTATION

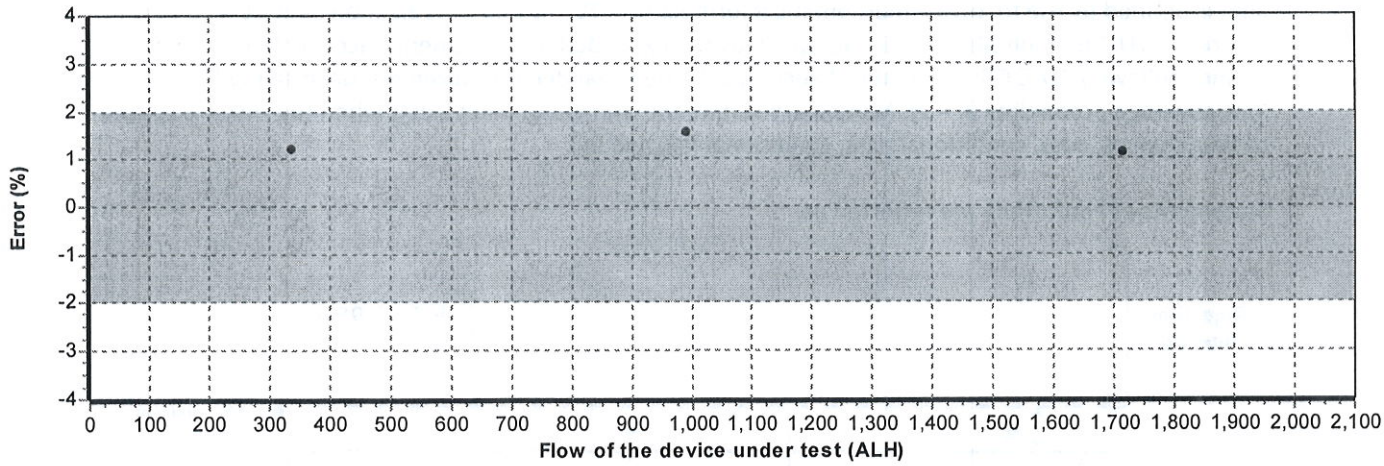
CLAS MC-CNRC CLAS 2009-02

SCC Accredited LAB LAB Accredité CCN #655

Calibration certificate # 15754

Serial Number:	23543	Test stand:	3
Calibration Date:	2022/01/03	Procedure:	POS-CAL-005
Instrument ID:	EM-179	Decision rule:	Method #3

Final results



See the appendix for the guideline of decision rule

2021-01-11

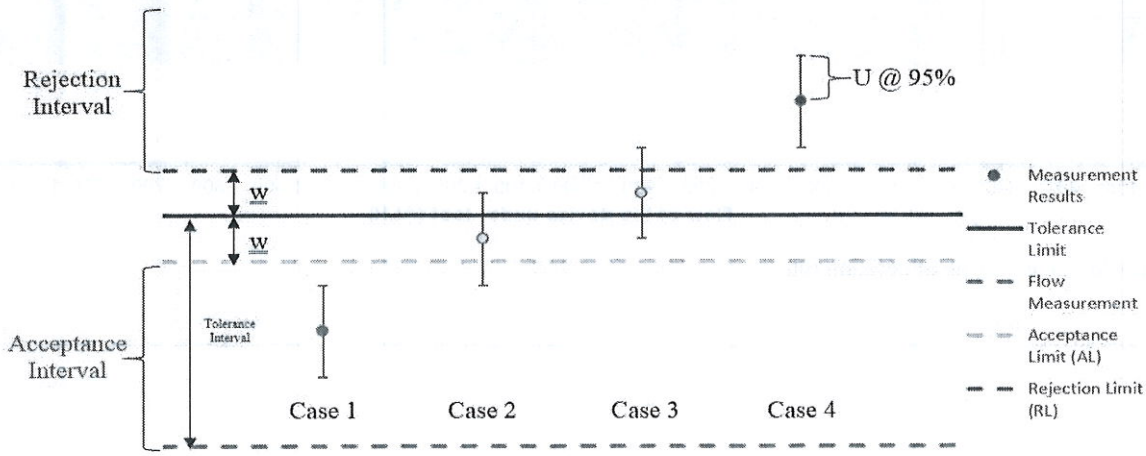
Fc: 0,9881747

Appendix for the decision rule

Method #3 Non-binary Statement with Guard Band, uncertainty directly taken into account

This decision rule uses a guard band to define the acceptance and rejection interval. The acceptance limit is defined by the following mathematical formula AL = TL – w and the rejection limit RL = TL + w, where w = rU. The multiple r that is multiplied by the expanded measurement uncertainty U can be defined following ILAC G8: 2019 table 1 section 5.2. The expanded measurement uncertainty U has a 95% coverage probability (k = 2). Non-binary statement with guard band exists when the result is limited to four choices: pass, conditional pass, conditional fail, and fail.

Statements of conformity are reported as:



Graphical representation of a Non-Binary Statement with a Guard Band

Case 1 – *Below acceptance limit AL,* ***Status: In tolerance.***

- The result is inside the acceptance interval. However, assuming a normal distribution, the risk that the result is outside the tolerance limit could be up to 2.5%. Uncertainty is directly taken into account. Green.

Case 2 – *Below tolerance limit TL, greater than acceptance limit AL,* ***Status: In tolerance-Conditional.***

- The result is outside the acceptance interval but below tolerance limit. However, the observed value is inside the guard band w = TL – AL and the status is conditional on the customer's risk assessment. Uncertainty is directly taken into account. Yellow.

Case 3 – *Greater than tolerance limit, below rejection limit RL,* ***Status: Out of tolerance-Conditional.***

- Le result is greater than tolerance limit but outside the rejection interval. However, the observed value is inside the guard band w = TL – RL and the status is conditional on the customer's risk assessment. Uncertainty is directly taken into account. Yellow.

Case 4 – *Greater than rejection limit RL,* ***Status: Out of tolerance.***

- The result is inside the rejection interval. Uncertainty is directly taken into account. Red.

3650, Matte blvd. (Unit A-1), Brossard (Quebec), Canada, J4Y 2Z2
Tel: (450) 444-3600 Fax: (450) 444-1088 www.polycontrols.com

DISPERSION
Laboratoire • Laboratory

CLAS
NRC·CNRC
CLAS 2010-01

CERTIFICAT D'ÉTALONNAGE

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

Client :	Polytests	**No. du Certificat :**	**121-28D702-151**
Adresse :	695 B rue Gaudette St-Jean-sur-Richelieu, QC J3B7S7	**Date d'étalonnage :**	23-02-2015

Technicien :
Trépanier, Pierre

Directeur de Laboratoire

Pierre Trépanier, Directeur laboratoire

DESCRIPTION DU SERVICE:

Description des masses :	NIST F	**Date d'approbation :**	23-02-2015
Classe de précision :	NIST F	**Date prochain étalonnage :**	23-02-2016 → 2020
Densité :	7.7g/cm³	**Accrédtation CCN n. :**	668
Identification (si unique) :	DI000D532	**Certification CLAS n. :**	2010-01

2015-03-10

Condition d'essai :	Temp °C:	20.025	Pression kPa:	102.59	Humidité:	44.915

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:

2015-03-10

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CLAS 2010-01

CERTIFICAT D'ÉTALONNAGE

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

Client :	Polytests	**No. du Certificat :**	**121-28D702-151**
Adresse :	695 B rue Gaudette	**Accrédtation CCN n. :**	668
	St-Jean-sur-Richelieu, QC	**Certification CLAS n. :**	2010-01
	J3B7S7	**Classe d'exactitude :**	NIST F
		Date d'étalonnage :	23-02-2015
Masse :	10 kg	**Date du prochain étalonnage :**	23-02-2016

RÉSULTAT DE L'ÉTALONNAGE, MASSE CONVENTIONNELLE:

Valeur Nominale	No de série	No d'inventaire	Masse conventionnelle	Masse conventionnelle après ajustement	Tolérance ± (mg)	Incertitudes ± (mg)
10 kg	DI000D532		10.000136 kg		1 000 mg	10 mg

10 kg DI000D532 EM.205 9,994 verif avec EM.204

20 MARS 2018

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

2015.03.10

DISPERSION
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CLAS 2010-01

CERTIFICAT D'ÉTALONNAGE

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

Client :	Polytests	**No. du Certificat :**	**121-28D702-151**
Adresse :	695 B rue Gaudette	**Accrédtation CCN n. :**	668
	St-Jean-sur-Richelieu, QC	**Certification CLAS n. :**	2010-01
	J3B7S7	**Classe d'exactitude :**	NIST F
		Date d'étalonnage :	23-02-2015
Masse :	10 kg	**Date du prochain étalonnage :**	23-02-2016

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)
10 kg	DI000D532		136 mg		1 000 mg	10 mg

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

2015.03.10

CERTIFICAT D'ÉTALONNAGE

108-86 Boulevard Des Entreprises, Boisbriand, Québec J7G 2T3
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.

2015. 03. 10

CERTIFICAT D'ÉTALONNAGE

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www.dispersion.ca 1.866.390.5066

RÉFÉRENCES UTILISÉES

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

ÉTALONS CERTFIÉS PAR LE CNRC:

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

RÉFÉRENCES DE LA STATION ROBOTISÉE:

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

2015.03.10

22 Albiston Way
Auburn, ME 04210
800-292-6218
207-777-6218
Fax 207-777-6215
www.specair.com

Date: 08/14/2017

Certificate of Analysis

Customer:
VAC OXY

Results are reported in mole percent, unless otherwise indicated. Mixes are prepared via partial pressure methods, or gravimetrically, using high load high sensitivity electronic scales. Prior to use, scales are verified for accuracy using applicable NIST traceable weights; analyses are calibrated against reference materials traceable to NIST weights and/or NIST gas reference materials.

Cylinder Serial #: 809277 **Cylinder Size:** K **CGA Connection:** 350 **Fill Pressure:** 1450 PSI

Analysis: Certified Standard **Lot #:** 4722621

Component(s):	Requested Concentration(s):	Actual Concentration(s):
Carbon Monoxide	3%	3.0%
Carbon Dioxide	18%	18.0%
Oxygen	2%	2.0%
Nitrogen	BALANCE	BALANCE

Expiration Date: 08/2020

Approved By:

Tom Bosse

EM-275

5. sept 2017

22 Albiston Way
Auburn, ME 04210
800-292-6218
207-777-6218
Fax 207-777-6215
www.specair.com

Date: 08/14/2017

Certificate of Analysis

Customer:
VAC OXY

Results are reported in mole percent, unless otherwise indicated. Mixes are prepared via partial pressure methods, or gravimetrically, using high load high sensitivity electronic scales. Prior to use, scales are verified for accuracy using applicable NIST traceable weights; analyses are calibrated against reference materials traceable to NIST weights and/or NIST gas reference materials.

Cylinder Serial #: K3886 **Cylinder Size:** K **CGA Connection:** 590 **Fill Pressure:** 1450 PSI

Analysis: Certified Standard **Lot #:** 4722622

Component(s):	Requested Concentration(s):	Actual Concentration(s):
Carbon Monoxide	1%	1.0%
Carbon Dioxide	10%	10.0%
Oxygen	10%	10.0%
Nitrogen	BALANCE	BALANCE

Expiration Date: 08/2020

Approved By:

Tom Bosse

5 sept 2017

EM. 276

POLYCONTROLS
INTEGRATION • CALIBRATION • INSTRUMENTATION

CLAS NRC·CNRC
CLAS 2009-02

SCC Accredited LAB
LAB Accredite CON
#655

CALIBRATION CERTIFICATE # 15755

Calibration date : 2022/01/04
Certificate issued : 2022/01/04

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

Calibration of
Positive displacement flow meter Shinigawa DCSDa-2C S/N : S8020

QUALITY PROGRAM CONFORMANCE

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Results	Final readings in tolerance
Remarks	Calibration frequency every 12 months

Olivier Duchesne Bamber
Metrologist

Laboratory Manager

3650, Matte blvd. (Unit A-1), Brossard (Quebec), Canada, J4Y 2Z2
Tel: (450) 444-3600 Fax: (450) 444-1088 www.polycontrols.com

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CLAS 2009-02

#655

Calibration certificate # 15755

Serial Number:	S8020	Test stand:	3
Calibration Date:	2022/01/04	Procedure:	POS-CAL-005
Instrument ID:	EM 318	Decision rule:	Method #3

Standard equipment used for final calibration

Description	Model	Serial #	Traceability	Due date
Fluke molbloc_30 slpm	3E4-VCR-V-Q	2403	1500308202	2022/06/03
Fluke molbox1	Molbox1	755	1500311473	2022/07/02
RTD Mist	M22	2208102	2020003043	2021/04/23
Module 44.5 PSI avec Baro 163671	Module 30	160659	2021003409	2022/05/04

Final specifications of the device under test		Calibration conditions	
Gas	Air	Gas	Air
Operation temperature		Ambient temperature	23.5 °C
Inlet pressure		Ambient pressure	1025.18 mbar
Outlet pressure		Orientation	
Reference temperature		Seals	
Reference pressure		Valve	
Range	10-2000 ALH		
Input/Output Signals	-		
Supply			
Accuracy ±2 %O.R.			

Final readings

Test Flow ALH	Device under test L	Measured values Pressure PSIA	Temperature °C	Reference L	Calculated Reference L	Calculated Error L	Acceptable Error L	Uncertainty k = 2 L	TUR
171.9473	28.4650	14.8397	20.67	28.98	28.65	-0.1850	0.5731	0.10	>4
936.1377	156.4750	14.8436	20.56	157.79	155.92	0.5550	3.1184	0.52	>4
1799.6279	239.1300	14.8962	21.62	243.25	240.39	-1.2600	4.8078	0.80	>4

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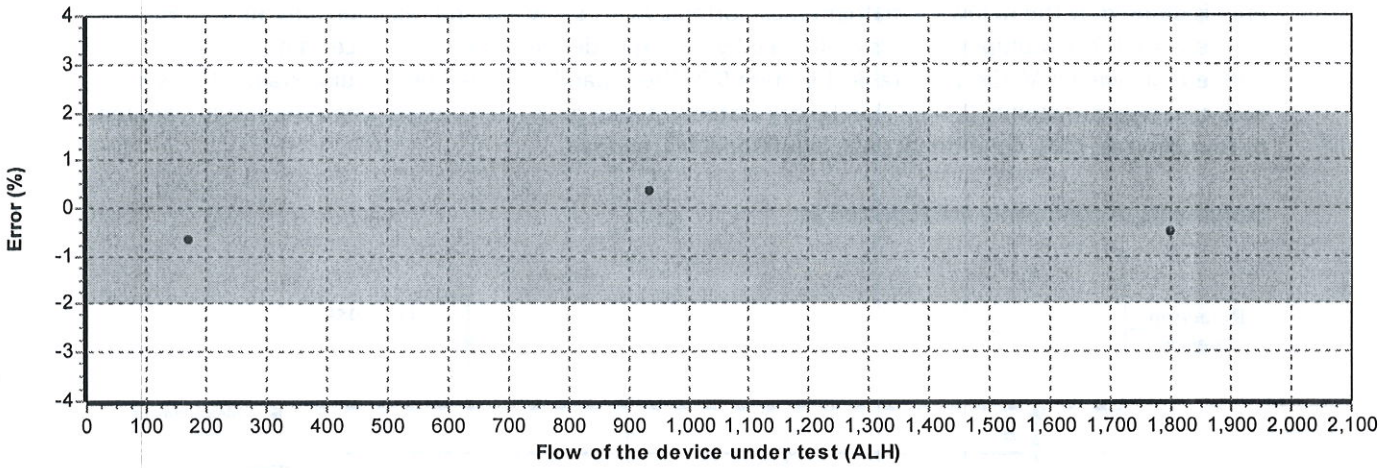
CLAS MC-CNRC
CLAS 2009-02

SCC Accredited LAB
LAB Accredité CCN
#655

Calibration certificate # 15755

Serial Number:	S8020	Test stand:	3
Calibration Date:	2022/01/04	Procedure:	POS-CAL-005
Instrument ID:	EM 318	Decision rule:	Method #3

Final results



See the appendix for the guideline of decision rule

2021-01-11

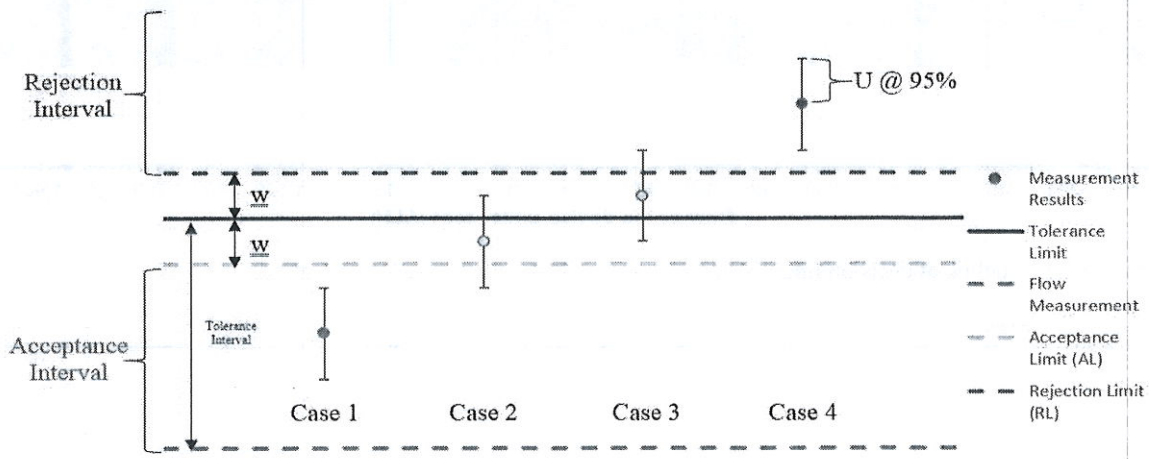
Fc : 1,005445

Appendix for the decision rule

Method #3 Non-binary Statement with Guard Band, uncertainty directly taken into account

This decision rule uses a guard band to define the acceptance and rejection interval. The acceptance limit is defined by the following mathematical formula AL = TL – w and the rejection limit RL = TL + w, where w = rU. The multiple r that is multiplied by the expanded measurement uncertainty U can be defined following ILAC G8: 2019 table 1 section 5.2. The expanded measurement uncertainty U has a 95% coverage probability (k = 2). Non-binary statement with guard band exists when the result is limited to four choices: pass, conditional pass, conditional fail, and fail.

Statements of conformity are reported as:



Graphical representation of a Non-Binary Statement with a Guard Band

Case 1 – *Below acceptance limit AL,* ***Status: In tolerance.***

- The result is inside the acceptance interval. However, assuming a normal distribution, the risk that the result is outside the tolerance limit could be up to 2.5%. Uncertainty is directly taken into account. Green.

Case 2 – *Below tolerance limit TL, greater than acceptance limit AL,* ***Status: In tolerance-Conditional.***

- The result is outside the acceptance interval but below tolerance limit. However, the observed value is inside the guard band w = TL – AL and the status is conditional on the customer's risk assessment. Uncertainty is directly taken into account. Yellow.

Case 3 – *Greater than tolerance limit, below rejection limit RL,* ***Status: Out of tolerance-Conditional.***

- Le result is greater than tolerance limit but outside the rejection interval. However, the observed value is inside the guard band w = TL – RL and the status is conditional on the customer's risk assessment. Uncertainty is directly taken into account. Yellow.

Case 4 – *Greater than rejection limit RL,* ***Status: Out of tolerance.***

- The result is inside the rejection interval. Uncertainty is directly taken into account. Red.

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Kalibrier-Protokoll

Certificate of conformity • Protocole d'étalonnage
Certicifato di taratura • Informe de calibración

Be sure. testo

Gerät / Module type / Modèle / Modelo: **testo 405i**

Messbereich / Measuring range / Etendue de mesure / Rango de medición: **Velocity: 0 … 30 m/s** **Temperature: -20 … +60 °C**

Serien-Nr. / Serial no. / N°. de série / Número de serie: 46100640

Messwerte / Measured values / Valeurs mesurées / Valores medidos:		
Sollwert / Reference / Référence / Referencia:	Zulässige Toleranz / Permissible tolerance / Tolérance admise / Tolerancia permitida:	Istwert / Actual Value / Valeur réelle / Valor medido:
Velocity:		
8.0 m/s	**±0.7 m/s**	**8.1 m/s**
Temperature :		
24.8 °C	**±0.5 °C**	**24.7 °C**

Prüfer / Inspector / Responsable / Verificador

EM-332

ACCREDITED
A2LA Certificate No. 1750.01
Calibration

Calibration complies with ISO/IEC 17025, ANSI/NCSL Z540-1, and 9001

Cert. No.: 4199-12609001

Traceable® Certificate of Calibration for Dial Barometer

Manufactured for and distributed by : Traceable® Products 12554 Galveston Rd B230, Webster, TX 77598

Instrument Identification:

Model: 4199,99760-50 S/N: 210758578 Manufacturer: Control Company

Standards/Equipment:

Description	Serial Number	Due Date	NIST Traceable Reference
Digital Barometer	D4540001	19 Nov 2021	1000461277

Certificate Information:

Technician: 57 Procedure: CAL-33 Cal Date: 02 Sep 2021 Cal Due Date: 02 Sep 2023

Test Conditions: 60.08%RH 23.68°C 1012mBar

Calibration Data: (New Instrument)

Unit(s)	Nominal	As Found	In Tol	Nominal	As Left	In Tol	Min	Max	±U	TUR
mb/hPa	N.A.	N.A.		960.35	961	Y	955	965	0.62	>4:1
mb/hPa	N.A.	N.A.		985.88	985	Y	981	991	0.62	>4:1
mb/hPa	N.A.	N.A.		1011.33	1009	Y	1006	1016	0.62	>4:1

This certificate indicates Traceability to standards provided by (NIST) National Institute of Standards and Technology and/or a National Standards Laboratory.

A Test Uncertainty Ratio of at least 4:1 is maintained unless otherwise stated and is calculated using the expanded measurement uncertainty. Uncertainty evaluation includes the instrument under test and is calculated in accordance with the ISO "Guide to the Expression of Uncertainty in Measurement : (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level. In tolerance conditions are based on test results falling within specified limits with no reduction by the uncertainty of the measurement. The results contained herein relate only to the item calibrated. This certificate shall not be reproduced except in full, without written approval of Control Company.

Nominal=Standard's Reading; As Left=Instrument's Reading; In Tol=In Tolerance; Min/Max=Acceptance Range; ± U=Expanded Measurement Uncertainty; TUR=Test Uncertainty Ratio; Accuracy=±(Max-Min)/2; Min=As Left Nominal(Rounded) – Tolerance; Max= As Left Nominal(Rounded) + Tolerance;

Nicol Rodriguez

Nicol Rodriguez, Quality Manager

Marisa Elms

Marisa Elms, Technical Manager

Note :

Maintaining Accuracy:

In our opinion once calibrated your Dial Barometer should maintain its accuracy. There is no exact way to determine how long calibration will be maintained. Dial Barometer change little, if any at all, but can be affected by aging, temperature, shock, and contamination.

Recalibration:

For factory calibration and re-certification traceable to National Institute of Standards and Technology contact Control Company.

Issue Date : 02 Sep 2021

EM. 333

CONTROL COMPANY 12554 Galveston RD Suite B230 Webster TX USA 77598
Phone 281 482-1714 Fax 281 482-9448 sales@control3.com www.traceable.com

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:W221-0664-01
Issue No: 1

Client: POLYTESTS
695-B Gaudette
St-jean-sur-richelieu, QB J3B 7S7
Attention: Danick Power

PO No: 100537

Signed:

Amber Anderson
Chemist
Date of Issue: 11/15/2021

Sample Details

Sample Log No:	W221-0664-01	**Sample Date:**	
Sample Designation:	Pellet 100537	**Sample Time:**	
Sample Recognized As:	Wood Pellets	**Arrival Date:**	11/3/2021

Test Results

	METHOD	UNITS	MOISTURE FREE	AS RECEIVED
Moisture Total	ASTM E871	wt. %		4.30
Ash	ASTM D1102	wt. %	0.37	0.36
Volatile Matter	ASTM D3175	wt. %		
Fixed Carbon by Difference	ASTM D3172	wt. %		
Sulfur	ASTM D4239	wt. %	0.012	0.011
SO_2	Calculated	lb/mmbtu		0.029
Net Cal. Value at Const. Pressure	ISO 1928	GJ/tonne	17.41	16.55
Gross Cal. Value at Const. Vol.	ASTM E711	Btu/lb	8271	7915
Carbon	ASTM D5373	wt. %	46.05	44.07
Hydrogen*	ASTM D5373	wt. %	8.45	8.09
Nitrogen	ASTM D5373	wt. %	< 0.19	< 0.19
Oxygen*	ASTM D3176	wt. %	> 44.92	> 42.98
*Note: As received values do not include hydrogen and oxygen in the total moisture.				
Chlorine	ASTM D6721	mg/kg		
Fluorine	ASTM D3761	mg/kg		
Mercury	ASTM D6722	mg/kg		
Bulk Density	ASTM E873	lbs/ft^3		
Fines (Less than 1/8")	TPT CH-P-06	wt.%		
Durability Index	Kansas State	PDI		
Sample Above 1.50"	TPT CH-P-06	wt.%		
Maximum Length (Single Pellet)	TPT CH-P-06	inch		
Diameter, Range	TPT CH-P-05	inch		to
Diameter, Average	TPT CH-P-05	inch		
Stated Bag Weight	TPT CH-P-01	lbs		
Actual Bag Weight	TPT CH-P-01	lbs		

Comments:

Accreditation #60243

APPENDIX 4: Unit pre burn

Temps acquisition minutes	Flue temp °F	Tunnel dry bulb °F	scale lbs	Tunnel Velocity Pressure in. Wc
0	91,36	66,99	24,43	0,0639
10	151,23	66,94	24,03	0,0658
20	178,37	69,19	23,42	0,0631
30	183,93	68,98	22,92	0,0629
40	193,33	68,65	22,42	0,0613
50	198,92	68,09	21,92	0,0597
60	211,31	68,31	21,42	0,0595
70	208,93	70,18	20,92	0,0597
80	209,62	69,36	20,52	0,0585
90	210,61	68,90	20,02	0,0594
100	211,55	68,43	19,52	0,0582
110	221,09	70,57	19,11	0,0599
120	212,70	69,69	18,72	0,0607
130	210,89	69,00	18,22	0,0572
140	207,69	68,45	17,81	0,0578
150	209,90	69,68	17,31	0,0578
160	223,12	69,72	16,81	0,0594
170	210,55	68,87	16,41	0,0578
180	206,72	68,29	16,01	0,0589
190	202,48	69,98	15,61	0,0594
200	203,57	69,32	15,11	0,0578
210	224,51	68,72	14,61	0,0590
220	205,39	68,08	14,27	0,0590
230	198,93	70,03	13,91	0,0587
240	198,68	68,93	13,41	0,0565
250	198,24	68,30	13,01	0,0585
260	197,88	68,43	12,51	0,0585
270	200,53	69,60	12,01	0,0575
280	198,54	68,74	11,61	0,0587
290	198,19	68,21	11,21	0,0601
300	195,63	69,65	10,71	0,0558
310	195,25	69,11	10,31	0,0565
320	198,88	68,46	9,81	0,0572
330	195,88	68,03	9,41	0,0582
340	195,21	69,70	9,01	0,0562
350	195,25	68,92	8,51	0,0565
360	194,54	68,18	8,11	0,0578
370	195,73	69,08	7,71	0,0565
380	195,26	69,42	7,21	0,0590
390	194,82	68,62	6,81	0,0578
400	194,85	68,16	6,31	0,0606
410	193,51	70,09	5,91	0,0582
420	195,56	69,21	5,51	0,0572
430	193,34	68,44	5,01	0,0572
440	192,05	67,90	4,51	0,0575
450	191,28	69,67	4,11	0,0574
460	191,24	68,75	3,71	0,0585
470	195,79	68,23	3,21	0,0583
480	190,50	68,44	2,81	0,0565
490	188,73	69,43	2,41	0,0573
500	189,37	68,72	2,11	0,0562
510	188,60	68,03	1,71	0,0559
520	191,46	69,14	1,41	0,0550
530	189,57	69,20	1,11	0,0585
540	191,15	68,51	0,91	0,0560
550	193,13	68,11	0,71	0,0578
560	192,48	69,90	0,61	0,0573
570	191,83	69,16	0,51	0,0585
580	183,79	68,58	0,41	0,0606
590	175,71	68,08	0,41	0,0606
600	168,92	69,29	0,31	0,0587
610	160,58	68,36	0,31	0,0587
620	154,41	67,81	0,21	0,0594
630	143,83	69,38	0,21	0,0582
640	133,74	68,49	0,21	0,0592
650	140,44	67,71	0,21	0,0597
660	126,73	69,08	0,21	0,0592
670	227,74	82,90	14,30	0,0534
680	214,49	80,87	13,51	0,0535
690	204,83	79,95	13,11	0,0543
700	203,16	84,03	12,71	0,0597
710	199,96	81,63	12,31	0,0550
720	196,63	80,15	11,91	0,0539
730	193,50	79,40	11,51	0,0539
740	193,75	79,18	11,11	0,0536
750	194,78	78,78	10,71	0,0521
760	191,10	83,57	10,31	0,0560
770	191,20	80,71	9,91	0,0573
780	190,26	79,43	9,51	0,0561
790	190,67	78,66	9,11	0,0558
800	194,22	78,55	8,71	0,0546
810	190,75	78,33	8,41	0,0536
820	190,69	78,54	8,01	0,0528
830	189,48	81,98	7,61	0,0536
840	190,37	80,58	7,21	0,0560
850	195,55	79,15	6,91	0,0534
860	190,71	79,41	6,51	0,0550
870	189,97	78,41	6,11	0,0565
880	189,82	78,73	5,71	0,0539

890	190,00	80,50	5,41	0,0561
900	193,61	80,74	5,01	0,0528
910	188,42	79,66	4,61	0,0542
920	187,88	78,81	4,21	0,0548
930	188,66	79,79	3,81	0,0555
940	185,67	78,93	3,41	0,0578
950	194,02	81,22	3,01	0,0543
960	188,70	79,31	2,61	0,0558
970	190,79	78,45	2,31	0,0578
980	194,28	78,79	2,01	0,0554
990	195,41	82,17	1,81	0,0553
1000	201,47	81,44	1,61	0,0557
1010	194,92	80,34	1,51	0,0587
1020	194,53	79,84	1,41	0,0550
1030	189,64	79,19	1,30	0,0553
1040	182,51	81,85	1,21	0,0562
1050	177,64	79,20	1,21	0,0604
1060	168,01	77,54	1,11	0,0587
1070	159,27	80,02	1,11	0,0560
1080	153,47	78,88	1,11	0,0578
1090	148,09	76,45	1,01	0,0578
1100	144,94	75,68	1,01	0,0558
1110	136,29	81,72	1,01	0,0578
1120	132,72	76,10	1,01	0,0563
1130	139,65	82,42	1,01	0,0578
1140	119,72	85,34	0,91	0,0548
1150	70,39	74,89	26,53	0,0539
1160	147,44	82,83	26,03	0,0560
1170	172,25	79,81	25,32	0,0543
1180	169,04	77,99	25,02	0,0548
1190	170,05	77,92	24,63	0,0536
1200	170,26	78,46	24,32	0,0546
1210	170,39	77,07	23,92	0,0528
1220	172,55	77,04	23,62	0,0546
1230	169,64	81,66	23,32	0,0553
1240	169,10	79,98	23,02	0,0555
1250	171,45	77,18	22,62	0,0553
1260	170,13	87,33	22,31	0,0547
1270	174,19	80,54	22,02	0,0543
1280	170,59	79,56	21,71	0,0553
1290	170,14	78,88	21,42	0,0546
1300	171,20	77,60	21,11	0,0546
1310	170,91	77,57	20,81	0,0539
1320	172,94	84,50	20,51	0,0526
1330	171,42	79,50	20,21	0,0534
1340	171,85	77,57	19,91	0,0534
1350	172,95	77,26	19,51	0,0536
1360	172,91	78,13	19,21	0,0552
1370	176,11	80,67	18,91	0,0534
1380	172,11	78,26	18,61	0,0539
1390	172,38	78,50	18,31	0,0521
1400	173,09	76,84	17,91	0,0548
1410	172,35	84,39	17,61	0,0535
1420	175,54	79,73	17,31	0,0534
1430	173,34	77,77	17,01	0,0578
1440	173,39	77,13	16,71	0,0544
1450	172,79	83,84	16,41	0,0526
1460	173,62	79,67	16,11	0,0543
1470	176,98	77,56	15,81	0,0534
1480	173,16	78,21	15,61	0,0548
1490	173,47	82,23	15,31	0,0523
1500	173,80	79,05	15,01	0,0539
1510	173,29	78,33	14,81	0,0523
1520	177,10	77,10	14,51	0,0528
1530	173,47	81,47	14,21	0,0546
1540	172,53	79,03	13,91	0,0528
1550	173,66	78,31	13,61	0,0553
1560	174,96	81,51	13,31	0,0528
1570	180,35	79,70	13,01	0,0554
1580	174,14	77,68	12,71	0,0553
1590	173,62	77,01	12,41	0,0536
1600	173,76	82,69	12,11	0,0534
1610	174,32	78,91	11,91	0,0553
1620	182,09	77,36	11,51	0,0538
1630	175,33	85,53	11,21	0,0534
1640	174,62	79,43	11,01	0,0548
1650	175,69	78,40	10,71	0,0535
1660	173,99	84,39	10,41	0,0536
1670	184,02	79,25	10,11	0,0534
1680	176,17	78,27	9,81	0,0549
1690	173,70	85,06	9,51	0,0530
1700	175,91	79,69	9,21	0,0536
1710	176,05	77,46	9,01	0,0575
1720	186,84	87,11	8,71	0,0528
1730	175,91	79,63	8,41	0,0548
1740	173,58	78,36	8,11	0,0534
1750	174,80	86,02	7,91	0,0528
1760	176,24	79,59	7,51	0,0533
1770	191,14	80,71	7,21	0,0553
1780	176,02	85,79	6,91	0,0558
1790	175,59	79,70	6,61	0,0526
1800	175,81	77,90	6,31	0,0558
1810	176,74	85,50	6,01	0,0528

1820	176,54	79,66	5,71	0,0548
1830	176,59	78,30	5,41	0,0543
1840	174,72	85,74	5,11	0,0540
1850	175,49	79,38	4,81	0,0546
1860	174,96	77,89	4,51	0,0519
1870	174,12	85,10	4,31	0,0529
1880	175,41	79,44	3,91	0,0546
1890	176,66	78,25	3,61	0,0528
1900	175,59	82,83	3,41	0,0534
1910	178,54	79,28	3,01	0,0546
1920	178,69	79,13	2,71	0,0543
1930	181,66	82,16	2,51	0,0558
1940	181,76	79,12	2,31	0,0543
1950	183,27	82,18	2,11	0,0526
1960	185,05	81,43	1,91	0,0526
1970	185,23	79,21	1,71	0,0539
1980	185,01	86,11	1,61	0,0553
1990	181,72	80,10	1,51	0,0555
2000	178,26	78,78	1,41	0,0530
2010	173,58	83,11	1,31	0,0528
2020	166,97	78,52	1,31	0,0548
2030	162,42	84,25	1,21	0,0530
2040	153,73	79,80	1,21	0,0554
2050	145,18	76,35	1,21	0,0562
2060	139,06	86,56	1,21	0,0539
2070	133,69	77,72	1,21	0,0553
2080	127,77	81,38	1,11	0,0526
2090	133,24	85,67	1,11	0,0550
2100	132,89	83,82	1,11	0,0558
2110	183,49	79,20	25,61	0,0565
2120	186,02	78,55	25,31	0,0569
2130	183,06	78,80	24,91	0,0578
2140	183,22	79,90	24,51	0,0558
2150	184,38	79,38	24,21	0,0585
2160	183,85	79,80	23,91	0,0560
2170	187,96	77,89	23,51	0,0562
2180	183,06	78,83	23,21	0,0553
2190	181,28	79,38	23,01	0,0558
2200	181,75	78,77	22,61	0,0575
2210	177,28	78,42	22,31	0,0539
2220	179,82	78,03	22,11	0,0539
2230	173,86	78,05	21,91	0,0555
2240	167,81	77,35	21,81	0,0562
2250	165,23	76,98	21,61	0,0558
2260	162,31	76,13	21,41	0,0578
2270	164,32	76,68	21,21	0,0553
2280	159,64	75,85	21,01	0,0575
2290	156,69	79,37	20,81	0,0546
2300	153,63	77,09	20,71	0,0550
2310	148,88	75,71	20,61	0,0568
2320	154,20	75,48	20,41	0,0572
2330	143,94	74,25	20,31	0,0578
2340	143,19	74,31	20,21	0,0587
2350	139,37	78,27	20,11	0,0550
2360	139,62	76,16	20,01	0,0552
2370	144,60	74,97	19,81	0,0578
2380	140,32	74,25	19,71	0,0550
2390	140,11	73,96	19,61	0,0560
2400	136,66	73,92	19,51	0,0543
2410	138,70	76,80	19,31	0,0565
2420	147,50	75,55	19,11	0,0550
2430	141,59	74,74	19,01	0,0575
2440	140,93	73,81	18,81	0,0578
2450	140,41	77,75	18,71	0,0582
2460	140,00	76,18	18,61	0,0560
2470	151,16	75,51	18,41	0,0578
2480	140,16	73,76	18,31	0,0553
2490	138,06	76,92	18,11	0,0548
2500	137,42	76,07	18,01	0,0573
2510	136,25	73,74	17,91	0,0555
2520	147,86	74,49	17,71	0,0578
2530	139,54	77,62	17,61	0,0574
2540	139,45	74,72	17,41	0,0585
2550	138,06	73,22	17,31	0,0566
2560	138,29	80,64	17,21	0,0585
2570	145,17	76,71	17,01	0,0575
2580	141,34	73,91	16,81	0,0592
2590	138,71	79,96	16,71	0,0560
2600	135,26	75,77	16,61	0,0560
2610	136,57	74,27	16,51	0,0565
2620	136,32	74,63	16,31	0,0582
2630	141,87	77,62	16,11	0,0578
2640	140,41	75,06	16,01	0,0575
2650	138,76	73,83	15,91	0,0577
2660	137,99	79,84	15,71	0,0572
2670	138,07	75,17	15,61	0,0597
2680	140,43	74,07	15,41	0,0591
2690	138,85	80,11	15,31	0,0550
2700	136,05	75,95	15,21	0,0549
2710	136,09	74,52	15,11	0,0575
2720	132,28	75,38	15,01	0,0552
2730	138,97	77,11	14,81	0,0560
2740	139,85	74,53	14,61	0,0592

2750	139,51	75,53	14,51	0,0576
2760	139,23	77,33	14,31	0,0572
2770	138,10	74,51	14,21	0,0552
2780	143,33	75,09	14,01	0,0578
2790	142,23	77,85	13,81	0,0583
2800	143,48	74,85	13,71	0,0578
2810	143,29	76,47	13,51	0,0572
2820	143,89	77,71	13,31	0,0575
2830	149,83	75,18	13,11	0,0578
2840	147,64	77,94	12,91	0,0575
2850	146,82	77,42	12,81	0,0590
2860	147,34	74,78	12,61	0,0594
2870	144,65	79,93	12,51	0,0592
2880	150,11	77,07	12,31	0,0590
2890	146,84	75,25	12,11	0,0591
2900	145,73	81,30	12,01	0,0594
2910	142,48	76,51	11,81	0,0582
2920	144,42	74,72	11,71	0,0604
2930	148,60	82,72	11,51	0,0567
2940	144,90	76,00	11,31	0,0585
2950	141,31	74,08	11,21	0,0590
2960	140,51	81,02	11,11	0,0562
2970	141,04	75,32	10,91	0,0582
2980	146,95	75,19	10,81	0,0565
2990	141,60	78,74	10,71	0,0575
3000	137,37	74,50	10,61	0,0600
3010	137,87	78,54	10,41	0,0578
3020	136,55	76,57	10,31	0,0578
3030	147,02	74,31	10,11	0,0588
3040	142,78	83,22	9,91	0,0587
3050	142,39	75,60	9,81	0,0575
3060	249,18	89,10	9,41	0,0582
3070	216,07	94,35	9,31	0,0580
3080	178,19	85,68	9,31	0,0575
3090	154,07	87,60	9,31	0,0546
3100	135,24	85,17	9,31	0,0558
3110	120,14	80,24	9,41	0,0553
3120	108,12	77,06	10,31	0,0645
3130	200,30	81,53	9,61	0,0667
3140	197,24	79,49	9,11	0,0652
3150	187,81	78,91	8,72	0,0656
3160	186,73	78,13	8,41	0,0658
3170	189,01	77,69	8,01	0,0657

APPENDIX 5 : Participants

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

Sébastien Boulais
Technicien
Services Polytests inc.
450.741.3636
www.polytests.com

APPENDIX 6: Drawings and specifications

APPENDIX 7: Operator's manual

USE AND MAINTENANCE MANUAL

RAVELLI
il fuoco intelligente

Stoves with RDS technology

Francesca - RV 80 Ceramica
Nicole - RV 100 Classic - Roma

US
Energy Verified

SAVE THESE INSTRUCTIONS

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.
Contact local building or fire officials about restrictions and installation inspection requirements in your area.
Contact local authorities to see if a permit must be obtained before installation.

ASTM E 1509-12 • UL 1482 - 11 • ULC S627-00 • Oregon Administration Rules 814-23-909 • Mobile Home Approved

SUMMARY

INTRODUCTION

Please read this manual carefully. It describes all the phases necessary for perfect functioning of the stove.

The regulations on installation and operation in this manual may differ from the regulations in force locally. In this case, the indications of the competent local authorities must always be followed. The drawings shown in this manual are indicative and not to scale.

Information

The packaging that we have used offers good protection against any damage due to transport. Always check the stove immediately after delivery: in the event of any damage, please inform your Ravelli dealer immediately.

Description of use and maintenance manual

With this use and maintenance manual, Ravelli wishes to provide the user with all the information on safety in using the stove, in order to avoid damage to persons or things or parts of the stove. Please read this manual carefully before use and any work on the product.

WARNINGS

Ravelli stoves are manufactured taking care even on the individual components in order to protect both the user and the installer from any accidents.
The authorized personnel, after any work on the product, should therefore always pay special attention to the electrical connections.
Installation must be performed by authorized personnel, who must give the purchaser a declaration of conformity of the appliance, and who will assume all responsibility for the final installation and consequent good functioning of the product installed. It is also necessary to take into consideration all the laws and national, regional, provincial and local regulations present in the country in which the appliance has been installed. In the event of failure to respect these precautions, Aico S.p.A. declines all responsibility.
This instruction manual is an integral part of the product: please make sure that it is always with the stove, including in the case of transfer to another owner or user, or transfer to another place. In the case of its damage or loss, please request another copy from the Technical service.
This stove must be used for the purpose for which it has been specifically manufactured. Do not use the appliance as an incinerator or in any way other than that for which it was designed. All contractual and tort responsibility of the manufacturer is excluded for damage caused to persons, animals or things, due to errors of installation, maintenance regulation or improper use. No other fuel except the pellets must be used. Do not use liquid fuels.
After having removed the packaging, please make sure that the contents are complete and intact.
All the electrical components that make up the stove must be replaced with original spare parts exclusively from an authorized technical assistance centre.
Maintenance of the stove must be performed at least once a year, planning it in time with the technical assistance centre.
Do not make any unauthorized modification to the appliance.

For safety reasons, please remember that:
- the stove must not be used by children or disabled people without assistance;
- do not touch the stove when barefoot or when any parts of the body are wet;
- the safety devices or adjustment devices must not be modified without the authorization or instructions of Ravelli.

The stove, especially the external surfaces, reaches very high temperatures when it is in operation; take care when touching it to avoid burns.

The stove has been designed to function in any climatic condition; in the event of particularly adverse conditions (wind, freezing), safety systems could switch off the stove.
If this occurs, contact the technical assistance and, in any case, do not disable the safety systems.

THANK YOU

Dear Customer,
We would like to thank you and congratulate you on the excellent choice you have made.
With the Ravelli stove, you will see that quality and economy can go hand in hand, offering excellent performances with limited consumption and being totally practical. Please find below some suggestions, which we would like to give you, to obtain the most from your stove and to fully enjoy all the advantages that it can give you.
Through this, we want to be close to our customers to offer the maximum technical support to all those who use our technology.

Aico S.p.A. thanks you for your confidence
and wishes you happy times in the company
of your pellet stove.

SAFETY INFORMATION

The stove must be installed and tested by specialized personnel instructed by the Ravelli. Please read this use and maintenance manual before installing and putting the stove into operation!
If you require further information, please contact your Ravelli dealer.

IMPORTANT
The place of installation of the stove must comply with local, national and Federal regulations.
The stove must be fuelled only with quality pellets with a diameter of 6 mm as described in the specific chapter.
The stove cannot operate with traditional wood
The stove must not be used as an incinerator. FIRE HAZARD!!!
Installation, the electrical connections, checking the functioning and maintenance must be performed by qualified and authorized personnel.
Improper installation or poor maintenance (not compliant with what is shown in the following manual) may cause damage to persons and things. In this condition, Ravelli is relieved of all civil or criminal responsibility.
Before connecting the stove electrically, the connection of the exhaust tubes must be completed (specifically for pellet stoves, not made from aluminium) with the flue.
The protection grille inside the pellet hopper must never be removed.
There must be sufficient circulation of air in the room where the stove is installed.
Never open the door of the stove whilst it is functioning. FIRE HAZARD!!!
The stove must not be used with the door open or with the glass broken. FIRE HAZARD!!!
When the stove is operating, the surfaces, the glass, the handle and the pipes become overheated: during functioning, these parts must only be touched with the adequate protection.
Do not light the stove without having first performed the daily inspection as described in the MAINTENANCE chapter of this manual.
Do not place any washing on the stove to dry. Keep clothes and similar at a suitable distance from the stove. FIRE HAZARD!!!
DO NOT USE CHEMICALS OR FLUIDS TO START THE FIRE.
DO NOT BURN GARBAGE OR FLAMMABLE FLUIDS SUCH AS GASOLINE, NAPHTHA OR ENGINE OIL.
DO NOT INSTALL A FLUE DAMPER.
DO NOT CONNECT THIS UNIT TO A CHIMNEY FLUE SERVING ANOTHER APPLIANCE.
Attachment and securement of the exhaust venting system to the product and to each adjoining section. All joints for connector pipe shall be required to be fastened with at least three screws. If vented horizontally, joints shall be made gaslight in a manner that shall be specified.
Perform regular inspection, maintenance, and cleaning of the chimney and chimney connector
Disposal of Ashes: Ashes should be placed in a metal container with a tight fitting lid. The closed container of ashes should be placed on a non-combustible floor or on the ground, well away from all combustible materials, and moved outdoors immediately. 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. Other waste shall not be placed in this container.
Caution against the storage or use of flammable liquids, as follows: Never use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter fluid, or similar liquids to start or 'freshen up' a fire in this heater. Keep all such liquids well away from the heater while it is in use.
Creosote - Formation and Need for Removal
When wood is burned slowly, it produces tar and other organic vapors, which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue of a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited this creosote makes an extremely hot fire
The exhaust venting system should be inspected at least once every two months during the heating season to determine if a creosote buildup has occurred.
If creosote has accumulated it should be removed to reduce the risk of a chimney fire.
Scrupulously follow the maintenance programme.
Do not switch off the stove by disconnecting the electricity mains supply.
Do not clean the stove until the structure and the ashes have cooled down completely.
Carry out all operations in maximum safety and tranquillity.
Coply with exhaust venting system termination requirements including location restrictions to air inlets, distances from windows, doors, and air inlets and distance to combustible materials.
DO NOT CONNECT TO OR USE IN CONJUNCTION WITH ANY AIR DISTRIBUTION DUCTWORK UNLESS SPECIFICALLY APPROVED FOR SUCH INSTALLATIONS.
Hot while in operation. Keep children, clothing and furniture away. Contact may cause skin burns.
The type of chimney shall be suitable for solid fuel and the chimney connector must be in good condition and kept clean.
Establish a routine for the fuel, pellet burner and fring technique. Check daily for creosote build-up until experience shows how often you need to clean to be safe. Be aware that the hotter the fire the less creosote is deposited and weekly cleaning may be necessary in mild weather even though monthly cleaning may be enough in the coldest months. Contact your local or fire authority for information on how to handle a chimney fire. Have a clearly understood plan to handle a chimney fire.
Keep firing and deashing doors closed and maintain all seals in good conditions.
Do not strike or slam shut the door, the glass can brake. The glass shall be cleaned only when cold, do not clean a hot glass.
Use a dry cloth with normal glass detergent, do not use any abrasive cleaner.
The type of chimney shall be suitable for solid fuel and the chimney connector must be in good condition and kept clean.
When this room heater is not properly installed, a house fire may result. To reduce the risk of fire, follow the installation

instructions. Contact local building or fire officials about restrictions and installation inspection requirements in your area. This room heater must be connected to a chimney complying with the requirements for type L pellet vent listed to UL641 or CAN/ULC S609 or a code-approved masonry chimney with a flue liner.
This wood heater needs periodic inspection and repair for proper operation. It is against federal regulations to operate this wood heater in a manner inconsistent with operating instructions in this manual. - This wood heater has a manufacturer-set minimum low burn rate that must not be altered. It is against federal regulations to alter this setting or otherwise operate this wood heater in a manner inconsistent with operating instructions in this manual.
This heater is designed to burn wood pellet only. DO NOT BURN ANY OTHER FUEL. Burning other materials may result in release of toxic fumes or render the heater ineffective and cause smoke.
Do not overfire. Attempts to achieve heat output rates that exceed heater design specifications can result in permanent damage to the heater.
Flues gases contain carbon monoxide (CO), it is recommended to install smoke monitors and CO monitors for areas that are expected to generated CO. Inspect 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.

GENERAL

The Stove must only operate in rooms. As it is controlled by an electronic board, combustion is completely automatic and controlled and the control unit regulates the ignition phase, 5 levels of power and the switching off phase, guaranteeing safe functioning.
Most of the ashes produced by the combustion of the pellets fall into the collection drawer.
However, always check the fire pot every day, as not all pellets have high standards of quality and could leave residue that is difficult to remove.
The glass has a special air circulation for self-cleaning. However, a slight greyish film cannot be avoided after a few hours of functioning.
As already mentioned earlier, pellets with a diameter of 6 mm must be used with the stove.

Responsibility

Ravelli declines all responsibility, both civil and criminal, with the delivery of this manual, for any accidents deriving from partial or total failure to observe the instructions it contains,
Ravelli declines all responsibility deriving from the improper use of the stove, from its incorrect use by the user, by unauthorized modifications and/or repairs or from the use of spare parts which are not original.
The manufacturer declines all direct civil or criminal responsibility due to:

- poor maintenance
- failure to observe the instructions in the manual
- use not compliant with the safety instructions
- installation that is not compliant with the regulations in force in the country.
- installation by personnel who are not qualified or authorized
- modifications and repairs that are not authorized by the manufacturer
- use of spare parts that are not original
- exceptional events

Majolica finishes

Due to the special hand finish of the majolica surface imperfections such as shadowing my accour .Those are details that make every

majolica one of its kind. As it is a delicate material, please handle with care whilst cleaning and avoid blows as sudden breakage may occur. Please also take care when loading the hopper (Ed.'s note; tank containing the pellets) with the bag of pellets: do not place it on the stove!

What are the wood pellets

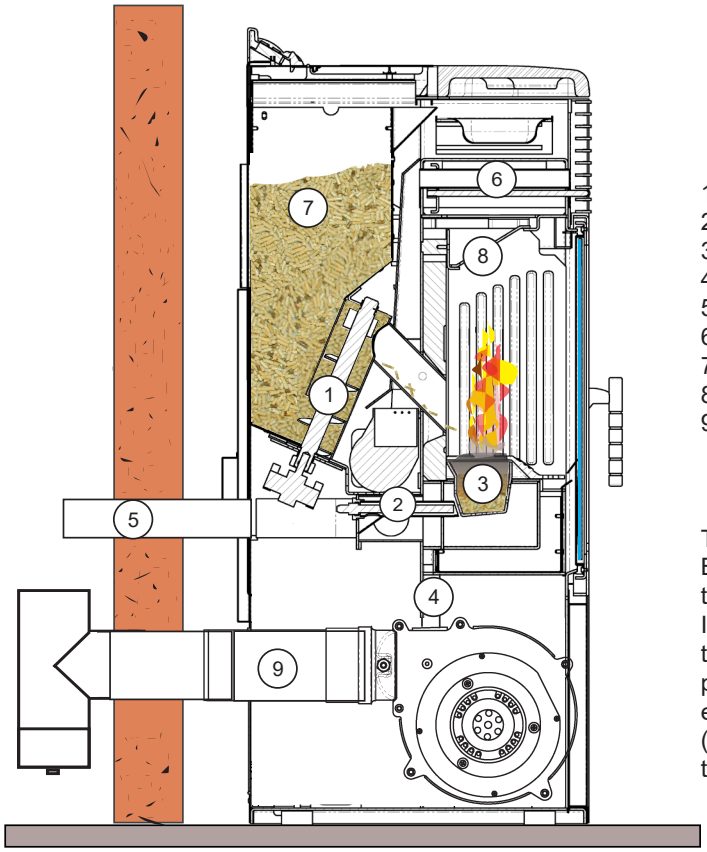
The wood pellets are made from sawdust and wood shavings produced in joiners' shops. The material used cannot contain any foreign substance such as glue, varnish or synthetic substances.
Subjecting it to high pressure, the wood is pressed through a plate with holes and due to the high pressure the sawdust is heated activating the natural binders of the wood. Thus, the pellets keep their shape even without the addition of bonding substances. The density of the wood pellet varies according to the type of wood and can be 1.5 – twice greater than that of natural wood.
The diameter of the cylindrical rods is 6 mm and their length can vary between 10 and 40 mm.
Their real weight is greather than 650 kg/m^3. Due to the low content of water (<10%) they have a high energy content.
The standards ISO 17225-2:2014 define the quality of the pellets:

Length: < 40 mm
Diameter: 6 mm approx.
Real weight: > 600 kg/m3
Lower heating value: ≥ 16,5 MJ/kg (≥ 7100 BTU/lb)
Residual humidity: < 10 %
Ashes: < 1.2 %
Specific weight: >1000 kg/m3

Do not put the bag of pellets on the ceramic parts during the loading operations.

The pellets must be transported and stored in a dry place. They swell on contact with damp, and cannot be used, They must always be protected from the damp both during transport and in storage. Do not place such fuel within the space heater installation clearances or within the space required for charging and ash removal.

The components of the stove



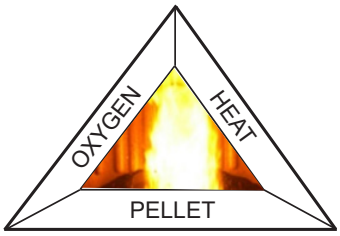
1) pellet loading auger
2) electrical igniter
3) combustion fire pot
4) tube for passage of smoke
5) air intake tube
6) stainless steel heat exchanger
7) pellet hopper
8) baffle
9) smoke exhaust tube

This drawing shows the internal parts of a pellet stove.
By filling the hopper (7), the pellets are loaded into the fire pot (3) through the loading auger (1).
Ignition is by means of the electrical igniter (2), which overheats the air from the special entrance (5) which on contact with the pellets will allow the development of the flame. At this point the exhaust smoke is deviated towards the stainless steel exchanger (6) and through the smoke extraction tube (4) it is released into the flue, through the connection with the smoke exhaust pipe. (9).

The combustion

The combustion is a chemical reaction between fuel and oxidizer. The result of this reaction is the heat.
The three elements that are required for the combustion are:

- Fuel (pellet)
- Oxidizer (oxygen available in the air)
- Ignition (heat of embers or electrical ignitor)



To get the combustion, the combustible and the carburant must be available in a correct proportion.

The reaction between combustible and carburant is made by an external starter. The start can be made by the hot reaction or by a sparkle.
The combustion is NOT CORRECT, the flame is too tight with too much incandescent pellet in the fire pot.
Adjust the Set pellet/air reducing the air percentage (from 0 up to -5); in the vent this is not enough to get a proper flame, increase the loading quantity of the pellet (from 0 up to +5) to reach the flame condition shown in picture 3.

Pic. 1

INCORRECT combustion, flame too drawn, in “blowtorch” style with a high quality of incandescent pellets coming out of the grate. Correct the pellet/air set by reducing the percentage of air (from 0 to -5); if not sufficient, also increase the percentage of falling pellets (from 0 to +5) to arrive to the condition in Figure 3.
If the changes made to the settings do not bring the stove to the right combustion conditions in Figure 3, contact the Technical Support Centre.

Pic. 2

INCORRECT combustion, “spring” flame in “wood stove” style with high quantity of pellets not burning on the grate. Firstly, check the door is closed and the ash pan. Secondly, correct the pellet/air set by increasing the percentage of air (from 0 to +5); if not sufficient, also reduce the percentage of falling pellets (from 0 to -5) to arrive to the condition in Figure 3.
If the changes made to the settings do not bring the stove to the right combustion conditions in Figure 3, contact the Technical Support Centre.

Pic. 3

The combustion IS CORRECT, full flame yellow/white and minimum quantity of pellet in the fire pot.
The combustion if fine and no ad.

The picture 3 show a flame done with a stove working at power P5.

Compliance status

This manual describes the installation and operation of the Ravelli, Francesca 2015, Nicole, RV80 Ceramica wood pellet heater. This heaters meet the 2020 U.S. Environmental Protection Agency's wood pellet emission limits for wood heaters sold after May 15th 2015. Under specific test conditions this heater has been shown to deliver heat at rates ranging from 11695 to 28231 Btu/hr.
This manual describes the installation and operation of the Ravelli, Roma wood pellet fireplace insert. This heater meets the 2020 U.S. Environmental Protection Agency's wood pellet emission limits for wood heaters sold after May 15th 2015. Under specific test conditions this heater has been shown to deliver heat at rates ranging from 10250 to 31500 Btu/hr.
This manual describes the installation and operation of the Ravelli, RV100 CLASSIC wood pellet heater. This heaters meet the 2020 U.S. Environmental Protection Agency's wood pellet emission limits for wood heaters sold after May 15th 2015. Under specific test conditions this heater has been shown to deliver heat at rates ranging from 10750 to 34500 Btu/hr.

	Emission Rate (g/hr)	Heating Efficiency (% Overall)	1st hour Emission Rate (g/hr)	CO emission gr/hr
Francesca 2015, Nicole and RV80 Ceramica	1.00	80.73%	1.09	6.24
RV100 Classic	0.7	80.2%	0.67	2.72
Roma	0.74	75.5%	1.33	9.45

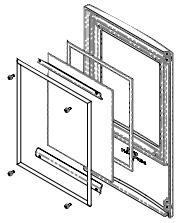
Spare parts

Use original spare parts only. Do not use any substitute material. Do not wait for the components to be worn before replacing them. Replace a worn component before it is completely broken to prevent any accidents caused by the sudden breakage of components, perform the periodic maintenance checks as described in the dedicated chapter. Removal of broken or damaged components shall be only done by authorized technical service.

Glass and gasket replacement

Use only ceramic type glass. To replace the glass the door needs to be disassembled according to the below drawing.

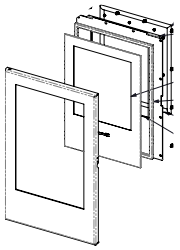
Francesca 2015 - Nicole



Ceramic glass dimensions:
250 x 307 mm (9.8'' x 12.08'')
thickness 4mm (0.16'')

Glass twist tricovet gasket:
diam. 10 mm / 0.39"
L1230 mm / 48.43"

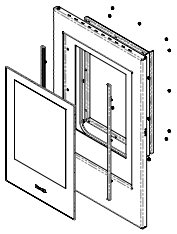
RV 80 Ceramica



Ceramic glass dimensions:
305 x 449 mm (12 '' x 17.68'')
thickness 4mm (0.16'')

Glass twist tricovet gasket:
diam. 14 mm / 0.55"
L1250 mm /49.21"

RV 100 Classic

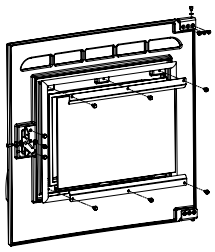


Ceramic glass dimensions:
319 x 460 mm (12.55'' x 18.11'')
thickness 5 mm (0.20'')

Glass ribbon trecotee gasket:
10 mm x 3 mm (0.39" x 0.12")
L1344 mm (52.91")

Door tricovet gasket:
diam. 14 mm / 0.55"
L1365 mm / 53.77"

Roma



Ceramic glass dimensions:
260 x 375 mm (10.24'' x 14.76'')
thickness 5mm (0.20'')

Glass ribbon trecotee gasket:
10 mm x 3 mm (0.39" x 0.12")
L1100 mm (43.31")

Door tricovet gasket:
diam. 10 mm / 0.39"
L1500 mm / 59.06"

SAFETY DEVICES

The stove is fitted with sophisticated safety systems so that, in the case of breakage of one of the individual parts or defects in the

flue, no damage will be caused to the stove and the room in which it is installed. In any case, when a problem arises, the pellets stop falling immediately and the " switch off " phase is activated.
The corresponding alarm will be shown on the display. The details can be seen in chapter 9 "DESCRIPTION OF ALARMS".

TECHNICAL FEATURES

		Francesca 2015	Nicole	RV 80 Ceramica	RV 100 Classic	Roma
Height	Inch	37.67	36.8	39	44.1	31.5
Width	Inch	17.32	17.4	20.20	21.7	43.4
Depth	Inch	18.46	19.6	19.1	21.9	29.5
Weight	Lbs	200	253	270	320	550
Diameter of smoke exit tube	Inch	3.14	3.14	3.14	3.14	3.14
Min - max hourly consumption of pellets	Lbs/h	1.7 - 4.3	1.7 - 4.3	1.7 - 4.3	1.5 - 5.1	1.6 - 5
Supply	V - Hz	120 - 60	120 - 60	120 - 60	120 - 60	120 - 60
Hopper capacity	Lbs	35	35	35	50	50
Efficiency *	%	80.73	80.73	80.73	80.2	75.5
Smoke temperature min - max	°F	176 - 302	176 - 302	176 - 302	200 - 415	240 - 410

*overll heating efficiency is determined using higher heating value of the fuel. To achieve the declared efficiency the stove should be placed in the main living area. Basament or other external locations will negatively affect efficiency.

The data shown above are indicative and not binding. Ravelli reserves the right to make any modifications for the purpose of improving the performances of the product.

POSITIONING, ASSEMBLY AND INSTALLATION

Environment of use

The positioning of the stove is decisive for a successful and equal heating of the room. Before deciding where to place the stove, the following must be taken into account:
- The stove must be installed on a floor with a sufficient carrying capacity. If the existing building does not meet this requisite, appropriate measures must be taken (i.e. load distribution plate).
- The combustion air cannot be obtained from a garage or from an area without ventilation or exchange of air, but from a free or external space
- The stove must not be installed in a bedroom, bathroom or shower, or where there is already another heating appliance without an autonomous air flow (chimney, stove etc.)
- A non-combustable Hearth board 6” from front of unit and 6” from the sides must be installed before unit is placed on the floor.
- Installation is better in a large and central room in the house to ensure maximum circulation of the heat;
- Connection to the main supply is recommended using a grounded outlet (if the cable supplied is not long enough to reach the nearest outlet, use an extension cord with a surge protector);
- The stove must be placed in a position that receives the necessary level of air for appropriate combustion of the pellets (at least 131.23 f^3/h must be available), in accordance with installation regulation and local legislations;
- All joints for connector pipe is required to be fastened with at least three screws.
- If vented horizontally joint should be siliconed with hi-temp. silicone and screwed so they are gas tight. (RTU 500 silicone)
- the chimney connector shall not pass through an attic or roof space, closet or similar conceald space, or a floor or ceiling. Where passage through a wal, or partition of combustible construction is desired, the installationshall conform to CAN/CSA-B365.

The stove must be installed and assembled by qualified personnel.
The room must be:
- Prepared for the environmental functioning conditions
- Prepared with an adequate system of evacuation of smoke
- Have a 120V 60 Hz electricity mains supply
- Do not connect this unit to a chimney flue serving another appliance
- Use only UL Listed Type L Vent or Pellet Vent 3” in. I.D. venting system to exhaust. Do not install flue damper in the exhaust system of this unit.
- The chimney connector and each other adjoining section must be firmly attached and secured to the stove.
- Do not install the chimney directly at the outlet of the appliance. A chimney connector (flue pipe) is required unless the appliance is specifically approved for that type of installation.
- It is important to use all the specified components, do not use other components.
- “In Canada, to comply with CSA B365, Installation Code for Solid-Fuel-Burning Appliances and Equipment, any combustible covering beneath the appliance and/or within the area extending horizontally at least 450 mm (18 in) beyond the appliance on any side equipped with a door, and at least 200 mm (8 in) beyond the appliance on other sides, shall be protected by a continuous, durable, non-combustible pad that will provide ember protection. The 450 mm (18 in) ember protection required on any side with a door shall extend for the full width of the appliance plus the 200 mm (8 in) required on each side of the appliance without a door. Where an appliance is installed less than 200 mm (8 in) from a wall,
the ember pad need only extend to the base of the wall. An ember pad shall not be placed on top of a carpet unless the pad is structurally supported to prevent displacement and distortion”.
- Specification of the chimney as a CAN/ULC-S609 listed.

Mobile Home Requirements

- Outside air is required
- The heater must be secured to the floor using lag bolts.
- The heater must be grounded to the chassis of the mobile home.
- Installation should be in accordance with the manufactured home.
- When outside air is required, system parts, such as vent sections, supports, spark arresters, rodent screens, etc. must be used.
- The space heater is to be connected to a type L pellet vent conforming to CAN/ULC S609 or UL641.
- Installation shall maintain an effective vapour barrier at the location where the chimney or other component penetrates to the exterior of the structure.
- Operating the space heater with open firing doors can cause serious injuries and health damages due to excaping flames or carbon monoxide generation inside the room.
- Adequate ventilation is required to avoid air starvation and icing which can determine an unhealthy indoor environment.
- Do not overfire.
- If the space heater is not correctly installed and operated it can interfere with smoke detectors.
- Where the space heater is installed in a transportable building, removal of the chimney for transportation of the building.

Do not install in bedroom

The structural integrity of the mobile home floor, ceiling, walls, roof must be maintained.

Refer to HUD Requirements, CFR 3280, Part 24

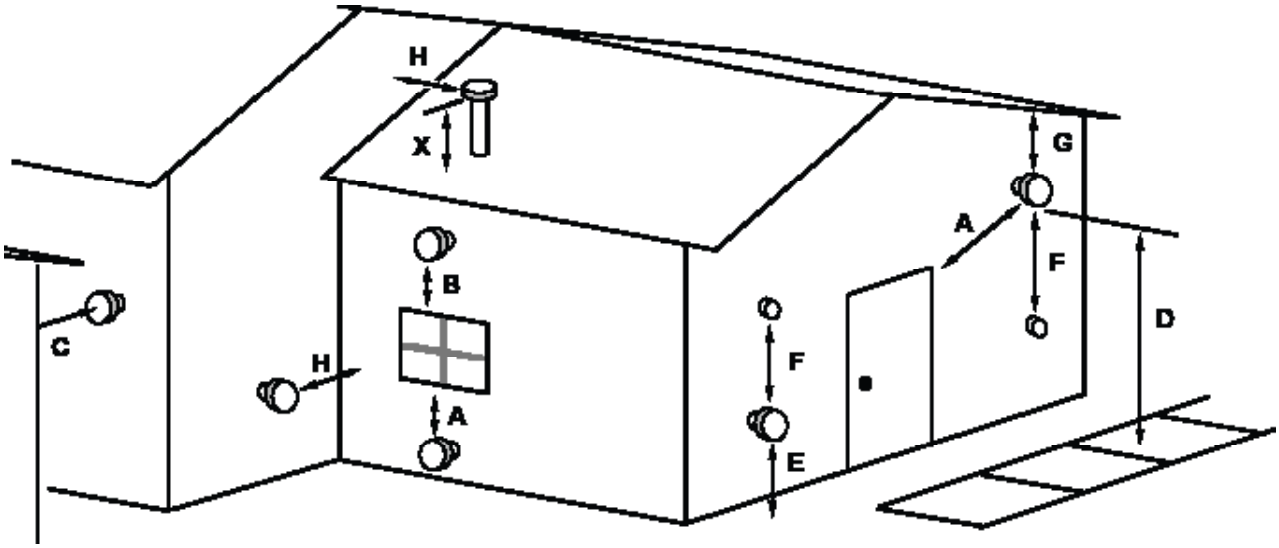
Install vent at clearances specified by the vent manufactures.

Measure clearances to the nearest edge of the exhaust hood.

Vent may not terminate in covered walkway or breezeway.

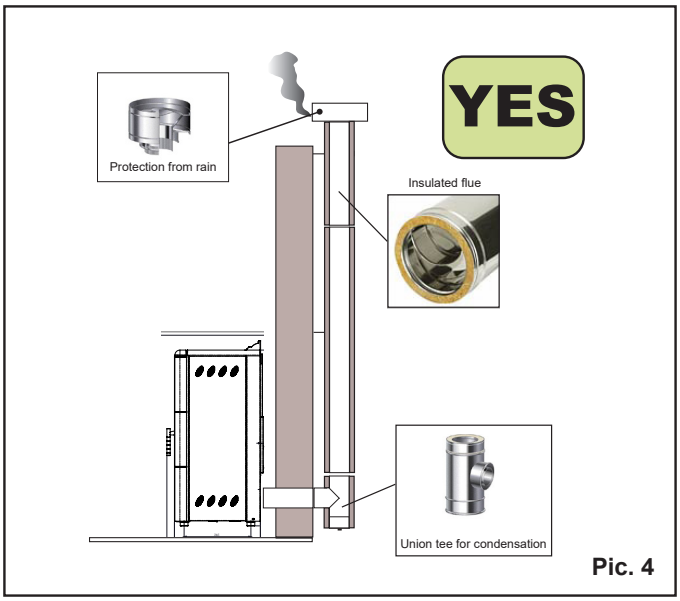
If venting horizontally, check your venting specifications for distance pipe should extrude from building.

Vent Termination Locations

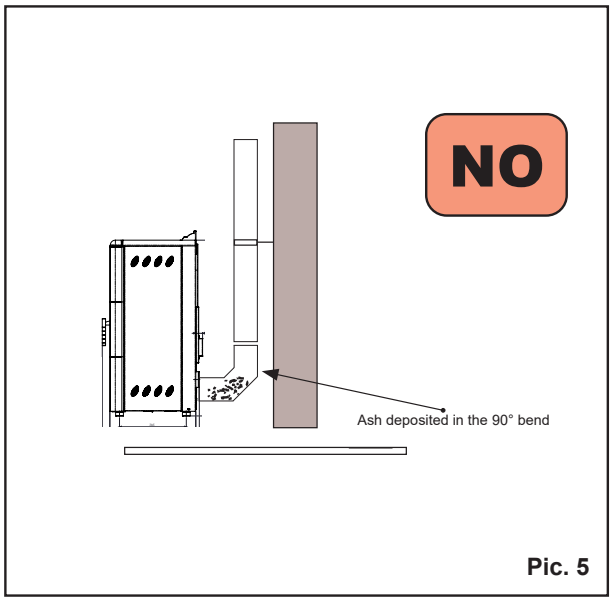


A) Minimum 4’ clearance below or beside any door or window that opens (with outside air installed, 1’ below or beside)
Minimum 1’ clearance below or beside any window that does not open.
B) Minimum 1’ clearance above any door or window that opens
C) Minimum 2’ clearance from any adjacent building
D) Minimum 7’ clearance above any grade when adjacent to public walkways
E) Minimum 2’ clearance above any grass, plants, or other combustible materials
F) Minimum 3’ clearance from any forced air intake of any other appliance
G) Minimum 2’ clearance below eaves or overhangs
H) Minimum 1’ clearance horizontally from combustible wall
X) Must be a minimum of 2’ above the roof ridge

Examples of installation

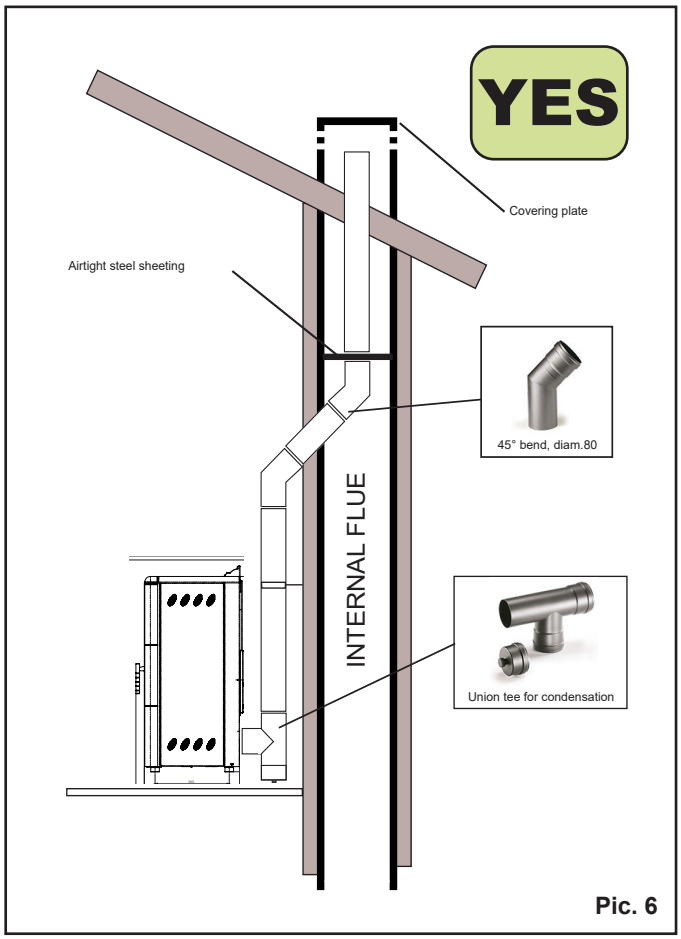


Pic. 4



Pic. 5

This type of installation (see Pic. 4) requires an insulated flue, as all the smoke pipe has been installed outside the house.
In the lower part of the flue, a union tee has been mounted with an inspection cap.
A 90° bend should not be installed as the first initial piece as the ashes would quickly obstruct the passage of smoke, causing problems for the draught of the flue. (See Pic. 5).



Pic. 6

This type of installation (se Pic. 6) does not require an insulated flue as the smoke tube has been assembled partly inside the house and partly inside an existing flue.
In the lower part of the flue a union tee has been installed with a peephole cap.
A 90° bend should not be installed as the first piece, as the ash would quickly block the passage of smoke, causing problems for the draught of the flue (See Pic. 5).
Please note the use of 2 45° bends, to guarantee that the ash falls in the union tee with a peephole.

Determining Size of Pipe to install

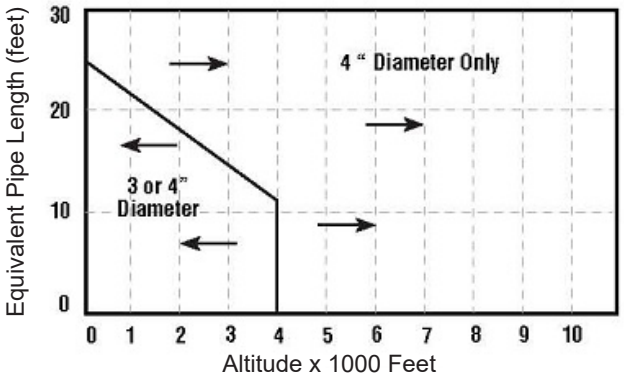
To determine the diameter of pipe to use (3"or 4"), you can use the following guidelines.

Fillout the installation chart (table 1), and calculate your total equivalent pipe length.
Then use the total equivalent pipe length and the altitude in the pipe selection chart. (Pic. 7) to determine if your installation requires 3" or 4" exhaust pipe.

Table 1 - Installation chart

Type of Pipe	# of Elbows or Feet of Pipe		Equivalent
90° Elbows/ Tee (A & G)		x	5 feet (1.5 m)
45° Elbows (C)		x	3 feet (1.0 m)
Horizontal (B & F)		x	1 feet (0.3 m)
Vertical (E)		x	0.5 feet (0.15 m)

Pic. 7 - Pipe Selection Chart



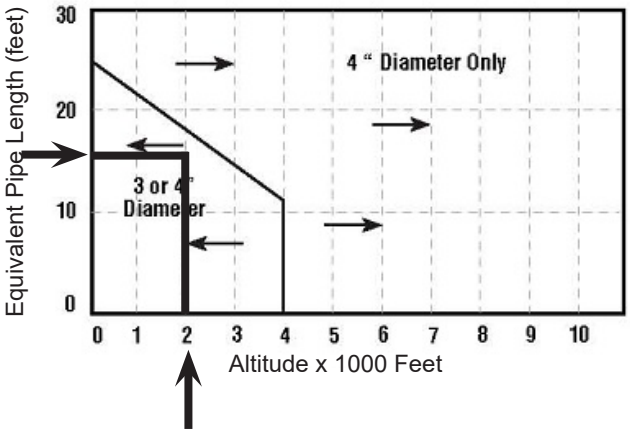
Sample installation chart

Type of Pipe	# of Elbows or Feet of Pipe		Equivalent	Total Equivalent
90° Elbows/ Tee (A & G)	2	x	5 feet (1.5 m)	10 feet (3.0 m)
45° Elbows (C)	1	x	3 feet (1.0 m)	3 feet (1.0 m)
Horizontal (B & F)	3	x	1 feet (0.3 m)	1 feet (1,0 m)
Vertical (E)	8	x	0.5 feet (0.15m)	1 feet (1,2 m)

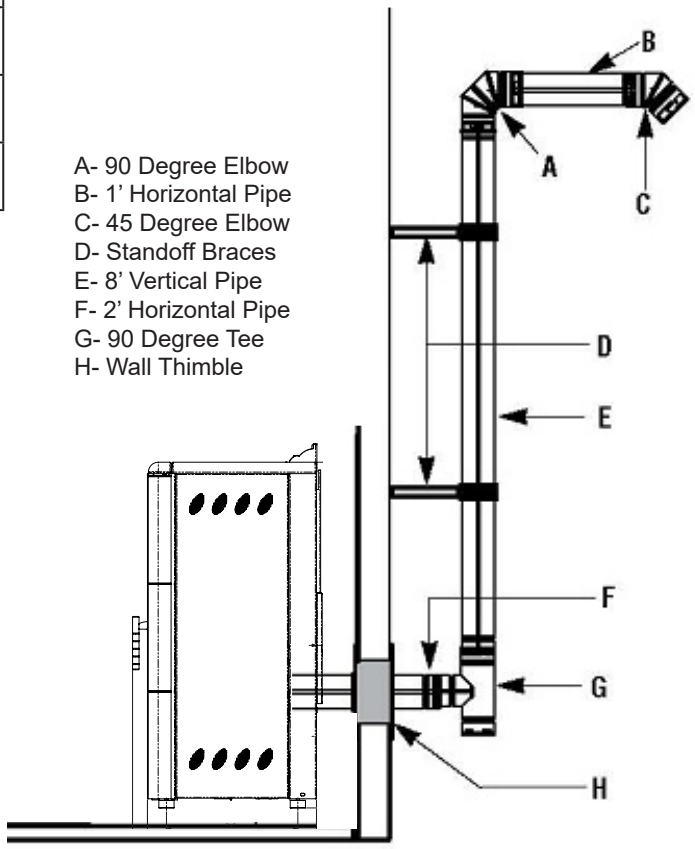
Table 2 - Sample chart for Pic. 8

Equivalent pipe lenght = (10 + 3 + 1 + 1) ft = 15 ft

If the stove is installed in a place with an altitude of 2000 ft, it is possible to use either a pipe of 3" or of 4", as you can see in the pipe selection chart below.



A- 90 Degree Elbow
B- 1' Horizontal Pipe
C- 45 Degree Elbow
D- Standoff Braces
E- 8' Vertical Pipe
F- 2' Horizontal Pipe
G- 90 Degree Tee
H- Wall Thimble

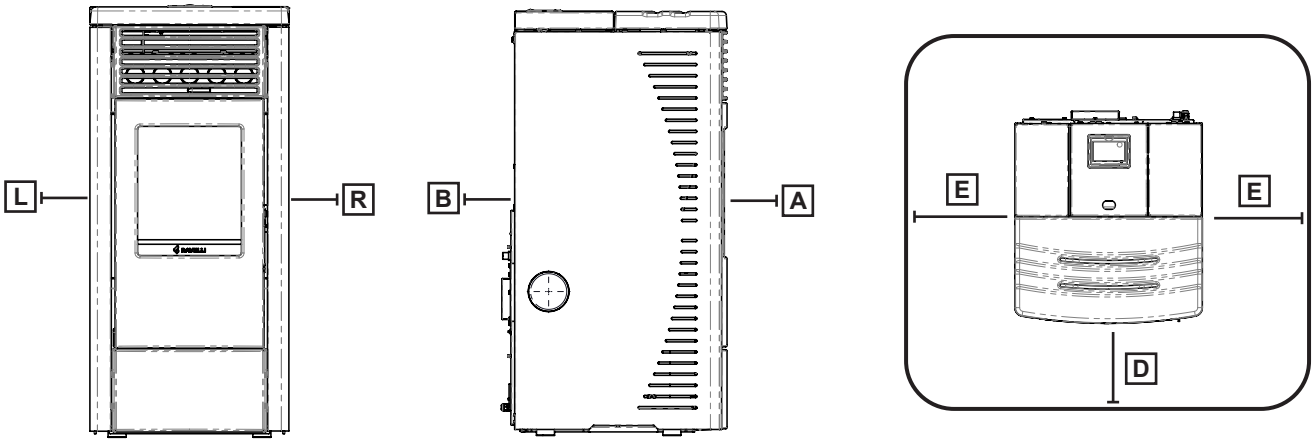


Pic. 8 - See sample installation chart

The vent pipe can be a minimum of 2 feet and a maximum of 45 feet long.

Minimum distance from combustible material

For Francesca 2015, Nicole, Rv80 ceramica, Rv100 classic

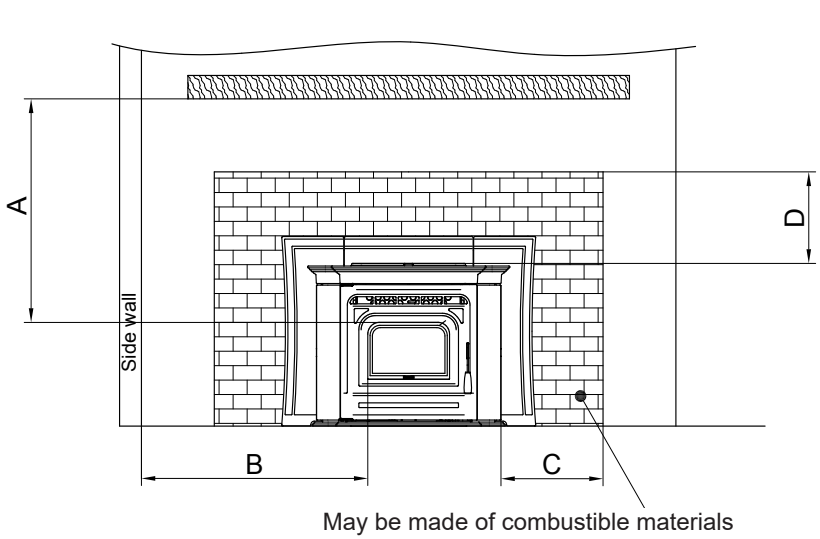


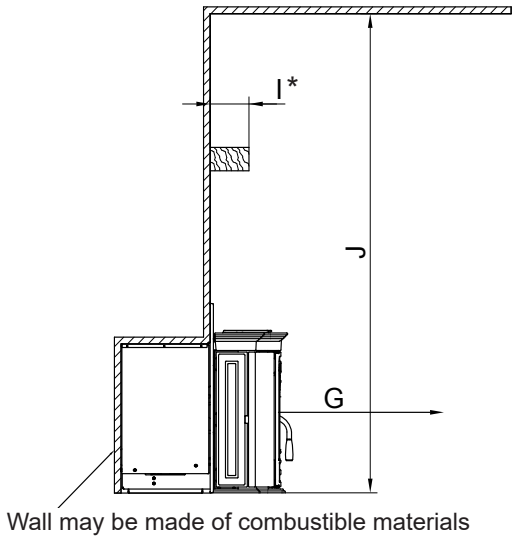
NOTE: Install vent at clearances specified by the vent manufactures.

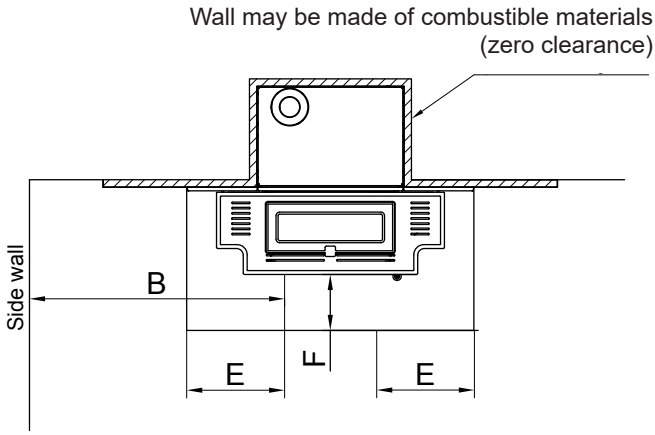
	STANDARD INSTALLATION					ALCOVE INSTALLATION			FLOOR PROTECTION	
	Side wall from stove (R, L)	Rear side wall from stove (B)	Front side (A)	Ceiling from floor (F)	Corner from stove	Side wall from stove	Rear side wall from stove	Ceiling from floor	Front (D)	Side (E)
Unit of measurement	Inch / mm	Inch / mm	Inch / mm	Inch / mm	Inch / mm	Inch / mm	Inch / mm	Inch / mm	Inch / mm	Inch / mm
Francesca, Nicole, RV 80 Ceramica	4 / 102	2 / 51	40 / 1000	84 / 2134	4 / 102	6 / 152	10 / 254	57 / 1450	6 / 152	6 / 152
Rv 100 Classic	4 / 102	4 /102	40 / 1000	84 / 2134	4 / 102	4 / 102	4 / 102	52 / 1320	6 / 152	6 / 152

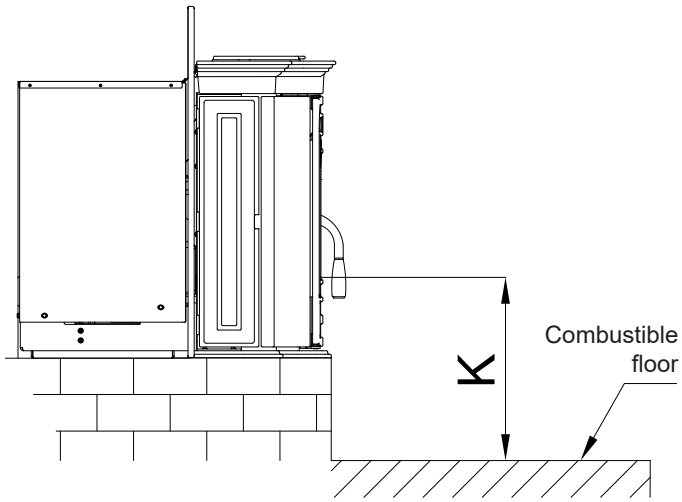
Floor: combustible floor;
Floor protection: 6 in in front and sides.
N.B. The floor protection must extend under the chimney connector and 2 inches (51 mm) beyond each side.

Minimum distance from combustible material for pellet fireplace insert (Roma)





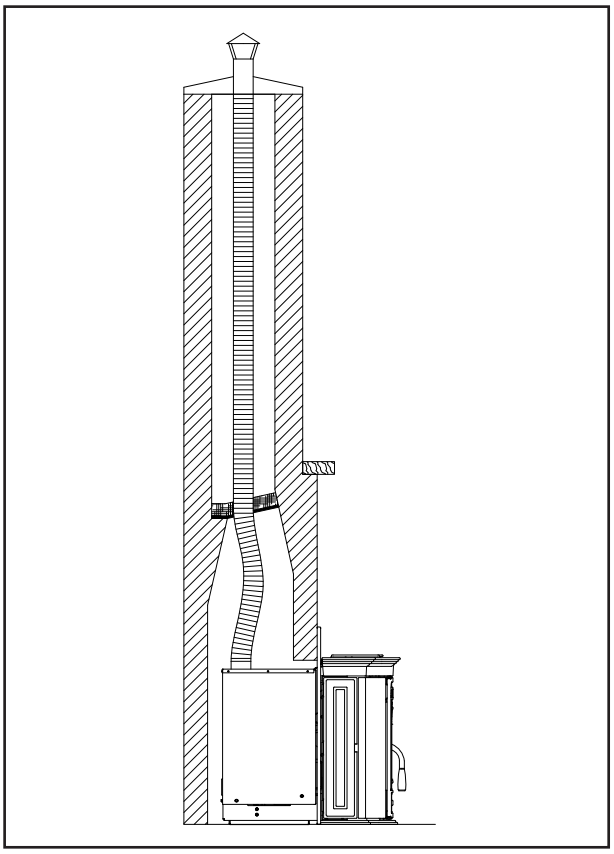


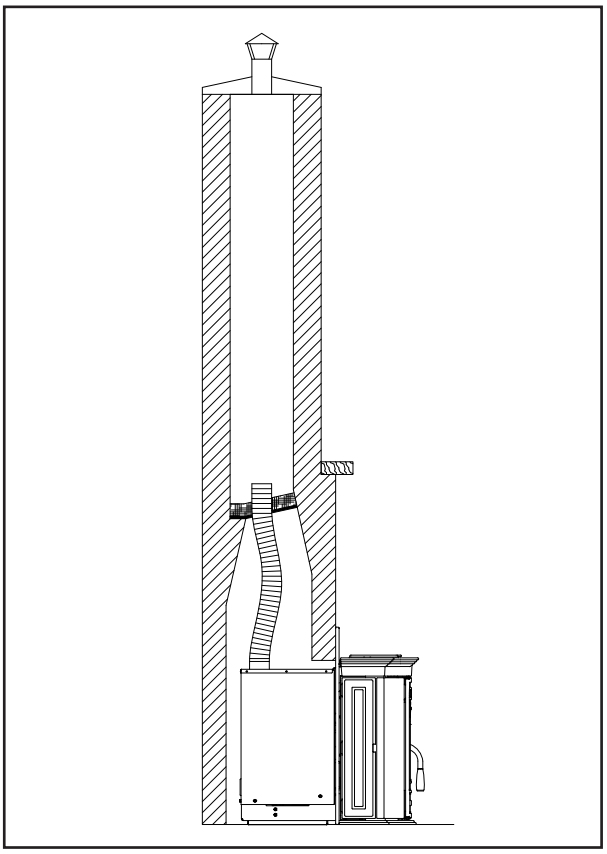


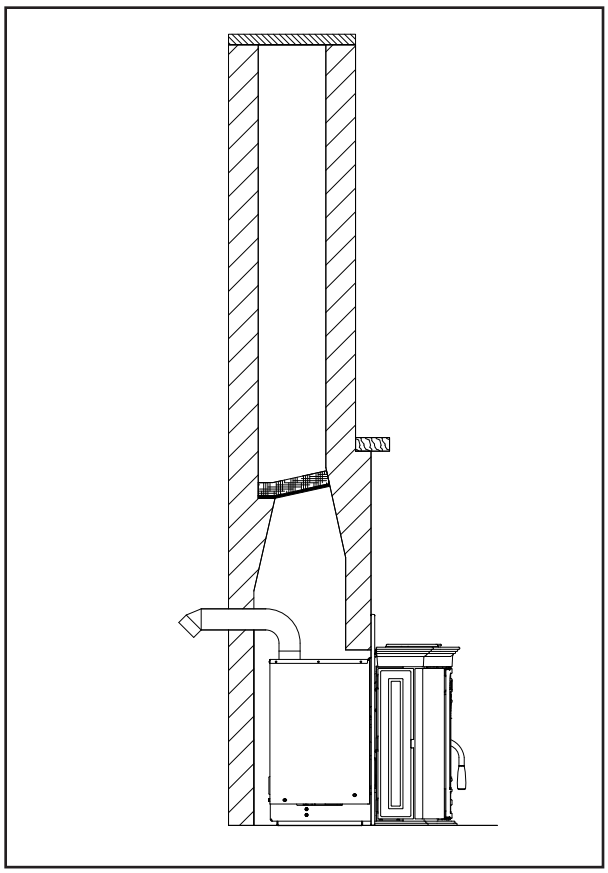
	Unit of measurement	Roma
A = clearance to mantel	Inch / mm	18 / 470
B= clearance to sidewall	Inch / mm	15 / 381
C = clearance to face trim (side)	Inch / mm	0 / 0
D = clearance to face trim (top)	Inch / mm	0 / 0
E = floor protection	Inch / mm	6 / 152
F = floor protection	Inch / mm	6 / 152
G = clearence to front	Inch / mm	48 / 1220
I = mantel depth (*Max Depth)	Inch / mm	6 / 152
J = ceiling from bottom of unit	Inch / mm	72 / 1830
K = combustible floor from bottom of the glass	Inch / mm	10 / 241

The I (mantel depth) is a maximum depth. All other distances are minimum distances. Reasonably if the clearance A is much more than the required minimum, depth I could be slightly higher, but other arrangements have not been tested.

Examples of installation (only for pellet fireplace insert)

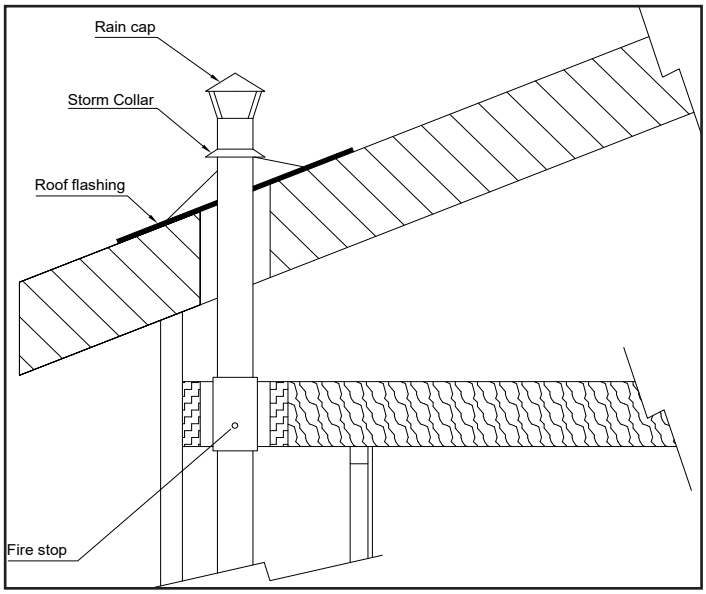


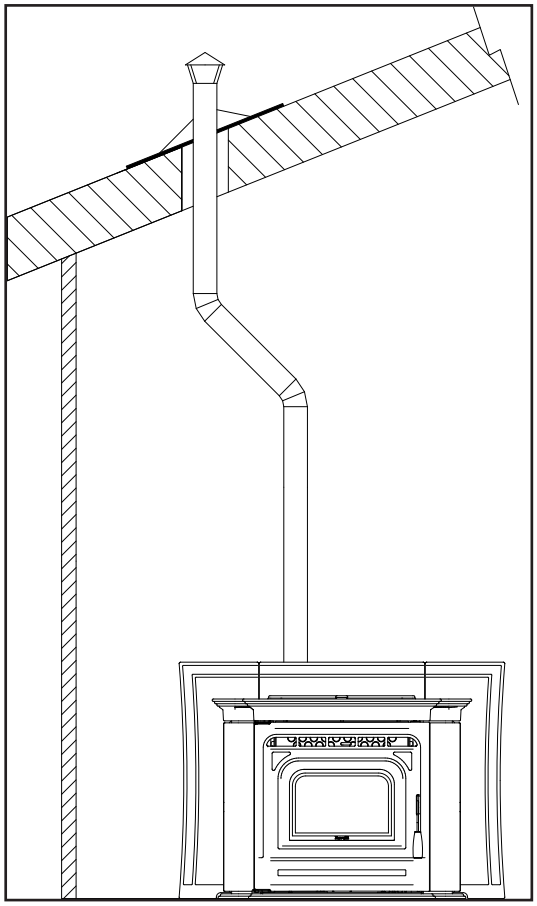


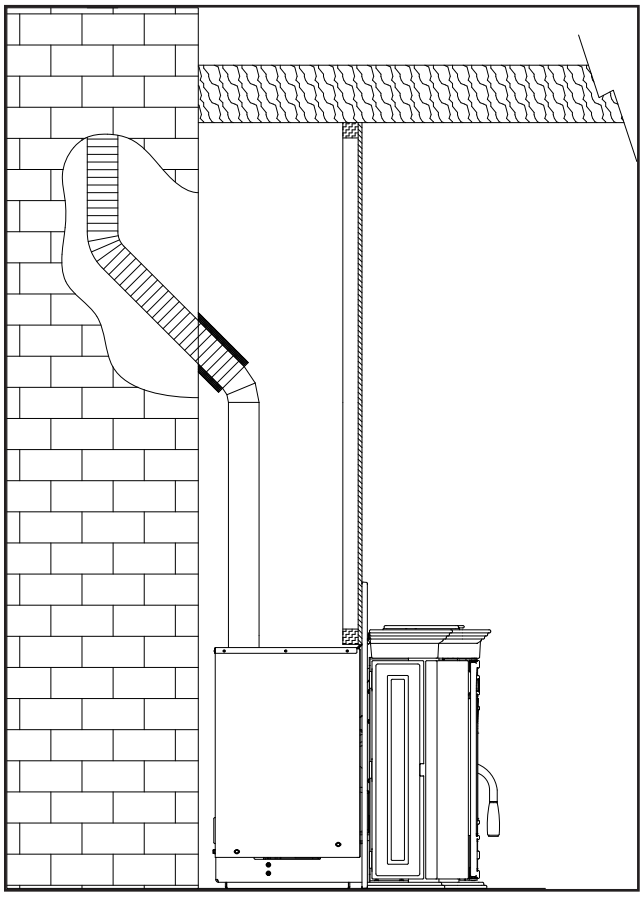


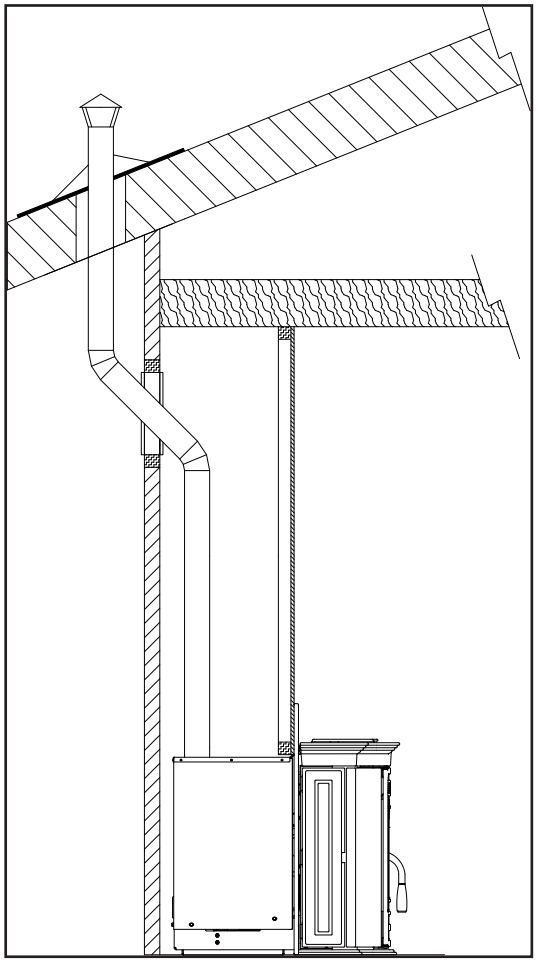
The damper area must be sealed with a steel plate and a non-combustible insulation on the top of the plate to reduce the possibility of condensation.

This fireplace has not been tested with unvented Gas log set. To reduce risk of injury, do not install an unvented gas log set into this fireplace. Do not pack required air spaces with insulation or other materials. Do not use a fireplace insert or other products not specified for use with this fireplace.

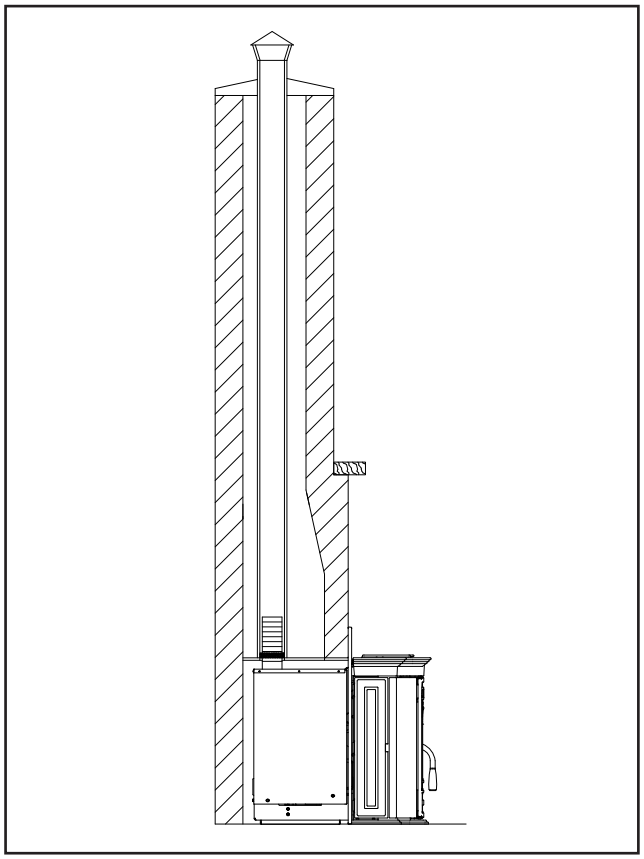




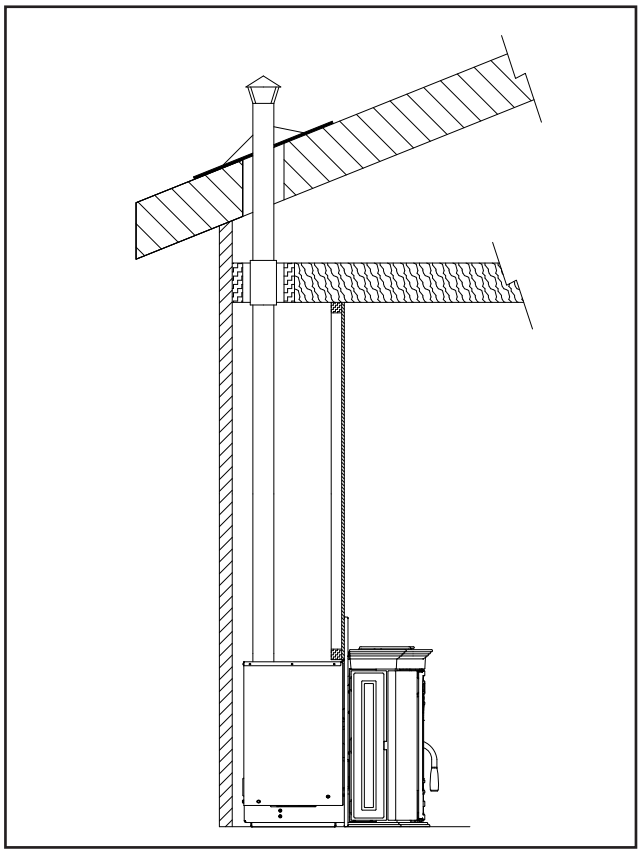


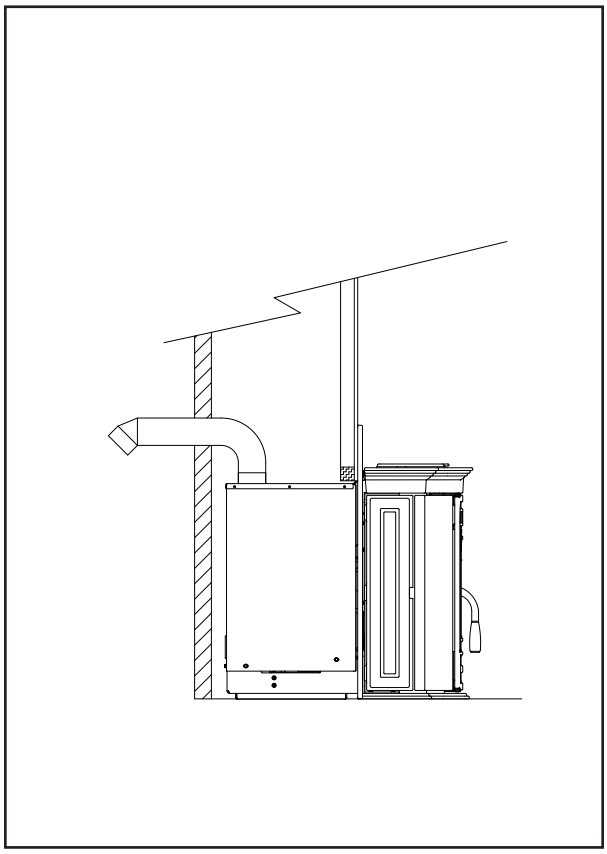


Use only 45° or 30° bends, do not use 90° bends.

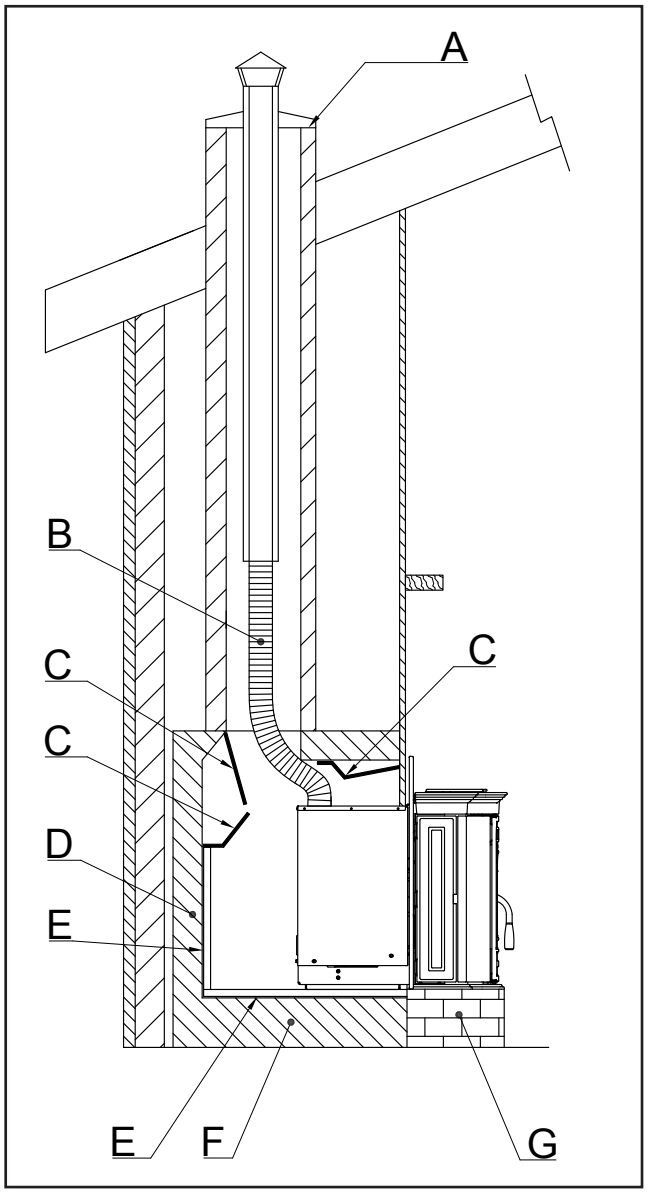


In Canada this fireplace insert must be installed with a continuous chimney liner of a minimum 3” diameter extending from the insert to the top of the chimney. The chimney liner must be conform to the class 3 requirements of CAN/ULC-S635, Standard for Lining Systems for ExistingMasonry or Factory Built Chimneys and Vents, or CAN/ULC-S640, Standard for Lining Systems for New Masonry Chimneys.





This pellet insert is suitable for Zero Clearance installation.
Flex pipe for vent is not approved these types of installation.



A) Seal the cover plate (non-combustible);

B) “L” vent flex section;

C) The smoke baffle, damper and shields may be removed if attached with mechanical fasteners;

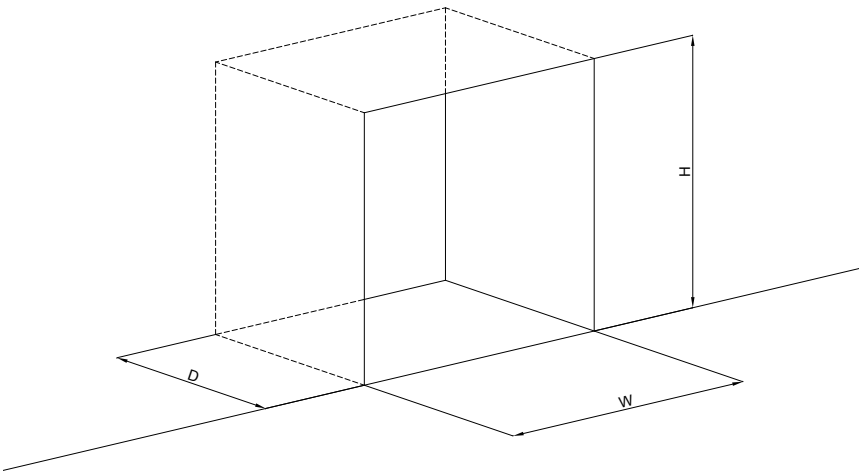
D) The metal sides, frame members, or other structural components of the factory built fireplace may not be removed or altered;

E) The firebrick (refractory) may be removed;

F) The metal floor of the firebox may be removed leaving the fireplace floor outer wrap;

G) You shall built a support for insert on raised fireplace.

Minimum opening for masonry and manufactured fireplace (only for pellet fireplace insert)



D = 16.5 “ / 419 mm

W = 22.5” / 571.5 mm

H = 26” / 660.4 mm

Standard horizontal installation configurations

Ravelli does not recommend the horizontal venting in areas with particular environmental conditions such as: proximity to lakes or sea, very cold, very windy, very humid areas, etc..

1. Locate the proper position for the listed type “PL” wall thimble. Avoid cutting wall studs when installing your pipe. Use a saber saw or keyhole saw to cut the proper diameter hole through the wall to accommodate the wall thimble. Use extreme caution to avoid cutting into power lines within the wall of the home.
The hole size will depend on the brand of pellet vent that you are using. Install the wall thimble in the hole.

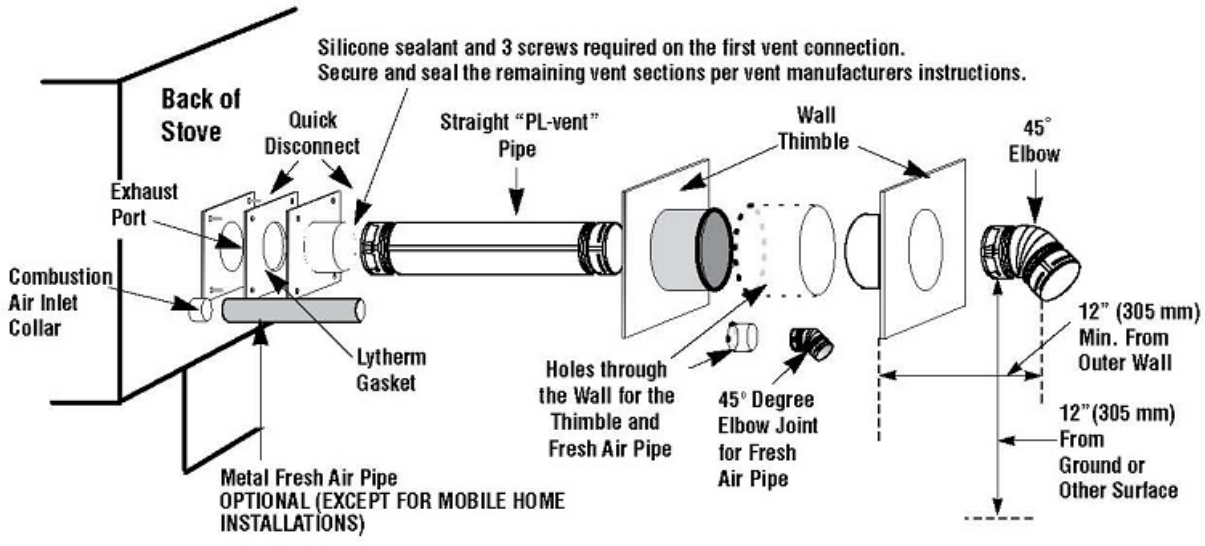
2. ALL INTERLOCKING PIPE CONNECTIONS WITH-IN THE ROOM MUST BE SEALED WITH HIGH TEMPERATURE RTV AND SECURED WITH A MINIMUM OF 3 FASTENERS PER CONNECTION. Position the stove approximately 12” (305 mm) from the wall on the floor pad. Push the “PL” pipe through the wall thimble. Squeeze a bead of high temperature silicone (RTV) sealer around the end of the machined portion of the 3” (76mm) pipe connector on the back of the stove. Firmly push on a section of “PL” pipe until inner pipe liner pushes into the bead of RTV sealer.

3. Push the stove with pipe attached towards the wall (the pipe will go through the wall thimble). Do not position the back of the stove closer than 2” (51mm) from the wall.

4. Install listed type “PL” 45 degree elbow with optional rodent screen or cap (recommended) on outside end of pipe. The rodent screen should be no less than 1/2” (13 mm) mesh and may clog with soot and ash if left unattended during the burn season.
NOTE: The end of the exhaust pipe must extend a minimum of 12” (305 mm) from the outside of the building.

5. If the installation includes a source of outside combustion air; cut a separate hole through the wall for the fresh air tube. Use a galvanized or stainless steel pipe for the duct. The minimum size for the duct shall be not less than 50% of the cross sectional flue area. Connect outside air pipe to air inlet on stove.
This tube must be terminated with a 45 degree elbow or hood.

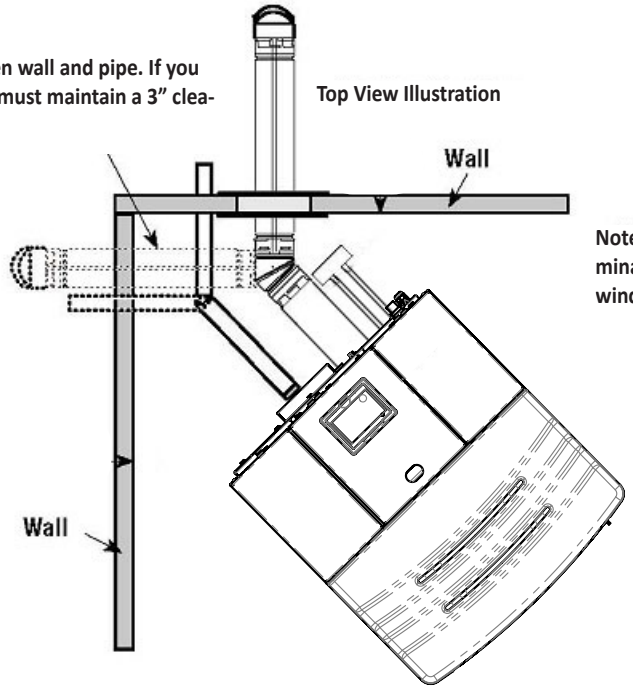
NOTES:
Combustion air may also be drawn from a vented crawl space under the home.
All joints for connector pipe are required to be fastened with at least three screws. If vented horizontally, joints shall be made gas-tight (air tight, sealed connection) in a manner as specified on this page (see instruction #2).
Install vent at clearances specified by the vent manufacturer.



Horizontal Vent installation

3" (75 mm) Minimum clearance between wall and pipe. If you vent to the furthest wall, the vent pipe must maintain a 3" clearance parallel to the other wall.

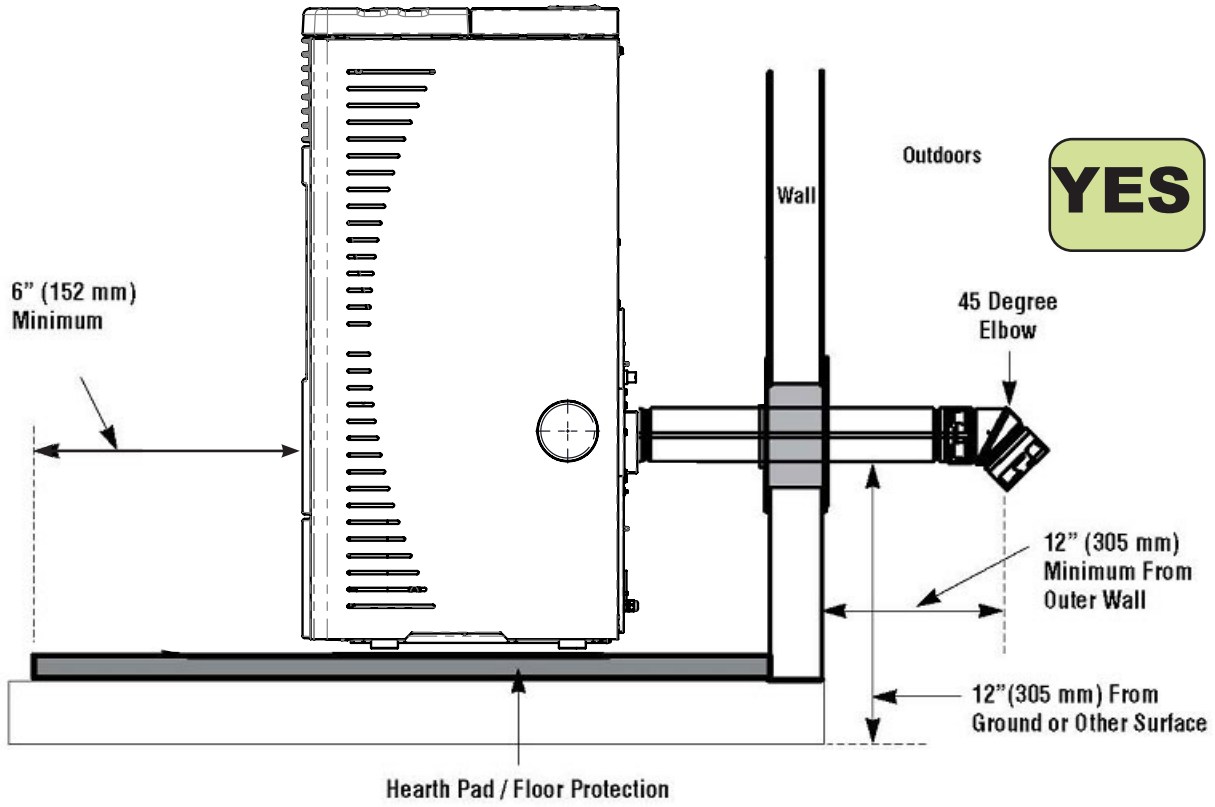
Top View Illustration



YES

Notes: It is not recommended to terminate exhaust vent on the prevailing wind side of the house

Corner Through the Wall

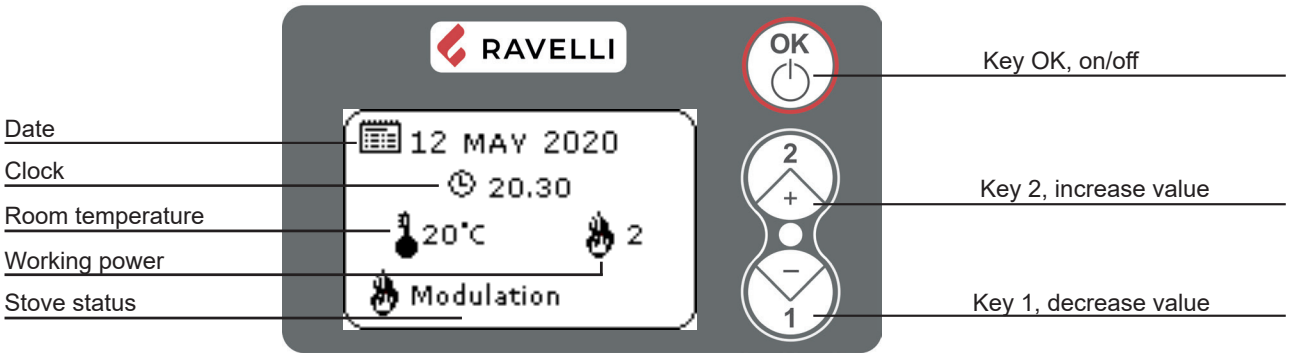


YES

Parallel Through the Wall

DESCRIPTION OF THE FUNCTIONING AND SYMBOLOGY OF THE DISPLAY

The display of the handheld set is described below (in “Home” mode):



Key “OK”: in the Home screen, long press to turn the appliance on / off or reset the alarms; short press to enter the menu
Key “1”: access key to “set room temperature” and regulation (decrease value)
Key “2”: access key to “set power” and regulation (increase value)

The first press of any key with active display turns on its backlight, not interpreting it as a command.

These stoves are equipped with an electronic RDS system that optimises combustion parameters while minimising emissions.

PROCEDURES FOR USE

If the chimney catches fire you must call the fire brigade immediately.

Checks prior to start-up

You have read and perfectly understood the contents of this instructions manual.

Before lighting the stove, you must ensure that:

- the combustion chamber is clean;
- the fire door and ash drawer seals are functioning properly;
- the electrical plug is connected correctly;
- all items that could burn (instructions, various adhesive labels) have been removed;
- the fire pot, if removable, is correctly positioned in its housing.

During the first hours of use the paints used for the stove finish may release an unpleasant odour. You might also smell the typical odour of metal parts subject to high temperatures. Make sure sufficient air circulation is guaranteed in the room. These unavoidable inconveniences will disappear after the first hours of operation. To reduce your discomfort to a minimum, keep the stove on for a few hours on low power and in the beginning, do not overload it, avoiding intense heating-cooling cycles

At the initial start-up, the paint finishes drying and hardens. Accordingly, to avoid ruining it, we advise you not to touch the stove’s painted surfaces at this time.

Pellet auger loading

Before starting the stove for the first time, whenever the stove is in alarm “06 - Pellets finished”, and in any case whenever the hopper has emptied completely, the initial auger loading is required.
This phase allows the stove to fill the pellet loading system (the system that carries the pellets from the tank to the fire pot), so that at the time of ignition, the pellets can be loaded into the fire pot and then the stove can be ignited. If the auger loading operations are not carried out, the stove could fail to ignite.
To load the auger, follow the instructions given in the paragraph “Stove status menu”.

After loading the auger and before lighting the stove, always remember to empty the fire pot and check that the fire pot is clean. Never empty the fire pot inside the hopper.

After each maintenance operation, make sure that the fire pot is positioned correctly in its seat.

Switching the appliance on and off

From the “Home” screen, it is possible to switch the stove on and off by keeping the OK button 

pressed on the device for a few seconds. An acoustic signal will warn you that the appliance has switched on or off.

Do not turn off the stove by disconnecting the electric plug from the wall socket.

The appearance of the “SET RDS” message indicates that the initial parameter testing and calibration procedure was not carried out correctly. This indication does not imply blocking the stove (see SIGNALING POP UP section).

Failed ignition

If the system does not detect the ignition of the flame within the preset time, operation will be blocked with the “No ignition” alarm. Before relighting the stove, check that there are pellets in the hopper, that the door and ash drawer compartment are closed, that there are no obstructions to the combustion air inlet system and above all that, in models without self-cleaning fire pot, the fire pot is empty, clean and correctly positioned. If the problem persists, it could be due to a technical problem (ignition plug, adjustments, etc ...), so please contact a Ravelli CAT.

The accumulation of unburned pellets in the fire pot after a failed ignition must be removed before proceeding with a new ignition.

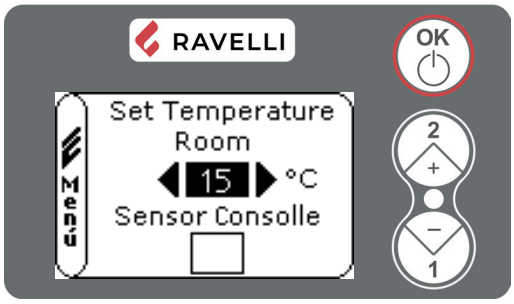
The fire pot could be very hot: danger of burns

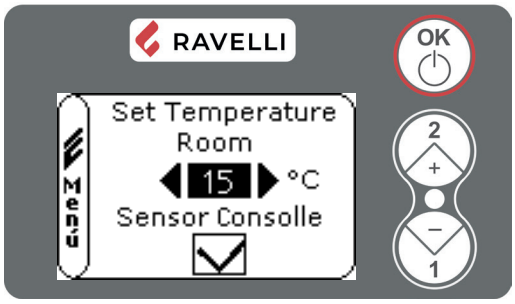
Never empty the fire pot inside the hopper.

Set of the room temperature

The functioning of the stove with room thermostat activated is of 3 types:
-With supplied room sensor positioned on the backside of the stove
-With room sensor integrated to the display (recommended for use with wall mounted display only)
-With external thermostat

Press key 1 from the “Home” screen to enter the room temperature setting page

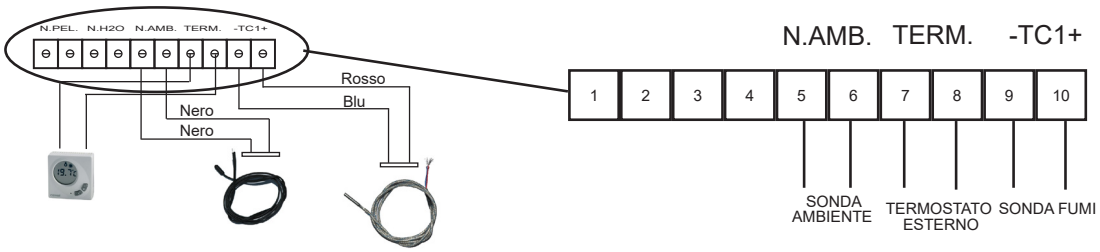




Set the desired temperature with keys 1 and 2. The selectable values are: EST, from 7 °C to 40 °C (or from 44 °F to 104 °F), MAN. The EST value must be selected if you want to use the external thermostat and MAN when you want to make the stove work at constant power.
To go back directly to the “Home” screen, press keys 1 and 2 at the same time, or press OK to go to “Console probe”.
By enabling the “Console probe” function, the temperature reading with the ambient probe integrated in the display is enabled. Enable the function with key 2 and disable it with key 1. To return to the Home screen, press OK

If you use an external thermostat correctly connected as shown in the electrical scheme, the display will not show the room temperature but the writing T ON (when the contact is closed) or T OFF (when the contact is open).
To use the external thermostat, the “console probe” must be deactivated.
The room temperature will be adjusted by the external thermostat.

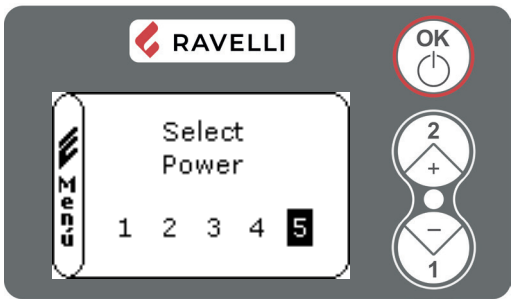
Once reached the set temperature of the thermostat the display will show MODULATION, so the stove will reduce to minimum the pellet consumption and the power as well. If activated the mode COMFORT CLIMA, the stove will switch on and off automatically.



If you want to use the COMFORT CLIMA is advisable an external thermostat with OFF-SET of at least 3°C.

Set of the working power

To modify the working power press key 2 to enter in the dedicated menu and with keys 1 and 2 to set the power you desire from 1 to 5 and confirm with key OK. Increasing the power also the pellet consumption and the speed of the fan increase as well.



OPERATING PHASES OF THE APPLIANCE

Sequence of ignition phases

During the ignition phase, the following indications will appear on the display:

- IGNITION: loading phase of the pellets in the fire pot and heating of the ignition electrode (variable waiting time according to the factory parameters)
- WAITING FLAME: flame ignition waiting phase (variable waiting time depending on the factory parameters)
- FLAME LIGHT: phase of development and stabilization of combustion (waiting time varies depending on the factory parameters)
- WORK: normal operating mode, according to the chosen settings

If the ignition command is given when the stove is still hot, i.e. in FINAL CLEANING, the stove will remain in the WAITING RESTART phase for a few minutes, after which it will automatically re-ignite (IGNITION RESTART).

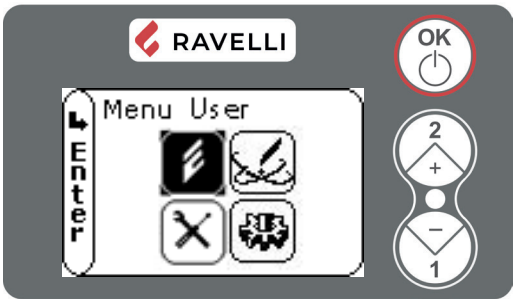
Modulation

During the work phase, the appliance should reach the room temperature set; when this condition is met, the stove switches to MODULATION mode in which fuel consumption is minimum.

Description of menu functions

To access the menu from the “Home” screen, press the OK button (short press).
To scroll the menu list, use buttons 1 and 2 and then confirm with OK to enter the submenus.
Then, to return to the “Home” screen, press keys 1 and 2 at the same time. To return to the previous menu, press OK (long press).

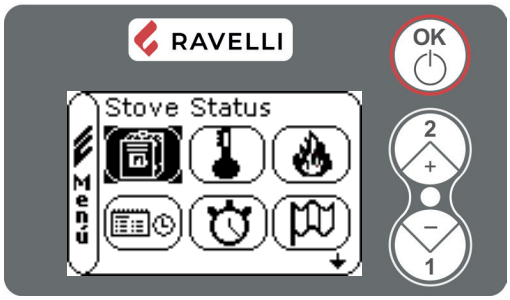
The stove is equipped with many functions available in each menu programming. Some of these menu are accessible for the end user , other are protected with a password so they are accessible only for the After sales center.



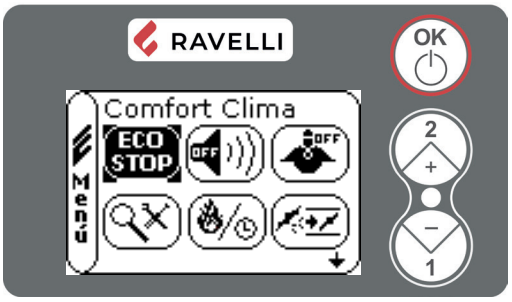
- Menu USER
- Menu SET RDS
- Menu DEFAULT SETTINGS
- Menu STANDARD PARAMETERS

The SET RDS, DEFAULT SETTINGS, and STANDARD PARAMETERS menus are password protected. Changing parameters within these menus could compromise the operation and safety of the stove. In this case the warranty will be invalidated.

The submenus of the USER MENU (the only one accessible for the end user) are the following:



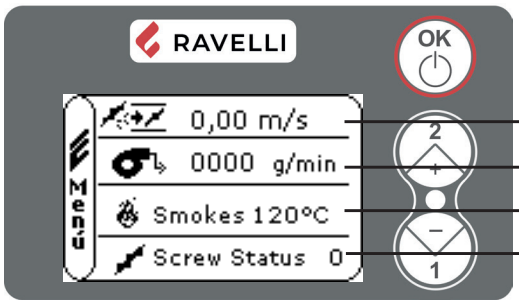
- Menu STOVE STATUS
- Menu SET TEMPER. ROOM
- Menu SET POWER
- Menu CLOCK
- Menu TIMER
- Menu LANGUAGE



- Menu COMFORT CLIMA
- Modalità SILENCE
- Modalità SELF CONTROL SYSTEM
- Menu VIEW SETTINGS
- Menu VIEW WORKING HOURS
- Menu SET DRAUGH/PELLET

Menu STOVE STATUS

In this menu you can check the correct functioning of the most important components of the stove. Here is a list of real data of the stove useful for service during inspection.



RDS current reading RDS (m/s)

RPM current smoke extractor speed (rpm)

Smokes temperature (°C)

Screw status

SET Set value RDS (m/s)

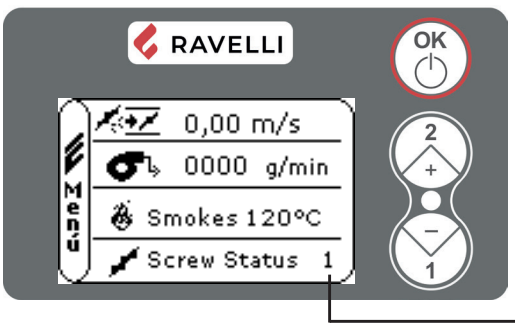
DF Cold probe temperature RDS (°C)

DR Hot probe temperature RDS (°C)

SK Electronic board temperature (°C

To go to the second screen, press key 1.

From the first screen it is possible to activate the initial loading of the auger by pressing key 2.
The Screw Status value will become 1.



The initial load will stop automatically after a pre-set time, to stop it first press key 2.

Repeat the operation several times until you see the pellet fall into the firepot.
It is possible to do this operation only if the stove is in FINAL CLEANING phase or OFF.

Menu SET TEMPERATURE ROOM

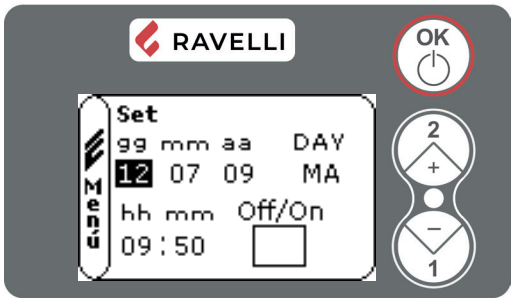
To modify the setting please reference to paragraph “Set of the room temperature”

Menu SET POWER

To modify the setting please reference to paragraph “Set of the working power”

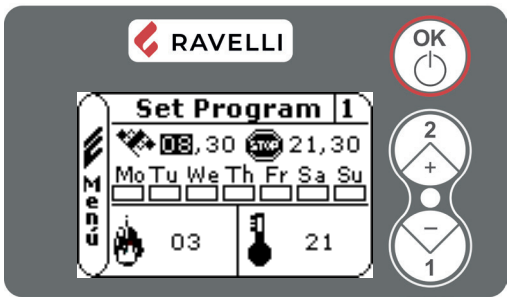
Menu CLOCK

To modify the settings use keys 1 and 2 and by pressing OK you confirm the data and go on to the following one. By activating the box (flag) ON/OFF you enable the function chrono.
By last confirmation with OK you save all settings and return automatically to the screen with the icons.



Menu TIMER

With the function chrono thermostat is possible to program for each day of the week the switch on and off of the stove in four independent intervals time. To enable the TIMER, see what is reported in the Clock menu.



1 TIMER program number

START: switch on time

STOP: switch off time

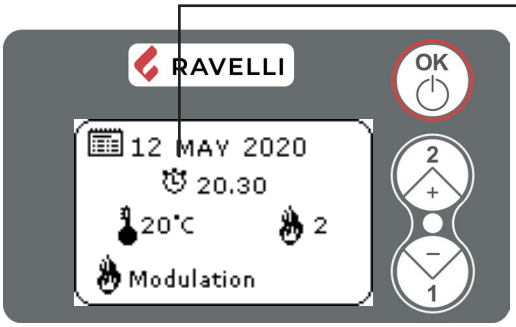
DAY: days of activation of the program

POWER: desired power at the time of switch ON of the stove

TEMPERATURE: setting of ambient temperatures

In ducted stoves it is possible to set the temperatures of the individual rooms:
F (front) temperature of the stove installation room
R (Rear, single duct) room temperature heated by ducting
RL and RR (Rear Left and Rear Right for double ducting)
The EST (operation with external thermostat) and MAN (constant power operation) values can also be set

To choose the prog.tion use keys 1 and 2; confirms with OK.
Use keys 1 and 2 to modify the settings and by each press of OK you confirm the data and go on to the following one.
By last confirmation with OK you save all settings and return automatically to the screen with the icons.

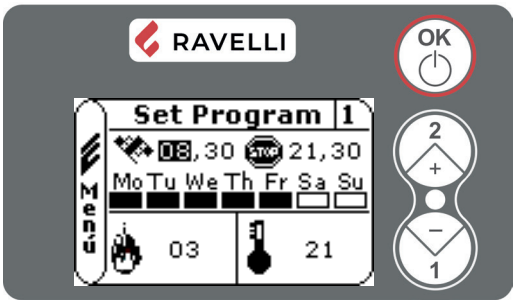


The symbol indicates that the chrono function is active. It is however possible to program the chrono even if it is deactivated. To make it work, refer to the chapter dedicated to setting the clock.

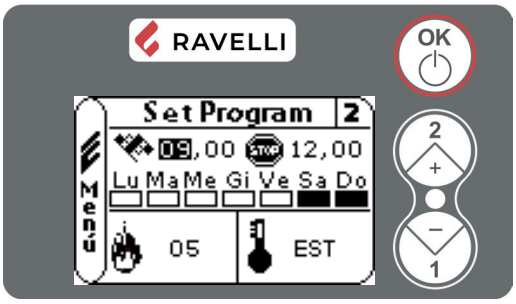
Description

Description	Settable values
START	From OFF to 23:50 by step of 10’
STOP	From OFF to 23:50 by step of 10’
DAY	On/off for the days from Monday to Sunday
POWER	From 01 to 05
SET AMB.	From EST to MAN

Examples



Activation days: Monday to Friday
Switch on at 8.00
Switch off at 21.30
Power: 3
Room temperature: 21°C



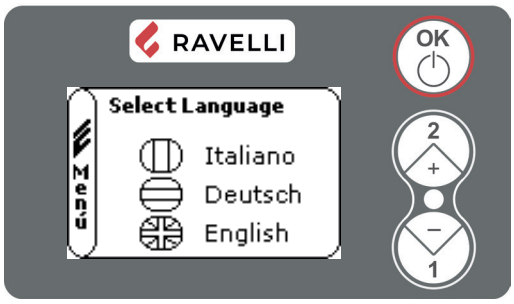
Activation days: Saturday and Sunday
Switch on at 9.00
Switch off at 12.00
Power: 5
Room temperature: Regulated by an external thermostat

The Comfort Clima function also works with the Timer active.

By using this mode it is necessary to check that after every automatic switching off the firepot is always well clenaed in order to guarantee a perfect automatic ignition.

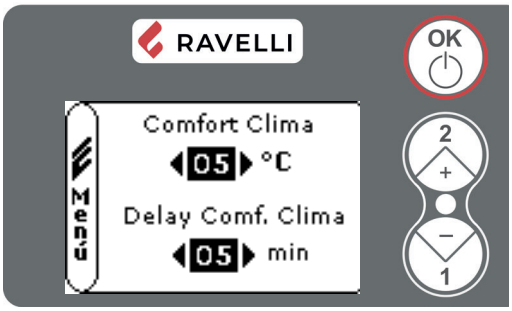
Menu LANGUAGE

To select language please use keys 1 and 2.
By last confirmation with OK you save all settings and return automatically to the screen with the icons.



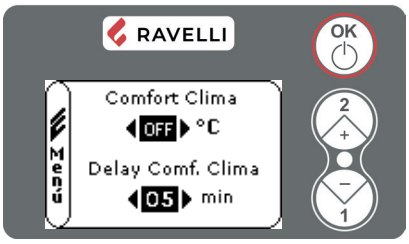
Menu COMFORT CLIMA ECO STOP

To modify the settings use keys 1 and 2 and by pressing OK you confirm the data and go on to the following one.
By last confirmation with OK you save all settings and return automatically to the screen with the icons.

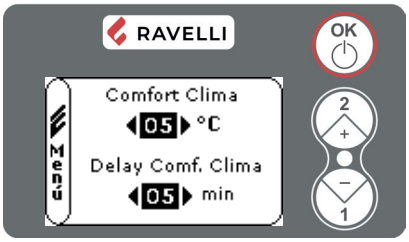


The activation of this function enables the stove to reduce pellet consumption by activating the modulation phases, after the desired temperature has been reached. Subsequently, the stove checks that the temperature is maintained steady for a preset time (DELAY COMFORT CLIMA). If this condition is met, it automatically switches off, and on display appears the writing ECO STOP.
The stove turns on again when the temperature drops below the set threshold (COMFORT CLIMA).
Below are given the steps for accessing the relative menu.

Example



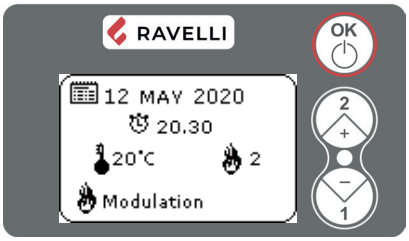
To activate the function, set the COMFORT CLIMA value different from OFF using buttons 1 and 2. Confirm with OK.
Set the time in which the stove must remain in MODULATION, before switching to ECO STOP (default 4 ‘).



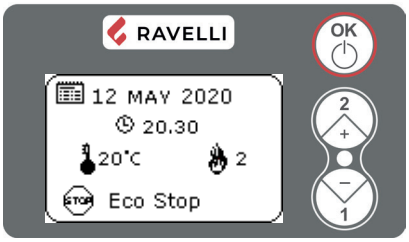
The set value (in this case 5 ° C) activated the Comfort Clima function.
OPERATION:
The value adjusts the re-ignition temperature of the stove.
EXAMPLE:

- room temperature set at 21 ° C
- Comfort Clima value set at 5 ° C

With this adjustment, the stove will switch off when it reaches 21 ° C and will switch on again when the room temperature is 15 ° C (21 ° C - 5 - 0.5 tolerance = about 15 ° C). The strings shown in the screens on the left will appear in sequence on the display.



The modulation phase is activated, as the room set temperature has been reached. If the temperature is maintained for the set “DELAY COMFORT CLIMA” time, the stove switches off.



Once the swich-off phase is complete, the display will show ECO STOP. The stove will remain in this state until the temperature drops to 15 ° C, only then will the ignition phase be restarted.

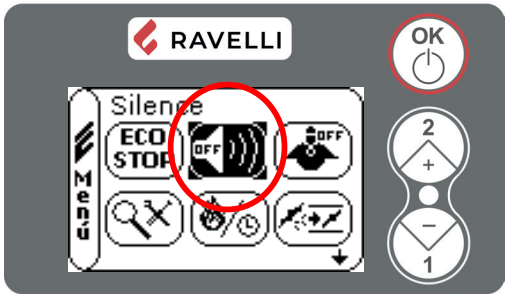
The operation of the stove in COMFORT CLIMA mode can start the ignition and shutdown phase several times during the day; this can compromise the duration of the resistance for automatic stove ignition.

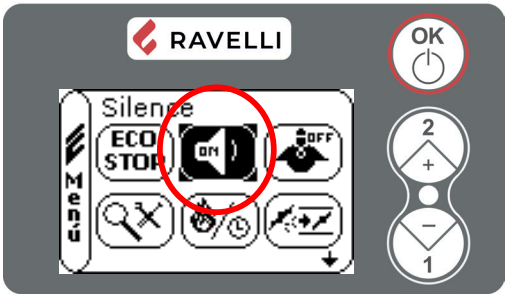
Using this mode, it is necessary to make sure that after each automatic switch-off, the fire pot always remains perfectly clean in order to guarantee correct automatic ignition. The COMFORT CLIMA mode also works with an external thermostat connected.

Mode SILENCE

Enable or disable the function by using key OK.

Mode SILENCE has been realized for reducing noise level of fan. It reduce the speed of the fan in all five working power.
Use is suggested especially during night time.

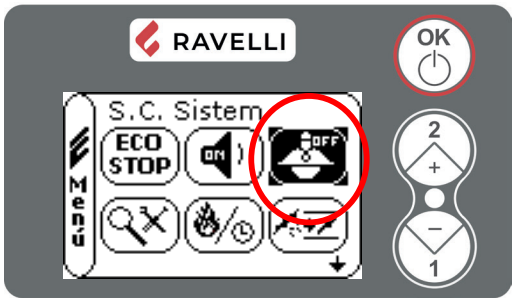


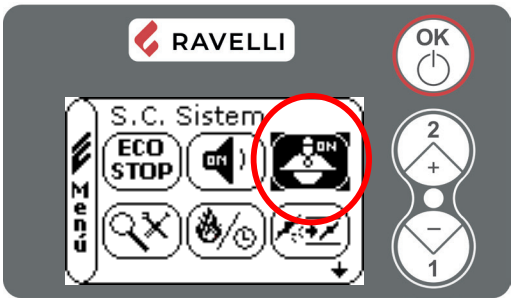


Mode SELF CONTROL SYSTEM (S.C.S)

Enable or disable the function by using key OK.

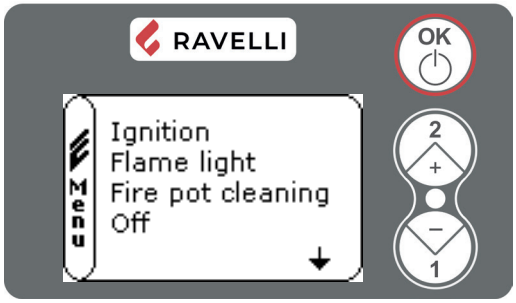
Mode SELF CONTROL SYSTEM (S.C.S) has been realized allowing the stove to recognize faster an eventual problem just in case you are out of home of far from the stove.
It is advisable to activate this function especially if you are not in the vicinity of the stove during work phase.





Menu VIEW SETTINGS

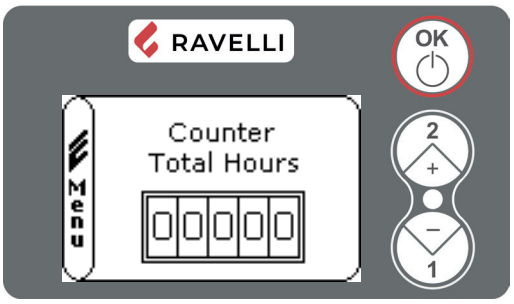
In this menu you can verify the parameters set in the motherboard.



To scroll the list of parameters use key 1 and 2, to view the parameters press OK.

Menu VIEW WORKING HOURS

In the menu VIEW WORKING HOURS you can check the total or partial working hours and also the number of ignitions of the stove. This menu is used by the After Sales Center to evaluate the total working hours of the stove during the season and consequently to evaluate the need of cleaning (“service hours”).

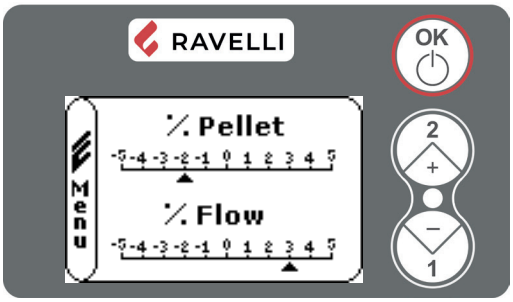


You can see the working hours of the stove. To scroll the different counters (total or partial hours and number of ignitions) use key 1 and 2.

Menu SET DRAUGH/PELLET

The setting of the PELLET-FLOW mixture allows to adjust the combustion by varying the quantity of pellets loaded in the fire pot and/or the quantity of air. In fact, by its nature, pellets vary in grain size and composition: even bags of pellets of the same brand can have different characteristics. If combustion is not optimal, vary the flow parameter to adjust the combustion air. If air regulation alone is not sufficient, it may also be necessary to modify the pellet parameter.

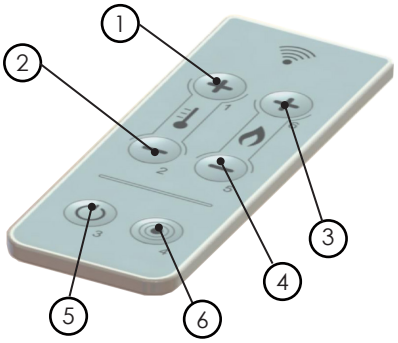
Combustion regulation is an operation that requires a lot of experience. We recommend that you contact an Authorised Service Centre to calibrate the stove appropriately.



By accessing the menu, the adjustment of the draft / pellet mixture is displayed. To change the percentage use buttons 1 and 2, to switch from adjusting the quantity of pellets to adjusting the inlet air flow, press OK.
At the last confirmation with OK, the settings are saved and you automatically return to the icons screen.

Service hours
All our models need in addition to the regular cleaning, also a special cleaning which should be done by the installer (authorized by the producer).
At the time of the installation it is possible to set a number of working hours appropriate for the model. At the end of these hours on the display will appear the message “SERVICE HOURS” followed by an acoustic signal. When this message appears please contact the installer to do the special cleaning of the stove.
If the cleaning is not done the message will appear by each ignition but will not interrupt the functioning of the stove.

Remote control
Infrared handheld device for remote control



• **1 - 2 Set temperature**: allows to set the desired value for the room temperature from minimum 6 °C to maximum 40 °C (or from 44 °F to 104 °F).

• **3 - 4 Set power**: allows to set the working power between a range of minimum 1 to maximum 5.

• **5 ON/OFF**: by keeping pressed for 2 second longs it allows the manual switch on and off of the stove

• **6 Without function**

Stove phase general layout

Phase	Description
FINAL CLEANING	The stove is switching off, the cooling phase is not yet completed
IGNITION	The ignition phase has started,the pellets are loaded into firebox
WAITING FLAME	The pellet is lighted by the hot air passing through the ignition candle
FLAME LIGHT	The flame is visible in the fire pot
WORK	The stove completed switch ON phase; you can change power
FIRE POT CLEANING	The stove is performing the cleaning
MODULATION	The room temperature set has been reached
ECO STOP	Comfort Clima activated, temperature set has been reached; the stove is off.
T ON / T OFF	The room sensor is off or an external thermostat has been connected and the room set is set to EXT
WAITING START	The stove is cooling DOWN: when stove is cooled down can start automatically
WAITING RESTART	The stove is in the cooling DOWN: when stove is cooled down can restart automatically.
HOT SMOKES	The maximum fume temperature threshold has been reached. To facilitate cooling, the stove brings the capacity to a minimum with ventilation at max power level
OFF	The stove is off
ANOMALY (general)	The stove has detected an anomaly; refer to the troubleshooting chapter.

Description of alarms

AL	Warning	Reason	Solution
AL 01	**BLACK - OUT**	No electricity supply during working phase	Press the off button and repeat switching on the stove
			If the problem continues, contact the area Technical Assistance Centre.
AL 02	**SMOKE SENSOR**	The smoke sensor is malfunctioning	Please contact the local Technical Assistance Centre
		The smoke sensor has been disconnected from the board	Please contact the local Technical Assistance Centre
AL 03	**HOT SMOKE**	Combustion in the fire pot is not optimal	Switch off the stove, clean the fire pot and regulate combustion with the setting of the pellets.
		The centrifugal fan is defective	Contact local Technical Assistance Centre.
			If the problem continues, contact the area Technical Assistance Centre.
AL 04	**FAN BROKEN**	Smoke extractor encoder is not functioning or not correctly connected	Contact local Technical Assistance Centre.
		No electricity supply to smoke extractor	Contact local Technical Assistance Centre.
		The smoke extractor is blocked	Contact local Technical Assistance Centre.

AL	Warning	Reason	Solution
AL 05	NO IGNITION	The pellet tank is empty.	Check if there are pellets inside the tank.
		Setting of pellets and of intake during ignition phase insufficient.	Contact local Technical Assistance Centre.
		The resistance for lighting is defective of not in position	Contact local Technical Assistance Centre.
AL 06	NO PELLETS	The pellet tank is empty	Check whether there are pellets in the tank
		The ratiomotor does not load pellets.	Empty the tank to check that no objects have fallen inside which could prevent the correct functioning of the auger
		No pellet loading	Regulate the pellet setting
			If the problem continues, contact the area Technical Assistance Centre.
AL 07	THERMAL ALARM WITH RESET	The thermostat with manual reset has intervened	Reset the thermostat pressing the button on the back of the stove
		The centrifugal fan is defective	Please contact local Technical Assistance Centre.
		Combustion in the fire pot is not optimal	Switch off the stove, clean the fire pot and regulate combustion with the setting of the pellets.
			If the problem continues, contact the area Technical Assistance Centre.
AL 08	DEPRESSION	The combustion chamber is dirty	Follow the cleaning operations of the stove as per the instructions in the booklet
		The flue is blocked	Check that the flue is clear and clean
		The vacuum switch is malfunctioning	Please contact local Technical Assistance Centre
AL 09	AIR-FLOW METER	The device who read the quantity of inlet air could be disconnected or defect	Please contact the local Technical Assistance Centre
		The device could be dirty and so not read correctly	Please contact the local Technical Assistance Centre
AL 11	LOW FLAME	The pellet tank is empty.	Check whether there are pellets in the tank
		Bad setting of pellet and air on ignition in phase	Contact local Technical Assistance Centre
AL 12	FAN RPM	The revolution of smoke fan lowering more the 15% of speed to fan congestion	Contact local Technical Assistance Centre
AL 13	INSUFFICIENT FLOW	The door and the ashtray are not correctly closed	Check the devices are closed
		Bad combustion in the fire pot	Switch off the stove, clean the fire pot, the grid and set the combustion through the set pellet/ flow.
		Presence of a foreign body inside the air inlet pipe	Check for its presence and extract the unwanted body
			Please contact the local Technical Assistance Centre
AL 14	AUGER PHASE	The gear motor is not correctly connected	Please contact the local Technical Assistance Centre
AL 15	AUGER TRIAC	The device in the motherboard who gears the auger is defect	Please contact the local Technical Assistance Centre

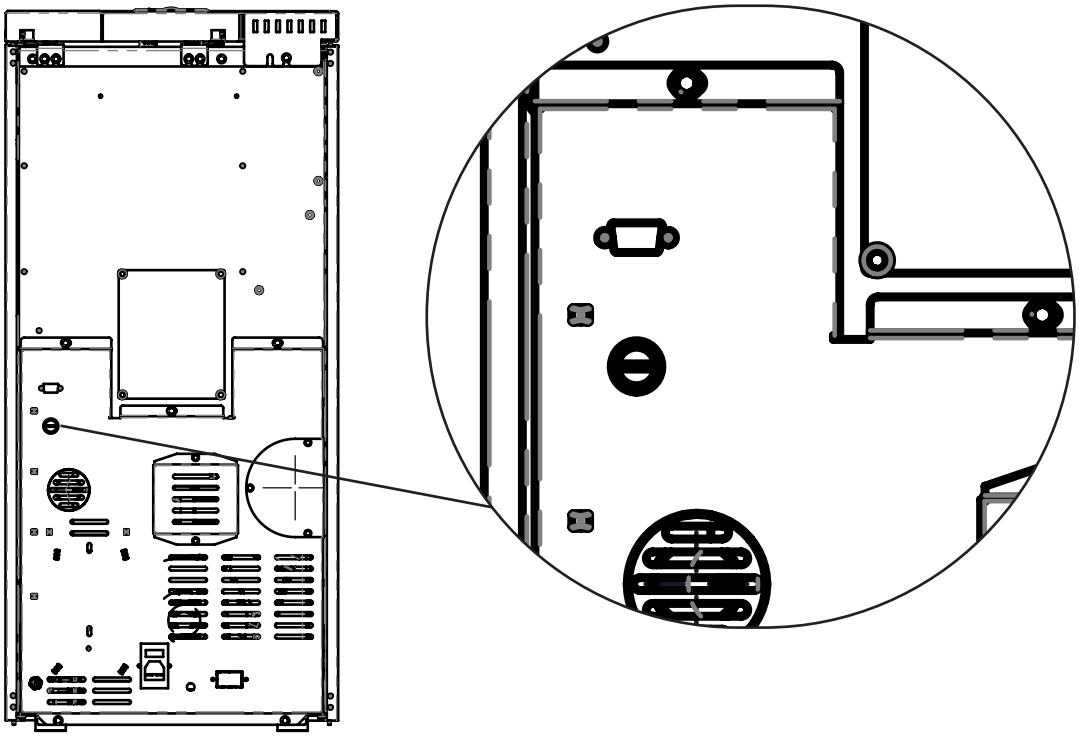
AL 09 - AIR-FLOW METER is an alarm that do not block the operation of the stove. In these conditions, the stove goes into modulating work, working at fixed extractor revolutions (RDS off). In any case, a periodic visual and acoustic signal indicating the type of problem remains active. Please contact the local Technical Assistance Centre.

To reset the alarm, keep the OK key pressed for a few seconds. The stove can be restarted manually or automatically (in the case of an active chronothermostat or external thermostat) only after resetting the alarm.

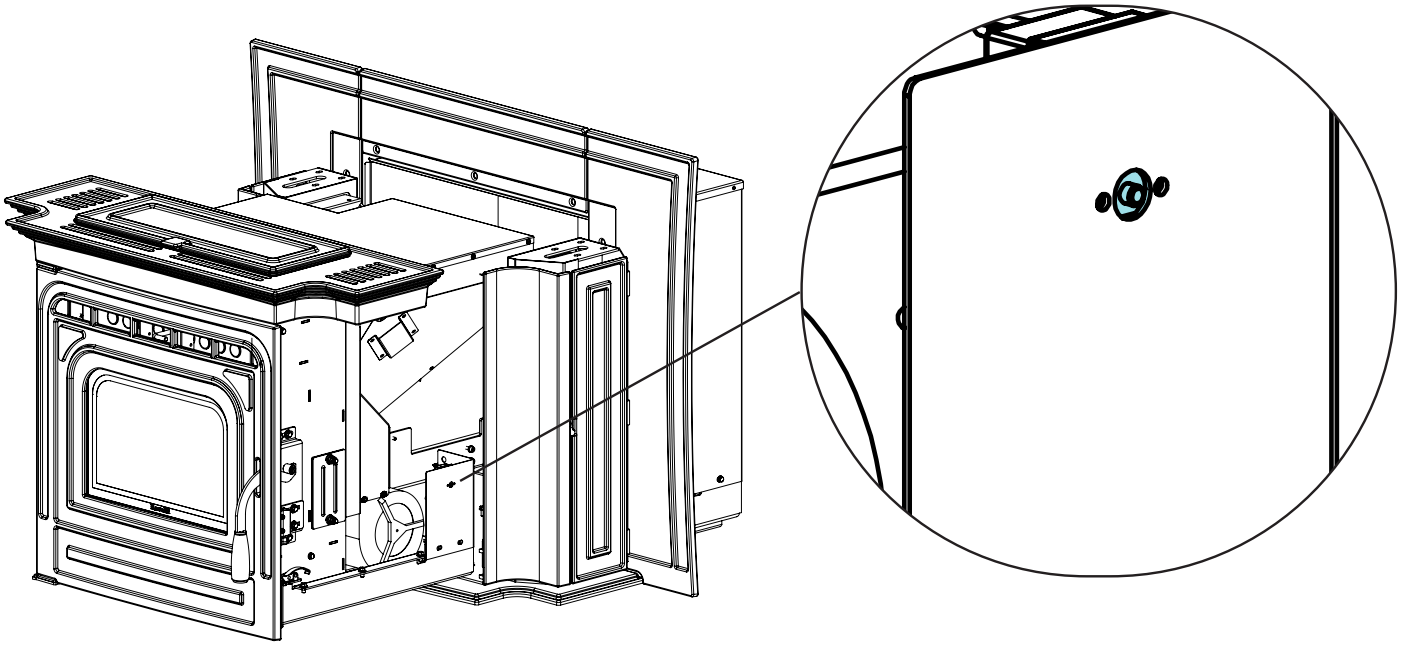
Thermal alarm with reset

1) By pressing the button OK on the display. the alarm can be reset.
2) Unscrew the protection cap and press the button to reset the thermostat alarm.
3) Try and repeat lighting after the cooling phase.

For Francesca 2015, Nicole, Rv80 Ceramica, Rv100 classic

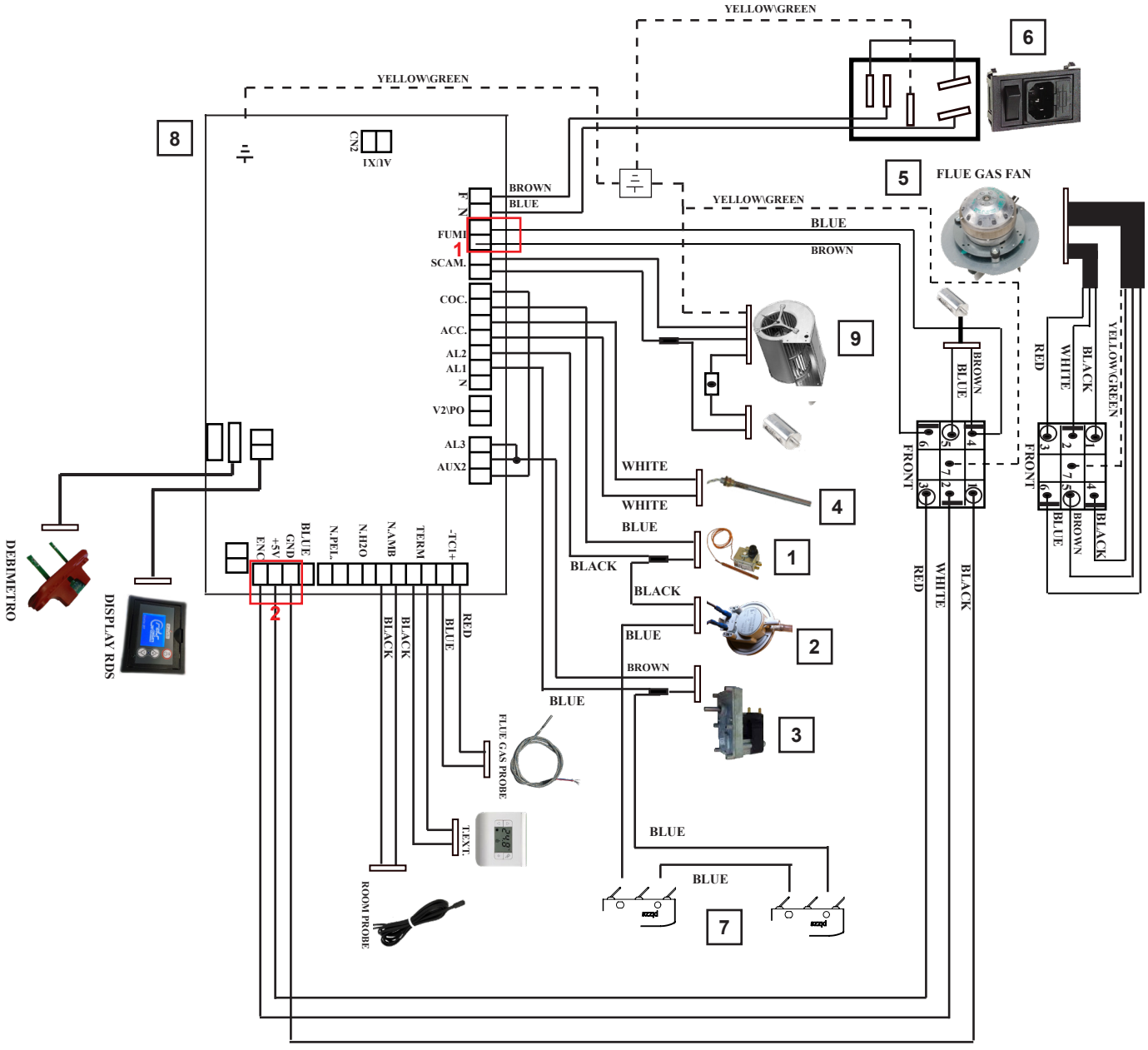


For pellet fireplace insert (Roma)

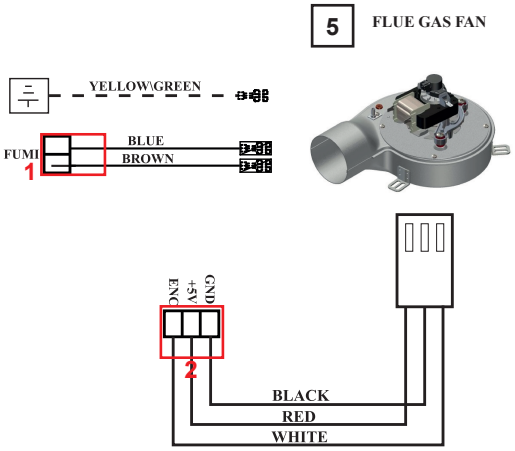


ELECTRICAL WIRING DIAGRAM

For Francesca 2015, Nicole, Rv80 Ceramica and Rv100 classic



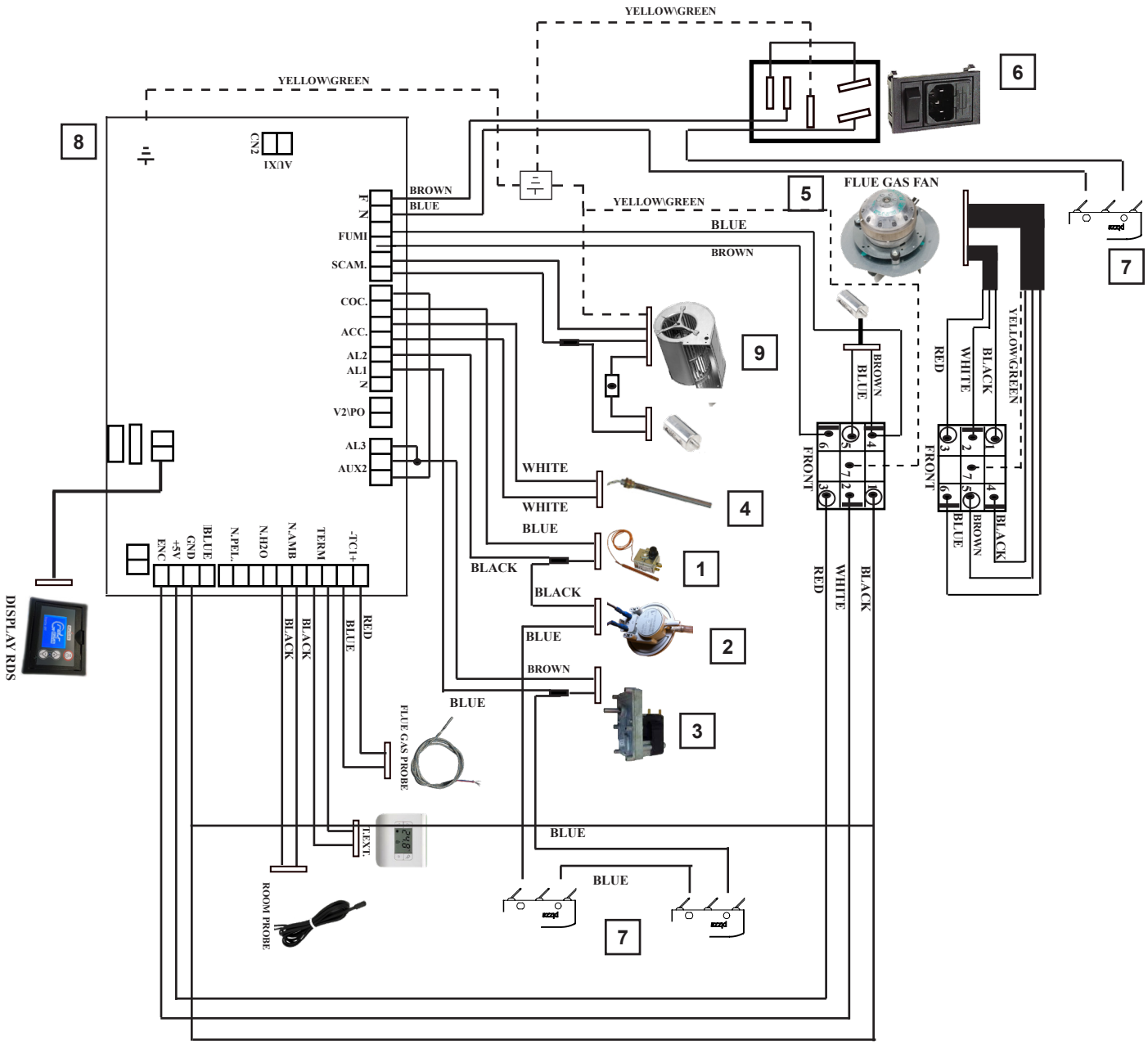
Alternative component (only for Francesca 2015, Nicole, Rv80 Ceramica)



LEGEND:

1- Safety temperature switch
2- Safety pressure switch
3- Gearmotor
4- Igniter
5- Flue gas fan
6- Power cord plug; Main switch
7- Proximity switch
8- Motherboard
9- Room fan

The electrical wiring diagram for Roma



LEGEND:

1- Safety temperature switch
2- Safety pressure switch
3- Gearmotor
4- Igniter
5- Flue gas fan
6- Power cord plug; Main switch
7- Proximity switch
8- Motherboard
9- Room fan

MAINTENANCE

This wood heater needs periodic inspection and repair for proper operation. It is against federal regulations to operate this wood heater in a manner inconsistent with operating instructions in this manual.

Before carrying out any maintenance operation on the stove, please take the following precautions:

- Make sure that all the parts of the stove are cold
- Make sure that the ashes are completely extinguished
- Make sure that the general switch is in the zero position (off)
- Make sure that the plug is disconnected from the socket, thus avoiding accidental contacts.

Please follow the instructions for cleaning shown below carefully! Failure to observe them may lead to problems in the functioning of the stove AND FIRE HAZARD.

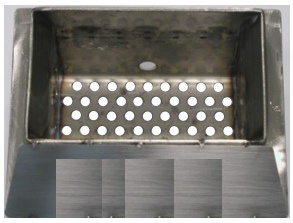
Cleaning the surfaces

To clean the surfaces on the painted metal parts, use a wet cloth in water or at the most, water and soap.

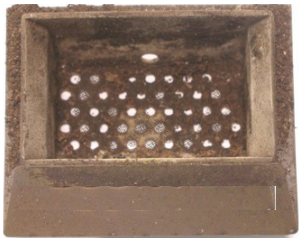
The use of aggressive detergents or diluents can damage the surfaces of the stove.

Cleaning the fire pot before each ignition

You must check that the fire pot, where the combustion takes place, is clean and that no waste or residue blocks the holes, in order to always guarantee excellent combustion of the stove, thus avoiding possible overheating, which could causes changes in the colour of the paint or flaking of the door, as well as failing to light the stove.



Clean fire pot with all the holes clearly visible



Fire pot needing cleaning with the holes blocked by ashes

Only a clean fire pot guarantees that the pellet stove functions without problems. During functioning deposits may be formed.
It is easy to see when the fire pot has to be cleaned! It only needs a glimpse, each day, before switching on. For minor cleansing, it can be left in the stove, but if the residue is difficult to remove, it has to be extracted from its housing and the waste scraped out.
The residue of ash depends on the quality of pellets used.
Important: even with a new batch of pellets, although using the same brand, there may be differences during combustion and therefore they may dirty to a greater or lesser extent.
Correct cleaning, done on a daily basis, allows the stove to burn optimally and to have a good yield, avoiding malfunctioning which in the long term could require technical assistance to reset the stove.

After each maintenance operation, make sure that the fire pot is positioned correctly in its seat.

Cleaning the FIREX 600

All Ravelli products have a combustion chamber made with FIREX 600, a material based on vermiculite, the result of research and development by Ravelli. The main features of FIREX 600 are resistant to heat, its lightness and excellent insulating capacities, improving the combustion and performance of the stove.
During combustion, FIREX 600 turns white, due to an effect called PYROLYSIS, making the flame clear and shining. If the combustion is regulated in an optimal way, the FIREX 600 interior always remains clean and white.

The condition of FIREX 600 is therefore a thermometer to understand whether the combustion is good or not.
FIREX 600 LIGHT – GOOD COMBUSTION
FIREX 600 DARK – POOR COMBUSTION

Firex 600 does not require special maintenance, it only has to be dusted with a soft brush to remove the ash that is deposited during combustion.
Abrasive sponges to clean to most resistant waste should not be used as they could compromise the thickness of the FIREX600 panel, creating critical points of breakage.
The tube of the vacuum cleaner should not be used in direct contact with FIREX 600.
Wet cloths should not be used to clean FIREX 600.
FIREX 600 is resistant to heat but not to knocks; handle with care if moved.
FIREX 600 may show a slight abrasion after a few hours of functioning, this is perfectly normal as the flame creates microgrooves in the panel without compromising it.
The duration of FIREX 600 depends only on how maintenance is carried out.
The pellet stove is a generator of heat with a solid fuel and as such requires servicing by qualified personnel at least once a year at the start of the season. This maintenance has the purpose of ascertaining and ensuring the perfect efficiency of all the components.
We recommend you draw up an annual contract for maintenance of the product with your installer/dealer.

WARRANTY

Read the warranty conditions contained below.

Warranty conditions

The warranty for the Customer is acknowledged by the Dealer under the terms of law.
The Dealer acknowledges the warranty only if the product has not been tampered with and only if it has been installed in accordance with the Manufacturer's instructions.
The limited warranty covers manufacturing material defects, as long as the product has not broken sue to an incorrect use, negligence, incorrect connection, tampering, installation errors.
The warranty becomes null and void even if only one requirement in this manual is not complied with.

The following are not covered by warranty:
- the combustion chamber refractory stones;
- the door glass;
- the gaskets;
- the paint job;
- the stainless steel or cast iron fire pot;
- the electric resistance;
- the Majolica cladding;
- the aesthetic parts;
- any damages caused by unsuitable installation and/or use of the product and/or shortcomings on the part of the customer.

The use of poor quality pellet or any other unauthorised fuel may damage the product's components, cause its warranty to be voided and as a result eliminate the connected manufacturer liability.
It is therefore recommended to use good quality pellet that fulfils the requirements listed in the dedicated chapter.
All damages caused by transportation are not recognised, for this reason it is recommended to carefully check goods upon receipt, immediately warning the reseller of any damage.

Registration of warranty

To activate the warranty, it is necessary to register the product on the Guarantee Portal on the website www.ravelligroup.it, by entering your data and the purchase receipt.

Info and problems

Dealers authorised by Ravelli use a trained Technical Service Centre network to meet the Customer's requirements. For any information or request for assistance, please contact your Dealer or the Technical Service Centre.

RAVELLI
il fuoco intelligente

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PNMU00086 Rev.0 06/10/2022

OPUSCOLO DEDICATO - BROCHURE FOR - OPUSCULE DÉDIÉ AU - BROSCHÜRE FÜR MODELL
FOLLETO DEDICADO AL MODELO - BROCHURE TIL MODEL

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Nicole

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Energy Verified

M.C.258359

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CAUTION /
AVERTISSEMENT:

HOT WHILE IN OPERATION. DO NOT TOUCH, KEEP CHILDREN, CLOTHING AND FURNITURE AWAY.CONTACT MAY CAUSE SKIN BURNS SEE NAME-PLATE AND INSTRUCTIONS. / ***CHAUD LORSQU'EN FONCTIONNEMENT NE PAS TOUCHER, GARDER LES ENFANTS, LES VÊTEMENTS ET MEUBLES HORS DE PORTÉE. LE CONTACT PEUT CAUSER DES BRÛLURES À LA PEAU. VOIR NOM DE LA PLAQUE ET LES INSTRUCTIONS***

SAFETY LABEL / *ÉTIQUETTE DE SÉCURITÉ*

Listed Solid Fuel Room Heater/Pellet. Also suitable for Mob. Home installation. / *Granulé de bois/Appareil e chauffage autonome pour combustible solide répertorié. Convient également aux installations pour maisons mobiles.*

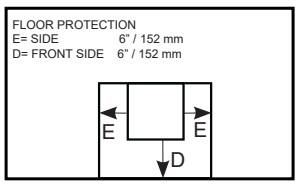
Standard met / *Norme respectée*: CFR EPA Title / *Titre* 40, Part / *Partie* 60, Subpart / *Sous-partie* AAA. Tested to / *Testé* : ASTM E1509-12,ULC-S627-00,UL 1482-11 Room Heating Pellet Burning Type / *Type appareil de chauffage autonome à granule de bois.* Particulate emissions / *Émissions de particules:* ASTM E2779-10 (integrated run / *course intégrée*) ; ASTM E2515-11 methods / *méthodes* 28R and ASMT E2515.

Date of production / *Date de production* : 03/2017
Electrical Rating / Service nominal électrique: 120VAC, 60Hz, 5amps

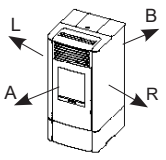
Serial number/
Numéro de série

Route power cord away from unit.do not route cord under or in front of appliance.
DANGER: Risk of Electric Shock. Disconnect power before servicing / *Risque de choc électrique. Débrancher l'alimentation électrique avant d'effectuer l'entretien ou la réparation*. **CAUTION /ATTENTION:** Moving parts may cause injury.Do not operate unit with external panels removed. Hot parts.Do not operate unit with external panels removedReplace glass only with ceramic glass original spare parts available from your dealer.To start set thermostat above room temperature, the stove will light automatically. To shutdown, set thermostat below room temperature. For further instructions refer to owner's manual./ *bouger les parties peut causer des blessures.Ne pas allumer l'appareil avec des habillages manquantes.Endroits chauds. Pour commencer, régler le thermostat au-dessus de la température ambiante, la poêle s'allumera automatiquement.Pour la éteindre, régler le thermostat au-dessous de la température de la chambre. Pour de plus amples informations se référer au manuel du propriétaire.* **OPERATE ONLY WITH DOORS CLOSED.** / ***FAIRE FONCTIONNER AVEC LES PORTES FERMÉES***. Never touch the door handle when the stove is running, you can burn your self. Do not obstruct the space beneath the heater / Ne jamais toucher la poignée de la porte quand le poêle est en marche, pour ne pas encourir de risque de brûlure. Ne pas obstruer l'espace en dessous de l'appareil de chauffage.
PREVENT HOUSE FIRES / *PRÉVENIR LES INCENDIES DE MAISON*
Install and Use Only in Accordance With (Aico SpA) Installation And Operating Instructions. Contact Local Building or Fire Officials About Restrictions and Installation Inspection in Your Area. / *Installer et utiliser uniquement en conformité avec (*Aico SpA*) Installation et instructions pour le fonctionnement.Contacter l'immeuble ou les officiers pompiers à propos des restrictions et l'inspection de l'installation dans votre région.*
This wood pellet heater needs periodic inspection and repair for proper operation.Consult the owner's manual for further information. It is against federal regulations to operate this wood heater in a manner inconsistent with the operating instructions in the owner's manual. / *Ce poêle à granulés de bois necessite d'entretien périodique pour le nettoyage. Consultez le manuel dédié pour plusieurs d'informations. Nous prions de suivre les instruction du manuel car opérer de façon different c'est contre le réglementation féderale.*
WARNING FOR MOBILE HOMES / AVERTISSEMENT POUR LES MAISONS MOBILES : Do not install appliance in a sleeping room. Combustion air openieng are not to be obstructed. An outside combustion air inlet must be provided. The structural integrity of the mobile home floor, ceiling and walls must be maintined. If installed on a combustible floor, provide a non combustible floor protection.Use only original Ravelli components for replacement. / Ne pas installer l'appareil dans une chambre à coucher. Il ne faut pas que les ouverture d'air de combustion soient obstruées. Il faut fournir une entrée externe d'air de combustion. Il faut maintenir l'intégrité structurale du plancher, du plafond et des murs de la maison mobile. Si l'appareil est installé sur un plancher combustible, fournir une protection de plancher non combustible couvrant la zone sous le radiateur et s'étendant jusqu'à au moins 450 mm (18 ") sur le côté du feu et 200 mm (8") sur les autres côtés.
When constructing floor protection for your pellet appliance, any part or materials used must be non-combustible.
For Use Only With Pelletized Wood Fuel. Do not use any other type of fuel than wood pellet. / ***Lors de la construction protection de plancher pour votre poêle à granulés, toutes les pièces et matériaux utilisés doivent être incombustibles. Utiliser uniquement avec du bois de chauffage en granules. Ne pas utiliser avec des types de carburants autres que le granulé de bois.***
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. / Se rapporter aux instructions du fabricant et aux codes locaux afin de prendre connaissance des précautions nécessaires pour faire passer la cheminée à travers un mur ou un plafond combustible. Inspecter et nettoyer fréquemment le réseau de tuyaux de ventilation conformément aux instructions du fabriquant.
DO not connect this unit to a chimney flue serving other appliances./ ***Ne pas raccorder cet appareil sur un conduit de fumée desservant d'autres appareils.***
Use a 3 or 4inch(76-102mm) diametertype "L" or "PL" venting system./ *Utiliser un réseau de ventilation secondaire «L» ou «PL» d'un type de diamètre de 3 ou 4 pouces (76-102mm).*

Minimum Clearances to combustible materials / Dégagement minimal pour les matériaux de combustion



R =RIGT SIDE / CÔTÉ DROIT 4"/ 102 mm
L = LEFT SIDE / CÔTÉ GAUCHE 4"/ 102 mm
B =BACK SIDE / CÔTÉ ARRIÈRE 2"/ 51 mm
A =FRONT SIDE / CÔTÉ AVANT 39,4" /1000 mm



N.B. The floor protection must extrend under the chymney connector and 2 inches (50.8mm) beyond each side

MANUTENZIONE E PULIZIA:
Prima di effettuare qualsiasi operazione di manutenzione adottare le seguenti precauzioni:
- Accertarsi che l'interruttore generale di linea sia disinserito.
- Accertarsi che tutte le parti della stufa siano fredde.
- Accertarsi che le ceneri siano completamente fredde.
- Operare sempre con attrezzature appropriate per la manutenzione.
- Terminata la manutenzione reinstallare tutte le protezioni di sicurezza prima di rimetterla in servizio.

La stufa necessita di poca manutenzione se viene utilizzato un pellet di qualità. E' quindi difficile stabilire con che frequenza debba avvenire la pulizia. La qualità del pellet e la regolazione della combustione sono determinanti.

Pulizia della camera di combustione:
La stufa necessità di una semplice ma frequente pulizia per garantire un efficiente rendimento ed un regolare funzionamento. Aspirare quindi tutti i giorni la camera di combustione con un aspiratore tipo bidone, assicurandosi che le ceneri siano completamente spente.

Pulizia del braciere:
Effettuare la pulizia del braciere come descritto nel capitolo dedicato sul manuale d'istruzione. Solo un braciere in ordine e pulito può garantire un funzionamento senza problemi della stufa a pellet. Durante il funzionamento si possono formare dei depositi, che devono essere subito eliminati. Una corretta pulizia, fatta giornalmente, permette alla stufa di bruciare in modo ottimale e di avere una buona resa, evitando malfunzionamenti che alla lunga potrebbero richiedere l'intervento del tecnico per ripristinare la stufa.

MAINTENANCE AND C LEANING:
Before carrying out any maintenance operation take the following precautions:
- Make sure that the general power switch has been disconnected.
- Make sure that all the parts of the stove are cold.
- Make sure that the ashes have cooled completely.
- Always use appropriate tools for maintenance.
- When you have finished maintenance reinstall all the safety guards before using the stove again.

The stove requires little maintenance if a quality pellet is used. Therefore it is difficult to establish how often the stove needs to be cleaned. The quality of the pellet and the combustion adjustment are crucial.

Cleaning the combustion chamber:
The stove requires simple but frequent cleaning to guarantee an efficient yield and correct functioning.
Therefore, clean the combustion chamber every day using a drum-type vacuum cleaner, making sure that the ashes have gone out completely.

Cleaning the fire pot:
Clean the fire pot as described in the dedicated chapter of the instruction manual. Only a clean and tidy fire pot can guarantee that the pellet stove will run without any problems. Deposits may form while it is running and these must be eliminated immediately.
Correct, daily cleaning will allow the stove to burn properly and to give a good yield, avoiding problems that in the long term could require the intervention of a technician to repair the stove

ENTRETIEN ET NETTOYAGE:
Avant d'effectuer n'importe quelle opération d'entretien, adopter les précautions suivantes :
- S'assurer que l'interrupteur général de ligne est débranché
- S'assurer que toutes les parties du poêle sont froides.
- S'assurer que les cendres sont complètement froides
- Travailler toujours avec des outils appropriés pour l'entretien.
- Quand l'entretien est terminé, réinstaller toutes les protections de sécurité avant de remettre le poêle en service.

Ce poêle a besoin de peu d'entretien si l'on utilise des granulés de qualité. Il est donc difficile d'établir avec quelle fréquence il faut effectuer le nettoyage. La qualité des granulés et le réglage de la combustion sont des facteurs déterminants.

Nettoyage de la chambre de combustion:
Le poêle a besoin d'un nettoyage simple mais fréquent pour garantir un rendement efficace et un bon fonctionnement.
Il faut donc passer un aspirateur du type bidon tous les jours dans la chambre de combustion, après avoir vérifié que les cendres sont complètement éteintes.

Nettoyage du brasier :
Effectuer le nettoyage du brasier comme décrit au chapitre dédié du manuel d'instructions. Seul un brasier bien tenu et propre peut garantir le fonctionnement du poêle à granulés sans problèmes. Pendant le fonctionnement il peut se former des dépôts, qu'il faut tout de suite éliminer.
Un nettoyage correct fait tous les jours permet au poêle de brûler de façon optimale et d'avoir un bon rendement, tout en évitant des défauts de fonctionnement qui à la longue pourraient requérir l'intervention du technicien pour faire repartir le poêle.

INSTANDHALTUNG UND REINIGUNG:
Vor der Durchführung von Instandhaltungsarbeiten sind folgende Vorsichtsmaßnahmen zu treffen:
- Vergewissern Sie sich, dass der Hauptschalter der Anlage abgeschaltet ist.
- Vergewissern Sie sich, dass alle Ofenteile kalt sind.
- Vergewissern Sie sich, dass die Asche vollständig erkaltet ist.
- Benutzen Sie zur Instandhaltung stets geeignetes Werkzeug.
  Nach Beendigung der Instandhaltungsarbeiten setzen Sie alle Schutzeinrichtungen wieder ein, bevor Sie den Ofen in Betrieb nehmen.

Der Ofen ist extrem wartungsfreundlich, wenn qualitativ hochwertige Pellets verwendet werden. Es ist daher schwer zu sagen, mit welcher Häufigkeit er gereinigt werden muss. Die Pelletqualität und die Einstellung der Verbrennung sind in diesem Zusammenhang ausschlaggebend.

Reinigung der Brennkammer:
Der Ofen ist einfach zu reinigen, doch er muss häufig gereinigt werden, um eine wirkungsvolle Leistung und einen einwandfreien Betrieb zu

Reinigung der Glutpfanne:
Reinigen Sie die Glutpfanne, wie im Kapitel zur Bedienungsanleitung beschrieben. Nur eine saubere Glutpfanne, die in Ordnung ist, gewährleistet einen problemlosen Betrieb des Pelletofens. Während des Betriebs können sich Ablagerungen bilden, die umgehend entfernt werden müssen.
Wenn der Ofen täglich korrekt gereinigt wird, brennt der Ofen optimal und bringt eine gute Leistung. Betriebsstörungen werden vermieden, die auf lange Sicht den Einsatz eines Technikers erforderlich machen könnten, um den Ofen wieder in Ordnung zu bringen.

MANTENIMIENTO Y LIMPIEZA:
Antes de realizar cualquier tipo de operación de mantenimiento adoptar las siguientes precauciones:
- Asegurarse que el interruptor general de la línea esté desconectado.
- Asegurarse que todas las partes de la estufa estén frías.
- Asegurarse que las cenizas estén completamente frías.
- Trabajar siempre con equipos adecuados a las operaciones de mantenimiento.
- Concluidas las operaciones de mantenimiento, reinstalar todas las protecciones de seguridad antes de ponerla de nuevo en funcionamiento.

La estufa necesita de poco mantenimiento si se utilizan pellets de buena calidad. Por esto no es fácil establecer la frecuencia con la que

se debe realizar la limpieza. La calidad de los pellets y la regulación de la combustión son determinantes.

Limpieza de la cámara de combustión:

La estufa necesita de una sencilla pero frecuente limpieza para garantizar su buen rendimiento y un funcionamiento regular. Aspirar todos los días la cámara de combustión con un aspirador de bidón, asegurándose que las cenizas estén completamente apagadas.

Limpieza del brasero:

Llevar a cabo la limpieza del brasero tal y como se describe en el capítulo específico del manual de instrucciones. Solamente un brasero limpio y ordenado puede garantizar el funcionamiento sin problemas de la estufa de pellets. Durante el funcionamiento se pueden formar depósitos, que deben ser eliminados inmediatamente.
Una correcta limpieza, realizada diariamente, permite que la estufa queme de modo óptimo y se tenga un buen rendimiento, evitando malfunctionamientos, que a largo plazo podrían requerir la intervención de un técnico para reparar la estufa.

VEDLIGEHOLDELSE OG RENGØRING:

Før der udføres nogen form for vedligeholdelsesindgreb, skal der tages følgende forholdsregler:

- Sørg for, at liniens hovedafbryder er afbrudt.
- Sørg for, at alle brændeovnens dele er kolde.
- Sørg for, at asken er helt kold.
- Arbejd altid med egnet værktøj til vedligeholdelsen.
- Når vedligeholdelsen er afsluttet, skal alle sikkerhedsbeskyttelserne genmonteres, før brændeovnen tændes igen.

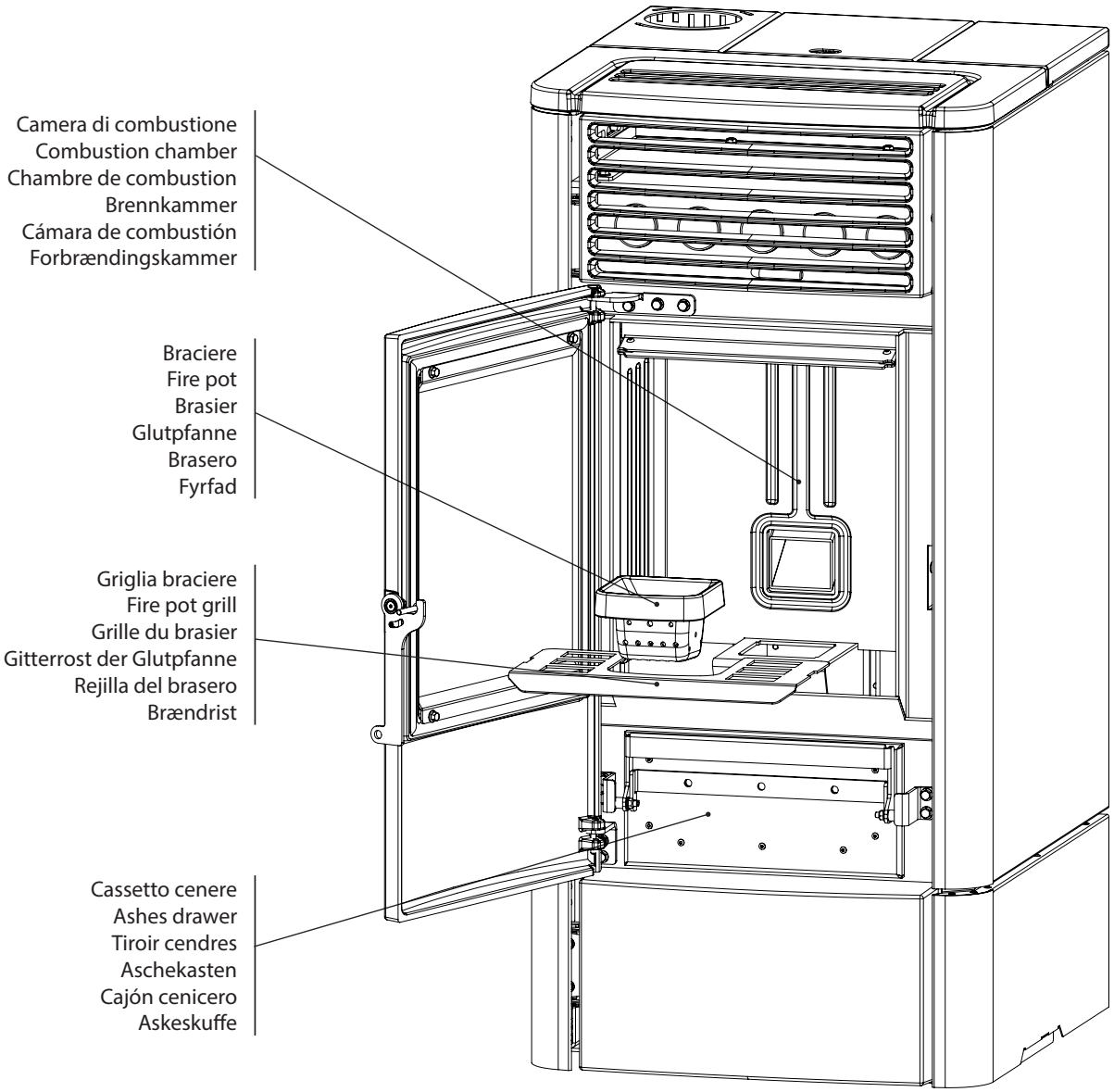
Brændeovnen har kun behov for lidt vedligeholdelse, når den anvendes med kvalitetspellets. Det er derfor vanskeligt at fastsætte, hvor ofte den skal rengøres. Pelletkvaliteten og forbrændingsreguleringen er bestemmende.

Rengøring af forbrændingskammer:

Brændeovnen har behov for enkelt men hyppig rengøring for at garantere en effektiv ydelse og en regelmæssig funktion.
Støvsug derfor hver dag forbrændingskammeret med en støvsuger af typen med tank. Sørg for, at asken er slukket fuldstændigt.

Rengøring af fyrfadet:

Rengør fyrfadet som beskrevet i det respektive kapitel i brugervejledningen. Kun et fyrfad, som er i orden og er rent kan garantere en funktion uden problemer for pellet-brændeovnen. Under funktionen kan der dannes aflejringer, som omgående skal fjernes.
En korrekt, daglig rengøring gør det muligt for brændeovnen at brænde optimalt, at få en god ydeevne og at undgå fejlfunktioner, som i det lange løb kan kræve en teknikers indgreb for at genoprette brændeovnen.



Pulizia del cassetto cenere:
La pulizia del cassetto cenere deve essere effettuata ogni 2 giorni, dipende comunque dal tempo di utilizzo della stufa e dal tipo di pellet utilizzato.
Per accedere al cassetto aprire la porta (vedi Figura 1) e sfilarlo (vedi Figura 2).
N.B.:l' operazione deve essere effettuata a stufa fredda utilizzando un aspiratore di tipo bidone.

Cleaning the ashes drawer:
The ashes drawer must be cleaned every 2 days, depending on the length of time the stove is used and the type of pellet used.
To access the drawer, open the door (see figure 1) and extract the ashes drawer (see figure 2).
N.B.: The operation must be carried out when the stove is cold, using a drum-type vacuum cleaner.

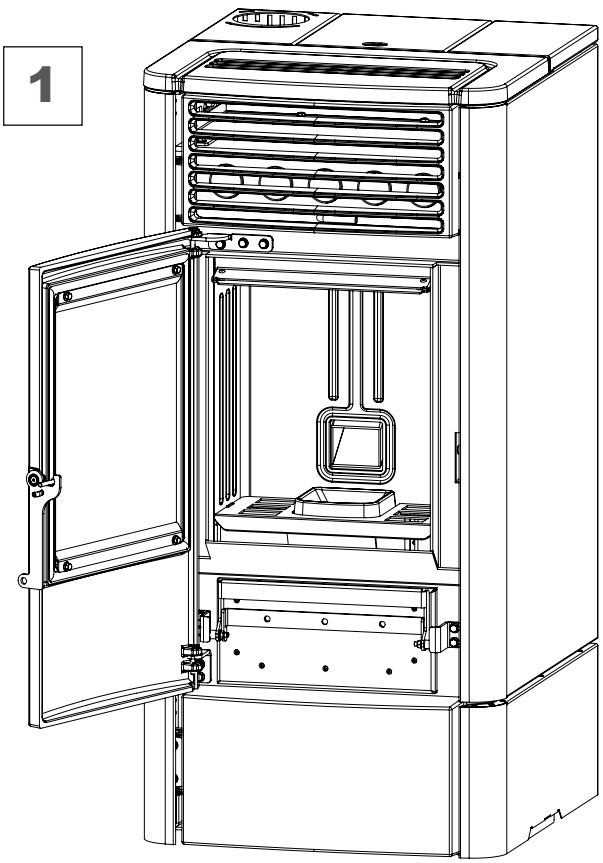
Nettoyage du tiroir cendres:
Il faut effectuer le nettoyage du tiroir cendres tous les 2 jours, mais de toute façon cela dépend du temps d'utilisation du poêle, et du type de granulés utilisés.
Pour accéder au tiroir, ouvrir la porte (voir figure 1) et extraire le tiroir cendres (voir figure 2).
N.B. : ce nettoyage doit être effectué avec le poêle froid, en utilisant un aspirateur du type bidon.

Reinigung des Aschekastens:
Der Aschekasten muss alle 2 Tage gereinigt werden. Die Reinigungshäufigkeit hängt jedoch in jedem Fall von der Zeit ab, über die der Ofen betrieben wird, wie auch vom verwendeten Pellettyp.
Öffnen Sie die Tür (siehe Abbildung 1), um den Aschekasten herauszuziehen (siehe Abbildung 2). **Hinweis: Saugen Sie den Aschekasten in kaltem Zustand mit einem Schmutzsauger ab.**

Limpieza del cajón cenicero:
La limpieza del cajón cenicero debe realizarse cada 2 días, dependiendo en todo caso del tiempo de uso de la estufa y del tipo de pellets utilizados.
Para acceder al cajón, abrir la puerta (véase la Figura 1) y extraerlo (véase la Figura 2).
Nota: esta operación debe llevarse cabo con la estufa fría y empleando un aspirador de bidón.

Rengøring af askeskuffen:
Askeskuffen skal rengøres hver 2. dag. Det afhænger i alle tilfælde af hvor længe brændeovnen anvendes og af den type pellet, som benyttes.
For at få adgang til skuffen skal lågen åbnes (se figur 1) og skuffen trækkes ud (se figur 2). **N.B.: rengøringen skal ske med kold brændeovn og ved hjælp af en støvsuger.**

1



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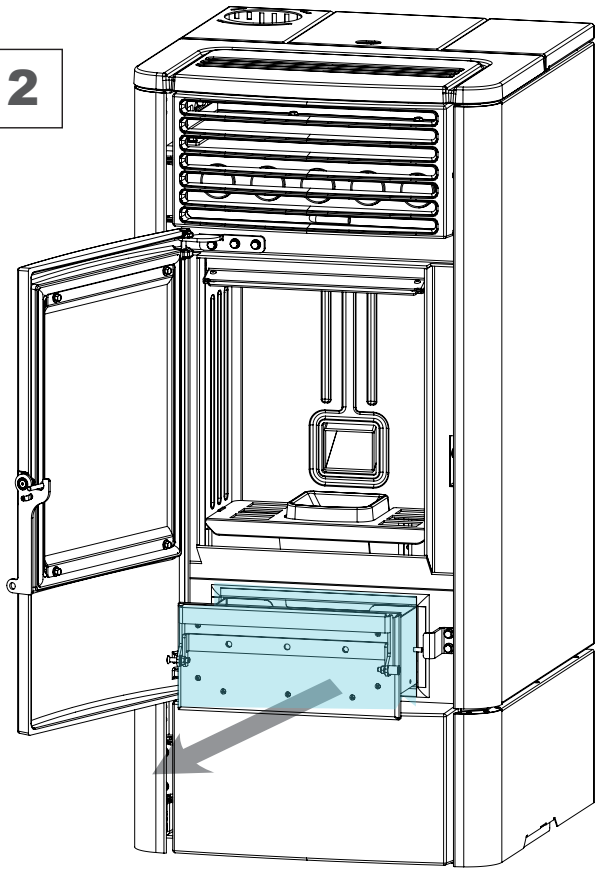


Come togliere il tagliafiamma:
Togliere e pulire regolarmente il tagliafiamma.

How to remove the flame trap:
Remove and clean the flame trap regularly

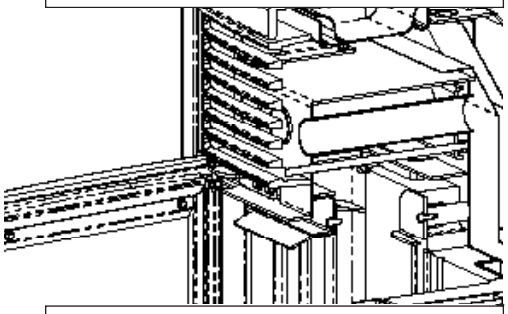
Comment enlever le dispositif anti-retour de flamme:
Enlever et nettoyer le dispositif anti-retour de flamme regulierement.

So entfernen sie den feuerschutz:
Entfernen und reinigen sie den feuerschutz regelmässig.

Cómo quitar el elemento separador de la llama:
Quitar y limpiar regularmente el elemento separador de la llama.

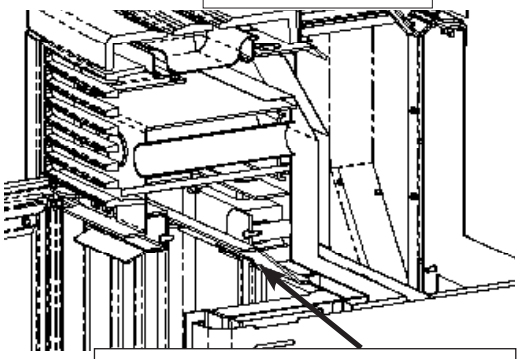
Hvordan brandspjældet fjernes:
Fjern og rengør jævnligt brandspjældet

APPOGGIO FRONTALE TAGLIAFIAMMA
FRONT FLAME TRAP REST
APPUI FRONTAL ANTI-RETOUR DE FLAMME
VORDERE FEUERSCHUTZAUFLAGE
APOYO FRONTAL DEL ELEMENTO SEPARADOR DE LA LLAMA
BRANDSPJÆLDETS FORRESTE HOLDER



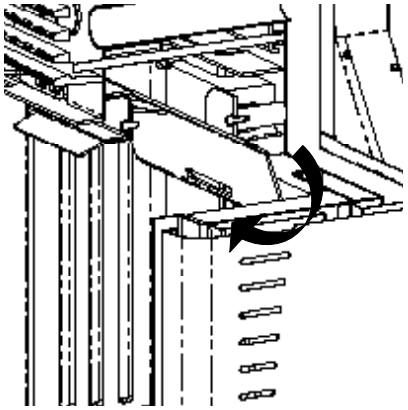
APPOGGIO POSTERIORE TAGLIAFIAMMA
REAR FLAME TRAP REST
APPUI POSTERIEUR ANTI-RETOUR DE FLAMME
HINTERE FEUERSCHUTZAUFLAGE
APOYO TRASERO DEL ELEMENTO SEPARADOR DE LA LLAMA
BRANDSPJÆLDETS BAGESTE HOLDER

Fase A / Phase A



POSIZIONE DELL'ASOLA TAGLIAFIAMMA
POSITION OF THE FRAME TRAP SLOT
POSITION DE LA FENTE DU DISP. ANTI-RETOUR DE FLAMME
LAGE DES FEUERSCHUTZSCHLITZES
POSICIÓN DEL OJETE DEL ELEMENTO SEPARADOR DE LA LLAMA
PLACERING AF BRANDSPJÆLDETS LANGHUL

Fase B / Phase B



Pulizia condotto fumi (ogni 1000 ore):
La pulizia del condotto fumi va effettuata ogni 3 mesi (il tempo può variare a seconda della qualità del pellet utilizzato).
Smontare il pannello posteriore per accedere alla botola di ispezione. La piastra di ispezione è sigillata con silicone per alte temperature; dopo la pulizia deve essere pulita e deve essere messo un nuovo strato di silicone in modo da garantirne l'ermeticità.
Si consiglia di accordare con il vostro centro assistenza Ravelli questo tipo di pulizia.
N.B.: Utilizzare solo un aspiratore di tipo bidone.

Cleaning the flue (every 1000 hours):
The flue must be cleaned once every 3 months (the time may vary depending on the quality of the pellet used).
Remove the back panel to access the inspection hatch. The inspection plate is sealed with high temperature silicone; after cleaning, it must be clean and a new layer of silicone must be applied to guarantee its seal.
You are advised to agree this type of cleaning with your Ravelli assistance centre. N.B.: Use a drum-type vacuum cleaner only.

Nettoyage conduit de fumées (toutes les 1000 heures):
Le nettoyage du conduit de fumées doit être effectué tous les trois mois (le temps peut varier en fonction de la qualité des granulés utilisés). Démonter le panneau postérieur pour accéder à l'ouverture d'inspection. La plaque d'inspection est scellée avec de la colle silicone pour hautes températures ; après le nettoyage du poêle il faut nettoyer la plaque et mettre une nouvelle couche de silicone, pour garantir l'herméticité.
Nous vous conseillons de vous mettre d'accord avec votre centre d'assistance Ravelli pour effectuer ce genre de nettoyage. N.B. : Utiliser uniquement un aspirateur du type bidon.

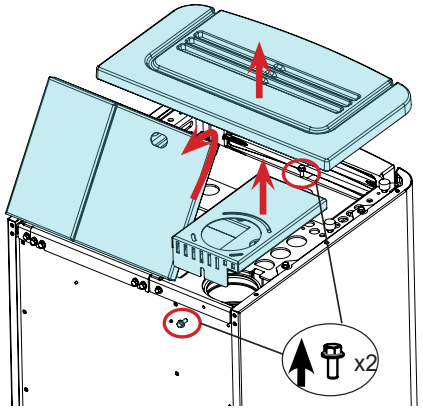
Reinigung des Rauchfang (alle 1000 Stunden):
Die Reinigung des Rauchgases erfolgt alle 3 Monate durchgeführt (der Zeitraum kann je nach der Qualität der verwendeten Pellets variieren).Bauen Sie die rückwärtige Platte aus, um an die Inspektionsklappe zu gelangen. Die Inspektionsplatte ist mit Silikon für hohe Temperaturen versiegelt; nach der Reinigung muss sie gesäubert und eine neue Schicht Silikon aufgetragen werden, um die Dichtigkeit zu gewährleisten.
Sie sollten sich zur Vereinbarung einer derartigen Reinigung mit Ihrem Ravelli Kundendienst in Verbindung setzen. Anm.: Verwenden Sie ausschließlich einen Schmutzsauger.

Limpieza del conductos de humos (cada 1.000 horas):
La limpieza del conductos de humos debe realizarse cada 3 meses (este tiempo puede variar en función de la calidad de los pellets utilizados).
Desmontar el panel trasero para acceder a la tapa de inspección. La placa de inspección está sellada con silicona para altas temperaturas; después de haberla limpiado debe aplicarse una nueva capa de silicona de manera de garantizar su hermeticidad.
Se recomienda solicitar a su centro de asistencia Ravelli este tipo de limpieza. NOTA: Utiliza solamente un aspirador de bidón.

Rengøring af skorstenen (hver 1000 timer):
Der skal udføres rengøring hver 3. måned (tiden kan variere efter kvaliteten af den pellet, der benyttes).
Tag bagpanelet af for at få adgang til inspektionsproppen. Inspektionspladen er forseglet med silikone til høje temperaturer. Efter rengøringen skal den rengøres, og der skal påføres et nyt lag silikone for at garantere hermetisk tæthed.
Det anbefales at aftale denne type rengøring med dit Ravelli servicecenter.
N.B.: Brug kun støvsugere af typen med tank.

Come accedere alle botole di ispezione / How to access the inspection hatches / Comment accéder aux plaques d'inspection / So gelangen Sie an die Inspektionsklappen / Cómo acceder a las tapas de inspección / Hvordan der fås adgang til inspektionspladen

1



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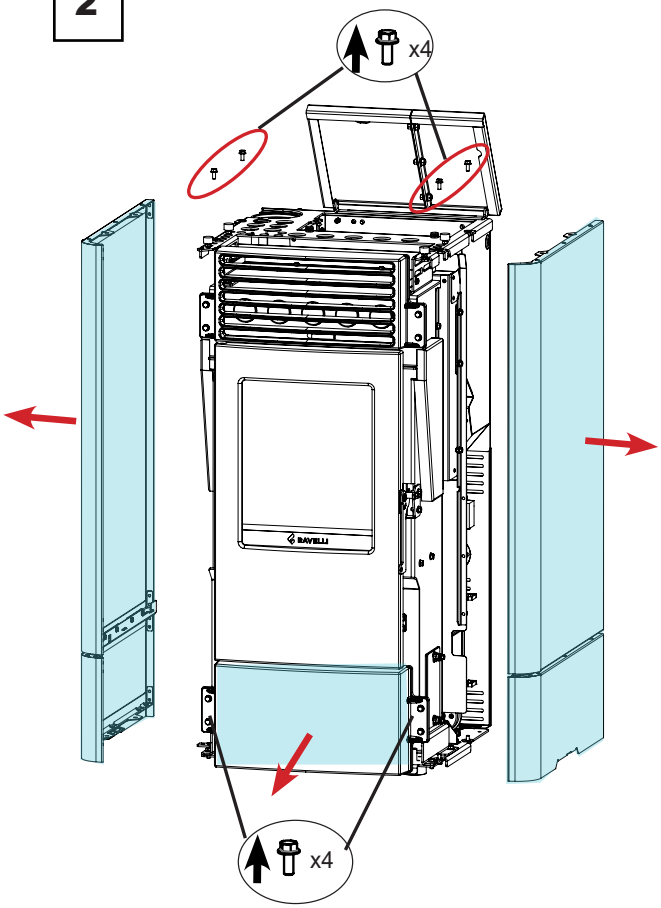

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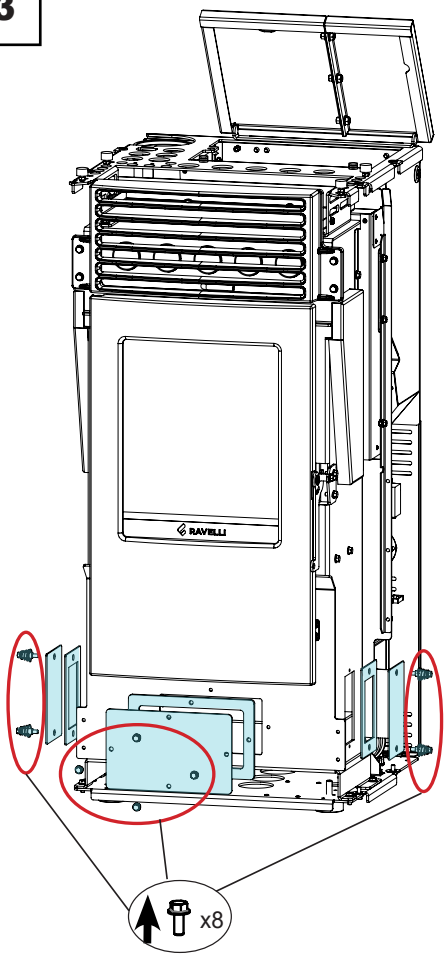
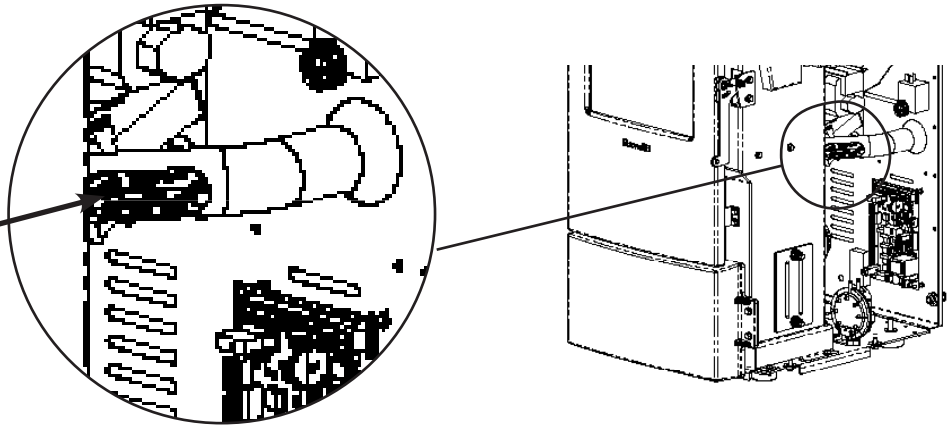


BOTOLA ISPEZIONE
INSPECTION HATCH
PLAQUE D'INSPECTIONINSPEKTIONSKLAPPE
TAPA DE INSPECCIÓN
INSPEKTIONSLEM

GUARNIZIONE / GASKET / JOINT
DICHTUNG / EMPAQUETADURA /
TÆTNINGSPAKNING

4

DEBIMETRO
DEBIMETER
DÉBITMÈTRE
FLUSSMASSENMESSER
FLUJOSTATO
FLOWMÅLER



PARTI / FREQUENZA PARTS / FREQUENCY PIECES / FREQUENCE BAUTEILE / HÄUFIGKEIT PARTES / FRECUENCIA DELE / HYPPIGHED	1 GIORNO 1 DAY 1 JOUR 1 TAG 1 DÍA 1 DAG	2-3 GIORNI 2-3 DAYS 2-3 JOURS 2-3 TAGE 2-3 DÍAS 2-3 DAGE	30 GIORNI 30 DAYS 30 JOURS 30 TAGE 30 DÍAS 30 DAGE	60-90 GIORNI 60-90 DAYS 60-90 JOURS 60-90 TAGE 60-90 DÍAS 60-90 DAGE	1 STAGIONE 1 SEASON 1 SAISON 1 HEIZSAISON 1 ESTACIÓN 1 SÆSON
Braciere / Fire pot / Brasier / Glutpfanne / Brasero / Fyrfad	●				
Cassetto cenere / Ashes drawer / Tiroir cendres / Aschekasten / Cajón cenicero / Askeskuffe		●			
Vetro / Glass / Vitre / Glasscheibe / Vidrio / Glas		●			
Condotto aspirazione / Suction duct / Conduit d'aspiration fumées / Saugkanal / Conducto de aspiración / Aftrækskanal				●	
Guarnizione porta / Door gasket / Joint porte / Türdichtung / Empaquetadura de la puerta / Lågepakning					●
Raschiatore fascio tubiero / Tube bundle scraper / Ramoneur du faisceau tubulaire / Schaber am Rohrbünde / Rascador de la batería de tubos / Skraber til rørbundt	X	X	X	X	X
Canna fumaria / Flue / Conduit de fumée / Schornstein / Conducto de salida de humos / Skorsten					●
Camera di combustione / Combustion chamber / Chambre de combustion / Brennkammer / Cámara de combustión / Forbrændingskammer		●			
Aspirare serbatoio pellet / Vacuum clean the pellet tank / Passer l'aspirateur dans le réservoir des granulés / Pelletbehälter absaugen / Aspirar el depósito de pellets / Støvsug pelletbeholder			●		

RAVELLI
il fuoco intelligente

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Rev.0 PNMD00015 11/02/2022

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CAUTION /
AVERTISSEMENT:

HOT WHILE IN OPERATION. DO NOT TOUCH, KEEP CHILDREN, CLOTHING AND FURNITURE AWAY.CONTACT MAY CAUSE SKIN BURNS SEE NAME-PLATE AND INSTRUCTIONS. / ***CHAUD LORSQU'EN FONCTIONNEMENT NE PAS TOUCHER, GARDER LES ENFANTS, LES VÊTEMENTS ET MEUBLES HORS DE PORTÉE. LE CONTACT PEUT CAUSER DES BRÛLURES À LA PEAU. VOIR NOM DE LA PLAQUE ET LES INSTRUCTIONS***

SAFETY LABEL / *ÉTIQUETTE DE SÉCURITÉ*

Listed Solid Fuel Room Heater/Pellet. Also suitable for Mob. Home installation. / *Granulé de bois/Appareil e chauffage autonome pour combustible solide répertorié. Convient également aux installations pour maisons mobiles.*

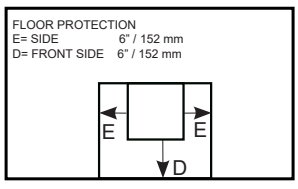
Standard met / *Norme respectée*: CFR EPA Title / *Titre* 40, Part / *Partie* 60, Subpart / *Sous-partie* AAA. Tested to / *Testé* : ASTM E1509-12,ULC-S627-00,UL 1482-11 Room Heating Pellet Burning Type / *Type appareil de chauffage autonome à granule de bois.* Particulate emissions / *Émissions de particules:* ASTM E2779-10 (integrated run / *course intégrée*) ; ASTM E2515-11 methods / *méthodes* 28R and ASMT E2515.

Date of production / *Date de production* : 03/2017
Electrical Rating / Service nominal électrique: 120VAC, 60Hz, 5amps

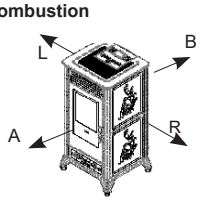
Serial number/
Numéro de série

Route power cord away from unit.do not route cord under or in front of appliance.
DANGER: Risk of Electric Shock. Disconnect power before servicing / *Risque de choc électrique. Débrancher l'alimentation électrique avant d'effectuer l'entretien ou la réparation*. **CAUTION /ATTENTION:** Moving parts may cause injury.Do not operate unit with external panels removed. Hot parts.Do not operate unit with external panels removedReplace glass only with ceramic glass original spare parts available from your dealer.To start set thermostat above room temperature, the stove will light automatically. To shutdown, set thermostat below room temperature. For further instructions refer to owner's manual./ *bouger les parties peut causer des blessures.Ne pas allumer l'appareil avec des habillages manquantes.Endroits chauds. Pour commencer, régler le thermostat au-dessus de la température ambiante, la poêle s'allumera automatiquement.Pour la éteindre, régler le thermostat au-dessous de la température de la chambre. Pour de plus amples informations se référer au manuel du propriétaire.* **OPERATE ONLY WITH DOORS CLOSED.** / ***FAIRE FONCTIONNER AVEC LES PORTES FERMÉES***. Never touch the door handle when the stove is running, you can burn your self. Do not obstruct the space beneath the heater / Ne jamais toucher la poignée de la porte quand le poêle est en marche, pour ne pas encourir de risque de brûlure. Ne pas obstruer l'espace en dessous de l'appareil de chauffage.
PREVENT HOUSE FIRES / *PRÉVENIR LES INCENDIES DE MAISON*
Install and Use Only in Accordance With (Aico SpA) Installation And Operating Instructions. Contact Local Building or Fire Officials About Restrictions and Installation Inspection in Your Area. / *Installer et utiliser uniquement en conformité avec (*Aico SpA*) Installation et instructions pour le fonctionnement.Contacter l'immeuble ou les officiers pompiers à propos des restrictions et l'inspection de l'installation dans votre région.*
This wood pellet heater needs periodic inspection and repair for proper operation.Consult the owner's manual for further information. It is against federal regulations to operate this wood heater in a manner inconsistent with the operating instructions in the owner's manual. / *Ce poêle à granulés de bois necessite d'entretien périodique pour le nettoyage. Consultez le manuel dédié pour plusieurs d'informations. Nous prions de suivre les instruction du manuel car opérer de façon different c'est contre le réglementation féderale.*
WARNING FOR MOBILE HOMES / AVERTISSEMENT POUR LES MAISONS MOBILES : Do not install appliance in a sleeping room. Combustion air openieng are not to be obstructed. An outside combustion air inlet must be provided. The structural integrity of the mobile home floor, ceiling and walls must be maintined. If installed on a combustible floor, provide a non combustible floor protection.Use only original Ravelli components for replacement. / Ne pas installer l'appareil dans une chambre à coucher. Il ne faut pas que les ouverture d'air de combustion soient obstruées. Il faut fournir une entrée externe d'air de combustion. Il faut maintenir l'intégrité structurale du plancher, du plafond et des murs de la maison mobile. Si l'appareil est installé sur un plancher combustible, fournir une protection de plancher non combustible couvrant la zone sous le radiateur et s'étendant jusqu'à au moins 450 mm (18 ") sur le côté du feu et 200 mm (8") sur les autres côtés.
When constructing floor protection for your pellet appliance, any part or materials used must be non-combustible.
For Use Only With Pelletized Wood Fuel. Do not use any other type of fuel than wood pellet. / ***Lors de la construction protection de plancher pour votre poêle à granulés, toutes les pièces et matériaux utilisés doivent être incombustibles. Utiliser uniquement avec du bois de chauffage en granules. Ne pas utiliser avec des types de carburants autres que le granulé de bois.***
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. / Se rapporter aux instructions du fabricant et aux codes locaux afin de prendre connaissance des précautions nécessaires pour faire passer la cheminée à travers un mur ou un plafond combustible. Inspecter et nettoyer fréquemment le réseau de tuyaux de ventilation conformément aux instructions du fabriquant.
DO not connect this unit to a chimney flue serving other appliances./ ***Ne pas raccorder cet appareil sur un conduit de fumée desservant d'autres appareils.***
Use a 3 or 4inch(76-102mm) diametertype "L" or "PL" venting system./ *Utiliser un réseau de ventilation secondaire «L» ou «PL» d'un type de diamètre de 3 ou 4 pouces (76-102mm).*

Minimum Clearances to combustible materials / Dégagement minimal pour les matériaux de combustion



R =RIGT SIDE / CÔTÉ DROIT 4"/ 102 mm
L = LEFT SIDE / CÔTÉ GAUCHE 4"/ 102 mm
B =BACK SIDE / CÔTÉ ARRIÈRE 2"/ 51 mm
A =FRONT SIDE / CÔTÉ AVANT 39,4" /1000 mm



N.B. The floor protection must extrend under the chymney connector and 2 inches (50.8mm) beyond each side

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INSTALLATION

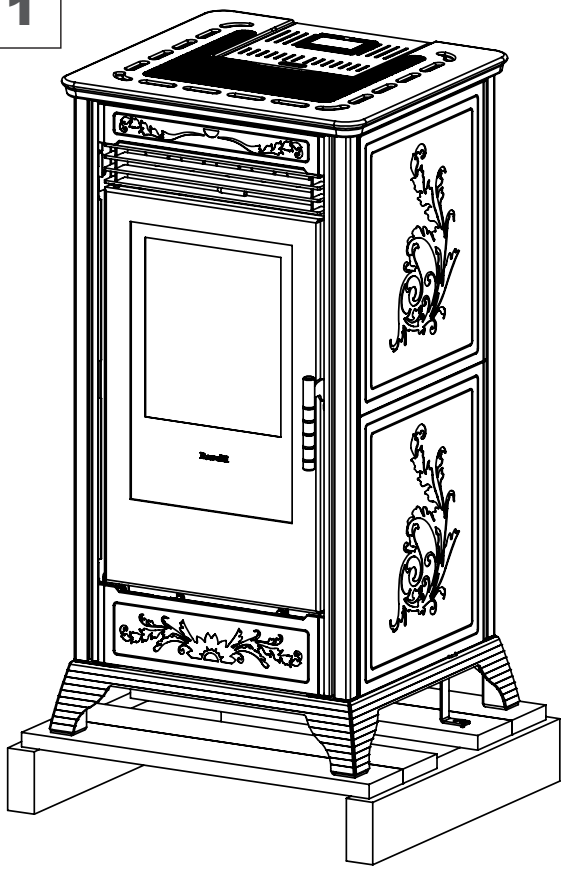
The stove must be installed on a floor with a sufficient carrying capacity. If the existing building does not meet this requisite, appropriate measures must be taken (i.e. load distribution plate). /
Le poêle doit être installé sur un sol ayant une capacité de charge adéquate. Si la construction existante ne satisfait pas cette exigence, il faudra prendre des mesures appropriées (ex. : plaque de distribution de la charge).

The installation of the stove should guarantee an installation with easy access to the stove and of the chimney. /
L'installation de l'appareil doit garantir d'y accéder facilement pour le nettoyage desconduits des gaz de décharge et du tuyau de cheminée.

Extraction fans (eg. kitchen hoods), when used in the same room or environment of the appliance, may cause problems. /
Les ventilateurs d'extraction (par exemple les hottes de cuisine), lorsqu'ils sont utilisés dans la même pièce ou dans le même environnement que l'appareil, peuvent causer des problèmes.

MOUNTING OF RUBBER FEET / MONTAGE DE PIEDS EN CAOUTCHOUC

1



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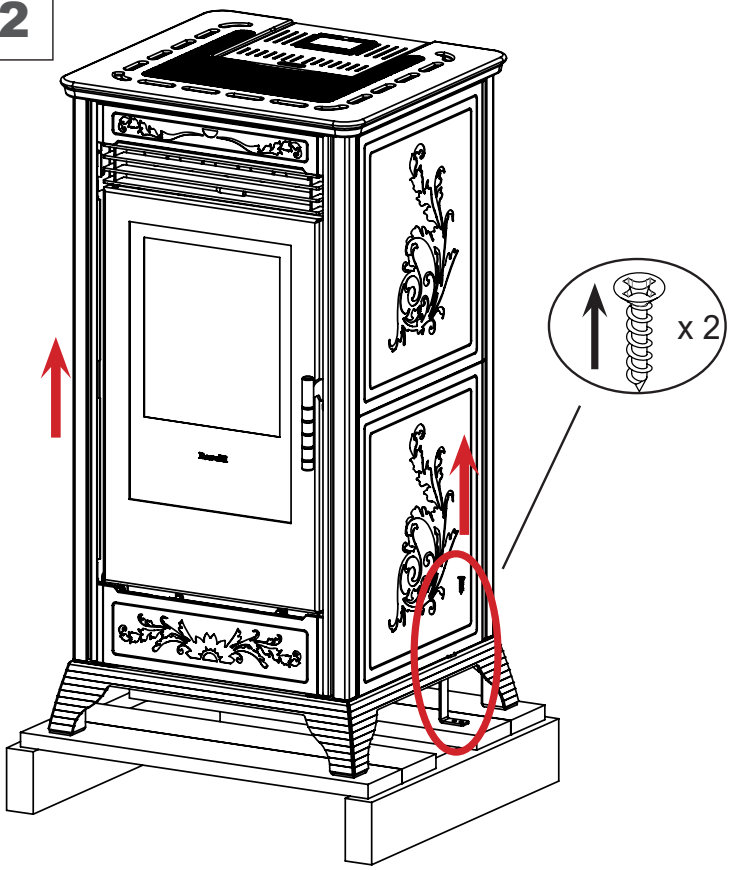

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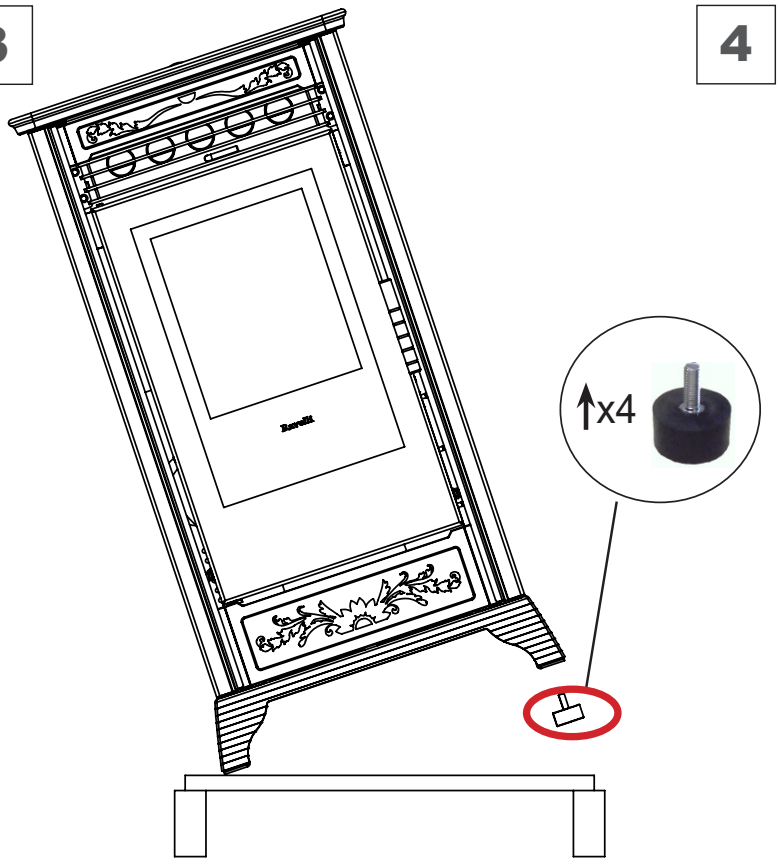

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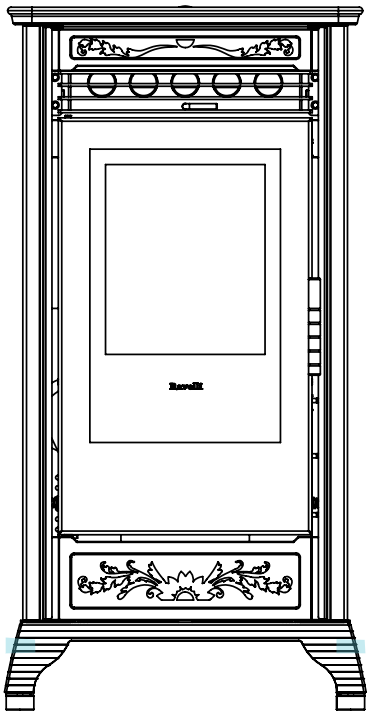
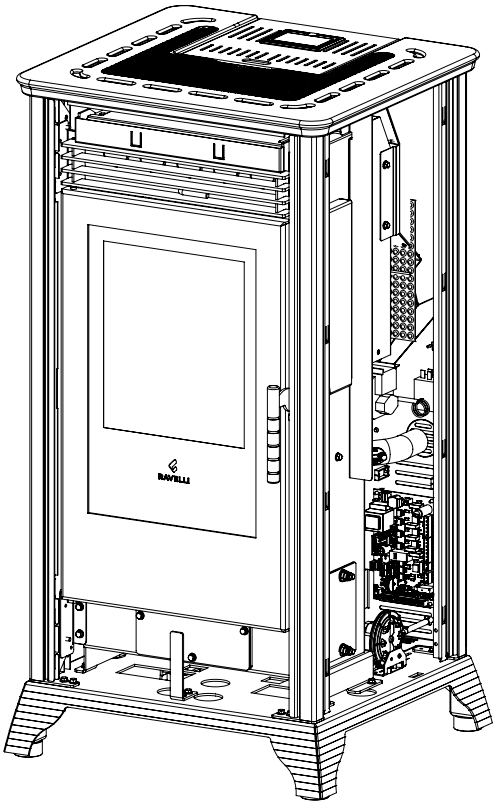


ASSEMBLY OF THE CERAMIC / ASSEMBLAGE DE LA CÉRAMIQUE

1



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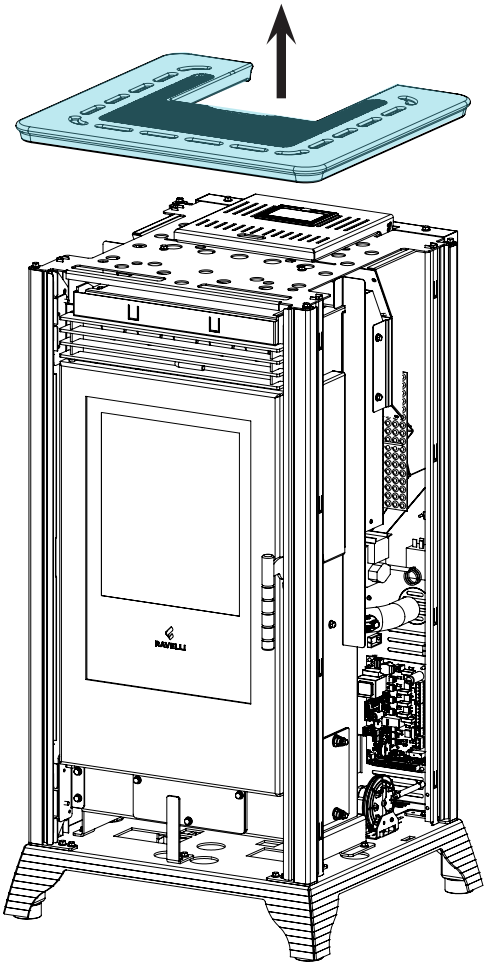

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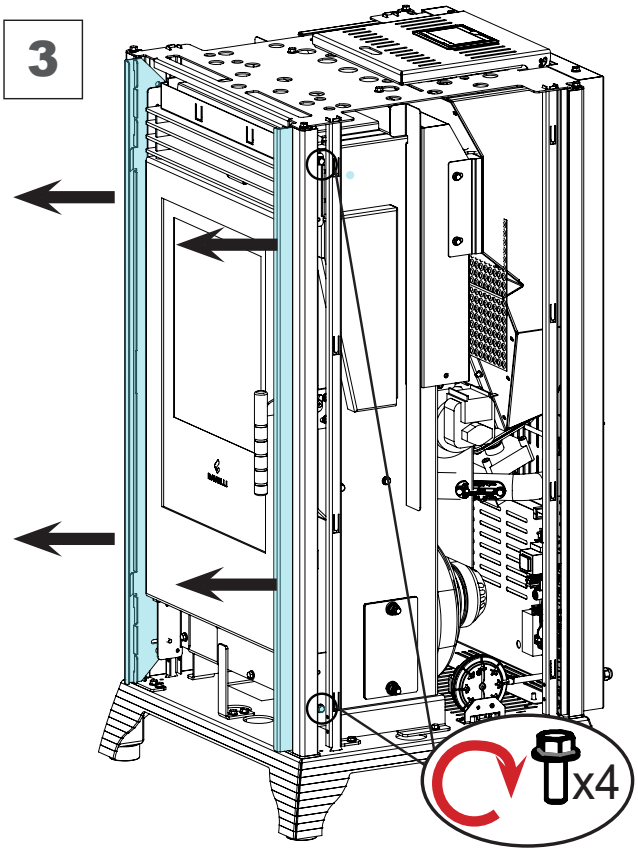

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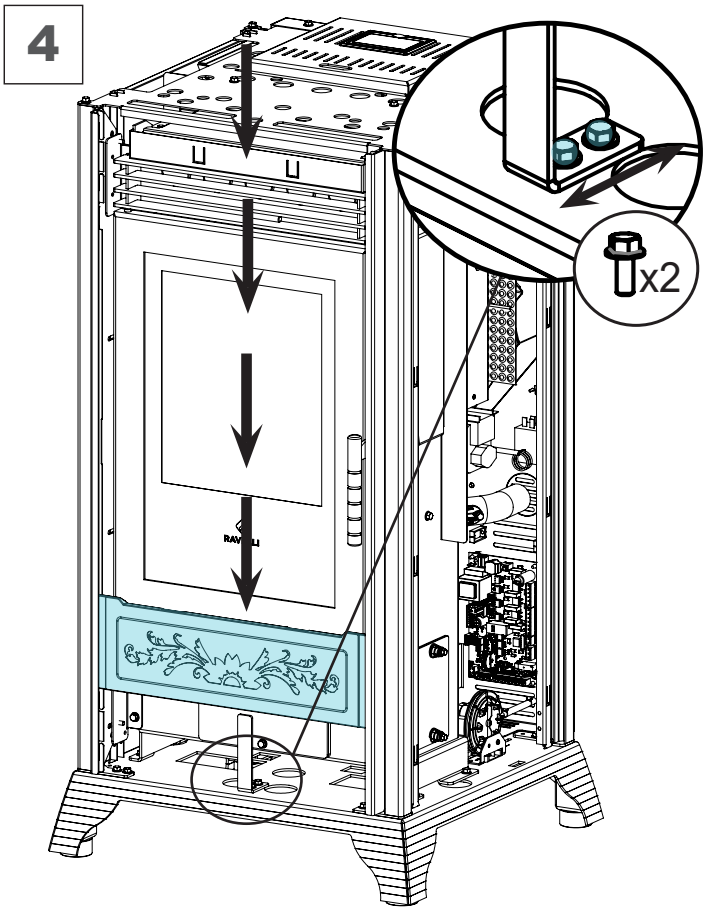

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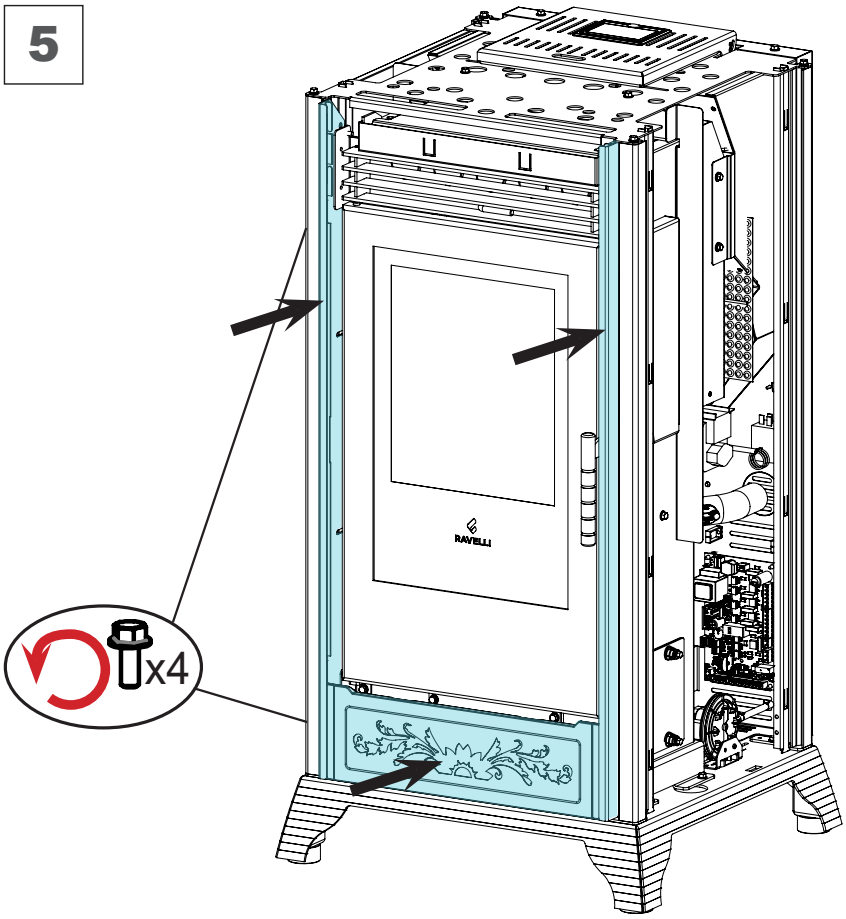

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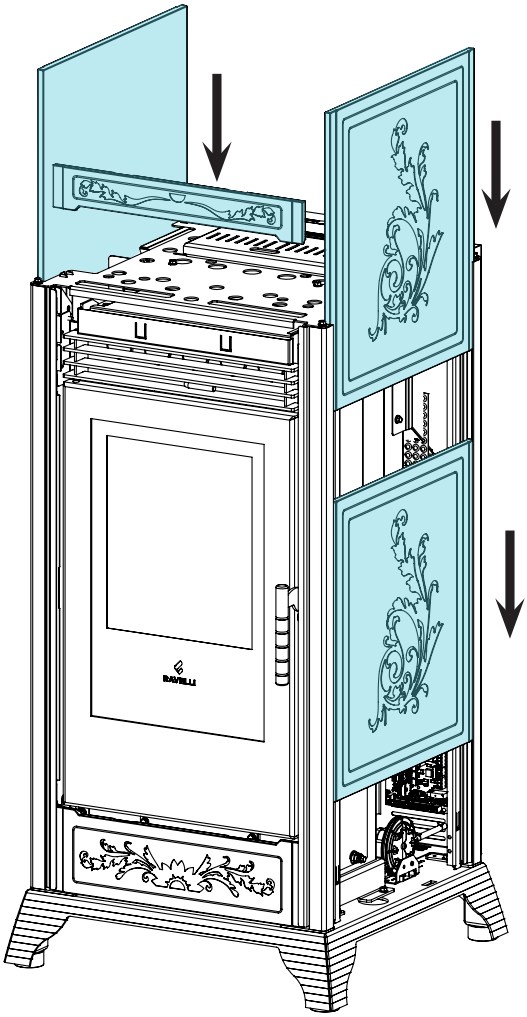

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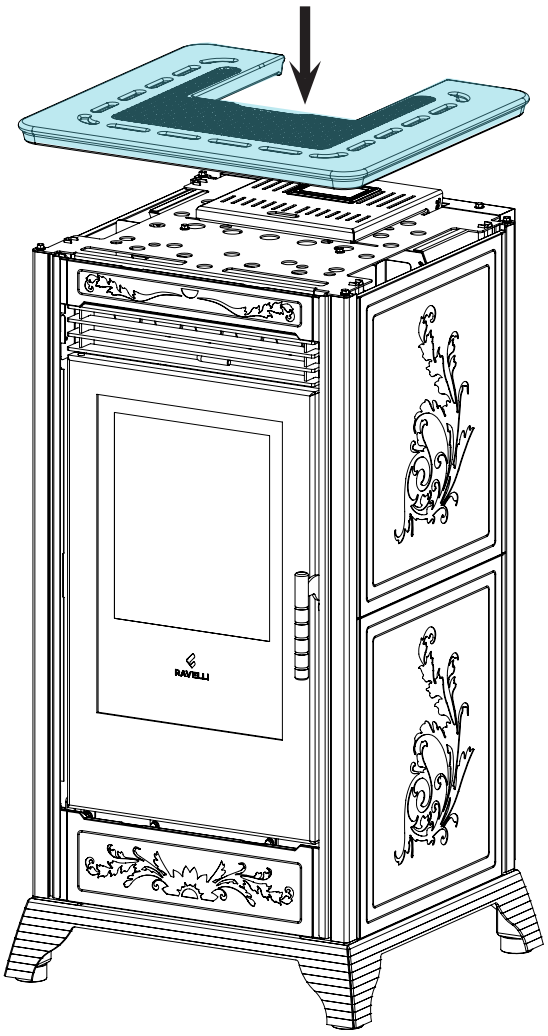


MAINTENANCE AND CLEANING:

Before carrying out any maintenance operation take the following precautions:

- Make sure that the general power switch has been disconnected.
- Make sure that all the parts of the stove are cold.
- Make sure that the ashes have cooled completely.
- Always use appropriate tools for maintenance.
- When you have finished maintenance reinstall all the safety guards before using the stove again.

The stove requires little maintenance if a quality pellet is used. Therefore it is difficult to establish how often the stove needs to be cleaned. The quality of the pellet and the combustion adjustment are crucial.

Cleaning the combustion chamber:

The stove requires simple but frequent cleaning to guarantee an efficient yield and correct functioning.
Therefore, clean the combustion chamber every day using a drum-type vacuum cleaner, making sure that the ashes have gone out completely.

Cleaning the fire pot:

Clean the fire pot as described in the dedicated chapter of the instruction manual. Only a clean and tidy fire pot can guarantee that the pellet stove will run without any problems. Deposits may form while it is running and these must be eliminated immediately. Correct, daily cleaning will allow the stove to burn properly and to give a good yield, avoiding problems that in the long term could require the intervention of a technician to repair the stove

ENTRETIEN ET NETTOYAGE:

Avant d'effectuer n'importe quelle opération d'entretien, adopter les précautions suivantes :

- S'assurer que l'interrupteur général de ligne est débranché
- S'assurer que toutes les parties du poêle sont froides.
- S'assurer que les cendres sont complètement froides
- Travailler toujours avec des outils appropriés pour l'entretien.
- Quand l'entretien est terminé, réinstaller toutes les protections de sécurité avant de remettre le poêle en service.

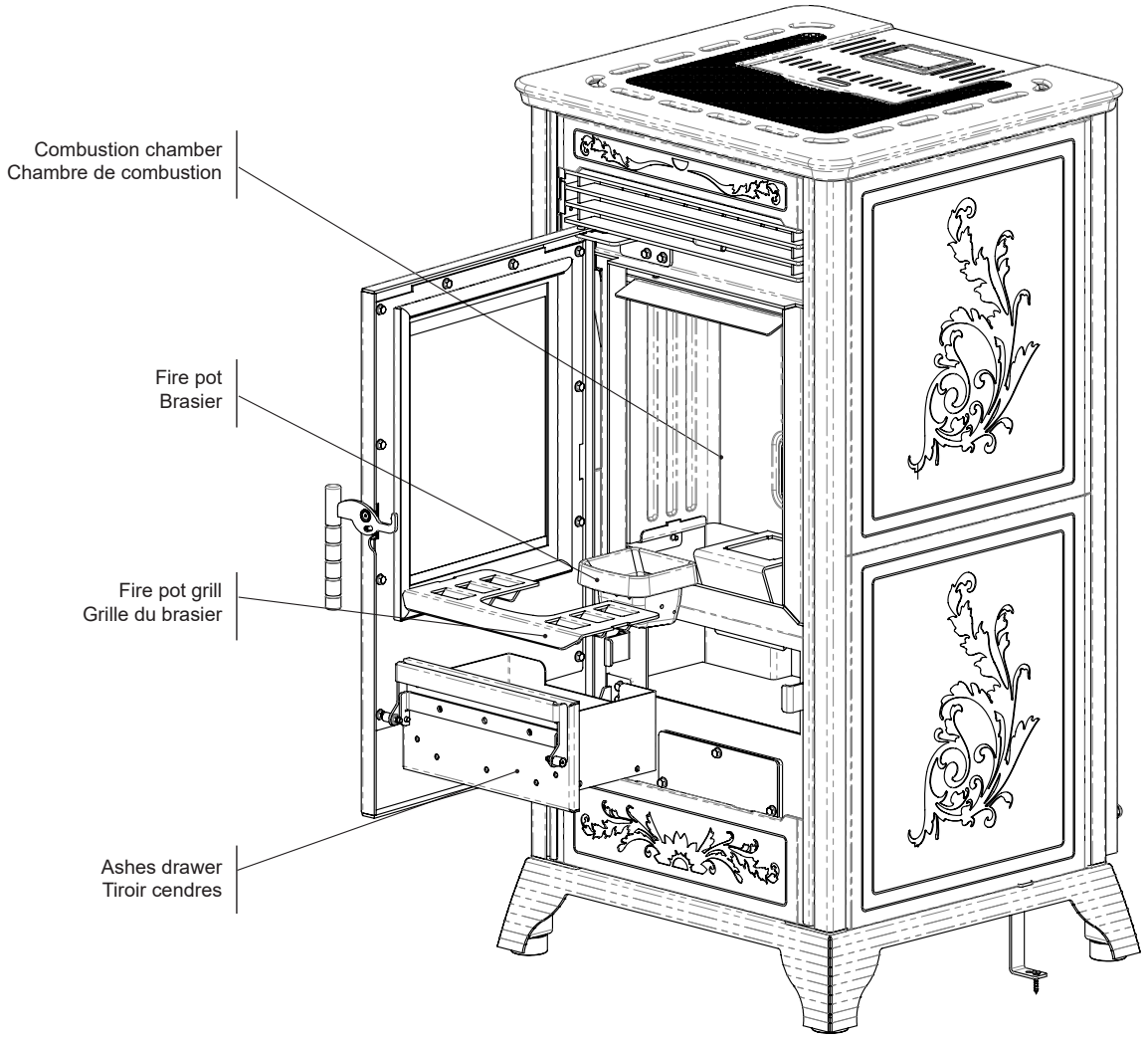
Ce poêle a besoin de peu d'entretien si l'on utilise des granulés de qualité. Il est donc difficile d'établir avec quelle fréquence il faut effectuer le nettoyage. La qualité des granulés et le réglage de la combustion sont des facteurs déterminants.

Nettoyage de la chambre de combustion:

Le poêle a besoin d'un nettoyage simple mais fréquent pour garantir un rendement efficace et un bon fonctionnement.
Il faut donc passer un aspirateur du type bidon tous les jours dans la chambre de combustion, après avoir vérifié que les cendres sont complètement éteintes.

Nettoyage du brasier :

Effectuer le nettoyage du brasier comme décrit au chapitre dédié du manuel d'instructions. Seul un brasier bien tenu et propre peut garantir le fonctionnement du poêle à granulés sans problèmes. Pendant le fonctionnement il peut se former des dépôts, qu'il faut tout de suite éliminer.
Un nettoyage correct fait tous les jours permet au poêle de brûler de façon optimale et d'avoir un bon rendement, tout en évitant des défauts de fonctionnement qui à la longue pourraient requérir l'intervention du technicien pour faire repartir le poêle.



Cleaning the ashes drawer:

The ashes drawer must be cleaned every 2 days, depending on the length of time the stove is used and the type of pellet used. To access the drawer, open the door (see figure 1) and extract the ashes drawer (see figure 2).

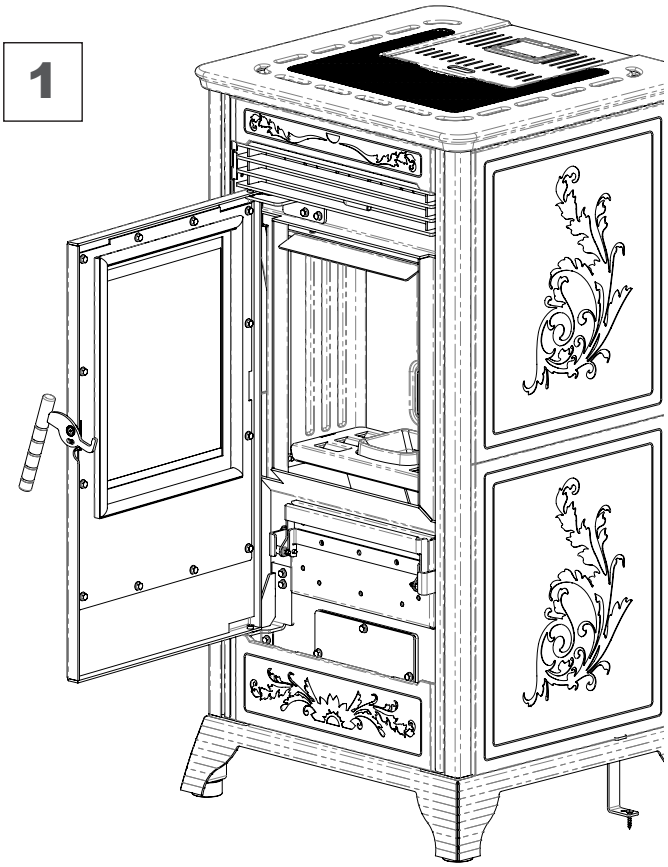
N.B.: The operation must be carried out when the stove is cold, using a drum-type vacuum cleaner.

Nettoyage du tiroir cendres:

Il faut effectuer le nettoyage du tiroir cendres tous les 2 jours, mais de toute façon cela dépend du temps d'utilisation du poêle, et du type de granulés utilisés.
Pour accéder au tiroir, ouvrir la porte (voir figure 1) et extraire le tiroir cendres (voir figure 2).

N.B. : ce nettoyage doit être effectué avec le poêle froid, en utilisant un aspirateur du type bidon.

1



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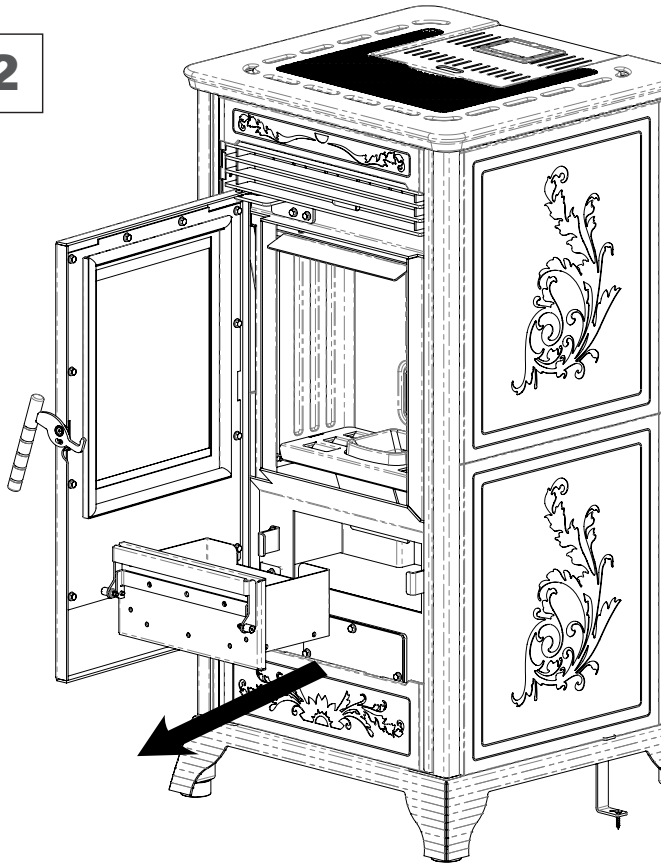


Cleaning the flue (every 1000 hours):

The flue must be cleaned once every 3 months (the time may vary depending on the quality of the pellet used).
Remove the back panel to access the inspection hatch. The inspection plate is sealed with high temperature silicone; after cleaning, it must be clean and a new layer of silicone must be applied to guarantee its seal.

You are advised to agree this type of cleaning with your Ravelli assistance centre. N.B.: Use a drum-type vacuum cleaner only.

Nettoyage conduit de fumées (toutes les 1000 heures):

Le nettoyage du conduit de fumées doit être effectué tous les trois mois (le temps peut varier en fonction de la qualité des granulés utilisés). Démonter le panneau postérieur pour accéder à l'ouverture d'inspection. La plaque d'inspection est scellée avec de la colle silicone pour hautes températures ;
après le nettoyage du poêle il faut nettoyer la plaque et mettre une nouvelle couche de silicone, pour garantir l'herméticité.

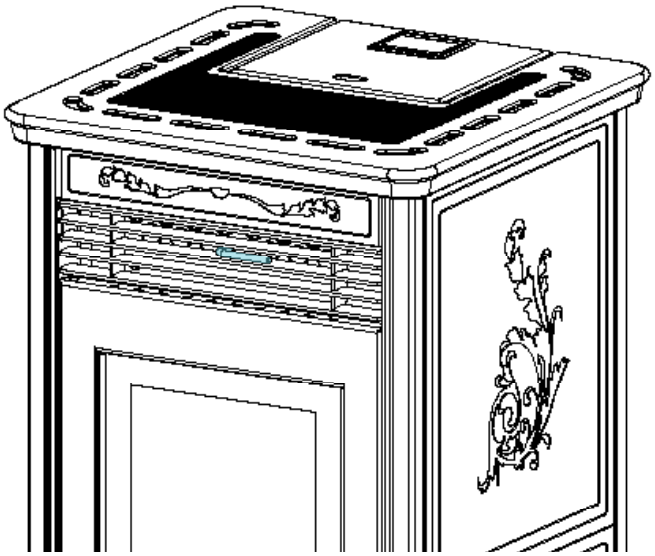
Nous vous conseillons de vous mettre d'accord avec votre centre d'assistance Ravelli pour effectuer ce genre de nettoyage. N.B. : Utiliser uniquement un aspirateur du type bidon.

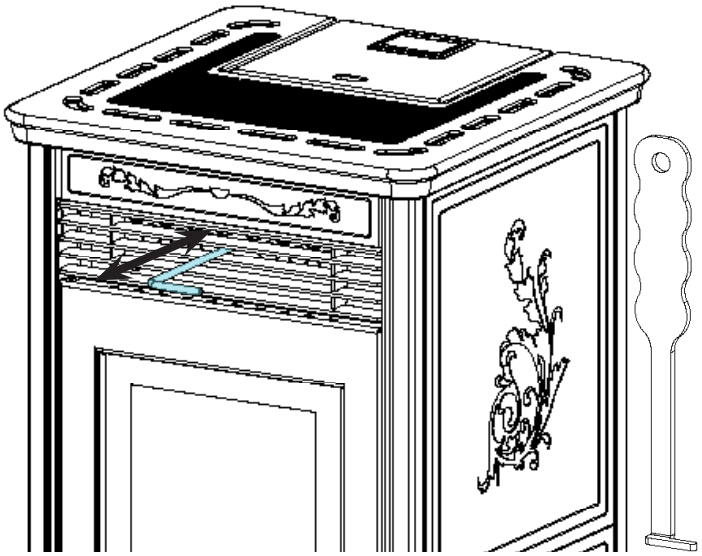
Cleaning the tube heat exchanger:

During operation, dust and soot are deposited on the surface of the heat exchanger tubes. To ensure smooth operation throughout the season, it is advisable to periodically clean the heat exchanger when the stove is cold. Using the cold handle, extract the scraper rod and firmly move the scraper back and forth.
Once you have finished cleaning the exchanger, push the scraper into the grille (never leave it removed).

Nettoyage de l'échangeur à faisceau tubulaire:

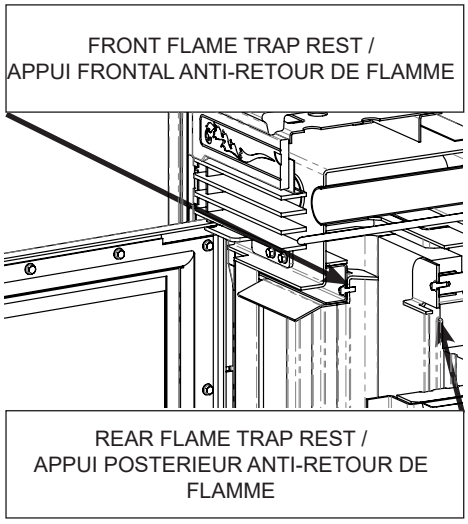
Durant le fonctionnement, si la poussière et la suie se déposent sur la surface des tubes de l'échangeur. Afin d'assurer un fonctionnement optimal durant toute la saison, il est recommandé de nettoyé l'échangeur régulièrement lorsque le poêle est froid. En utilisant la main-froide, extraire la tige du racleur et avec un mouvement décis, déplacer le racleur en avant et en arrière.
Une fois l'opération de nettoyage de l'échangeur terminée, pousser le racleur à l'intérieur de la grille (ne jamais le laisser sorti).





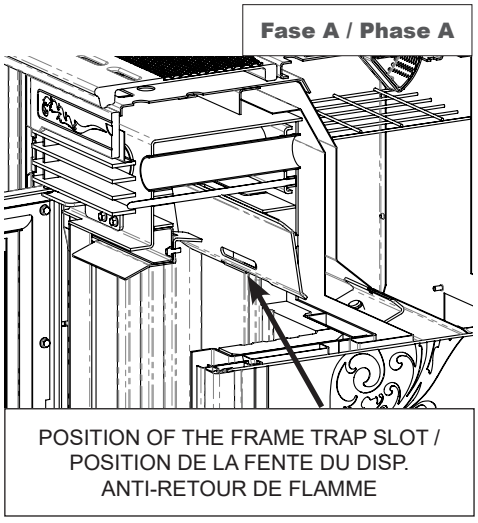
How to remove the flame trap:

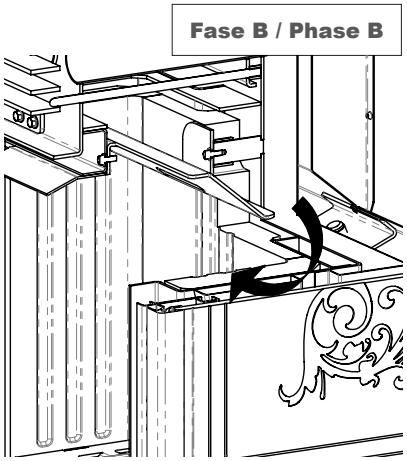
Remove and clean the flame trap regularly



Comment enlever le dispositif anti-retour de flamme:

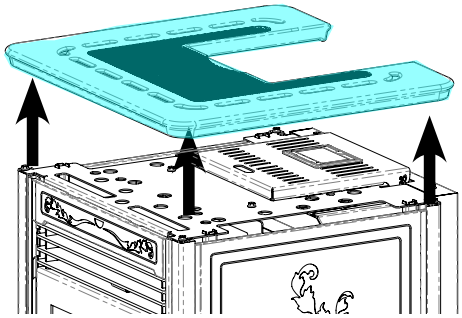
Enlever et nettoyer le dispositif anti-retour de flamme regulierement.





HOW TO ACCESS THE INSPECTION HATCHES / COMMENT ACCÉDER AUX PLAQUES D'INSPECTION

1



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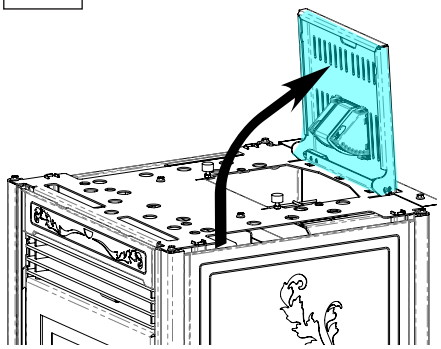

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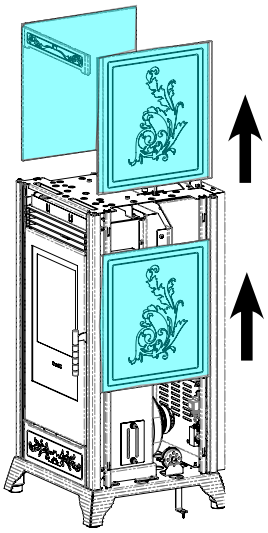

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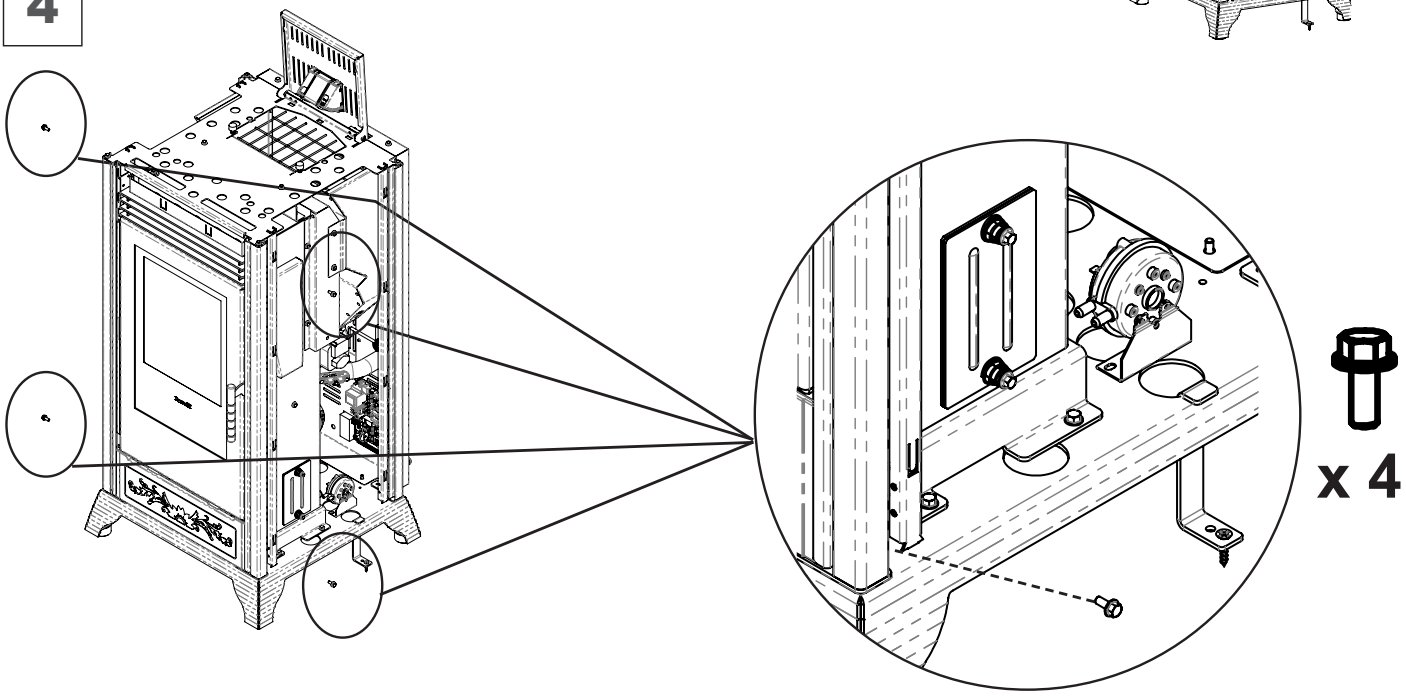

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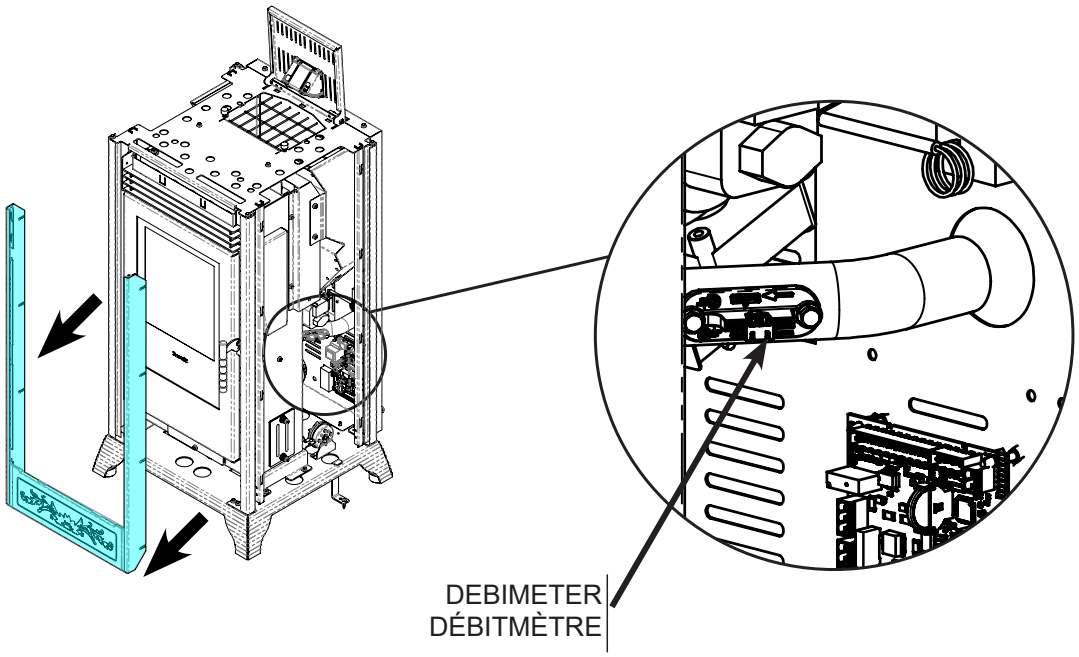

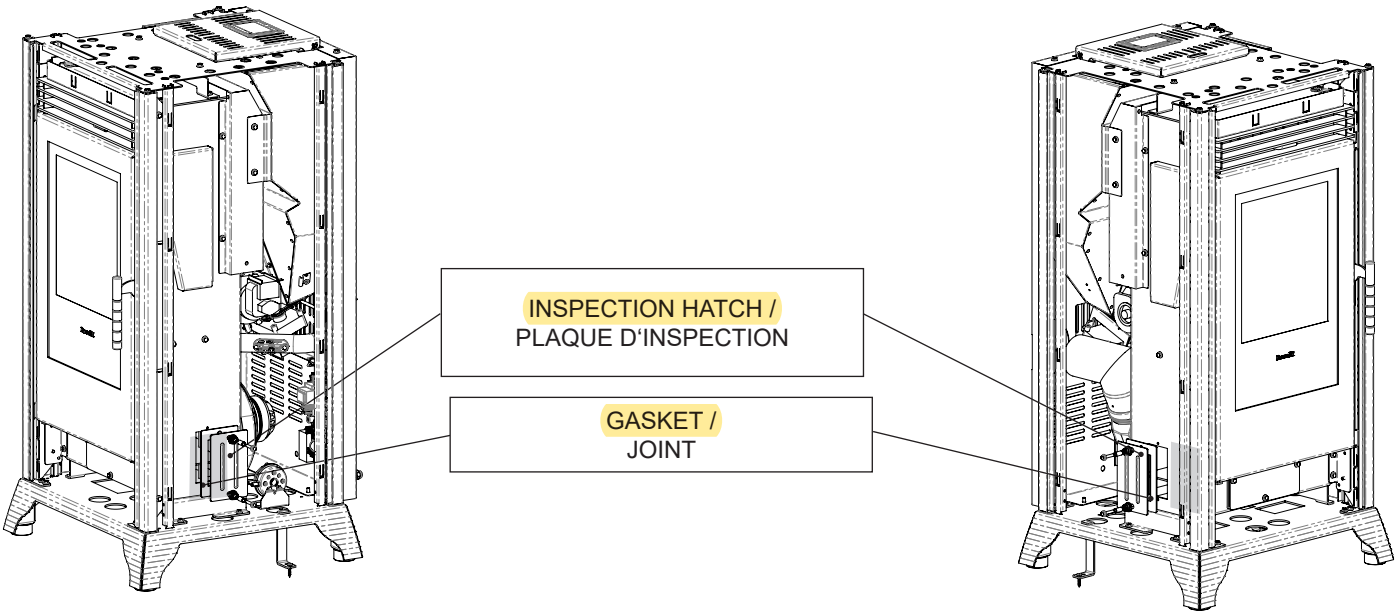

PARTS / FREQUENCY **PIECES / FREQUENCE**	**1 DAY** **1 JOUR**	**2-3 DAYS** **2-3 JOURS**	**30 DAYS** **30 JOURS**	**60-90 DAYS** **60-90 JOURS**	**1 SEASON** **1 SAISON**
Fire pot / Brasier	•				
Ashes drawer / Tiroir cendres		•			
Glass / Vitre		•			
Suction duct / Conduit d'aspiration fumées				•	
Door gasket / Joint porte					•
Tube bundle scraper / Ramoneur du faisceau tubulaire	•				
Flue / Conduit de fumée					•
Combustion chamber / Chambre de combustion		•			
Vacuum clean the pellet tank / Passer l'aspirateur dans le réservoir des granulés			•		

RAVELLI
il fuoco intelligente

Aico S.p.A.

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PNMD00018 Rev.0 11/02/2022

OPUSCOLO DEDICATO - BROCHURE FOR - OPUSCULE DÉDIÉ AU - BROSCHÜRE FÜR MODELL
FOLLETO DEDICADO AL MODELO - BROCHURE TIL MODEL

RAVELLI
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Francesca

US
Energy Verified

M.C.258359

Francesca 2015

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CAUTION /
AVERTISSEMENT:

HOT WHILE IN OPERATION. DO NOT TOUCH, KEEP CHILDREN, CLOTHING AND FURNITURE AWAY.CONTACT MAY CAUSE SKIN BURNS SEE NAME-PLATE AND INSTRUCTIONS. / ***CHAUD LORSQU'EN FONCTIONNEMENT NE PAS TOUCHER, GARDER LES ENFANTS, LES VÊTEMENTS ET MEUBLES HORS DE PORTÉE. LE CONTACT PEUT CAUSER DES BRÛLURES À LA PEAU. VOIR NOM DE LA PLAQUE ET LES INSTRUCTIONS***

SAFETY LABEL / *ÉTIQUETTE DE SÉCURITÉ*

Listed Solid Fuel Room Heater/Pellet. Also suitable for Mob. Home installation. / *Granulé de bois/Appareil e chauffage autonome pour combustible solide répertorié. Convient également aux installations pour maisons mobiles.*

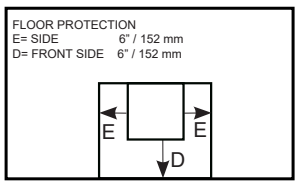
Standard met / *Norme respectée*: CFR EPA Title / *Titre* 40, Part / *Partie* 60, Subpart / *Sous-partie* AAA. Tested to / *Testé* : ASTM E1509-12,ULC-S627-00,UL 1482-11 Room Heating Pellet Burning Type / *Type appareil de chauffage autonome à granule de bois.* Particulate emissions / *Émissions de particules:* ASTM E2779-10 (integrated run / *course intégrée*) ; ASTM E2515-11 methods / *méthodes* 28R and ASMT E2515.

Date of production / *Date de production* : 03/2017
Electrical Rating / Service nominal électrique: 120VAC, 60Hz, 5amps

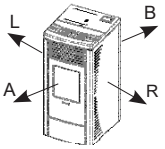
Serial number/
Numéro de série

Route power cord away from unit.do not route cord under or in front of appliance.
DANGER: Risk of Electric Shock. Disconnect power before servicing / *Risque de choc électrique. Débrancher l'alimentation électrique avant d'effectuer l'entretien ou la réparation*. **CAUTION /ATTENTION:** Moving parts may cause injury.Do not operate unit with external panels removed. Hot parts.Do not operate unit with external panels removedReplace glass only with ceramic glass original spare parts available from your dealer.To start set thermostat above room temperature, the stove will light automatically. To shutdown, set thermostat below room temperature. For further instructions refer to owner's manual./ *bouger les parties peut causer des blessures.Ne pas allumer l'appareil avec des habillages manquantes.Endroits chauds. Pour commencer, régler le thermostat au-dessus de la température ambiante, la poêle s'allumera automatiquement.Pour la éteindre, régler le thermostat au-dessous de la température de la chambre. Pour de plus amples informations se référer au manuel du propriétaire.* **OPERATE ONLY WITH DOORS CLOSED.** / ***FAIRE FONCTIONNER AVEC LES PORTES FERMÉES***. Never touch the door handle when the stove is running, you can burn your self. Do not obstruct the space beneath the heater / Ne jamais toucher la poignée de la porte quand le poêle est en marche, pour ne pas encourir de risque de brûlure. Ne pas obstruer l'espace en dessous de l'appareil de chauffage.
PREVENT HOUSE FIRES / *PRÉVENIR LES INCENDIES DE MAISON*
Install and Use Only in Accordance With (Aico SpA) Installation And Operating Instructions. Contact Local Building or Fire Officials About Restrictions and Installation Inspection in Your Area. / *Installer et utiliser uniquement en conformité avec (*Aico SpA*) Installation et instructions pour le fonctionnement.Contacter l'immeuble ou les officiers pompiers à propos des restrictions et l'inspection de l'installation dans votre région.*
This wood pellet heater needs periodic inspection and repair for proper operation.Consult the owner's manual for further information. It is against federal regulations to operate this wood heater in a manner inconsistent with the operating instructions in the owner's manual. / *Ce poêle à granulés de bois necessite d'entretien périodique pour le nettoyage. Consultez le manuel dédié pour plusieurs d'informations. Nous prions de suivre les instruction du manuel car opérer de façon different c'est contre le réglementation féderale.*
WARNING FOR MOBILE HOMES / AVERTISSEMENT POUR LES MAISONS MOBILES : Do not install appliance in a sleeping room. Combustion air openieng are not to be obstructed. An outside combustion air inlet must be provided. The structural integrity of the mobile home floor, ceiling and walls must be maintined. If installed on a combustible floor, provide a non combustible floor protection.Use only original Ravelli components for replacement. / Ne pas installer l'appareil dans une chambre à coucher. Il ne faut pas que les ouverture d'air de combustion soient obstruées. Il faut fournir une entrée externe d'air de combustion. Il faut maintenir l'intégrité structurale du plancher, du plafond et des murs de la maison mobile. Si l'appareil est installé sur un plancher combustible, fournir une protection de plancher non combustible couvrant la zone sous le radiateur et s'étendant jusqu'à au moins 450 mm (18 ") sur le côté du feu et 200 mm (8") sur les autres côtés.
When constructing floor protection for your pellet appliance, any part or materials used must be non-combustible.
For Use Only With Pelletized Wood Fuel. Do not use any other type of fuel than wood pellet. / ***Lors de la construction protection de plancher pour votre poêle à granulés, toutes les pièces et matériaux utilisés doivent être incombustibles. Utiliser uniquement avec du bois de chauffage en granules. Ne pas utiliser avec des types de carburants autres que le granulé de bois.***
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. / Se rapporter aux instructions du fabricant et aux codes locaux afin de prendre connaissance des précautions nécessaires pour faire passer la cheminée à travers un mur ou un plafond combustible. Inspecter et nettoyer fréquemment le réseau de tuyaux de ventilation conformément aux instructions du fabriquant.
DO not connect this unit to a chimney flue serving other appliances./ ***Ne pas raccorder cet appareil sur un conduit de fumée desservant d'autres appareils.***
Use a 3 or 4inch(76-102mm) diametertype "L" or "PL" venting system./ *Utiliser un réseau de ventilation secondaire «L» ou «PL» d'un type de diamètre de 3 ou 4 pouces (76-102mm).*

Minimum Clearances to combustible materials / Dégagement minimal pour les matériaux de combustion



R =RIGT SIDE / CÔTÉ DROIT 4"/ 102 mm
L = LEFT SIDE / CÔTÉ GAUCHE 4"/ 102 mm
B =BACK SIDE / CÔTÉ ARRIÈRE 2"/ 51 mm
A =FRONT SIDE / CÔTÉ AVANT 39,4" /1000 mm



N.B. The floor protection must extrend under the chymney connector and 2 inches (50.8mm) beyond each side

MANUTENZIONE E PULIZIA:

Prima di effettuare qualsiasi operazione di manutenzione adottare le seguenti precauzioni:

- Accertarsi che l'interruttore generale di linea sia disinserito.
- Accertarsi che tutte le parti della stufa siano fredde.
- Accertarsi che le ceneri siano completamente fredde.
- Operare sempre con attrezzature appropriate per la manutenzione.
- Terminata la manutenzione reinstallare tutte le protezioni di sicurezza prima di rimetterla in servizio.

La stufa necessita di poca manutenzione se viene utilizzato un pellet di qualità. E' quindi difficile stabilire con che frequenza debba avvenire la pulizia. La qualità del pellet e la regolazione della combustione sono determinanti.

Pulizia della camera di combustione:

La stufa necessità di una semplice ma frequente pulizia per garantire un efficiente rendimento ed un regolare funzionamento. Aspirare quindi tutti i giorni la camera di combustione con un aspiratore tipo bidone, assicurandosi che le ceneri siano completamente spente.

Pulizia del braciere:

Effettuare la pulizia del braciere come descritto nel capitolo dedicato sul manuale d'istruzione. Solo un braciere in ordine e pulito può garantire un funzionamento senza problemi della stufa a pellet. Durante il funzionamento si possono formare dei depositi, che devono essere subito eliminati.
Una corretta pulizia, fatta giornalmente, permette alla stufa di bruciare in modo ottimale e di avere una buona resa, evitando malfunzionamenti che alla lunga potrebbero richiedere l'intervento del tecnico per ripristinare la stufa.

MAINTENANCE AND CLEANING:

Before carrying out any maintenance operation take the following precautions:

- Make sure that the general power switch has been disconnected.
- Make sure that all the parts of the stove are cold.
- Make sure that the ashes have cooled completely.
- Always use appropriate tools for maintenance.
- When you have finished maintenance reinstall all the safety guards before using the stove again.

The stove requires little maintenance if a quality pellet is used. Therefore it is difficult to establish how often the stove needs to be cleaned. The quality of the pellet and the combustion adjustment are crucial.

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The stove requires simple but frequent cleaning to guarantee an efficient yield and correct functioning.
Therefore, clean the combustion chamber every day using a drum-type vacuum cleaner, making sure that the ashes have gone out completely.

Cleaning the fire pot:

Clean the fire pot as described in the dedicated chapter of the instruction manual. Only a clean and tidy fire pot can guarantee that the pellet stove will run without any problems. Deposits may form while it is running and these must be eliminated immediately.
Correct, daily cleaning will allow the stove to burn properly and to give a good yield, avoiding problems that in the long term could require the intervention of a technician to repair the stove

ENTRETIEN ET NETTOYAGE:

Avant d'effectuer n'importe quelle opération d'entretien, adopter les précautions suivantes :

- S'assurer que l'interrupteur général de ligne est débranché
- S'assurer que toutes les parties du poêle sont froides.
- S'assurer que les cendres sont complètement froides
- Travailler toujours avec des outils appropriés pour l'entretien.
- Quand l'entretien est terminé, réinstaller toutes les protections de sécurité avant de remettre le poêle en service.

Ce poêle a besoin de peu d'entretien si l'on utilise des granulés de qualité. Il est donc difficile d'établir avec quelle fréquence il faut effectuer le nettoyage. La qualité des granulés et le réglage de la combustion sont des facteurs déterminants.

Nettoyage de la chambre de combustion:

Le poêle a besoin d'un nettoyage simple mais fréquent pour garantir un rendement efficace et un bon fonctionnement.
Il faut donc passer un aspirateur du type bidon tous les jours dans la chambre de combustion, après avoir vérifié que les cendres sont complètement éteintes.

Nettoyage du brasier :

Effectuer le nettoyage du brasier comme décrit au chapitre dédié du manuel d'instructions. Seul un brasier bien tenu et propre peut garantir le fonctionnement du poêle à granulés sans problèmes. Pendant le fonctionnement il peut se former des dépôts, qu'il faut tout de suite éliminer. Un nettoyage correct fait tous les jours permet au poêle de brûler de façon optimale et d'avoir un bon rendement, tout en évitant des défauts de fonctionnement qui à la longue pourraient requérir l'intervention du technicien pour faire repartir le poêle.

INSTANDHALTUNG UND REINIGUNG:

Vor der Durchführung von Instandhaltungsarbeiten sind folgende Vorsichtsmaßnahmen zu treffen:

- Vergewissern Sie sich, dass der Hauptschalter der Anlage abgeschaltet ist.
- Vergewissern Sie sich, dass alle Ofenteile kalt sind.
- Vergewissern Sie sich, dass die Asche vollständig erkaltet ist.
- Benutzen Sie zur Instandhaltung stets geeignetes Werkzeug.
  Nach Beendigung der Instandhaltungsarbeiten setzen Sie alle Schutzeinrichtungen wieder ein, bevor Sie den Ofen in Betrieb nehmen.

Der Ofen ist extrem wartungsfreundlich, wenn qualitativ hochwertige Pellets verwendet werden. Es ist daher schwer zu sagen, mit welcher Häufigkeit er gereinigt werden muss. Die Pelletqualität und die Einstellung der Verbrennung sind in diesem Zusammenhang ausschlaggebend.

Reinigung der Brennkammer:

Der Ofen ist einfach zu reinigen, doch er muss häufig gereinigt werden, um eine wirkungsvolle Leistung und einen einwandfreien Betrieb zu

Reinigung der Glutpfanne:

Reinigen Sie die Glutpfanne, wie im Kapitel zur Bedienungsanleitung beschrieben. Nur eine saubere Glutpfanne, die in Ordnung ist, gewährleistet einen problemlosen Betrieb des Pelletofens. Während des Betriebs können sich Ablagerungen bilden, die umgehend entfernt werden müssen. Wenn der Ofen täglich korrekt gereinigt wird, brennt der Ofen optimal und bringt eine gute Leistung. Betriebsstörungen werden vermieden, die auf lange Sicht den Einsatz eines Technikers erforderlich machen könnten, um den Ofen wieder in Ordnung zu bringen.

MANTENIMIENTO Y LIMPIEZA:

Antes de realizar cualquier tipo de operación de mantenimiento adoptar las siguientes precauciones:

- Asegurarse que el interruptor general de la línea esté desconectado.
- Asegurarse que todas las partes de la estufa estén frías.
- Asegurarse que las cenizas estén completamente frías.
- Trabajar siempre con equipos adecuados a las operaciones de mantenimiento.
- Concluidas las operaciones de mantenimiento, reinstalar todas las protecciones de seguridad antes de ponerla de nuevo en funcionamiento.

La estufa necesita de poco mantenimiento si se utilizan pellets de buena calidad. Por esto no es fácil establecer la frecuencia

con la que se debe realizar la limpieza. La calidad de los pellets y la regulación de la combustión son determinantes.

Limpieza de la cámara de combustión:
La estufa necesita de una sencilla pero frecuente limpieza para garantizar su buen rendimiento y un funcionamiento regular. Aspirar todos los días la cámara de combustión con un aspirador de bidón, asegurándose que las cenizas estén completamente apagadas.

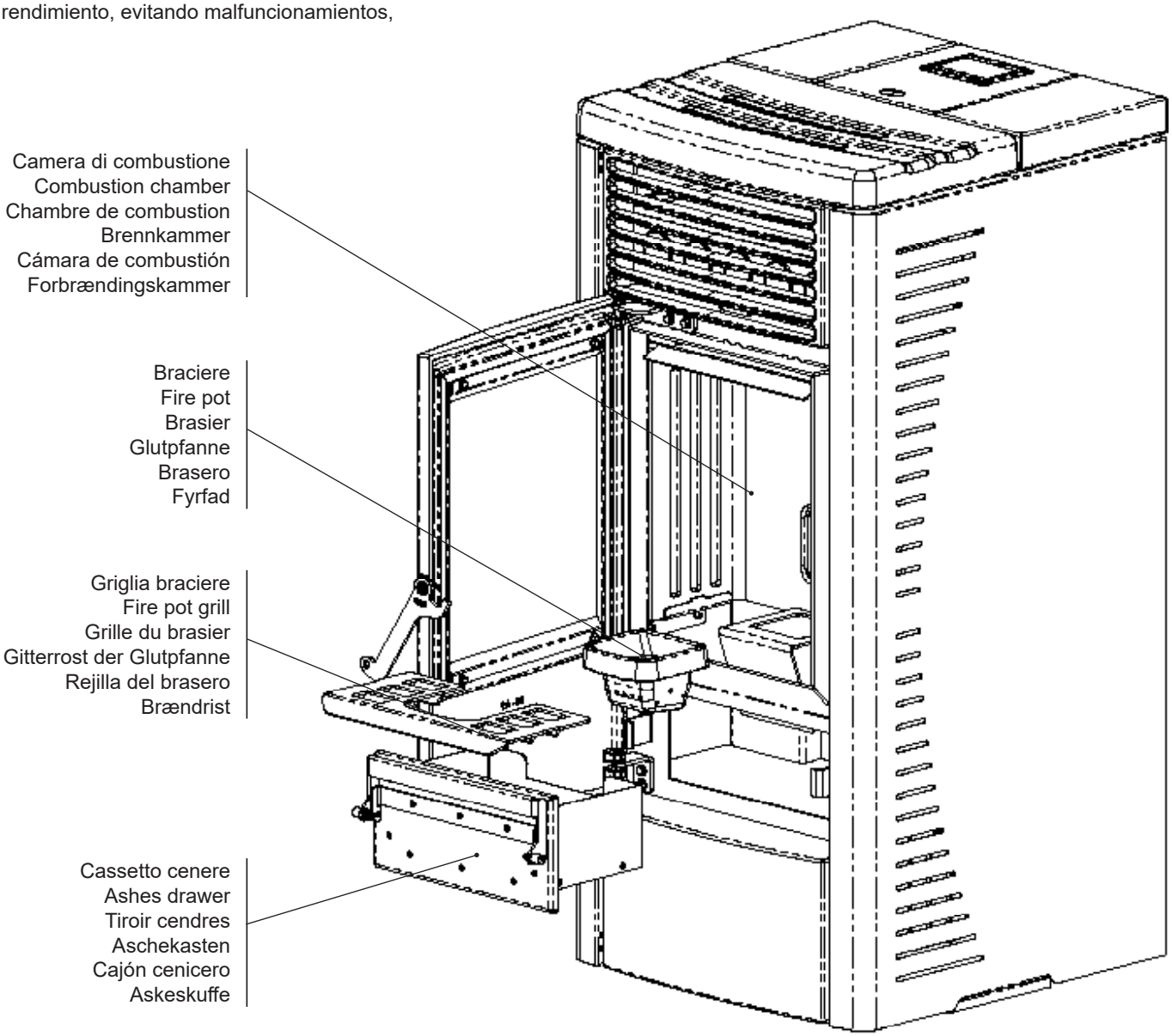
Limpieza del brasero:
Llevar a cabo la limpieza del brasero tal y como se describe en el capítulo específico del manual de instrucciones. Solamente un brasero limpio y ordenado puede garantizar el funcionamiento sin problemas de la estufa de pellets. Durante el funcionamiento se pueden formar depósitos, que deben ser eliminados inmediatamente.
Una correcta limpieza, realizada diariamente, permite que la estufa queme de modo óptimo y se tenga un buen rendimiento, evitando malfunctionamientos, que a largo plazo podrían requerir la intervención de un técnico para reparar la estufa.

VEDLIGEHOLDELSE OG RENGØRING:
Før der udføres nogen form for vedligeholdelsesindgreb, skal der tages følgende forholdsregler:
- Sørg for, at liniens hovedafbryder er afbrudt.
- Sørg for, at alle brændeovnens dele er kolde.
- Sørg for, at asken er helt kold.
- Arbejd altid med egnet værktøj til vedligeholdelsen.
- Når vedligeholdelsen er afsluttet, skal alle sikkerhedsbeskyttelserne genmonteres, før brændeovnen tændes igen.

Brændeovnen har kun behov for lidt vedligeholdelse, når den anvendes med kvalitetspellets. Det er derfor vanskeligt at fastsætte, hvor ofte den skal rengøres. Pelletkvaliteten og forbrændingsreguleringen er bestemmende.

Rengøring af forbrændingskammer:
Brændeovnen har behov for enkelt men hyppig rengøring for at garantere en effektiv ydelse og en regelmæssig funktion.
Støvsug derfor hver dag forbrændingskammeret med en støvsuger af typen med tank. Sørg for, at asken er slukket fuldstændigt.

Rengøring af fyrfadet:
Rengør fyrfadet som beskrevet i det respektive kapitel i brugervejledningen. Kun et fyrfad, som er i orden og er rent kan garantere en funktion uden problemer for pellet-brændeovnen. Under funktionen kan der dannes aflejringer, som omgående skal fjernes.
En korrekt, daglig rengøring gør det muligt for brændeovnen at brænde optimalt, at få en god ydeevne og at undgå fejlfunktioner, som i det lange løb kan kræve en teknikers indgreb for at genoprette brændeovnen.



Pulizia del cassetto cenere:

La pulizia del cassetto cenere deve essere effettuata ogni 2 giorni, dipende comunque dal tempo di utilizzo della stufa e dal tipo di pellet utilizzato.
Per accedere al cassetto aprire la porta (vedi Figura 1) e sfilarlo (vedi Figura 2).
N.B.:l' operazione deve essere effettuata a stufa fredda utilizzando un aspiratore di tipo bidone.

Nettoyage du tiroir cendres:

Il faut effectuer le nettoyage du tiroir cendres tous les 2 jours, mais de toute façon cela dépend du temps d'utilisation du poêle, et du type de granulés utilisés.
Pour accéder au tiroir, ouvrir la porte (voir figure 1) et extraire le tiroir cendres (voir figure 2).
N.B. : ce nettoyage doit être effectué avec le poêle froid, en utilisant un aspirateur du type bidon.

Limpieza del cajón cenicero:

La limpieza del cajón cenicero debe realizarse cada 2 días, dependiendo en todo caso del tiempo de uso de la estufa y del tipo de pellets utilizados.
Para acceder al cajón, abrir la puerta (véase la Figura 1) y extraerlo (véase la Figura 2).
Nota: esta operación debe llevarse cabo con la estufa fría y empleando un aspirador de bidón.

Cleaning the ashes drawer:

The ashes drawer must be cleaned every 2 days, depending on the length of time the stove is used and the type of pellet used.
To access the drawer, open the door (see figure 1) and extract the ashes drawer (see figure 2).
N.B.: The operation must be carried out when the stove is cold, using a drum-type vacuum cleaner.

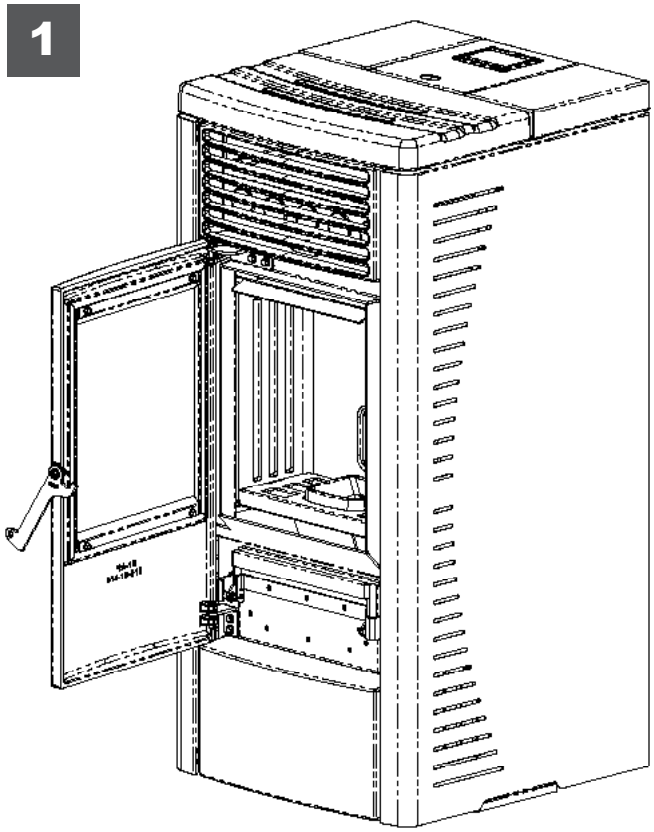
Reinigung des Aschekastens:

Der Aschekasten muss alle 2 Tage gereinigt werden. Die Reinigungshäufigkeit hängt jedoch in jedem Fall von der Zeit ab, über die der Ofen betrieben wird, wie auch vom verwendeten Pellettyp.
Öffnen Sie die Tür (siehe Abbildung 1), um den Aschekasten herauszuziehen (siehe Abbildung 2). **Hinweis: Saugen Sie den Aschekasten in kaltem Zustand mit einem Schmutzsauger ab.**

Rengøring af askeskuffen:

Askeskuffen skal rengøres hver 2. dag. Det afhænger i alle tilfælde af hvor længe brændeovnen anvendes og af den type pellet, som benyttes.
For at få adgang til skuffen skal lågen åbnes (se figur 1) og skuffen trækkes ud (se figur 2). **N.B.: rengøringen skal ske med kold brændeovn og ved hjælp af en støvsuger.**

1



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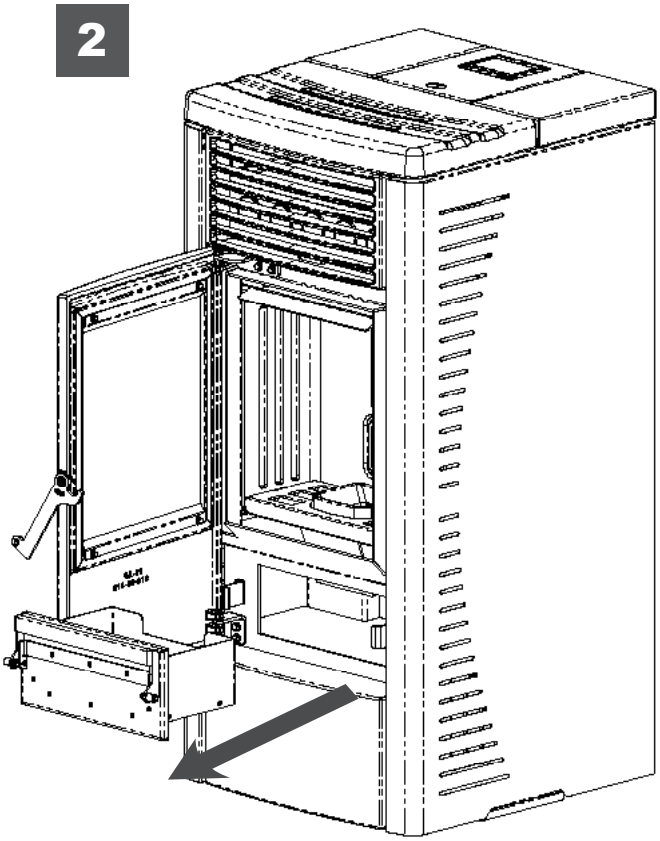


Come togliere il tagliafiamma:
Togliere e pulire regolarmente il tagliafiamma.

How to remove the flame trap:
Remove and clean the flame trap regularly

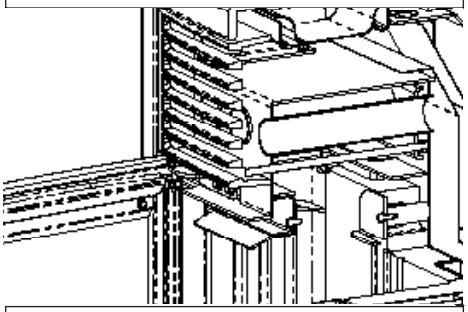
Comment enlever le dispositif anti-retour de flamme:
Enlever et nettoyer le dispositif anti-retour de flamme regulierement.

So entfernen sie den feuerschutz:
Entfernen und reinigen sie den feuerschutz regelmässig.

Cómo quitar el elemento separador de la llama:
Quitar y limpiar regularmente el elemento separador de la llama.

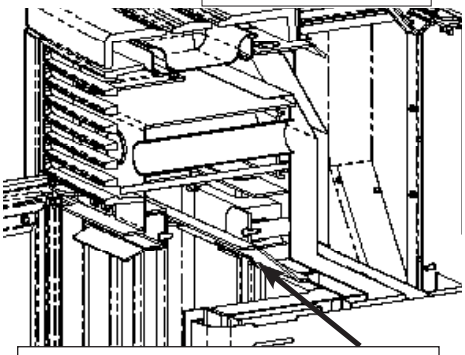
Hvordan brandspjældet fjernes:
Fjern og rengør jævnligt brandspjældet

APPOGGIO FRONTALE TAGLIAFIAMMA
FRONT FLAME TRAP REST
APPUI FRONTAL ANTI-RETOUR DE FLAMME
VORDERE FEUERSCHUTZAUFLAGE
APOYO FRONTAL DEL ELEMENTO SEPARADOR DE LA LLAMA
BRANDSPJÆLDETS FORRESTE HOLDER



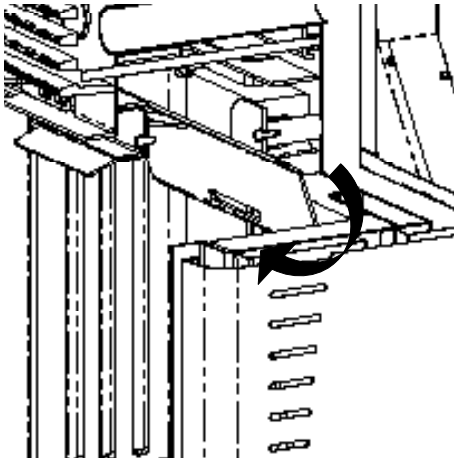
APPOGGIO POSTERIORE TAGLIAFIAMMA
REAR FLAME TRAP REST
APPUI POSTERIEUR ANTI-RETOUR DE FLAMME
HINTERE FEUERSCHUTZAUFLAGE
APOYO TRASERO DEL ELEMENTO SEPARADOR DE LA LLAMA
BRANDSPJÆLDETS BAGESTE HOLDER

Fase A / Phase A



POSIZIONE DELL'ASOLA TAGLIAFIAMMA
POSITION OF THE FRAME TRAP SLOT
POSITION DE LA FENTE DU DISP. ANTI-RETOUR DE FLAMME
LAGE DES FEUERSCHUTZSCHLITZES
POSICIÓN DEL OJETE DEL ELEMENTO SEPARADOR DE LA LLAMA
PLACERING AF BRANDSPJÆLDETS LANGHUL

Fase B / Phase B



Pulizia condotto fumi (ogni 1000 ore):
La pulizia del condotto fumi va effettuata ogni 3 mesi (il tempo può variare a seconda della qualità del pellet utilizzato). Smontare il pannello posteriore per accedere alla botola di ispezione. La piastra di ispezione è sigillata con silicone per alte temperature; dopo la pulizia deve essere pulita e deve essere messo un nuovo strato di silicone in modo da garantirne l'ermeticità.
Si consiglia di accordare con il vostro centro assistenza Ravelli questo tipo di pulizia.
N.B.: Utilizzare solo un aspiratore di tipo bidone.

Nettoyage conduit de fumées (toutes les 1000 heures):
Le nettoyage du conduit de fumées doit être effectué tous les trois mois (le temps peut varier en fonction de la qualité des granulés utilisés). Démonter le panneau postérieur pour accéder à l'ouverture d'inspection. La plaque d'inspection est scellée avec de la colle silicone pour hautes températures ;
après le nettoyage du poêle il faut nettoyer la plaque et mettre une nouvelle couche de silicone, pour garantir l'herméticité.
Nous vous conseillons de vous mettre d'accord avec votre centre d'assistance Ravelli pour effectuer ce genre de nettoyage. N.B. : Utiliser uniquement un aspirateur du type bidon.

Limpieza del conductos de humos (cada 1.000 horas):
La limpieza del conductos de humos debe realizarse cada 3 meses (este tiempo puede variar en función de la calidad de los pellets utilizados).
Desmontar el panel trasero para acceder a la tapa de inspección. La placa de inspección está sellada con silicona para altas temperaturas; después de haberla limpiado debe aplicarse una nueva capa de silicona de manera de garantizar su hermeticidad.
Se recomienda solicitar a su centro de asistencia Ravelli este tipo de limpieza. NOTA: Utiliza solamente un aspirador de bidón.

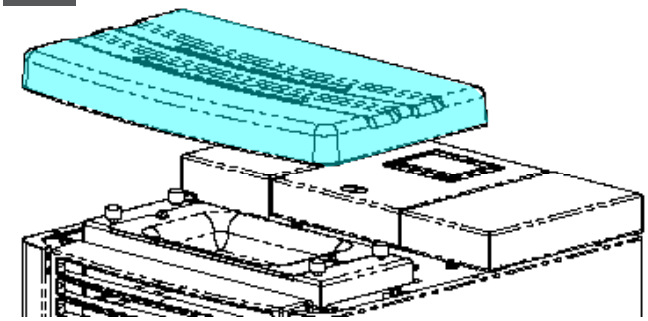
Cleaning the flue (every 1000 hours):
The flue must be cleaned once every 3 months (the time may vary depending on the quality of the pellet used).
Remove the back panel to access the inspection hatch. The inspection plate is sealed with high temperature silicone; after cleaning, it must be clean and a new layer of silicone must be applied to guarantee its seal.
You are advised to agree this type of cleaning with your Ravelli assistance centre. N.B.: Use a drum-type vacuum cleaner only.

Reinigung des Rauchfang (alle 1000 Stunden):
Die Reinigung des Rauchgases erfolgt alle 3 Monate durchgeführt (der Zeitraum kann je nach der Qualität der verwendeten Pellets variieren).Bauen Sie die rückwärtige Platte aus, um an die Inspektionsklappe zu gelangen.
Die Inspektionsplatte ist mit Silikon für hohe Temperaturen versiegelt; nach der Reinigung muss sie gesäubert und eine neue Schicht Silikon aufgetragen werden, um die Dichtigkeit zu gewährleisten.
Sie sollten sich zur Vereinbarung einer derartigen Reinigung mit Ihrem Ravelli Kundendienst in Verbindung setzen. Anm.: Verwenden Sie ausschließlich einen Schmutzsauger.

Rengøring af skorstenen (hver 1000 timer):
Der skal udføres rengøring hver 3. måned (tiden kan variere efter kvaliteten af den pellet, der benyttes).
Tag bagpanelet af for at få adgang til inspektionsproppen. Inspektionspladen er forseglet med silikone til høje temperaturer. Efter rengøringen skal den rengøres, og der skal påføres et nyt lag silikone for at garantere hermetisk tæthed.
Det anbefales at aftale denne type rengøring med dit Ravelli servicecenter.
N.B.: Brug kun støvsugere af typen med tank.

Come accedere alle botole di ispezione / How to access the inspection hatches / Comment accéder aux plaques d'inspection / So gelangen Sie an die Inspektionsklappen / Cómo acceder a las tapas de inspección / Hvordan der fås adgang til inspektionspladen

1



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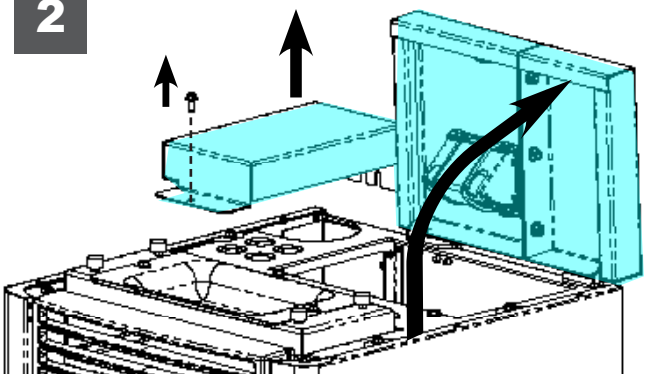

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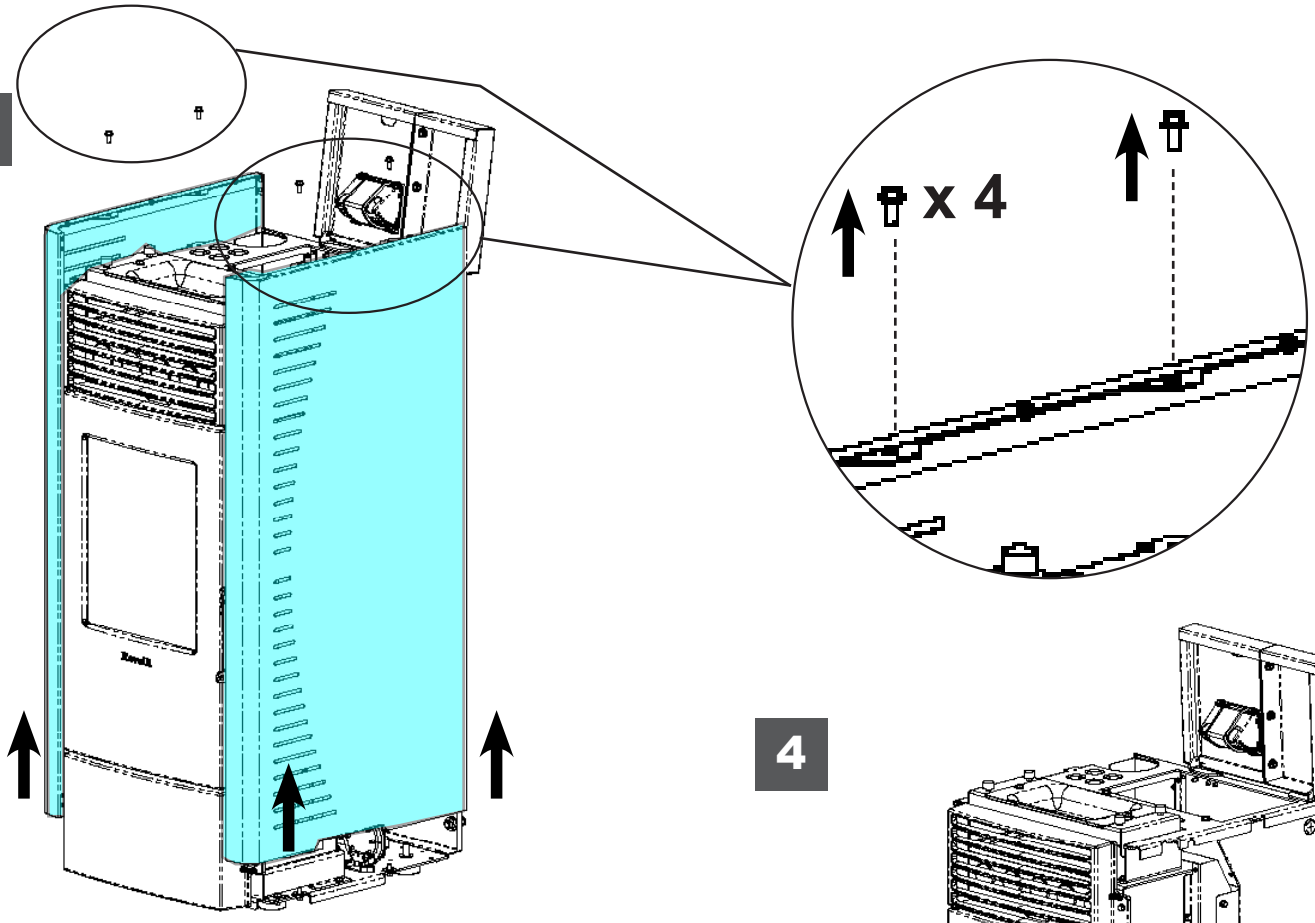

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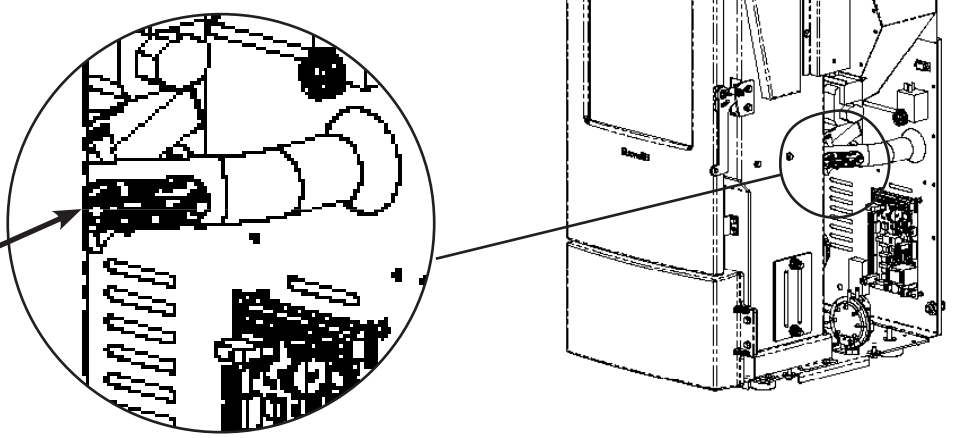
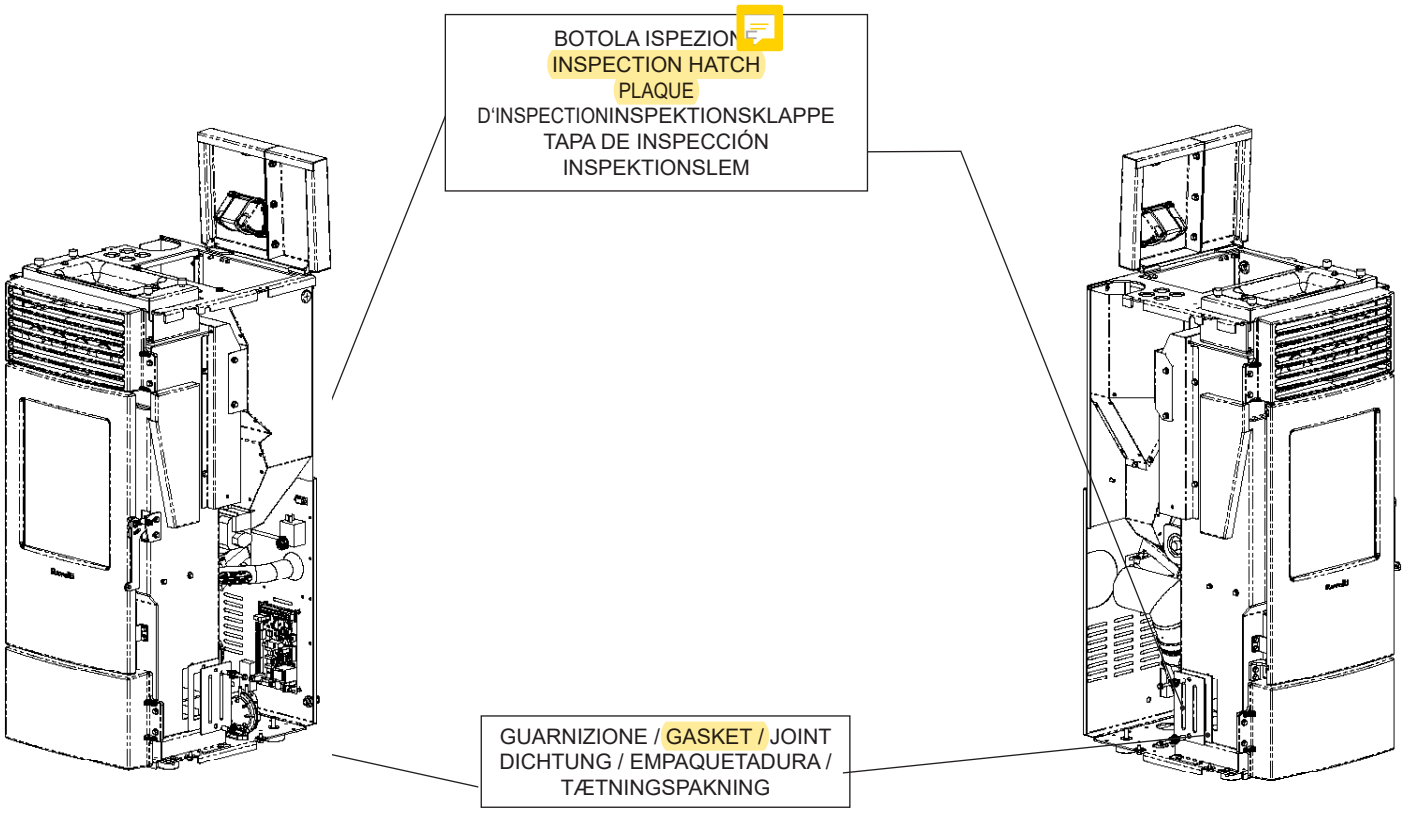


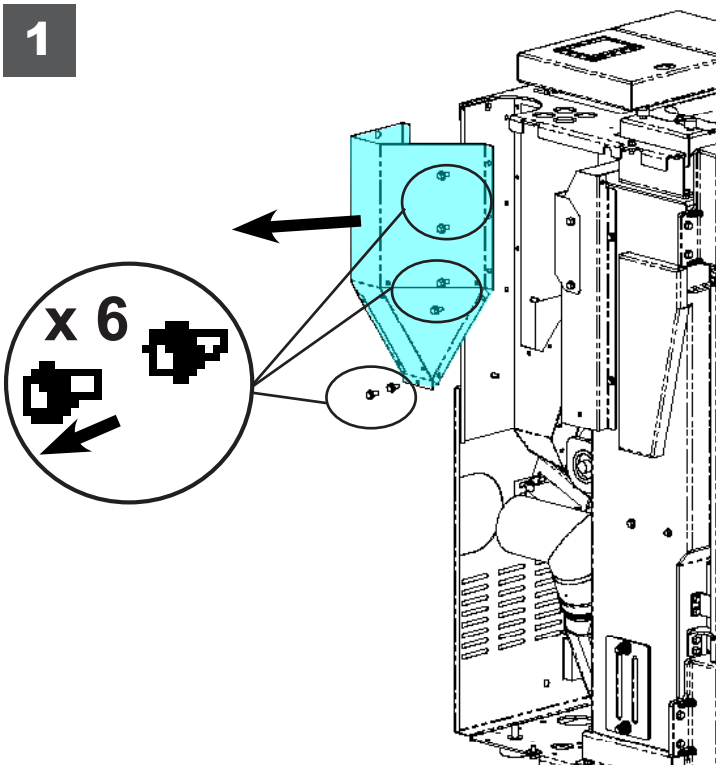
DEBIMETRO
DEBIMETER
DÉBITMÈTRE
FLUSSMASSENMESSER
FLUJOSTATO
FLOWMÅLER



PARTI / FREQUENZA PARTS / FREQUENCY PIECES / FREQUENCE BAUTEILE / HÄUFIGKEIT PARTES / FRECUENCIA DELE / HYPPIGHED	1 GIORNO 1 DAY 1 JOUR 1 TAG 1 DÍA 1 DAG	2-3 GIORNI 2-3 DAYS 2-3 JOURS 2-3 TAGE 2-3 DÍAS 2-3 DAGE	30 GIORNI 30 DAYS 30 JOURS 30 TAGE 30 DÍAS 30 DAGE	60-90 GIORNI 60-90 DAYS 60-90 JOURS 60-90 TAGE 60-90 DÍAS 60-90 DAGE	1 STAGIONE 1 SEASON 1 SAISON 1 HEIZSAISON 1 ESTACIÓN 1 SÆSON
Braciere / Fire pot / Brasier / Glutpfanne / Brasero / Fyrfad	●				
Cassetto cenere / Ashes drawer / Tiroir cendres / Aschekasten / Cajón cenicero / Askeskuffe		●			
Vetro / Glass / Vitre / Glasscheibe / Vidrio / Glas		●			
Condotto aspirazione / Suction duct / Conduit d'aspiration fumées / Saugkanal / Conducto de aspiración / Aftrækskanal				●	
Guarnizione porta / Door gasket / Joint porte / Türdichtung / Empaquetadura de la puerta / Lågepakning					●
Canna fumaria / Flue / Conduit de fumée / Schornstein / Conducto de salida de humos / Skorsten					●
Camera di combustione / Combustion chamber / Chambre de combustion / Brennkammer / Cámara de combustión / Forbrændingskammer		●			
Aspirare serbatoio pellet / Vacuum clean the pellet tank / Passer l'aspirateur dans le réservoir des granulés / Pelletbehälter absaugen / Aspirar el depósito de pellets / Støvsug pelletbeholder			●		

Montaggio scarico superiore / How to access the inspection hatches / Comment accéder aux plaques d'inspection / So gelangen Sie an die Inspektionsklappen / Cómo acceder a las tapas de inspección / Hvordan der fås adgang til inspektionspladen

1



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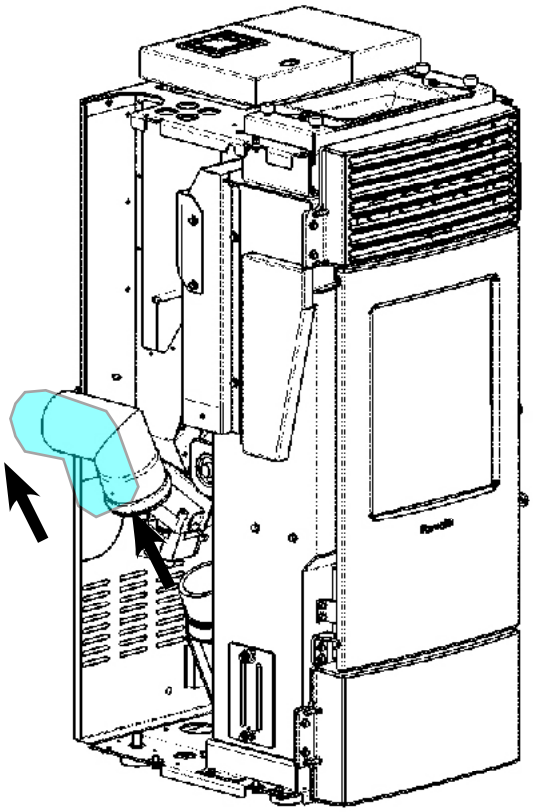

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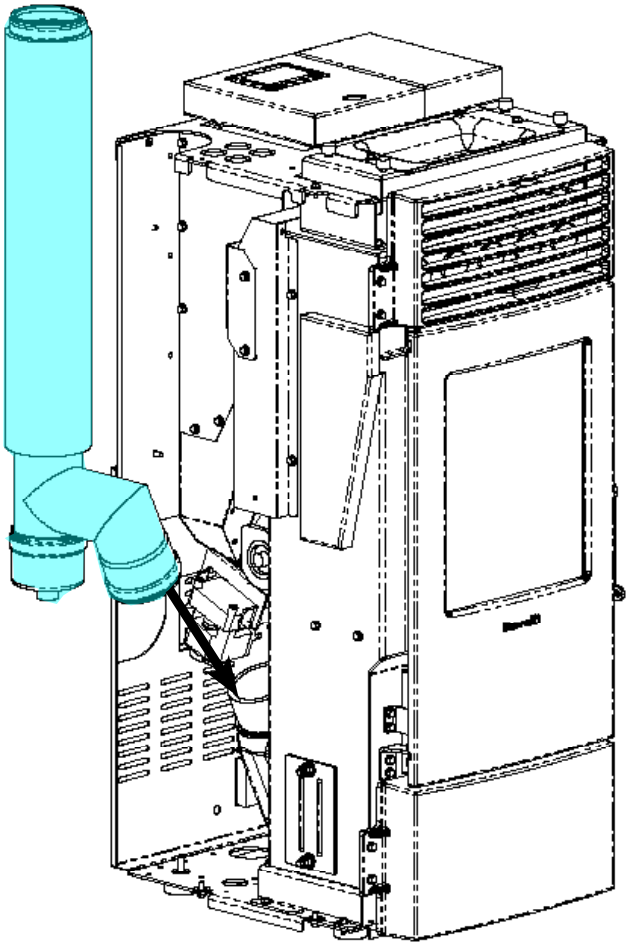

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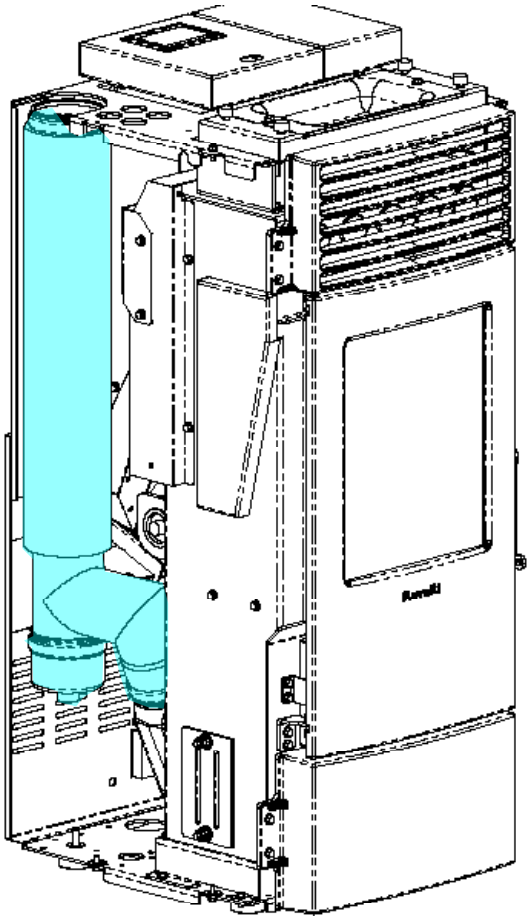

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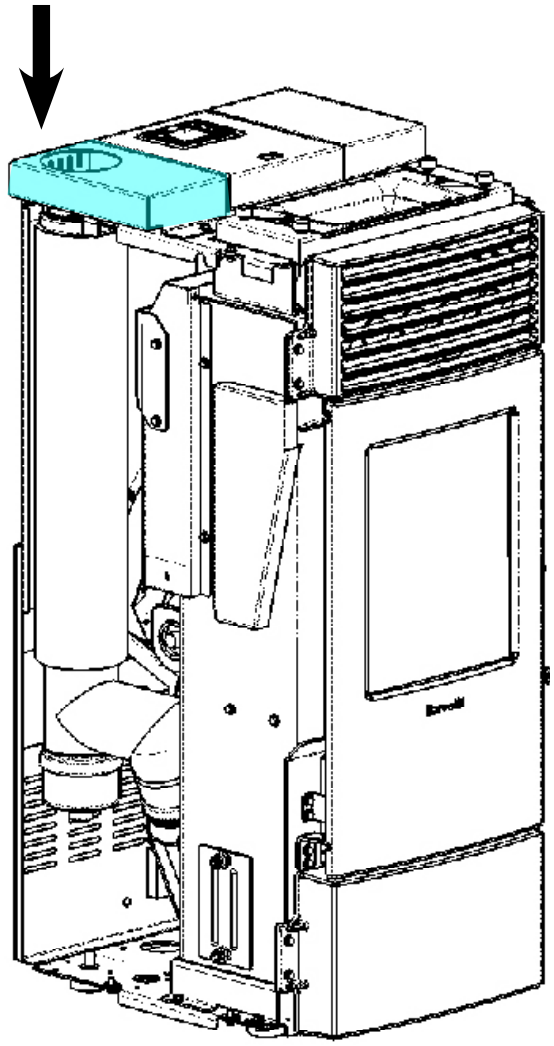

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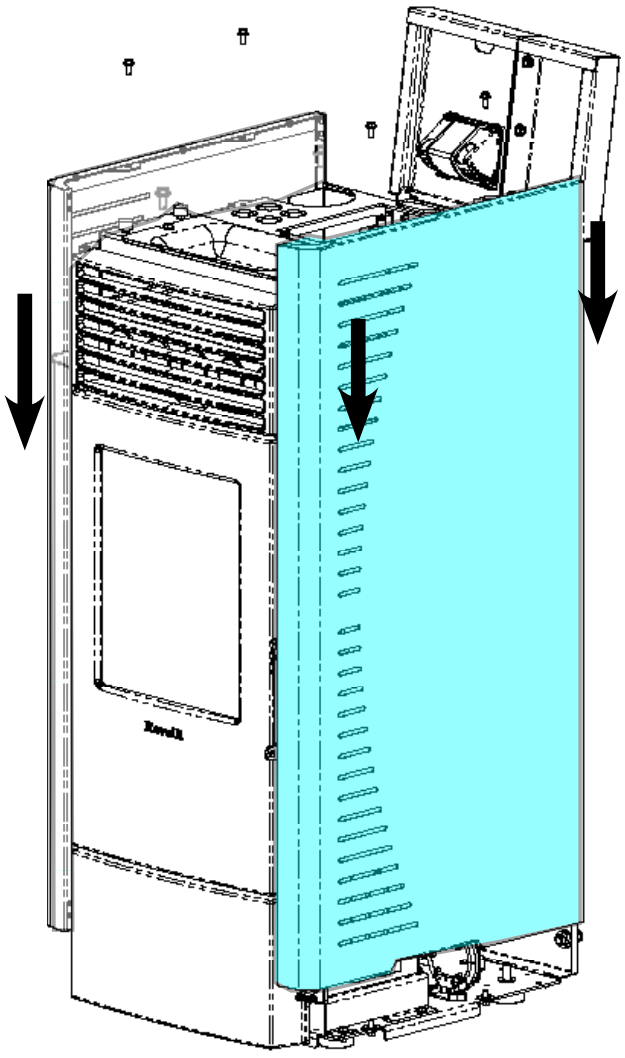

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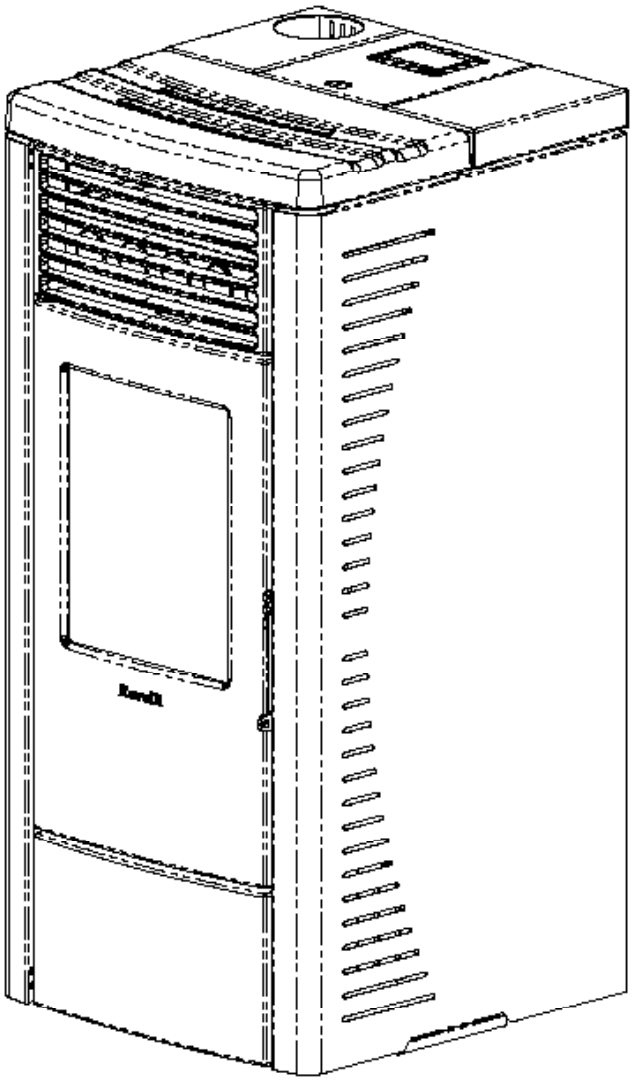

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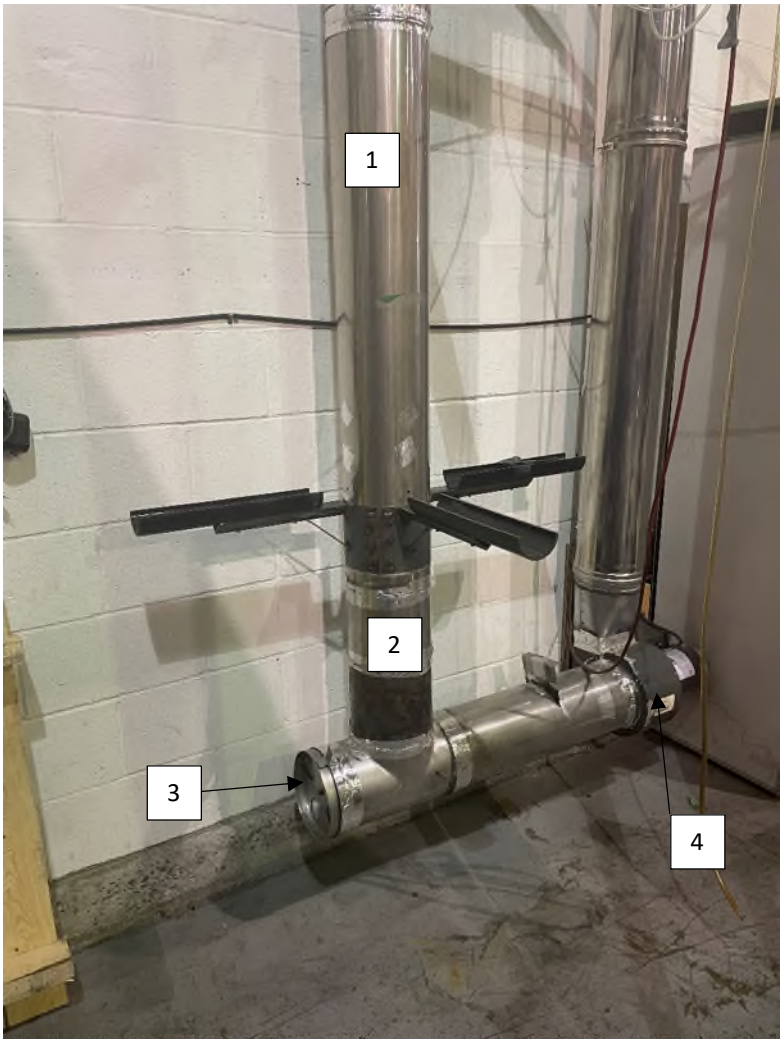
991397 Rev.1 11/02/2022

APPENDIX 8: Photographs of test set up

Dilution picture Dia 6

Picture 1: Sampling system



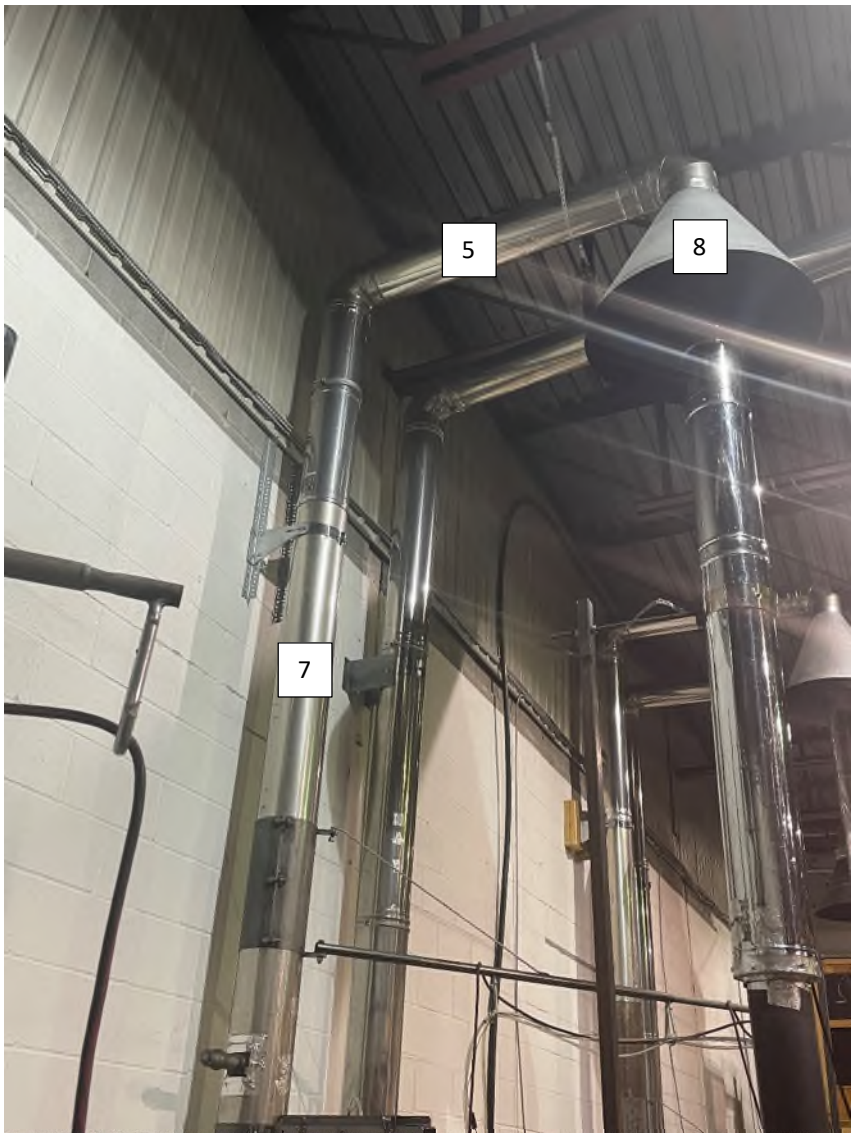
1 : 6 in dia Stainless steel pipe

2 : 16 in. Between sampling probe and lower elbow

3 : Air intake with damper to adjust flow rate

4 : Exhaust blower

Picture 2: Hood



5 : 6 in. dia. Stainless steel pipe

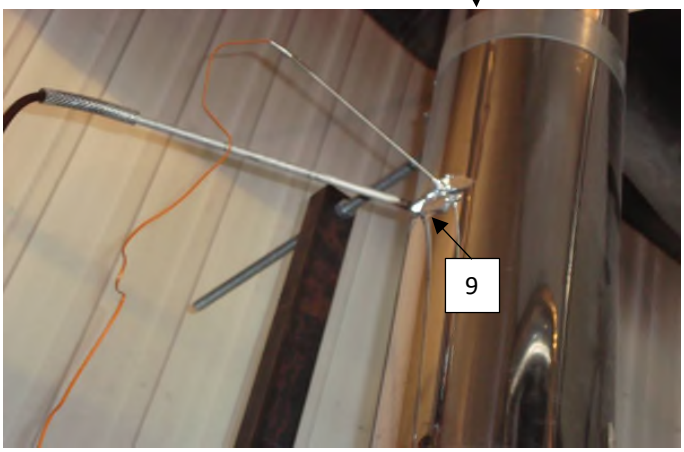
6 : na

7 : 10 feet long between velocity port and upper elbow

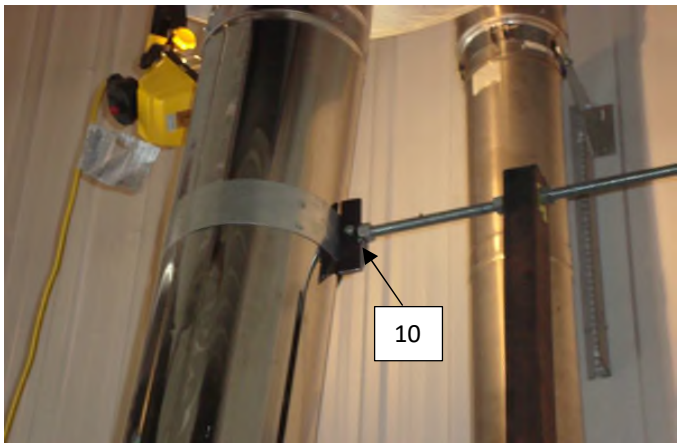
8 : 36 in. dia. Galvanized steel smoke captures hood

Picture 3: Stack sampling

Picture 3.1: Gas analysis and temperature probe



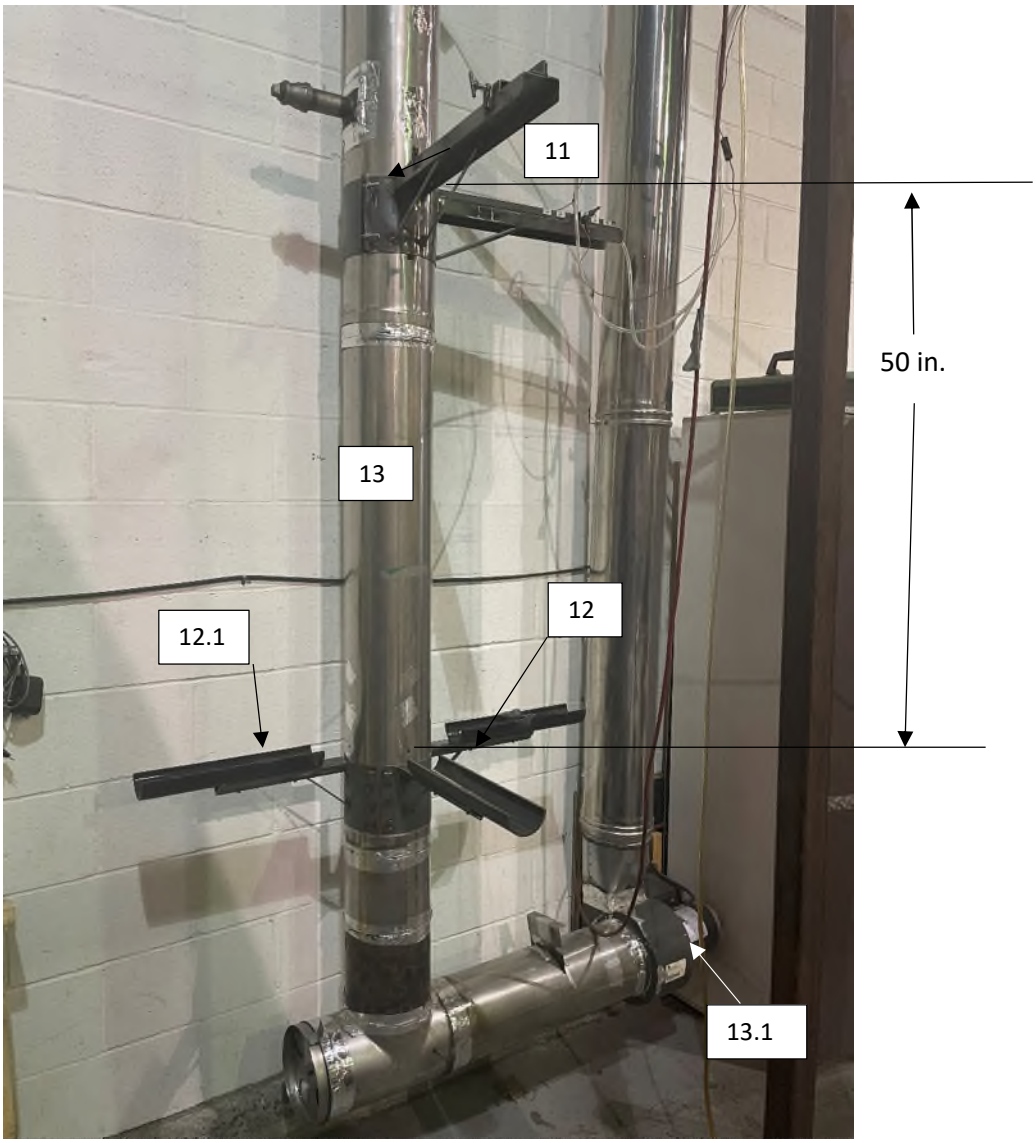
Picture 3.2: chimney support



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

10 : Exhaust system support bracket

Picture 4: Tunnel flow measurement and sampling probe



11: Velocity port

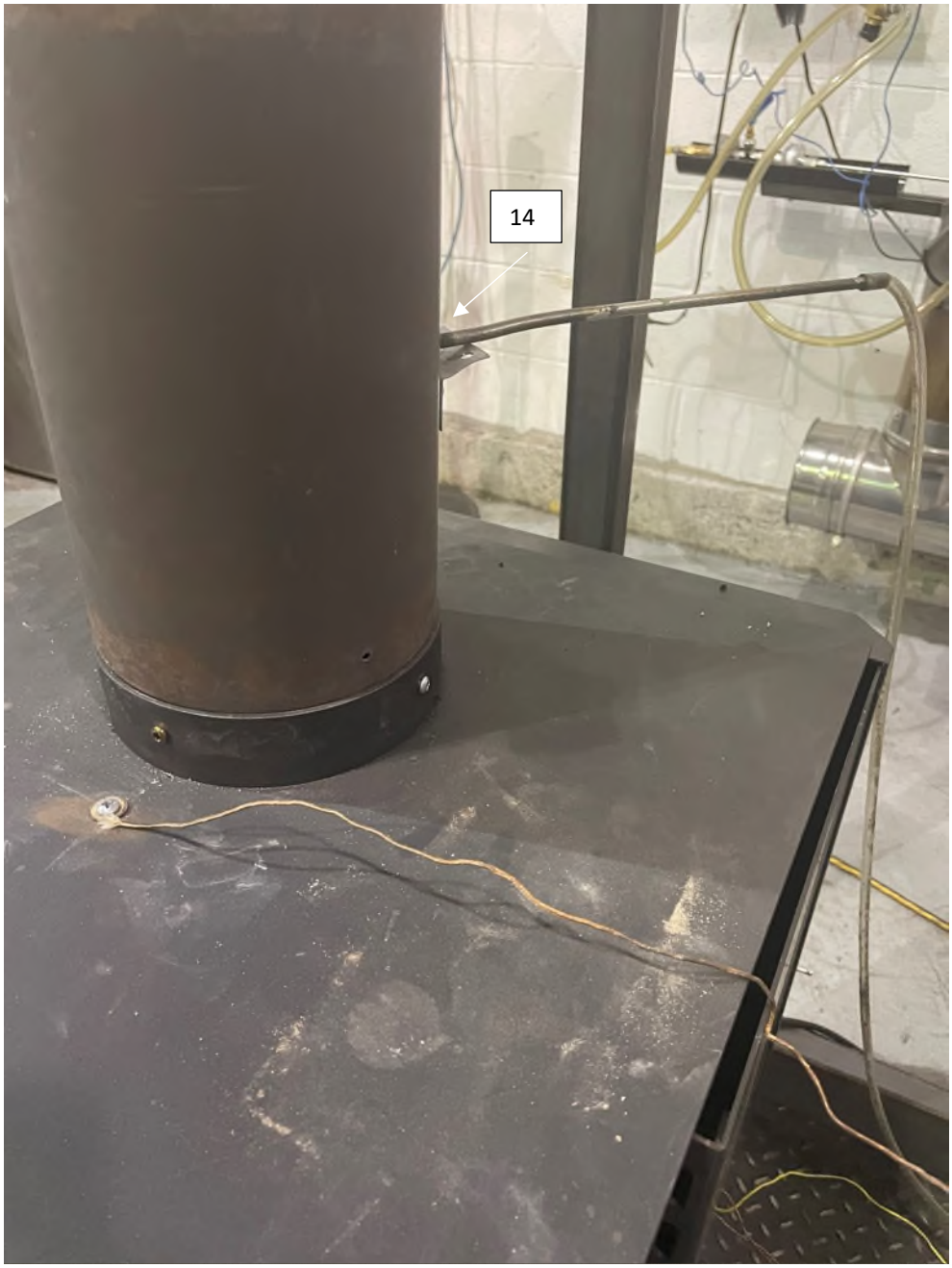
12: Sampling port, 2 sampling probes with 2x47 mm. dia.filter each.

12.1: Sampling port, sampling probes with 2x47 mm. dia.filter each., for first hour sampling

13:18 feet long dilution tunnel

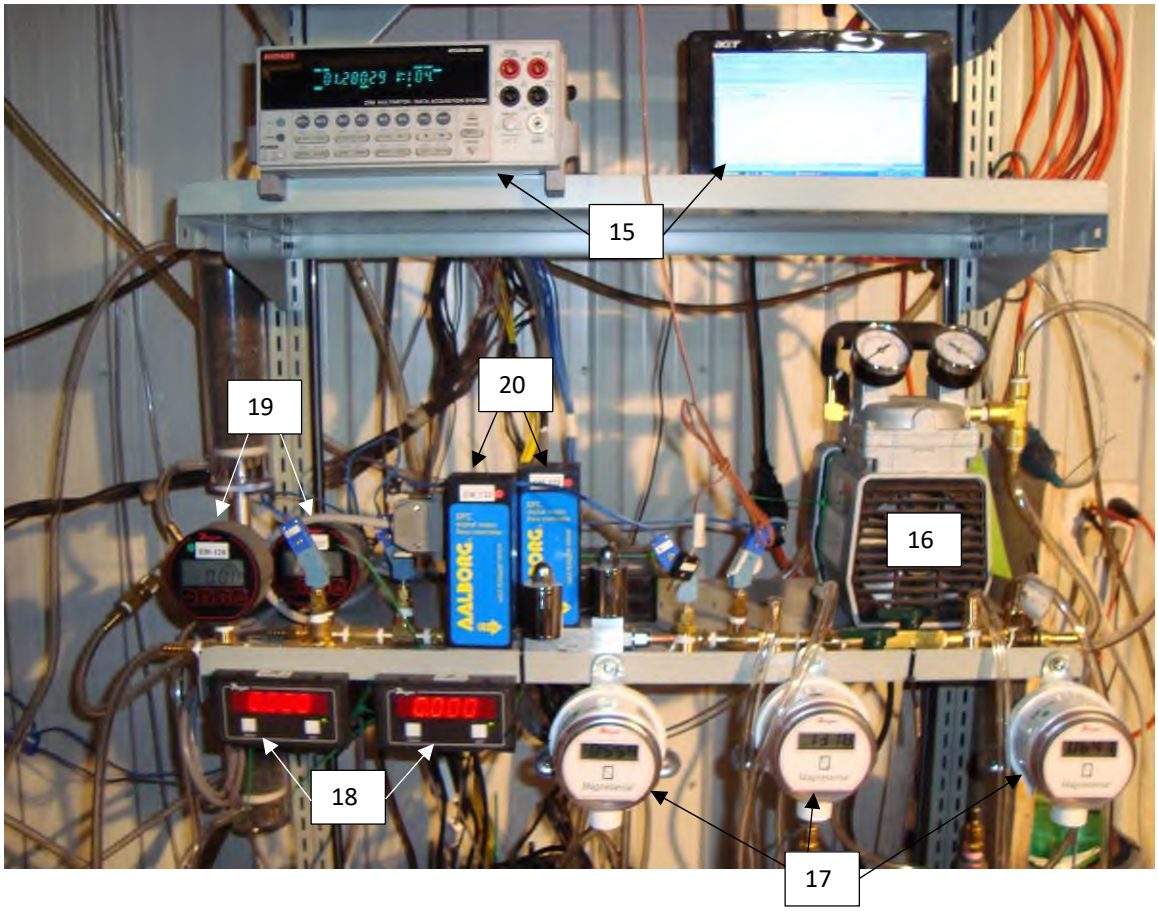
13.1: Extraction blower

Picture 5: Draft sampling



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

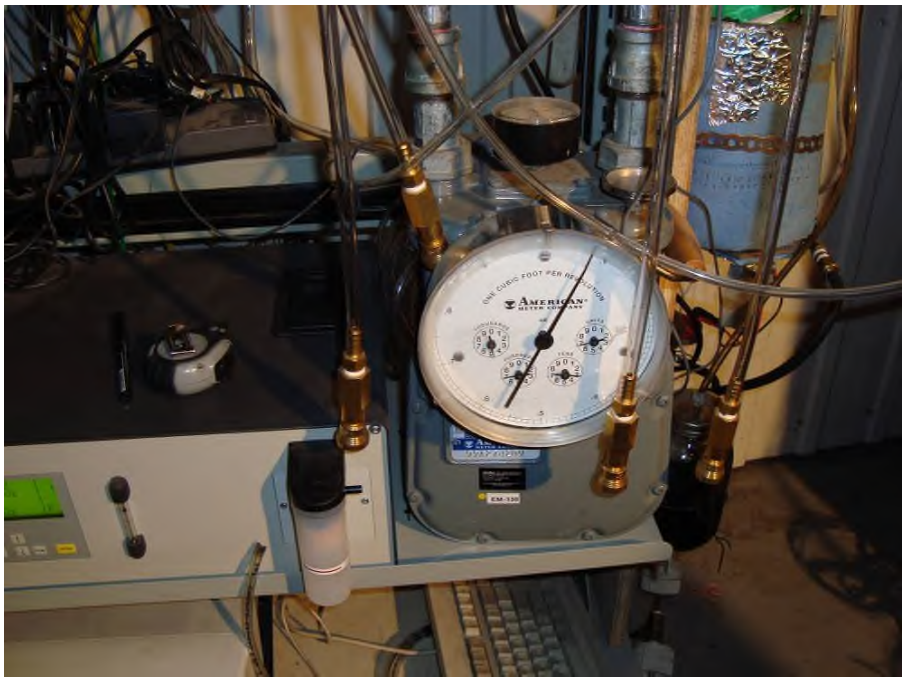
Picture 6: Equipments



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

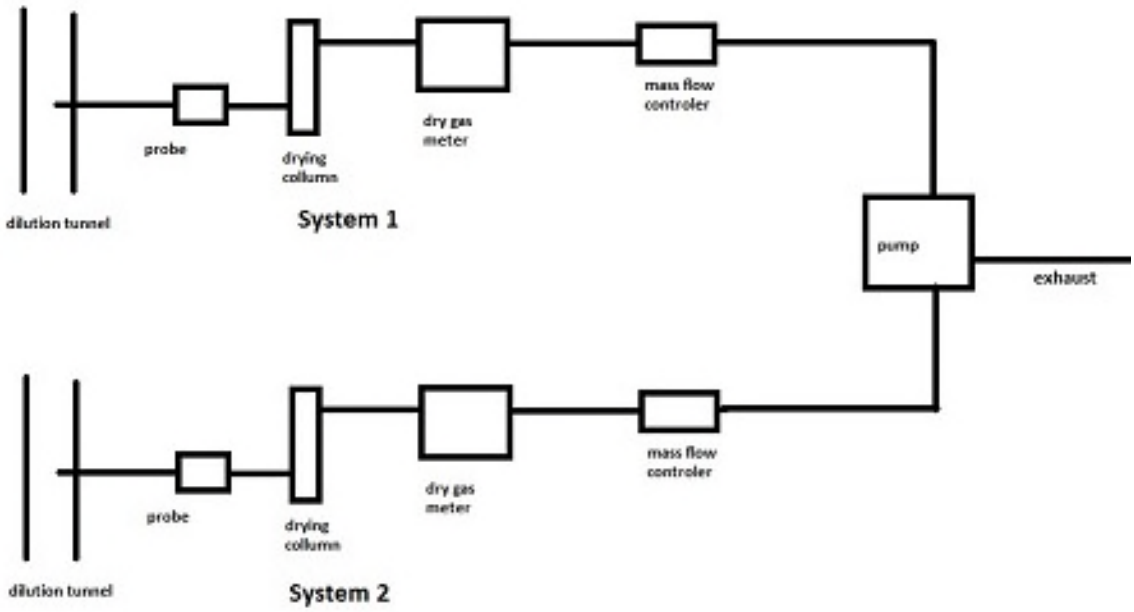
Picture 7: Gaz analyser

Picture 8: Reference dry gas meter



Picture 11: Dry gas meter

Picture 12: Dilution tunnel sample system



Picture 13: Dilution tunnel

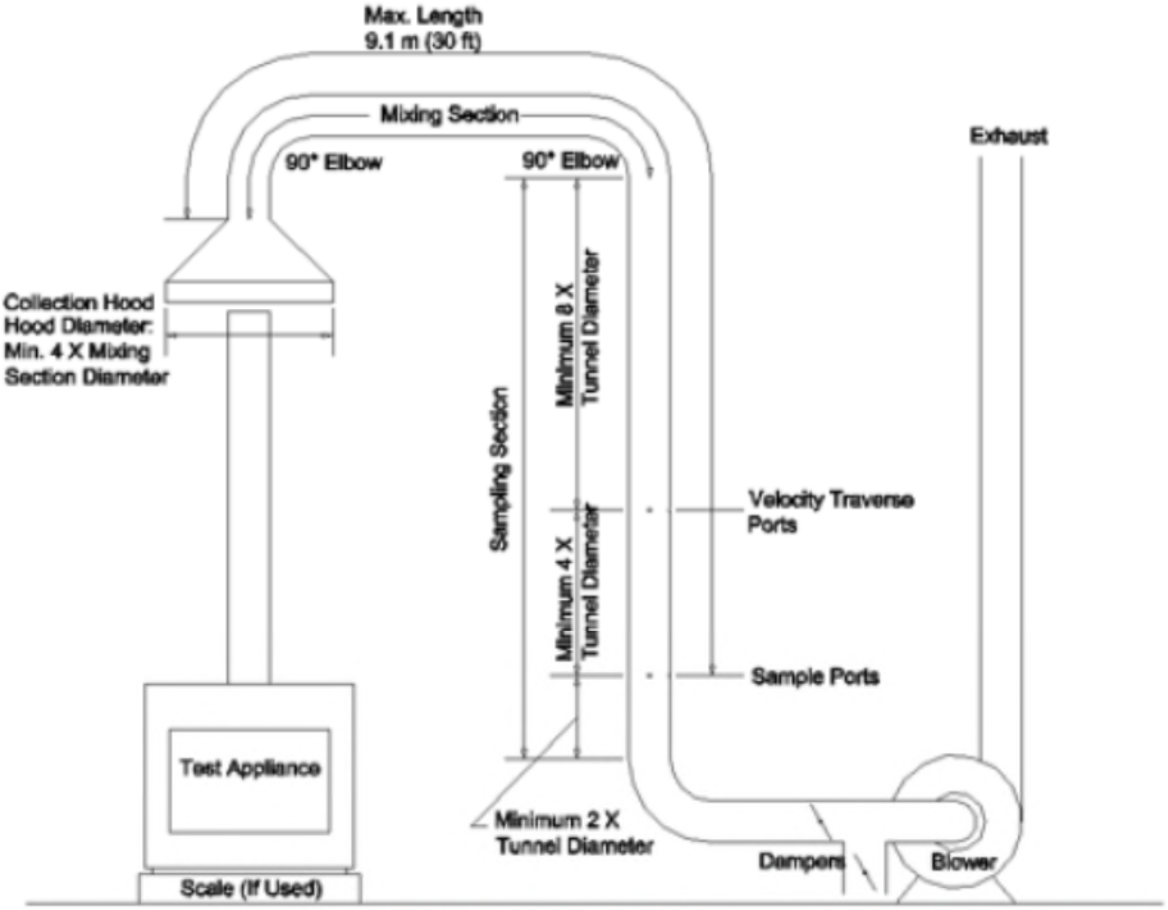
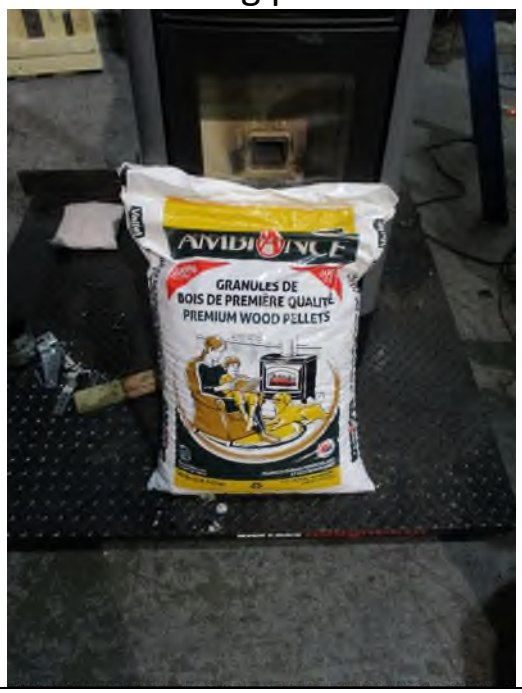


FIG. 3 Steel-Constructed Dilution Tunnel Apparatus

APPENDIX 9: Test load photographs

POLYTESTS
TESTING THROUGH YOUR REALITY

Run 1 January 17th 2022

Firebox 	Hopper 
stove Front view 	Testing pellets 

POLYTESTS
TESTING THROUGH YOUR REALITY

Run 1 January 17th 2022

front view

Stove back view

Stove Left side view

Stove right-side view

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, Method ALT-125, ASMTE 3053, ALT-134, ASTME2779

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
7. ALT-125
8. ASMTE 3053
9. ALT-134
10. ASTME2779

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 500 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.

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

2. 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.
3. If scale checks out, place unit on scale and align so chimney will be centered in hood.
4. 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.
5. 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.
6. 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 subtraction 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.
7. 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.
8. 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.
9. Note that inserts are tested as if they are freestanding stoves.
10. 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.

2. Calibrate analyzers as follows:

   NOTE: Prior to proceeding with calibration, make sure to use NIST traceable 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 48 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 10 inches Hg. (NOTE: During test, vacuum must not exceed 10 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 or (10 and 12 for cordwood method). 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 tunnel velocity to 500ft/min 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 manufacturers.
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. 15 minutes or 15% of lad burned allowed for ALT-125 method))
   f) An alarm will sound an audible signal at the (10) minutes intervals. This signals 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 48-hour desiccation before weighing.
4. Weigh probe filter holder units and filters at six (6) hour intervals minimum until weight change between weightings 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}	14,8	lbs
θ	363	min
$\%M_W$	4,12	%

Calculation

BR	1,064	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	67,60	dcf
Y	1,005445	
P_{bar}	30,19	in Hg
ΔH	-1,1334	in Hg
T_m	536,0	R

Calculation

$V_{m(std)}$	65,01	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	0,0059	g
F_2	0,000	g
ΔPF	0,000	g

Calculation

m_n	6,300	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	6,300 mg
$V_{m(std)}$	65,01 dscf

Calculation

C_s	0,000097 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 (dsc

Sample calculation

Data

m_r	0,100	mg
$V_{mr(std)}$	38,32	dscf

Calculation

C_r	0,000003	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}	0,230861825
V_{scent}	0,241865524

Calculation

F_P	0,954505

Average dilution tunnel gas velocity (V_S)

Equation used

ASTM 2515, equation 9

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

Nomenclature

V_S	Average dilution tunnel gas velocity, m/s (ft/s)
K_P	Pitot tube constant For the metric units: $34.97\ m/sec \left[\frac{\left(\frac{g}{g-mole}\right)(mm\ Hg)}{(°K)(mm\ H_2O)}\right]^{1/2}$ 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
$(\sqrt{\Delta P})_{avg}$	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	0,955	
$(\sqrt{\Delta P})_{avg}$	0,2478	in $H_20^{1/2}$
P_{bar}	30,19	in Hg
P_g	0,25	in H_20
P_S	30,21	in Hg
M_S	29	lb/lb-mol
t_S	86,18	F
T_S	546,18	R

Calculation

V_S	15,8027	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 for English units
t_S	Dilution tunnel temperature, °C (°F)
P_S	Absolute dilution tunnel static gas pressure, mm Hg (in. Hg), or P_{bar} + P_g
P_{bar}	Barometric pressure at measurement site, mm Hg (in. Hg)
P_g	Dilution tunnel static pressure, mm Hg (in. Hg)
P_{std}	Standard absolute pressure, 760 mm Hg (29.92 in. Hg)

Sample calculation

Data

B_{WS}	0,02	
V_S	15,803	
A	0,196	ft^2
T_{std}	528	R
T_S	546,18	R
P_S	30,213	in Hg
P_{std}	29,92	in Hg

Calculation

Q_{std}	178,10	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	0,000097	g/dscf
C_r	0,000003	g/dscf
Q_{std}	178,10	dscf/min

Calculation

E	0,02	g/min
E	1,01	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	0,000097	g/dscf
C_r	0,000003	g/dscf
Q_{std}	178,10	dscf/min
θ	363	min

Calculation

E	6,10	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	0,955		F_P	0,955	
K_P	85,49		K_P	85,49	
C_P	0,99		C_P	0,99	
Δp_i	0,057	in H_20	Δp_i	0,060	in H_20
T_{Si}	555,9	R	T_{Si}	556,1	R
P_S	30,21	in Hg	P_S	30,21	in Hg
M_S	29	lb/lb-mol	M_S	29	lb/lb-mol

Calculation

i=1			**i=2**		
v_{si}	15,30	ft/sec	v_{si}	15,78	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	363	min	θ	363	min
θ_i	1	min	θ_i	1	min
V_m	65,00	dcf	V_m	65,03	dcf
$V_{mi(std)}$	0,179	cuft	$V_{mi(std)}$	0,1786	cuft
V_S	15,81	ft/sec	V_S	15,81	ft/sec
V_{Si}	15,308	ft/sec	V_{Si}	15,308	ft/sec
T_m	532,8	R	T_m	536,0	R
T_{mi}	530,09	R	T_{mi}	529,71	R
T_S	546,18	R	T_S	546,18	R
T_{Si}	555,9	R	T_{Si}	555,9	R

Calculation

train=1		**train=2**	
PR	105,4 %	PR	106,0 %

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}	0,181	dcf
F_A	0,0116	ft^2

Calculation

FV_{max}	15,59	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	6,20 g
Train 2	6,10 g

Calculation

Dual train precision	0,83 %

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

POLYTESTS
TESTING THROUGH YOUR REALITY

Date: 17 JANUARY 2022 Manufacturer: RANELLI Model: NICOLE

Project #: PT-20265 Run: 1 Tech: S.B. Reviewer: [illegible]

→ LINE 139	POWER 5	60 MIN
	POWER 2	120 MIN
	POWER 1	180 MIN

★ UNIT WAS PREHEATED MORE THAN A HOUR BEFORE BEGINNING of TEST. ★

TEST LOAD CONFIGURATION

Ravelli

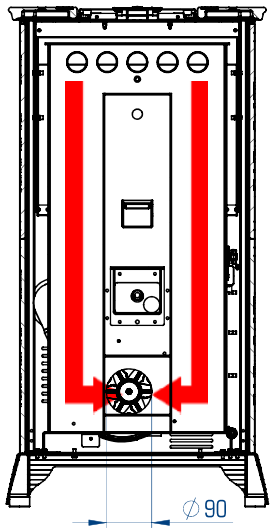
model: Francesca 2015, RV 80 Ceramica, Nicole

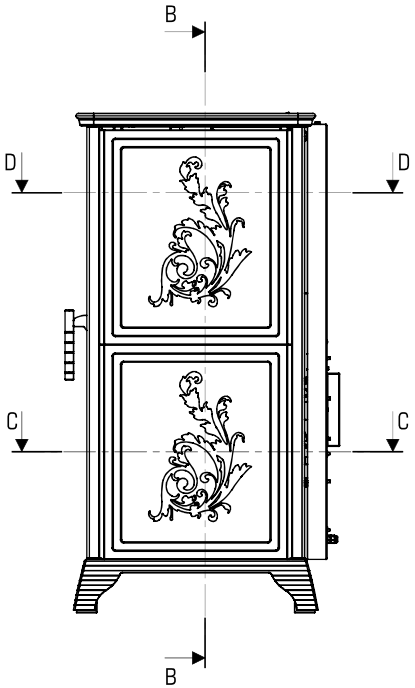
Operating procedure for testing January 2022

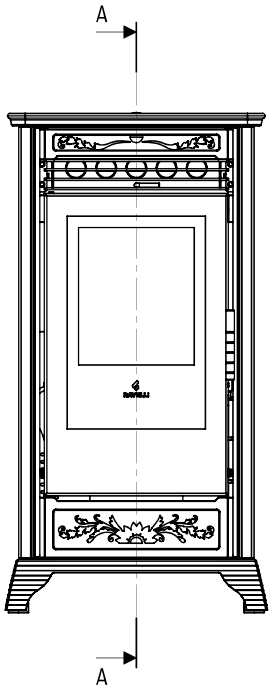
- Maximum output set at power 5
- Medium output set a power 2 to burn less than 50% of the maximum output
- Minimum output Set at power 1

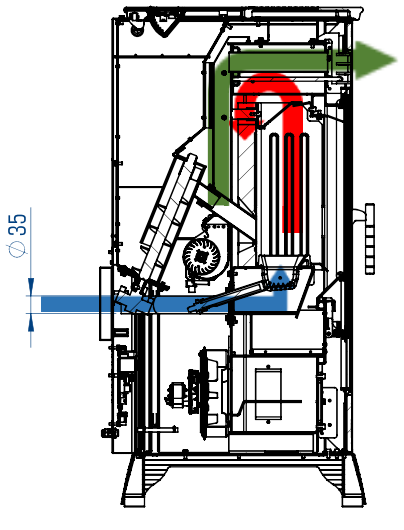
Convection fan will adjusted automatically with the power setting.

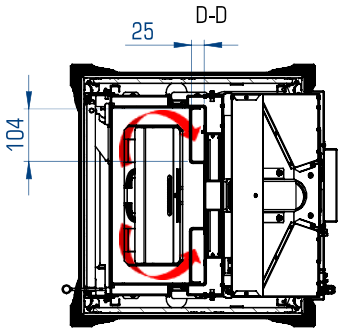
APPENDIX 14: Drawing Air flow pattern

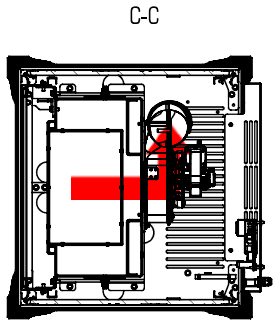












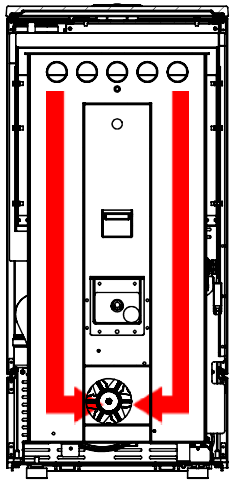
FLUE

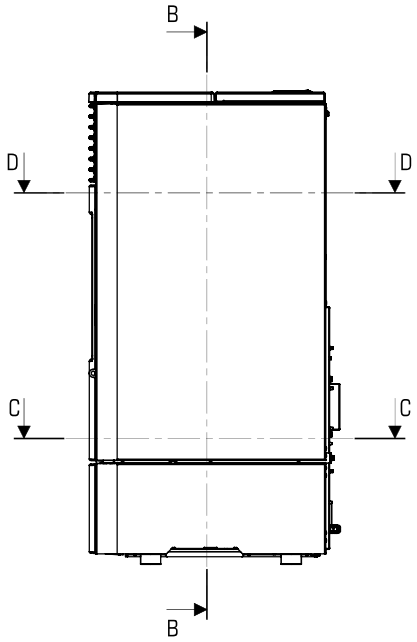
INLET AIR

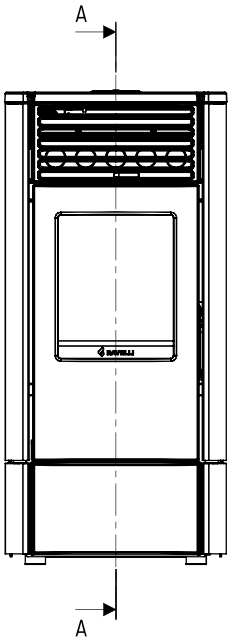
HEATING AIR

TOLLERANZE GENERALI SECONDO LA CLASSE UNI EN 22768-mK GENERAL TOLERANCES AS PER UNI EN 22768-mK		FORMATO A3	SCALA 1:10	MASSA 134.41 Kg	FOGLIO 1 / 1	TUTTE LE QUOTE MANCANTI SONO DA RICAVARE DAL MODELLO 3D ALL THE MISSING MEASUREMENTS CAN BE FOUND IN THE 3D MODEL
TIPOLOGIA Assieme Assemblato	GRUPPO DI APPARTENENZA		DENOMINAZIONE RV 80 USA 2022			
AICO S.p.a. *Via Consorzio Agrario, 3 - 25032 Chiari - BRESCIA - ITALY*	*Proprietà della Società AICO S.p.A. Senza autorizzazione scritta della stessa, il presente disegno non potrà essere utilizzato per la costruzione dell'oggetto rappresentato né venire comunicato e tersi o riprodotto. La Società proprietarie tutela i propri diritti a rigore di legge. All proprietary rights reserved by AICO S.p.A. This drawing shall not be reproduced or in any way utilized for the manufacture of the component of unit herein illustrated and must not be released to other parties without written consent. Any infringement will be legally pursued.*		DATA 04/08/2021	DISEGNATO V.Bertanza	CONTROLLATO S.Parmigiani	STATO -
			CODICE DISEGNO / REV 20064ERU1			

B-B







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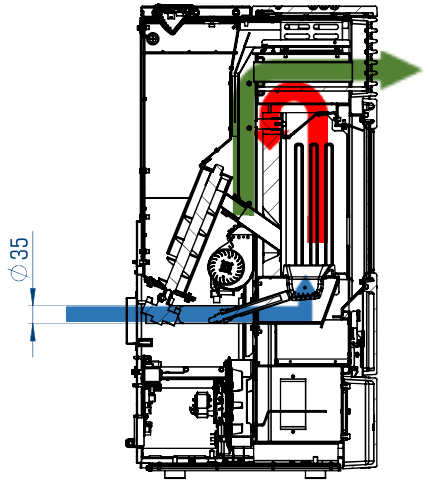
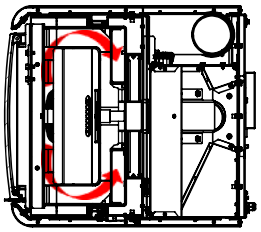
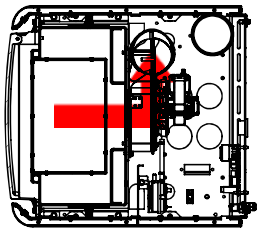


D-D



C-C

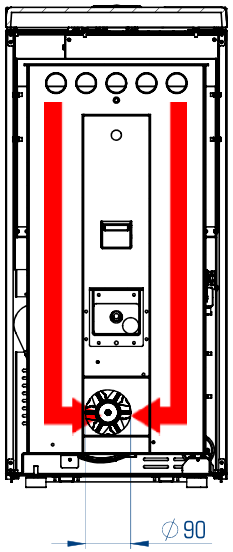


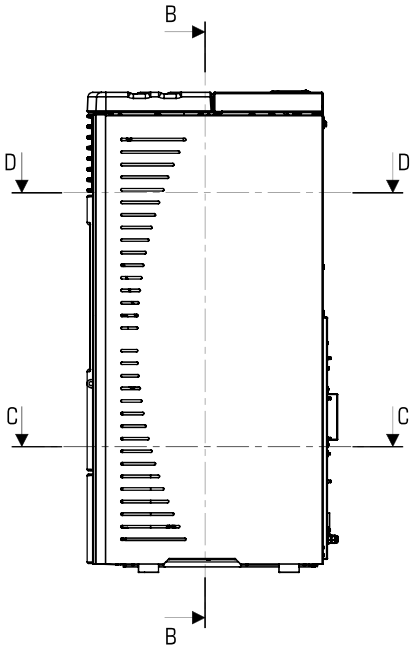
FLUE

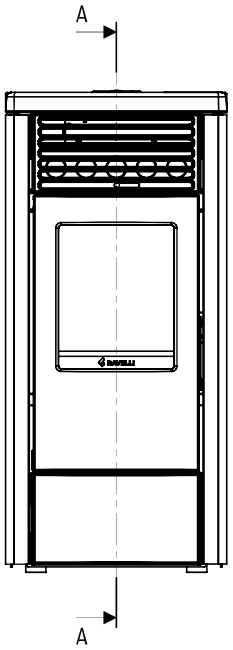
INLET AIR

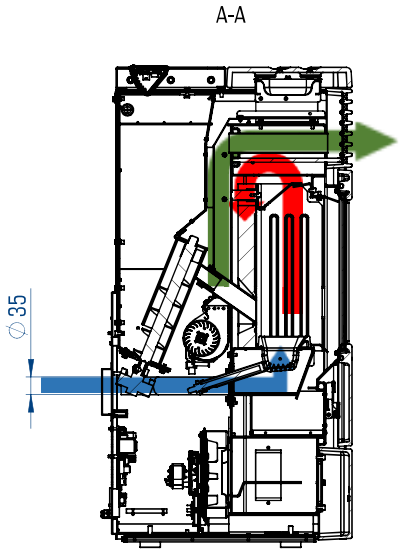
HEATING AIR

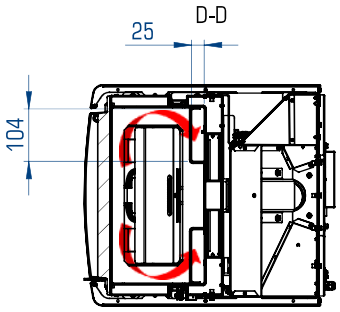
TOLLERANZE GENERALI SECONDO LA CLASSE UNI EN 22768-mK GENERAL TOLERANCES AS PER UNI EN 22768-mK		FORMATO A3	SCALA 1:10	MASSA 107.75 Kg	FOGLIO 1 / 1	TUTTE LE QUOTE MANCANTI SONO DA RICAVARE DAL MODELLO 3D ALL THE MISSING MEASUREMENTS CAN BE FOUND IN THE 3D MODEL
TIPOLOGIA Assieme Assemblato	GRUPPO DI APPARTENENZA		DENOMINAZIONE NICOLE USA 2022			
AICO S.p.a. *Via Consorzio Agrario, 3 - 25032 Chiari - BRESCIA - ITALY*		DATA 07/02/2022	DISEGNATO L.Lonardi	CONTROLLATO S.Parmigiani	STATO -
		CODICE DISEGNO / REV 20050ERU1				

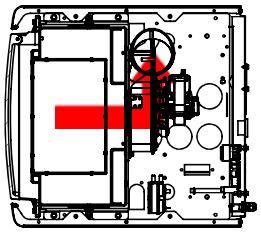












FLUE

INLET AIR

HEATING AIR

TOLLERANZE GENERALI SECONDO LA CLASSE UNI EN 22768-mK GENERAL TOLERANCES AS PER UNI EN 22768-mK		FORMATO A3	SCALA 1:10	MASSA 107.99 Kg	FOGLIO 1 / 1	TUTTE LE QUOTE MANCANTI SONO DA RICAVARE DAL MODELLO 3D ALL THE MISSING MEASUREMENTS CAN BE FOUND IN THE 3D MODEL
TIPOLOGIA Assieme Assemblato	GRUPPO DI APPARTENENZA		DENOMINAZIONE FRANCESCA USA 2022			
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			CODICE DISEGNO / REV 20065ERU1			

APPENDIX 15: Application for wood stove program

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: AICO SPA (Ravelli)

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 Type:	**Crib**	Pellet	Cordwood	Other:		

Model Name and Number:
- **Francesca 2015**
- **RV80 CERAMICA**
- **NICOLE**

Catalyst: No

Mailing Address: Via Consorzio Agrario, 3/D

Street Address: Via Consorzio Agrario, 3/D

City: Chiari (BS)	**State: Italy**	**ZIP Code: 25032**
Phone: +39 030 7402939	**Fax: N/A**	**Web Site: http://usa.ravelligroup.it/**

Address of Manufacturing Facility: Via Consorzio Agrario, 3/D Chiari, Italy

City: Chiari (BS)	**State: Italy**	**ZIP Code: 25032**

EPA APPROVED THIRD PARTY CERTIFIER

Authorized Representative: Aaron Reesor

Company: CSA Group

Phone: 416 747-2652	**E-mail:** aaron.reesor@csagroup.org	**Fax: N/A**
City: Toronto	**State: Ontario, Canada**	**ZIP Code: M9W 1R3**

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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Position: Ceritifer – Fuels Group

Report Number: **Polytest Test Report: PI-20265**	**Date of Tests: January 17th 2022**	**Date of Report:** **REPORT DATE: January 31st 2022** **Revision 1: May 18th 2022**
Quality Assurance Plan included?: **Yes**	**Wood Heater/Hydronic Heater/Forced-Air Furnace Application Included: NO**	**Remarks: N/A**

Affected Source Data Summary

Wood Burning Heater	**Hydronic Heater**	**Forced-Air Furnace**
Weighted particulate emission average of 1 test runs: 1.00 grams per hour	Maximum Output Rating:_____ Weighted particulate emission average: X Lb/MMbtu output	Particulate emission average: X Lb/MMbtu output
Weighted average HHV efficiency of 1 test runs: 80.73%	Annual Efficiency Rating:_____	Overall thermal efficiency (HHV): X%
	Particle Emissions: _____	Overall Delivered Heat Efficiency: X%

AFFIRMATIONS

- **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-20265, prepared by Danick Power and dated January 31st 2022, has been reviewed by Aaron Reesor and was found to be complete and to have used the correct procedures in accordance to the 2015 NSPS Standards.**
- **The emissions levels measured in the Test Report and listed above comply with the relevant particulate matter limits established by the 2015 NSPS Standards.**
- **The model listed above was tested to Particulate emissions: ASTM E2779-10 (section 9.4.1 integrate test run); ASTM E2515-11 as referred into 40 CFR Part 60 Subpart AAA, CSA B415.1-10 (for efficiency only)**
- **The permanent label and owner's manual meets 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 Aaron Reesor.**
- **The above-named manufacturer has contracted CSA Group 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).**

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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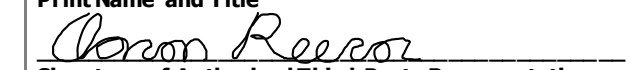
Aaron Reesor – CSA Group – Certifier – Fuels Group
Print Name and Title



Signature of Authorized Third-Party Representative

May 25th, 2022
Date

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

Third-party EPA approval expiration date: June 2027

V1

Remarks:

- **Revision 1 May 18th 2022:**
  - **Appendix 3 updated to included fuel analysis**
  - **Page 12/284 Clarification about the blower is automatic.**
  - **Appendix 13 updated to include Manufacturer's provided Operating instruction**
  - **All thermocouple ISO 17025 calibration can already be found in appendix 3**

Mr. Parmigiani,

We have concluded our review of your revised 3/14/21 certification test report for the above-referenced models and found certain irregularities in the certification test/test report. Below are the irregularities that Ravelli must address before acting on your Certification request. With that in view, we request that Ravelli submit both a revised confidential business information (CBI) test report and a revised non-CBI test report to EPA within ten (10) business days from receipt of this email to continue with our review. The revised test reports (both CBI and non-CBI) should clearly identify the report as revised, provide a revision date, and include a summary table indicating what revisions have been made and wherein the report the revisions are located. Ravelli must also submit an updated Certification of Conformity that includes a history of revisions page. If you have any questions, please let me know.

List of Issues Found			
Original TR			
Issue	**Applicable Method/Rule Section**	**Notes**	**How addressed by MFG/Test Lab?**
1. Page 12/284 says the test fuel analysis would be included in appendix 3. It was not found.		In the test report, provide Twin Ports Test Fuel Analysis in appendix 3.	Report updated to include Test fuel analysis in appendix 3
2. Page 12/284 please clarify if the blower is automatic.		Needs clarification.	Convection fan automatically adjust with output setting, fan lowest speed when stove is set at power 1 and convection fan at highest when the stove is set at power 5
3. Please clarify whether or not the manufacturer provided		Needs clarification and update accordingly.	Operating instruction was provided, please find in appendix 13

instructions to the lab on how to run the unit or if the owner's manual was followed.		If manufacturer provided written instructions, please attach. Page 255/284 gives the test day run note sheet but does not explain if the manufacturer provided instructions to the test lab or if the owner's manual was followed.	
4. Please provide calibration documentation for the thermocouples.	**ASTM E2779 8.2**	In the test report, include MFG instructions.	All thermocouple has been calibrated as per ISO 1705 in November 2021, as a system with acquisition system EM-154/2 & EM-015/2. Calibration certificate can be found in appendix 3

Rafael Sanchez, Ph.D.
Wood Heater Program Manager
Air Branch
Monitoring, Assistance, and Media Programs Division
Office of Compliance
U.S. Environmental Protection Agency (EPA)
Room 7149-D
1200 Pennsylvania Ave., NW
MS:2227A
Washington, DC 20460
Ph. 202-564-7028
Teleworking on Mondays, Wednesdays, and Fridays, ph. 703-389-6568

Questions about Wood Heaters or Certifications? Please send them to WoodHeaterReports@epa.gov

Are you looking for a wood heater or central heater? Please try our fully searchable EPA Certified Wood Heater Database (https://www.epa.gov/compliance/epa-certified-wood-heater-database).

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:
AICO SPA (RAVELLI)

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:

NICOLE (2005ERU1), FRANCESCA 2015 (014-US-001A), RV 80 CERAMICA (014-US-007A)

Catalyst: Yes_____ No___X____

Mailing Address:

Via Consorzio Agrario, 3/D

Street Address:

Via Consorzio Agrario, 3/D

City: Chiari (BS)	**State:** ITALY	**ZIP Code:** 25032
Phone: +390307402939	**Fax:** +390307302026	**Web Site:** http://usa.ravelligroup.it/

Address of Manufacturing Facility:
Jotul Poland Sp.z.o.o.
Ul.Ksiedza Jerzego Popieluszki, 17

City: Katy Wroclawskie	**State** Poland	**ZIP Code:** 55-080

EPA APPROVED TEST LABORATORY

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: Aaron Reesor		
Company: CSA Group		
Phone: 416 747-2652	E-mail: Aaron.reesor@csagroup.org	Fax:
City: Toronto	State: Ontario, CANADA	ZIP Code: M9W1R3
COMPLIANCE TEST INFORMATION		
Test Method(s): ASTME2779 & ASTME 2515		
Date(s) of Proposed Test: ~~DEC. 2nd AND AFTER~~ Postpone to dec 13th week		
Testing Location: Polytests Services Inc. 695 B rue Gaudette, St-Jean-sur-Richelieu Québec, Canada, J3B 7S7 *450.741.3636* ~~Postpone to week of JANUARY 10th and after~~ Postpone to week of JANUARY 17TH & after		

GIUSEPPE CINEFRA, CEO

Print Name and Title of Authorized Official

Signature

2021-11-2

Date

Remarks:

v1

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 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: AICO SPA

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): Particulate emissions: ASTM E2779-10 (integrated run) ; ASTM E2515-11 methods 28R and ASMT E2515 **Efficiency: CSA B415.1-10 section 13.7**	**Catalyst: Yes / No** **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): **Francesca 2015 (20065ERU1)**	
Physical Address (Street number and Address, not P.O. Box): Via Consorzio Agrario, 3/D	**Mailing Address: Via Consorzio Agrario, 3/D**

City: Chiari (BS)	**State: Italy**	**ZIP Code: 25032**
Phone: +39 030 7402939	**Email: info@ravelligroup.it**	**Website: http://usa.ravelligroup.it/**

EPA Submission Date of 30 day Notice: Dec. 22nd 2021

MANUFACTURER'S AUTHORIZED REPRESENTATIVE INFORMATION

Name: GIUSEPPE VITTORIO CINEFRA

Position/Title: CEO

Address: Via Consorzio Agrario, 3/D

City: Chiari (BS)	**State: Italy**	**ZIP Code: 25032**
Phone: +39 030 7402939	**E-mail: g.cinefra@ravelligroup.it**	**Website: http://usa.ravelligroup.it/**

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		
Remarks:		
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: CSA Group		
Name of Person Authorized or Responsible for Reviewing Test Report and/or Issuing Certification of Conformity: Aaron Reesor		
Position/Title: Certifier – Fuels Group		
Address: 178 Rexdale Boulevard		
City: Toronto,	**State:** Ontario, Canada	**ZIP Code:** M9W 1R3
Phone: 416 747-2652	**Email:** aaron.reesor@csagroup.org	**Website: www.csagroup.org**
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

Engineering drawings and specifications of components that may affect emissions (including specifications for each component listed in paragraphs (k)(2), (3) and (4) of 60.533(b) and 60.5475(b). Manufacturers may use assembly or design drawings that have been prepared for other purposes, but must designate on the drawings the dimensions of each component listed in paragraph (k) of this section. Manufacturers must identify tolerances of components listed in paragraph (k)(2) of 60.533(b) and 60.5475(b) that are different from those specified in that paragraph, and show that such tolerances cannot reasonably be anticipated to cause wood heaters in the model line to exceed the applicable emission limits. The drawings must identify how the emission-critical parts, such as air tubes and catalyst, can be readily inspected and replaced.

2. Firebox Statement Requirement

A statement whether the firebox or any firebox component (including the materials listed in paragraph (k)(3) of 60.533(b) and 60.5475(b) will be composed of material different from the material used for the firebox or firebox component in the wood heater on which certification testing was performed, a description of any such differences and demonstration that any such differences may not reasonably be anticipated to adversely affect emissions or efficiency.

3. CBI

Clear identification of any claimed confidential business information (CBI). Submit such information under separate cover to the EPA CBI Office; Attn: Residential Wood Heater Compliance Program Lead, 1200 Pennsylvania Ave., NW, Room 7138, MS:2227A, Washington, DC 20460. **Note that all emissions data, including all information necessary to determine emission rates in the format of the standard, cannot be claimed as CBI.**

4. Valid Certification Statement

All documentation pertaining to a valid certification test, including the complete test report and, for all test runs: Raw data sheets, laboratory technician notes, calculations and test results. Documentation must include the items specified in the applicable test methods. Documentation must include discussion of each test run and its appropriateness and validity, and must include detailed discussion of all anomalies, whether all burn rate categories were achieved, any data not used in the calculations and, for any test runs not completed, the data collected during the test run and the reason(s) that the test run was not completed and why. The burn rate for the low burn rate category must be no greater than the rate that an operator can achieve in home use and no greater than is advertised by the manufacturer or retailer. The test report must include a summary table that clearly presents the individual and overall emission rates, efficiencies and heat outputs. Submit the test report and all associated required information, according to the procedures for electronic reporting specified in § 60.537(f) and 60.5475(f).

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.

6. Q/A Statement

A statement that the manufacturer 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

A statement describing how the tested unit was sealed by the laboratory after the completion of certification testing and asserting that such unit will be stored by the manufacturer 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 submitted 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 web site.

9. Third Party Certification Statement

A statement that the manufacturer has entered into contracts with an approved laboratory and an approved third-party certifier that satisfy the requirements of paragraph (f) of this section.

10. Approved laboratory/third party Statement

A statement that the approved laboratory and approved third-party certifier are allowed to submit information on behalf of the manufacturer, including any claimed to be CBI.

11. Manufacturer's Website Certification Test Reports Availability Statement

A statement that the manufacturer 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

A statement of acknowledgment 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

A statement acknowledging that it is unlawful to sell, distribute or offer to sell or distribute an affected wood heater without a valid certificate of compliance.

Print Name and Title: GIUSEPPE VITTORIO CINEFRA, CEO

Date: Feb. 7th 2022

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	Burn Rate	Run Time (Min.)	Heat Output (Btu/hr)	1st Hour Emissions (g/hr)	Integrated Total (g/hr)	CO Emissions (g/hr)	Heating Efficiency (% HHV)
1	January 17th 2022	H	1,97	61	28 231	1,09	1,0	10,70	78,52
		M	1,04	121	15 302			6,85	81,00
		L	0,78	181	11 695			4,46	82,35
		Overall	1,06	363	15 677			6,24	80,73

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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GENERAL INFORMATION

Manufacturer's Name: AICO SPA (Ravelli)

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 Type:	**Crib**	Pellet	Cordwood	Other:		

Model Name and Number:
- **Francesca 2015**
- **RV80 CERAMICA**
- **NICOLE**

Catalyst: No

Mailing Address: Via Consorzio Agrario, 3/D

Street Address: Via Consorzio Agrario, 3/D

City: Chiari (BS)	**State: Italy**	**ZIP Code: 25032**
Phone: +39 030 7402939	**Fax: N/A**	**Web Site: http://usa.ravelligroup.it/**

Address of Manufacturing Facility: Via Consorzio Agrario, 3/D Chiari, Italy

City: Chiari (BS)	**State: Italy**	**ZIP Code: 25032**

EPA APPROVED THIRD PARTY CERTIFIER

Authorized Representative: Aaron Reesor

Company: CSA Group

Phone: 416 747-2652	**E-mail:** aaron.reesor@csagroup.org	**Fax: N/A**
City: Toronto	**State: Ontario, Canada**	**ZIP Code: M9W 1R3**

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
CERTIFICATION OF CONFORMITY
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Position: Ceritifer – Fuels Group

Report Number: **Polytest Test Report: PI-20265**	**Date of Tests: January 17th 2022**	**Date of Report:** **REPORT DATE: January 31st 2022** **Revision 1: May 18th 2022** **Revision2: October 4th 2022**
Quality Assurance Plan included?: **Yes**	**Wood Heater/Hydronic Heater/Forced-Air Furnace Application Included: NO**	**Remarks: N/A**

Affected Source Data Summary

Wood Burning Heater	**Hydronic Heater**	**Forced-Air Furnace**
Weighted particulate emission average of 1 test runs: 1.00 grams per hour	Maximum Output Rating:_____ Weighted particulate emission average: X Lb/MMbtu output	Particulate emission average: X Lb/MMbtu output
Weighted average HHV efficiency of 1 test runs: 80.73%	Annual Efficiency Rating:_____	Overall thermal efficiency (HHV): X%
	Particle Emissions: _____	Overall Delivered Heat Efficiency: X%

AFFIRMATIONS

- **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-20265, prepared by Danick Power and dated January 31st 2022, has been reviewed by Aaron Reesor and was found to be complete and to have used the correct procedures in accordance to the 2015 NSPS Standards.**
- **The emissions levels measured in the Test Report and listed above comply with the relevant particulate matter limits established by the 2015 NSPS Standards.**
- **The model listed above was tested to Particulate emissions: ASTM E2779-10 (section 9.4.1 integrate test run); ASTM E2515-11 as referred into 40 CFR Part 60 Subpart AAA, CSA B415.1-10 (for efficiency only)**
- **The permanent label and owner's manual meets 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 Aaron Reesor.**
- **The above-named manufacturer has contracted CSA Group 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).**

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
CERTIFICATION OF CONFORMITY
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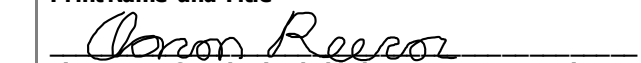
Aaron Reesor – CSA Group – Certifier – Fuels Group
Print Name and Title



Signature of Authorized Third-Party Representative

Oct 4th, 2022
Date

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

Third-party EPA approval expiration date: October 2027

V1

Remarks:

- **Revision 1 May 18th 2022:**
  - **Appendix 3 updated to included fuel analysis**
  - **Page 12/284 Clarification about the blower is automatic.**
  - **Appendix 13 updated to include Manufacturer's provided Operating instruction**
  - **All thermocouple ISO 17025 calibration can already be found in appendix 3**
- **Revision 2 October 4th 2022:**
  - **Appendix 1 updated to included PM emissions in g/hr with negative weights both corrected**
  - **to zero and uncorrected for run.**
  - **Manual updated appendix 7 to include replacement parts and the required statement for**
  - **non-catalytic models all sections are highlighted in the manual.**