

# Eco Ventless Submittal Information

---

Eco Spec Sheet .....	1.1
UL Ventless Label .....	2.1
Notice of Authorization to Apply to UL Mark (Safety) .....	3.1
UL KNLZ Explained .....	4.1
Emissions Test Results.....	5.1
Emissions by Product .....	6.1
Energy Usage Estimate .....	7.1
Eco Surface Temperatures .....	8.1
TurboChef Installation Recommendations .....	9.1





# THE Eco

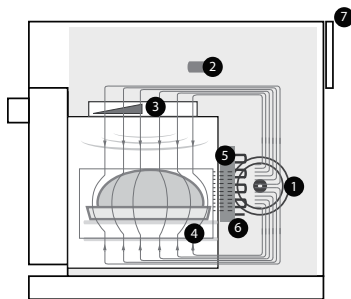


## PERFORMANCE

Utilizing TurboChef's patented technology to rapidly cook food without compromising quality, the Eco provides superior cooking performance while requiring less space and consuming less energy.

## VENTILATION

- Ventless certification
- EPA 202 test (8 hr):
  - Product: 162 Pepperoni Pizzas
  - Results: 0.89 mg/m<sup>3</sup>
  - Ventless Requirement: <5.00 mg/m<sup>3</sup>
- Internal catalytic filtration to limit smoke, grease, and odor emissions.



1. Blower Motor
2. Top-launched Microwave
3. Stirred Impinged Air (Top) and Microwave
4. Air Impingement (Bottom)
5. Catalytic Converter
6. Heater
7. Air Filter

Project \_\_\_\_\_

Item No. \_\_\_\_\_

Quantity \_\_\_\_\_

## EXTERIOR CONSTRUCTION

- 430 stainless steel outer wrap and door
- Cool-to-touch exterior; all surfaces below 122°F/50°C
- Ergonomic door handle

## INTERIOR CONSTRUCTION

- 201/304 stainless steel
- Fully welded and insulated cook chamber
- Removable rack and lower jetplate

## STANDARD FEATURES

- Single motor vertically circulates air impingement
- Top-launched microwave system
- Stirrer to help ensure even distribution of air and microwave
- Integral recirculating catalytic converter for UL® (KNLZ) listed ventless operation
- External air filtration
- Smart menu system capable of storing up to 256 recipes
- Customizable menu settings via Wi-Fi (additional fees apply), USB, or manual entry
- Flash firmware updates via USB
- Single or dual-temperature interface
- Self-diagnostics for monitoring oven components and performance
- Smart Voltage Sensor Technology\* (U.S. only)
- Stackable (requires stacking kit)
- Includes plug and cord (6 ft. nominal)
- Warranty – 1 year parts and labor
- Powder-coated color options available (additional fees apply):
  - Traffic Red (RAL-3020)
  - Yellow Green (RAL-6018)
  - Pure White (RAL-9010)
  - Jet Black (RAL-9005)
  - Blue (RAL-Custom TurboChef Blue)

## COMES WITH STANDARD ACCESSORIES

- 1 Bottle Oven Cleaner (103180)
- 1 Bottle Oven Guard (103181)
- 2 Trigger Sprayers (103182)
- 2 Solid Aluminum Pans (i1-9496)
- 1 Aluminum Paddle (i1-9716)

## CERTIFICATIONS



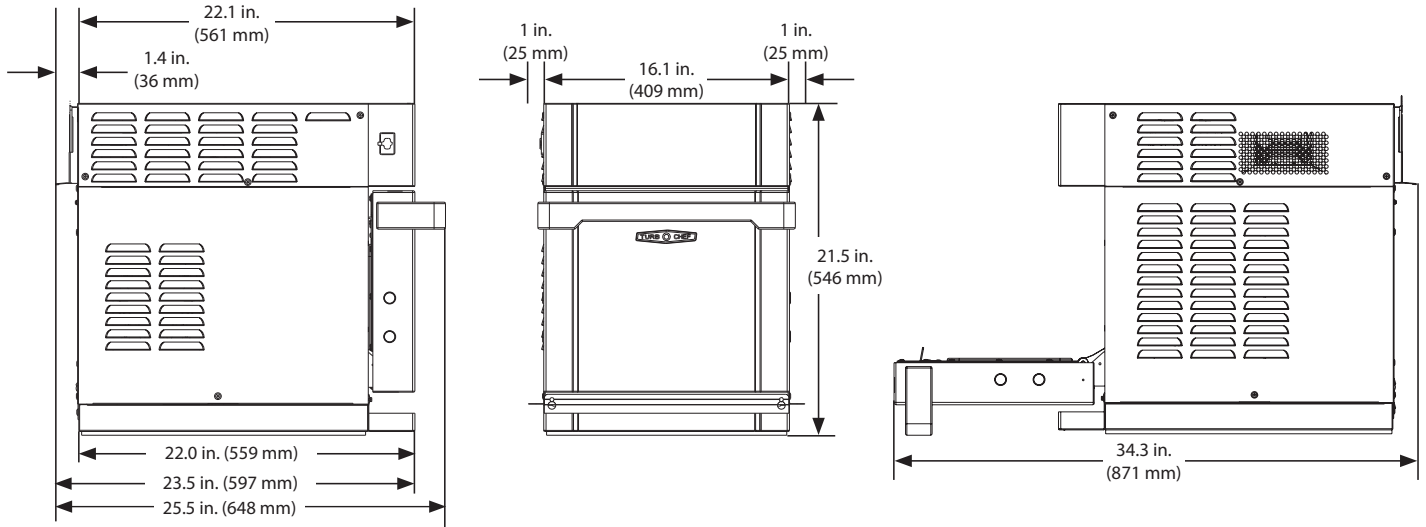
This product conforms to the ventilation recommendations set forth by NFPA96 using EPA202 test method.





\* Smart Voltage Sensor Technology does not compensate for lack of or over voltage situations. It is the responsibility of owner to supply voltage to the unit according to the specifications on the back of this sheet.

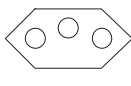

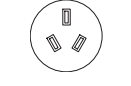

† This certification is for all food items except for foods classified as "fatty raw proteins." Such foods include bone-in, chicken, raw hamburger meat, raw bacon, raw sausage, steaks, etc. If cooking these types of foods, consult local HVAC codes and authorities to ensure compliance with ventilation requirements.

‡ This certification is dependent upon AHJ approval, as some jurisdictions may not recognize the UL certification. If you have questions regarding ventless certifications or local codes, please email ventless.help@turbochef.com

TurboChef reserves the right to make substitutions of components or change specifications without prior notice.



DIMENSIONS		
Single Units		
Height	21.5"	546 mm
Width	16.1"	409 mm
Depth	23.5"	597 mm
Weight	118 lb.	54 kg
Cook Chamber		
Height / Usable Height	7.2" / 5.7"	183 mm / 145 mm
Width	12.5"	318 mm
Depth / Usable Depth	10.5" / 9.3"	267 mm / 236 mm
Volume / Usable Volume	0.54 cu.ft. / 0.38 cu.ft.	15.3 liters / 10.7 liters
Wall Clearance (Oven not intended for built-in installation)		
Top	5"	127 mm
Sides	1"	25 mm
ELECTRICAL SPECIFICATIONS – STAINLESS STEEL, SINGLE PHASE		
Eco US Model (ECO-9500-1) – US/Canada		
Voltage	208/240 VAC	 L 6-20
Frequency	60 Hz	
Current	20 Amps	
Max Input/MW/Heaters & Blowers	3.6 kW/2.0 kW/4.0 kW*	
Eco EU Model (ECO-9500-7-EU) – Europe		
Voltage	230 VAC	 CEE7/V11
Frequency	50 Hz	
Current	16 Amps	
Max Input/MW/Heaters & Blowers	3.3 kW/2.0 kW/3.7 kW*	
Eco UK Model (ECO-9500-13-UK) – United Kingdom		
Voltage	230 VAC	 BS1363
Frequency	50 Hz	
Current	13 Amps	
Max Input/MW/Heaters & Blowers	2.6 kW/2.0 kW/2.9 kW*	
Eco JK Model 50 Hz (ECO-9500-25-JK) – Japan JK Model 60 Hz (ENC-9500-31-JK) – Japan		
Voltage	200 VAC	 JIS C 8303
Frequency	50 Hz or 60 Hz	
Current	20 Amps	
Max Input/MW/Heaters & Blowers	3.5 kW/2.0 kW/4.0 kW*	

Eco BK Model (ECO-9500-37-BK) – Brazil		
Voltage	220 VAC	 NBR14136
Frequency	60 Hz	
Current	20 Amps	
Max Input/MW/Heaters & Blowers	3.6 kW/2.0 kW/4.0 kW*	
Eco LA Model (ECO-9500-49-LA) – Latin America (cleaner and guard included) LA Model (ECO-9500-55-LA) – Latin America (without cleaner and guard)		
Voltage	220 VAC	 NEMA 6-20P
Frequency	60 Hz	
Current	20 Amps	
Max Input/MW/Heaters & Blowers	3.6 kW/2.0 kW/4.0 kW*	
Eco AK Model (ECO-9500-19-AK) – Australia		
Voltage	240 VAC	 CLIPSAL 425HD
Frequency	50 Hz	
Current	19 Amps	
Max Input/MW/Heaters & Blowers	3.5 kW/2.0 kW/4.0 kW*	
Eco SK Model (ECO-9500-43-SK) – Saudi Arabia		
Voltage	230 VAC	 IEC 309
Frequency	60 Hz	
Current	16 Amps	
Max Input/MW/Heaters & Blowers	3.3 kW/2.0 kW/3.7 kW*	
SHIPPING INFORMATION		
U.S.: All ovens shipped within the U.S. are packaged in a double-wall corrugated box banded to a wooden skid. International: All International ovens shipped via Air or Less than Container Loads are packaged in wooden crates.		
Box size: 33" x 24" x 34" (838 mm x 610 mm x 864 mm) Crate size: 33" x 24" x 34" (838 mm x 610 mm x 864 mm) Item class: 110 NMFC #26710 HS code 8419.81		
Approximate boxed weight: 163 lb. (74 kg) Approximate crated weight: 191 lb. (87 kg)		
Minimum entry clearance required for box: 34.5" (876 mm) Minimum entry clearance required for crate: 34.5" (876 mm)		

\* Under normal operation, the oven will not exceed the max input value.

**⚠ TurboChef recommends installing a type D circuit breaker for European installations.**

**TurboChef Global Operations**  
 2801 Trade Center Drive | Carrollton, Texas 75007 USA  
 US: 800.90TURBO (800.908.8726) | International: +1 214.379.6000  
 Fax: +1 214.379.6073 | www.turbochef.com



**81Y5**

**LISTED**

Commercial Cooking Appliance  
with Integral Systems for Limiting  
the Emissions of Grease-Laden Air

---

This Product Conforms to the Ventilation Recommendations  
Set Forth by NFPA96 Using EPA202 Test Method





# KNLZ.E151487 - COMMERCIAL COOKING APPLIANCES WITH INTEGRAL SYSTEMS FOR LIMITING THE EMISSION OF GREASE-LADEN AIR

## Commercial Cooking Appliances with Integral Systems for Limiting the Emission of Grease-laden Air

See General Information for Commercial Cooking Appliances with Integral Systems for Limiting the Emission of Grease-laden Air

### **TURBOCHEF TECHNOLOGIES INC**

E151487

2801 Trade Center Drive  
Carrollton, TX 75007 USA

**Commercial microwave/convection ovens**, Model(s) *C3/C\**, *Encore 2*, *Encore\**, *i3\**, *i5\**, *NGC\**, *NGO\**

**Commercial ovens**, Model(s) *HHB*, *HHB2*, *HHD*

**Conveyor Ovens**, Model(s) *HCW2620*, *HHC1618*, *HHC2020*

**NOTE: The ECO falls under NGC (i1).**

\* - Indicated complementary listed models.

Trademark and/or Tradename: "BULLET"

Last Updated on 2018-06-07

The appearance of a company's name or product in this database does not in itself assure that products so identified have been manufactured under UL's Follow-Up Service. Only those products bearing the UL Mark should be considered to be Certified and covered under UL's Follow-Up Service. Always look for the Mark on the product.

UL permits the reproduction of the material contained in the Online Certification Directory subject to the following conditions: 1. The Guide Information, Assemblies, Constructions, Designs, Systems, and/or Certifications (files) must be presented in their entirety and in a non-misleading manner, without any manipulation of the data (or drawings). 2. The statement "Reprinted from the Online Certifications Directory with permission from UL" must appear adjacent to the extracted material. In addition, the reprinted material must include a copyright notice in the following format: "© 2018 UL LLC".

UL and the UL logo are trademarks of UL LLC ©2018 All Rights Reserved.

[About](#) [Privacy Policy](#) [Terms & Conditions](#) [Access Your Data](#)

# KNLZ.GuideInfo - COMMERCIAL COOKING APPLIANCES WITH INTEGRAL SYSTEMS FOR LIMITING THE EMISSION OF GREASE-LADEN AIR

---

## [Heaters and Heating Equipment] (Heaters, Cooking Appliances) Commercial Cooking Appliances with Integral Systems for Limiting the Emission of Grease-laden Air

See General Information for Heaters, Cooking Appliances

### USE AND INSTALLATION

This category covers cooking equipment intended for commercial use, such as pressurized deep fat fryers and other appliances for use in commercial kitchens, restaurants or other business establishments where food is prepared. Each appliance covered under this category is manufactured with an integral system feature to limit the emission of grease-laden air from the cooking process to the room ambient.

These appliances have been investigated for the limit of 5 mg/m<sup>3</sup> for the emission of grease-laden air to the room ambient in accordance with the recommendations of ANSI/NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations," using the EPA-202 test method prescribed for cooking appliances provided with integral recirculating air systems.

These products are not intended for connection to a ducted exhaust system.

Appliances in this category are not provided with an integral fire extinguishing system. Authorities having jurisdiction should be consulted as to the requirements for this equipment with respect to fire extinguishing systems, such as the need for field installed systems in accordance with ANSI/NFPA 96.

In cases where the nature or construction of equipment is such that special precautions beyond the requirements of ANSI/NFPA 70, "National Electrical Code," must be observed in installations or use, suitable warning or special instructions are marked on the equipment.

Appliances covered under this category are suitable for wiring with either copper or aluminum power-supply conductors unless marked "Use Copper Wire Only For Power Supply Connections."

Commercial cooking appliances of certain types are designed for permanent connections to water supply and sewer lines at the point of installation. Authorities having jurisdiction should be consulted as to the requirements for this equipment with respect to sanitation and connection to water supply and waste disposal lines.

### FACTORS NOT INVESTIGATED

Neither the toxicity of coatings nor the physiological effects on persons consuming food products prepared by use of these appliances has been investigated.

### PRODUCT IDENTITY

One of the following product identities appears on the product:

Commercial Cooking Appliance with Integral System for Limiting the Emission of Grease-laden Air

Cooking Appliance with Integral System for Limiting the Emission of Grease-laden Air

Other product identities may be used as shown in the individual certifications, followed by the words "with Integral System for Limiting the Emission of Grease-laden Air."

### RELATED PRODUCTS



For products with integral recirculating systems including fire extinguishing systems, see Commercial, with Integral Recirculating Systems (KNKG).

For cooking oil filters that are not an integral part of another appliance, see Commercial Filters for Cooking Oil (KNRF).

### ADDITIONAL INFORMATION

For additional information, see Electrical Equipment for Use in Ordinary Locations (AALZ) and Heating, Cooling, Ventilating and Cooking Equipment (AAHC).

### REQUIREMENTS

The basic standard used to investigate products in this category is ANSI/UL 197, "Commercial Electric Cooking Appliances."

Appliances covered under this category with an integral cooking oil filter have been additionally investigated to ANSI/UL 1889, "Commercial Filters for Cooking Oil."

### UL MARK

The Certification Mark of UL on the product is the only method provided by UL to identify products manufactured under its Certification and Follow-Up Service. The Certification Mark for these products includes the UL symbol, the words "CERTIFIED" and "SAFETY," the geographic identifier(s), and a file number.

### Alternate UL Mark

The Listing Mark of UL on the product is the only method provided by UL to identify products manufactured under its Listing and Follow-Up Service. The Listing Mark for these products includes the UL symbol (as illustrated in the Introduction of this Directory) together with the word "LISTED," a control number, and the product name "Commercial Cooking Appliance" or "Cooking Appliance," or other appropriate product name as shown in the individual Listings, together with the words "with integral system for limiting the emission of grease-laden air."

\* \* \* \* \*

UL, in performing its functions in accordance with its objectives, does not assume or undertake to discharge any responsibility of the manufacturer or any other party. UL shall not incur any obligation or liability for any loss, expense or damages, including incidental or consequential damages, arising out of or in connection with the use, interpretation of, or reliance upon this Guide Information.

Last Updated on 2013-05-16

The appearance of a company's name or product in this database does not in itself assure that products so identified have been manufactured under UL's Follow-Up Service. Only those products bearing the UL Mark should be considered to be Certified and covered under UL's Follow-Up Service. Always look for the Mark on the product.

UL permits the reproduction of the material contained in the Online Certification Directory subject to the following conditions: 1. The Guide Information, Assemblies, Constructions, Designs, Systems, and/or Certifications (files) must be presented in their entirety and in a non-misleading manner, without any manipulation of the data (or drawings). 2. The statement "Reprinted from the Online Certifications Directory with permission from UL" must appear adjacent to the extracted material. In addition, the reprinted material must include a copyright notice in the following format: "© 2018 UL LLC".

UL and the UL logo are trademarks of UL LLC ©2018 All Rights Reserved.  
[About](#) [Privacy Policy](#) [Terms & Conditions](#) [Access Your Data](#)

2018-04-27

Mr. David Castillo  
Turbochef Technologies Inc  
2801 Trade Center Drive  
Carrollton, TX, 75007, US

E-mail: David.Castillo@turbochef.com

Reference: Project : 4788373636 P.O. Number: N/A

Product: EPA 202 TEST METHOD: USING THE TURBOCHEF MODEL X2ECO OVEN COOKING  
THE BELOW FOOD PRODUCT AS MEDIA.

Dear Mr. Castillo,

Per your request, project 4788373636 was opened for the evaluation of grease-laden vapors produced from the Model X2ECO oven.

The scope of this project was to determine the total grease emissions from cooking 9 inch pepperoni pizzas as the specified food load as noted in Appendix A. Testing is conducted in accordance with EPA Method 202 test guidelines to determine ultimate results. Results are used to determine compliance with Section 59 of UL710B, Second Edition, the Standard for Recirculating Systems, formerly Section 14 of UL 197, Eighth Edition, Supplement SB, and paragraph 4.1.1.2 of NFPA96, the Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations. The test was conducted at our facility in Northbrook, IL on April 24<sup>th</sup>, 2018. This letter will report the results of the EPA202 test.

For the record, the test was conducted using the Turbochef Model X2ECO oven, rated 208/240 V, 4000 W. Please see appendix A attached for the power measurement during the test. The test media, food load and oven programming as shown in Appendix A were taken from UL 710B, section 59. The results are considered to comply with UL710B, Section 59, formerly Section 14 of UL 197, Eighth Edition, Supplement SB, and NFPA96, paragraph 4.1.1.2 when tested with the specified food load and maximum cook times since the total amount of grease-laden effluents collected was 0.89 mg/m<sup>3</sup>, which is less than 5 mg/m<sup>3</sup> limit. No evaluation was conducted in regards to fire protection.

UL LLC did not select the samples, determine whether the samples were representative of production samples or witness the production of the test samples, nor were we provided with information relative to the formulation or identification of component materials used in the test samples. The test results apply only to the actual samples tested.

The issuance of this report in no way implies Listing, Classification or Recognition by UL LLC and does not authorize the use of UL Listing, Classification or Recognition Marks or any other reference to UL LLC on the product or system. UL LLC authorizes the above named company to reproduce this Report provided it is reproduced in its entirety. The name, Brand or Marks of UL LLC cannot be used in any packaging, advertising, promotion or marketing relating to the data in this Report, without UL's prior written permission.

UL, its employees and agents shall not be responsible to anyone for the use or nonuse of the information contained in this Report, and shall not incur any obligation or liability for damages, including consequential damages, arising out of or in connection with the use of, or inability to use, the information contained in this Report.

This letter will serve to report that all tests on the subject product have been completed. All information generated will be retained for future use. This concludes all work associated with Project 4788373636 and we are therefore closing this project. Our Accounting Department has been instructed to bill you for all charges incurred.

Thank you for the opportunity to provide your company with these services. Please do not hesitate to contact us if you should have any questions or comments.

Very truly yours,



Smit Thakkar  
Engineer  
E-mail: smit.thakkar@ul.com

Reviewed by:



Fred Zaplatosch  
Sr. Staff Engineer  
E-mail: fred.zaplatosch@ul.com

## APPENDIX: A

CLIENT INFORMATION	
Company Name	Turbochef Technologies Inc
Address	2801 Trade Center Drive Suite 110 Carrollton, Texas 75007

AUDIT INFORMATION:				
Description of Tests	Per Standard No.	UL 197	Edition/ Revision Date	10 <sup>th</sup> 9/17/2014
		CSA C22.2 No. 109-M1981		2 <sup>nd</sup> 4/1989 (R2013)
		UL 710B		2 <sup>nd</sup> 8/14/2014
<input checked="" type="checkbox"/> Tests Conducted by <sup>1</sup> Leo Carrillo				
<input type="checkbox"/> UL Staff supervising UL Staff in training				

TESTS TO BE CONDUCTED:				
Test No.	Start	Done <sup>3</sup>	Test Name	<input type="checkbox"/> Comments/Parameters <input type="checkbox"/> Tests Conducted by <sup>2</sup> <input type="checkbox"/> Link to separate data files <sup>4</sup>
1	2018-04-23	2018-04-25	POWER INPUT TEST (SINGLE PHASE RATED OVER 120V): RATING (CSA 22.2 109-M1981):	
2	2018-04-06	2018-04-30	CAPTURE TEST:	
3	2018-04-25	2018-04-30	EMISSION TEST:	

## Instructions -

- 1 - When all tests are conducted by one person, name can be inserted here instead of including name on each page containing data.
- 2 - When test conducted by more than one person, name of person conducting the test can be inserted next to the test name instead of including name on each page containing data. Test dates may be recorded here instead of entering test dates on the individual datasheet pages.
- 3 - Use of this field is optional and may be employed differently. If used to include a date instead of entering the testing date on the individual datasheet pages, the date shall be the date the test was conducted.
- 4 - Link to separate data files for a test can be inserted here. The link must be to a server that is accessible to UL staff, that provides for backup, required retention periods and a path, including file name, that does not change and result in a broken link. Not applicable to DAP.

## Special Instructions -

Unless specified otherwise in the individual Methods, the tests shall be conducted under the following ambient conditions. Confirmation of these conditions shall be recorded at the time the test is conducted.

Ambient Temperature, C \_\_\_\_\_ ± \_\_\_\_\_ Relative Humidity, % \_\_\_\_\_ ± \_\_\_\_\_ Barometric Pressure, mBar \_\_\_\_\_ ± \_\_\_\_\_

No general environmental conditions are specified in the Standard(s) or have been identified that could affect the test results or measurements.

## RISK ANALYSIS RELATED TO TESTING PERFORMANCE:

The following types of risks have been identified. Take necessary precautions. This list is not all inclusive.

<input checked="" type="checkbox"/> Electric shock	<input type="checkbox"/> Radiation
<input checked="" type="checkbox"/> Energy related hazards	<input type="checkbox"/> Chemical hazards
<input checked="" type="checkbox"/> Fire	<input type="checkbox"/> Noise
<input checked="" type="checkbox"/> Heat related hazards	<input type="checkbox"/> Vibration
<input type="checkbox"/> Mechanical	<input type="checkbox"/> Other (Specify)___

## GENERAL TEST CONSIDERATIONS - ALL TESTS:

## [Power Supply Connections]

Unless otherwise specified in the individual test methods, the appliance was connected to a ~~[120] [208]~~ [240] volt source of supply at ~~[50] [60]~~ Hz.

This supply connection was based on

- The marked voltage rating  
 The highest voltage of the applicable range of voltages

TEST LOCATION: (To be completed by Staff Conducting the Testing)					
<input checked="" type="checkbox"/> UL or Affiliate	<input type="checkbox"/> WTDP	<input type="checkbox"/> CTDP	<input type="checkbox"/> TPTDP	<input type="checkbox"/> TCP	<input type="checkbox"/> PPP
	<input type="checkbox"/> WMT	<input type="checkbox"/> TMP	<input type="checkbox"/> SMT		
Company Name: UL LLC					
Address: 333 Pfingsten Rd. Northbrook, IL, 60062					

TEST EQUIPMENT INFORMATION

UL test equipment information is recorded on Meter Use.

TEST SAMPLE IDENTIFICATION:

The table below is provided to establish correlation of sample numbers to specific product related information. Refer to this table when a test identifies a test sample by "Sample No." only.

Sample Card No.	Date Received	<input type="checkbox"/> Test No.+	Sample No.	Manufacturer, Product Identification and Ratings
1440355	2018-03-05	All	1	Turbochef, Model X2ECO Microwave Oven, rated 208/240 V, 4000 W, 20 A. Serial #:X2ECOUS01/spare parts (2 tranformers/2 caps)

+ - If Test Number is used, the Test Number or Numbers the sample was used in must be identified on the data sheet pages or on the Data Sheet Package cover page.

Sampling Procedure -

This document contains data or information using color and if printed, should be printed in color to retain legibility and the information represented by the color.

POWER INPUT TEST (SINGLE PHASE RATED OVER 120V):  
 RATING (CSA 22.2 109-M1981):

UL 197 Sec. 47  
 (6.2)

#### METHOD

**[x]** The supply voltage was adjusted to voltage and frequency as noted in "General Test Considerations", [240 V], [60 Hz].

The power input was measured with the appliance at the intended operating temperature under full-load conditions.

**[x]** (c-UL) To determine the proper test voltage for the Temperature (Normal) and Temperature (Abnormal) tests, the supply voltage was adjusted to the increased test voltage as noted below. Following the test at increased test voltage, the supply voltage was adjusted to the value necessary to cause the appliance to draw the increased test [current] [and] [power], calculated as specified below.

Increased Test Voltage ( $V_t$ ): 216V for appliances rated 208V.  
 250V for appliances rated between 220V-250V.

Increased Test Current ( $I_t$ ):  $I_r(V_t/V_r) = \underline{20.8} \text{ A}$

Increased Test Power ( $W_t$ ):  $W_r(V_t/V_r)^2 = \underline{4340} \text{ (W)}$

Where  $V_r$ ,  $I_r$ , and  $W_r$ , are the rated voltage, current, and power of the appliance, respectively. Note: when the appliance is rated for a range of voltages, the mean of the range is to be used as  $V_r$ .

#### PARAMETERS

Appliance Ratings:

Volts: 208/240; Current: 20 A; Power: 4000 (W)

## RESULTS (FOR REFERENCE ONLY)

Operating Conditions	Specified				Measured			
	Volts, L1-L2	Amps		Power, (W) (kW)	Volts, L1-L2	Amps		Power, (W) (kW)
		L1	L2			L1	L2	
Full power operation, rated voltage (heating only)	240	---	---	---	240.0	22.3		5230
<del>[*]</del> Full power operation, rated current (heating only)	---	<del>20</del>	<del>20</del>	---				
[*] Full power operation, rated power (heating only)	---	---	---	4000	216.0	19.7		4008
Full power operation, rated voltage with Microwave	240	--	--	--	240.0	20.0		4123
c-UL Test Conditions								
Full power operation, increased test voltage (heating only)	250	---	---	---	250.0	23.6		5695
<del>[*]</del> Full power operation, increased test current (heating only)	---	<del>20</del>	<del>20</del>	---				
[*] Full power operation, increased test power (heating only)	---	---	---	4340	218.0	20.5		4343

[ ] The input current [was] [was not] between 90% and 105% of the rated input current when the appliance was energized at rated voltage.

[ ] \*The input power [was] [was not] between 90% and 105% of the rated input power when the appliance was energized at rated voltage.



CAPTURE TEST:

UL 710B Sec. 58

UL 710 Sec. 31

## METHOD

The model X2ECO cooking appliance was placed under a hood operating at 500 CFM. Food product as specified below was then used for testing, see Emission Testing for specific details. The cooking area is to be observed for the presence of visible smoke and grease-laden air, and the hood assembly shall completely capture all of the emission as determined by observation.

## COOKING PRODUCT

**[x]** Microwave Oven - 9 in. pepperoni pizza (Tombstone, with 11 pepperonis per pizza), each cooked for 2 minutes with 30 seconds with 100% fan and 100% microwave ~~between loads~~ for 8 hours (total of 162 pizzas). Oven was set to maintain 540°F

## COOKING METHOD

## [Microwave Oven]

9 in. pepperoni pizza, each cooked for 2 minutes with 30 seconds with 100% fan and 100% microwave ~~between loads~~ for 8 hours (total of 162 pizzas). Oven was set to maintain 540°F.

## RESULTS

Their ~~[was]~~ **[was not]** the presence of visible smoke and grease-laden air from the appliance during testing.

The sample **[did]** ~~[did not]~~ capture all of the emissions from the cooking appliance.

EMISSION TEST:

UL 710B Sec. 59

## METHOD

## TEST FOR EVOLUTION OF SMOKE OR GREASE-LADEN AIR (\_540°F):

The model X2ECO cooking appliance was placed under a hood operating at 500 CFM, and was tested using a method derived from EPA Method 202. The ~~Manufacturer~~ [Underwriters Laboratories] also provided Pepperoni Pizza for the test.

A 12 in. by 6 in. rectangular, 108 in. tall sheet metal stack was constructed on top of the hood. A sampling port was located approximately 80 in. downstream from the hood exhaust, at which point it was determined there was laminar flow. The sampler was assembled and an out of stack filter was used. A pre-leak check was conducted and determined to be < 0.02 ft/min. Sampling was determined to be done at 8 traverse points.

The oven was operated normally by cooking the following foods:

## [Microwave Oven]

9 in. pepperoni pizza (Tombstone, with 11 pepperonis per pizza), each cooked for 2 minutes with 30 seconds with 100% fan and 100% microwave ~~between loads~~ for 8 hours (total of 162 pizzas). Oven was set to maintain 540°F

Temp °F	Event #	Time.	% Top Fan	% Bottom Fan	% Microwave Energy
540	1	2:30	100	N/A	100
	2				
	3				
	4				

The cooking cycle was repeated for 8 hours of continuous cooking.

During the cooking operation, it was noted whether or not visible effluents evolved from the air exhaust of the hood. Gauge, meter and temperature readings were taken and recorded every 10 min. After cooking, the condition of the duct was noted and a post-leak check was conducted and determined to be < 0.02 ft<sup>3</sup>/min.

EMISSION TEST (CONT'D):

UL 710B Sec. 59

After being allowed to cool, the sampling equipment was disassembled. The glass-filter is to be removed using a pair of forceps and placed in a clean petri dish. The dish is to be sealed and labeled "SAMPLE 1".

A sample of the acetone of the same volume that will be used to rinse-out the nozzle and probe is to be placed into a clean sample bottle, sealed, and labeled "SAMPLE 2". The level of the liquid in the sample bottle is to be recorded.

The inside of the nozzle and probe is to be rinsed with acetone taking care to collect all the rinse material in a clean sample bottle. The sample bottle is to be sealed, labeled "SAMPLE 3", and the level of the liquid in the bottle is to be recorded.

The liquid in the first three impingers is to be measured and the total volume is to be recorded which will be compared to the original volume. The liquid is to be quantitatively transferred to a clean sample bottle. Each impinger and the connecting glassware including the probe extension are to be rinsed twice with water. The rinse water is to be collected and added to the same sample bottle. The sample bottle is to be sealed, labeled "SAMPLE 4" and the level of the liquid in the bottle is to be recorded.

This rinse process is to be repeated with two rinses of methylene chloride ( $\text{MeCl}_2$ ). The rinses are to be recovered in a clean sample bottle. The sample bottle is to be sealed, labeled "SAMPLE 5" and the level of the liquid in the bottle is to be recorded.

A volume of water approximately equivalent to the volume of water used to rinse and a volume of  $\text{MeCl}_2$  approximately equivalent to the volume of  $\text{MeCl}_2$  used to rinse is to be placed in two clean sample bottles. The sample bottles are to be sealed, labeled "SAMPLE 6" and "SAMPLE 7" respectively, and the level of the liquid in the bottles is to be recorded.

The weight of the fourth impinger containing the silica gel is to be recorded and then the silica gel can be discarded.

The analysis phase was done in accordance with EPA Method 202, using the out of stack filter.

## RESULTS

The results **[are]** ~~[are not]~~ considered acceptable because there ~~[was]~~ **[was no]** visible smoke emitted from the exhaust of the hood during the normal cooking operation. There ~~[was]~~ **[was no]** noticeable amounts of smoke accumulated in the test room after 8 hours of continuous cooking.

The total amount of grease-laden effluents collected by the sampling equipment was found to be 0.89 mg/m<sup>3</sup>, which is **[less]** ~~[more]~~ than 5 mg/m<sup>3</sup>.

The total grease emissions (per clause 78.2 of 710B) in pounds per hour per linear food of hood was \_0.000488 lb/hr/ft.

Note: Additional spreadsheet is to be used when conducting the Emission Test. This spreadsheet (EPA 202) can be found in the MET/TEAM ~~Lab Equipment Management System (LEM)~~ under global ID 58255.

EMISSION TEST (CONT'D):

UL 710B Sec. 59

CONDENSIBLE MATTER  
(Lab Analysis)

Sample Bottle No.	Description	Volume, ml	Final Wt, mg
2	Acetone (Blank)	110.0	0.1
3	Acetone (Wash)	112.0	0.6
4&5	Solvent Phase(Wash)	540.0	2.5
4&5	Water Phase (Wash)	530+320=850	5.5
6&7	Solvent Phase (Blank)	590.0	0.1
6&7	Water Phase (Blank)	600+270=870	0.2

Filter paper weight before test- \_590.2 mg

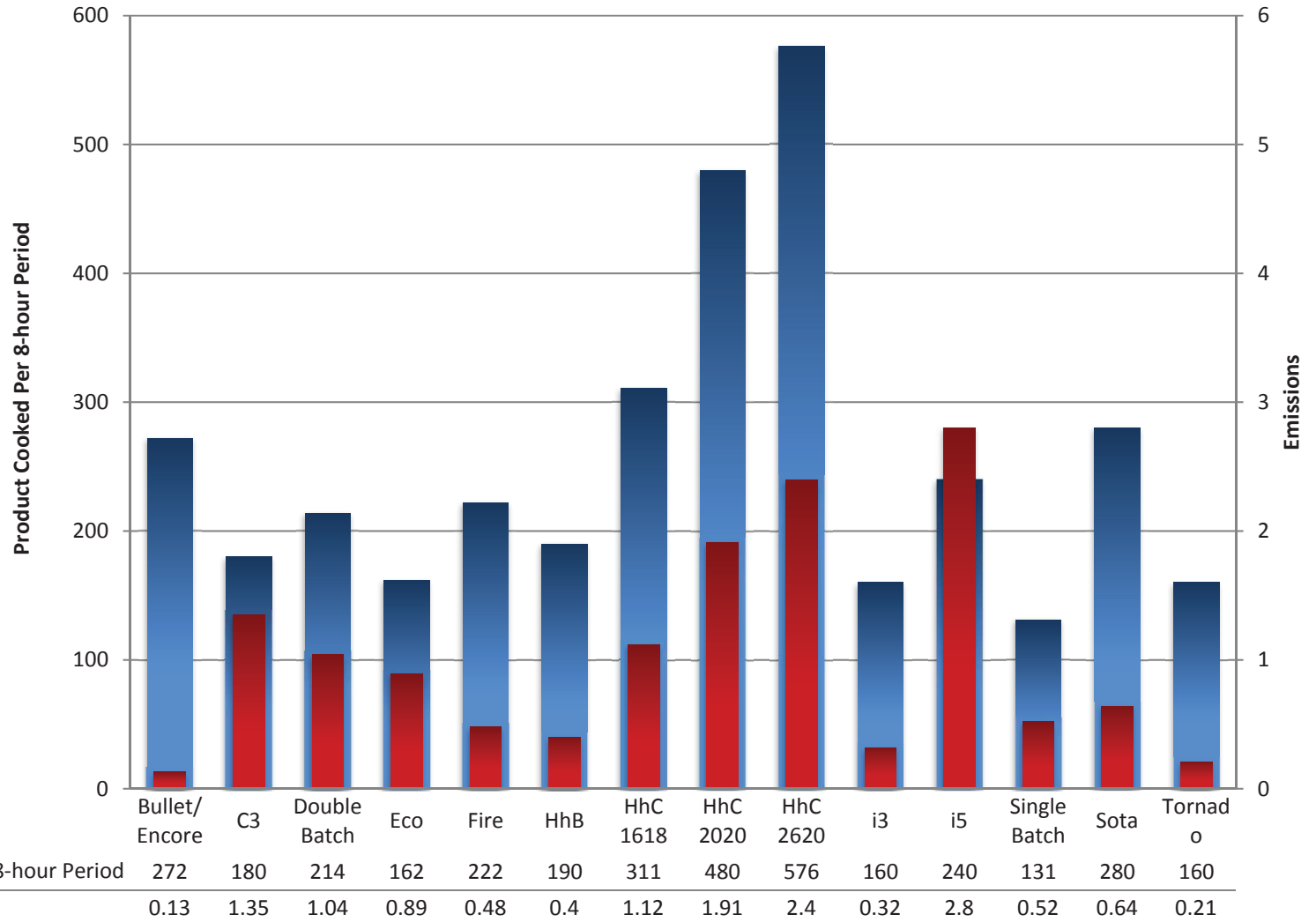
Filter paper weight after test- \_590.2\_ mg

Analysis

1. The liquid level of all the sample bottles is to be measured.
2. The filter from sample ONE is to be removed and dried to constant weight by means of a desiccator or an oven. The weight of the filter is to be recorded.
3. The volume of sample TWO is to be determined. The liquid is then to be transferred to a beaker and evaporated to dryness. The volume of the liquid and the final weight of the condensable matter are to be recorded.
4. The volume of sample THREE is to be determined. The liquid is then to be transferred to a beaker and evaporated to dryness. The volume of the liquid and the final weight of the condensable matter are to be recorded.
5. The volumes of sample FOUR and FIVE are to be measured.
6. Samples FOUR and FIVE are to be combined. The solvent phase is to be mixed, separated, and then repeated with two  $\text{MeCl}_2$  washes.
7. The solvent extracts obtained from the procedure in 6 are to be placed in a beaker and evaporated to a constant weight. The final weight is to be recorded.
8. The water phase is to be placed in a beaker and evaporated to dryness. The final weight is to be recorded.
9. The volumes of samples SIX and SEVEN are to be determined. Sample bottles SIX and SEVEN are to be analyzed according to procedures 8 and 7 respectively.

## UL® (KNLZ) Emissions by Product

Ventless Requirement: <5.00 mg/m<sup>3</sup>



# TurboChef Energy Calculator

## User Inputs

Total Operation Time per Day (hours)	12	hours
Cook Cycle Time (seconds)	45	seconds
Number of Cooks per Day	100	total
Energy Cost/kWhr (\$)	0.11	\$/kWhr

Constants	Eco
Power Warm-up (watts)	2,500
Power Cooking (watts)	1,850
Power Idle (watts)	700
Time Warm-up (seconds)	900

Energy = (Power x time), where power is in watts and time is in seconds

$E_{total} = E_{idle} + E_{cooking} + E_{warmup}$

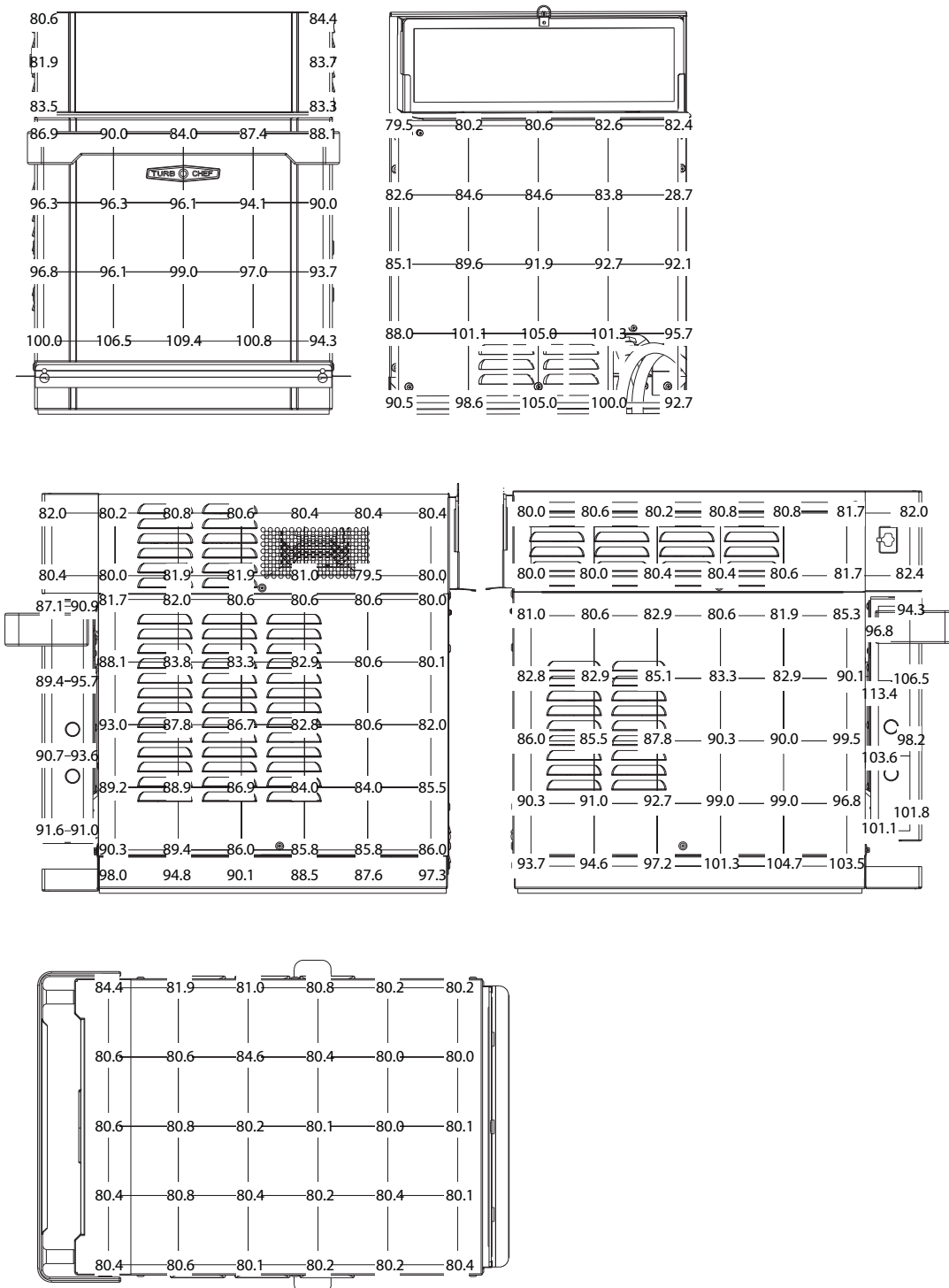
Ave Power =  $E_{total} / \text{total time per day}$

Calculated Times	Eco
Time (cooking, sec)	4,500
Time (idle, sec)	37,800
Time Check	12
Eidle (kJ)	26,460
Ewarm-up (kJ)	2,250
Ecooking (kJ)	8,325
Etotal (kJ)	37,035
Etotal (kWhr)	10.29
Avg Power/Day (kW)	0.86
Tons of Cooling	0.24
Cost/Day (\$)	\$1.13
Cost/Month (\$)	\$33.90
Cost/Year (\$)	\$412.45

# Eco Oven Surface Temperatures

This document illustrates the surface temperature testing data reported for the TurboChef Eco oven. Measurements were recorded after three hours of idle. The oven temperature was set to 540°F/282°C for the duration of the test.

After 3-hour Idle at 540°F (Values in °F)

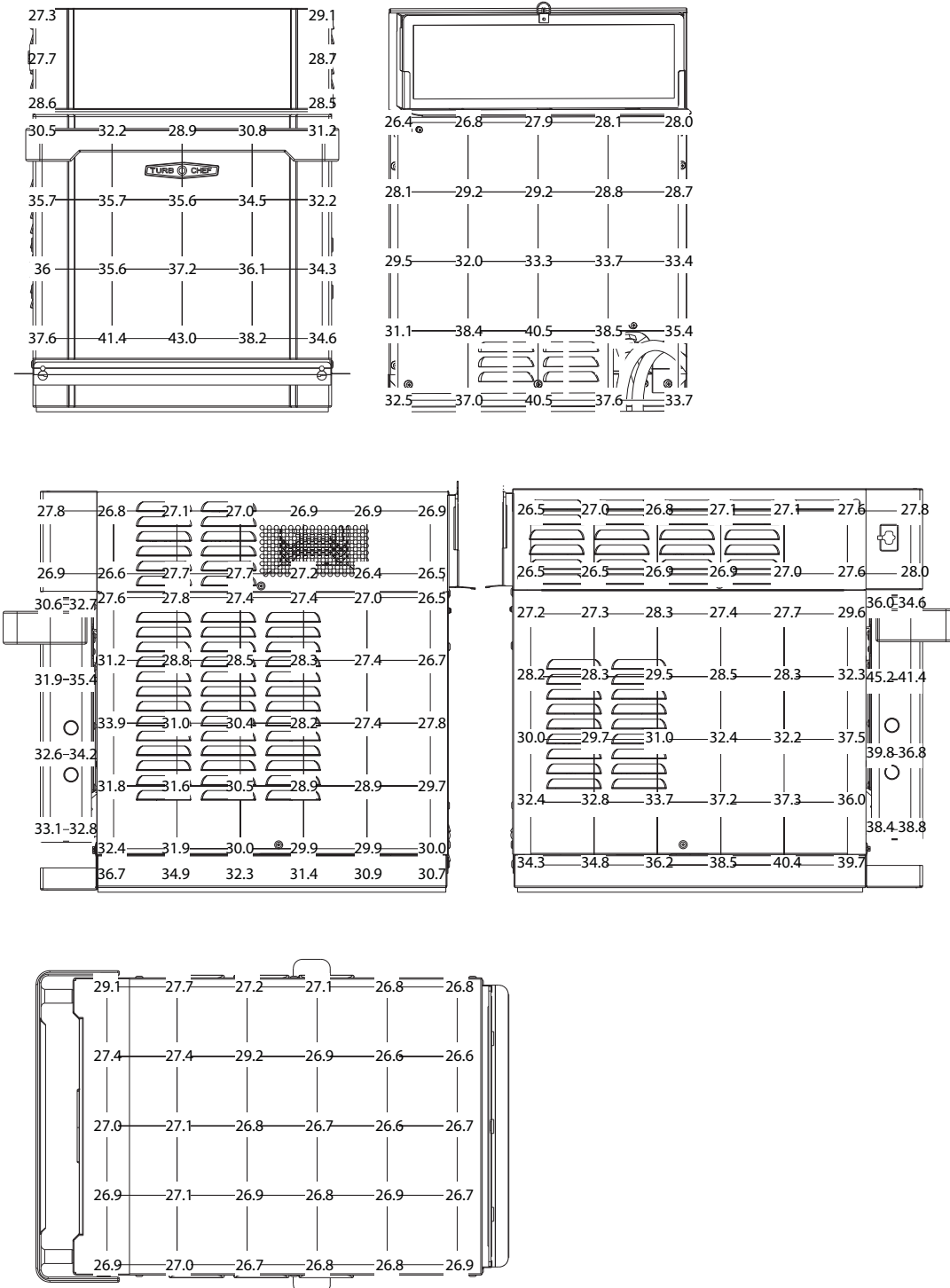




# Eco Oven Surface Temperatures

This document illustrates the surface temperature testing data reported for the TurboChef Eco oven. Measurements were recorded after three hours of idle. The oven temperature was set to 540°F/282°C for the duration of the test.

After 3-hour Idle at 282°C (Values in °C)





TURBOCHEF TECHNOLOGIES, INC.

## Installation Recommendations

TurboChef ventless ovens have internal systems for destroying grease laden vapor prior to the grease escaping the oven; therefore, the ovens are certified as non-grease emitting appliances. When following our recommendations, TurboChef ovens can be installed without the aid of a Type I or Type II hood per International Mechanical Code (2006, 2009, and 2012), NFPA 96, NFPA 101 (Life Safety Code), EPA 202, and Underwriter's Laboratory (UL KNLZ).

The following guide is intended to give relevant information for the ventless installation, operation, and maintenance of TurboChef ovens. It is important that these guidelines are followed and that the oven and surrounding areas be maintained regularly for optimal performance.

### Certifications

Safety – cULus, TUV (CE)

Sanitation – NSF\*, UL EPH\*

Ventless – UL (KNLZ)



### Electrical Requirements

TurboChef ovens must be installed on a circuit equal to the ratings listed below, per NEC sec 210.23, permissible loads.

Oven	Voltage	Current	Phase
Bullet	208/240 VAC	30 amp	1 Ph
C3	208/240 VAC	50 amp	1 Ph
Double Batch	208/240 VAC	50 amp	1 Ph
	208/240 VAC	30 amp	3 Ph
Eco			
Encore/Encore 2	208/240 VAC	30 amp	1 Ph
Fire	208/240 VAC	30 amp	1 Ph
HhB 2	208/240 VAC	30 amp	1 Ph
HhC 1618	208/240 VAC	30 amp	3 Ph
	208/240 VAC	50 amp	1 Ph
HhC 2020	208/240 VAC	50 amp	3 Ph
HhC 2620	208/240 VAC	50 amp	3 Ph
i1 (Panini, Söta, Waterless Steamer)	208/240 VAC	30 amp	1 Ph
i1 Söta Single Mag	208/240 VAC	20 amp	1 Ph
i3	208/240 VAC	40 amp	1 Ph
	208/240 VAC	30 amp	3 Ph
i5	208/240 VAC	50 amp	1 Ph
	208/240 VAC	30 amp	3 Ph
Single Batch	208/240 VAC	30 amp	1 Ph
Tornado	208/240 VAC	30 amp	1 Ph

\* NSF certification applies to the Tornado, C3, and HhB 2 ovens only. UL EPH certification applies to all ovens except the C3.

### Menu Requirements

TurboChef ovens have been approved by Underwriter's Laboratory for ventless operation (UL KNLZ listing) for all food items EXCEPT for foods classified as "fatty raw proteins." Such foods include bone-in, skin-on chicken, raw hamburger meat, raw bacon, raw sausage, steaks, etc.

The TurboChef certification includes precooked food items such as pizza toppings, sandwich meats, frozen appetizers, and cheeses. Additionally, raw, lean meats such as boneless, skinless chicken breasts and fish fall within the certification.

### Cleaning Requirements

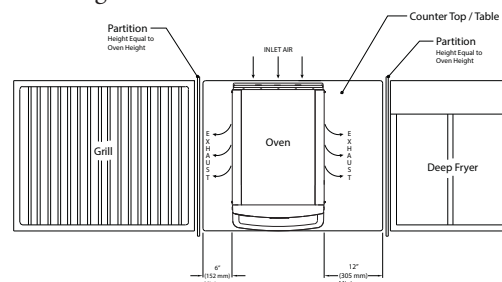
To ensure continued compliance with all health, building, and fire codes, users are required to:

- Use only TurboChef-approved cleaning chemicals.
- Follow monthly and quarterly cleaning instructions provided in the manual. Post cleaning instructions near the oven.
- Ventless installation requires that the areas around the oven (walls, ceilings, kitchen equipment, etc.) be cleaned as needed but no less than once every other month.

### Installation Near Open Heat Source

When placing a TurboChef oven near an open heat source (see illustration below), strictly adhere to the following:

- If the oven is being placed near a grill or stove, a divider must exist between the oven and the open heat source, with a minimum of 6" (152 mm) between the oven and the divider.
- If the oven is being placed near a fryer, a divider must exist between the oven and fryer, with a minimum of 12" (305 mm) between the oven and the divider.
- The height of the divider must be greater than or equal to the height of the oven.





## Oven Clearances

Verify the oven location has the following clearances on the top and each side. TurboChef ovens have built-in back bumpers that allow for the necessary spacing from the oven to the back wall.

Oven	Top	Sides
Bullet	5" (127 mm)	2" (51 mm)
C3	4" (102 mm)	2" (51 mm)
Double Batch	2" (51 mm)	2" (51 mm)
Eco	5" (127 mm)	1" (25 mm)
Encore/Encore 2	5" (127 mm)	2" (51 mm)
Fire	2" (51 mm)	2" (51 mm)
HhB 2	2" (51 mm)	2" (51 mm)
HhC 1618	10" (254 mm)	0" (0 mm)
HhC 2020	10" (254 mm)	0" (0 mm)
HhC 2620	10" (254 mm)	0" (0 mm)
i1 (Panini, Söta / Söta Single Mag, Waterless Steamer)	5" (127 mm)	1" (25 mm)
i3	19" (483 mm)	2" (51 mm)
i5	19" (483 mm)	2" (51 mm)
Single Batch	2" (51 mm)	2" (51 mm)
Tornado	4" (102 mm)	2" (51 mm)

## Ventilation

TurboChef ovens must be installed in a well-ventilated space. The space should have an exhaust rate of .70 cfm per square foot of kitchen space and an additional 100 sq. ft. (9.3 m<sup>2</sup>) of virtual space per ventless cooking appliance (TurboChef or any other).

If the air inlet is for general exhaust, pursuant to requirements for 507.2.2, paragraph 2, locate the air inlet above the center point of each oven.

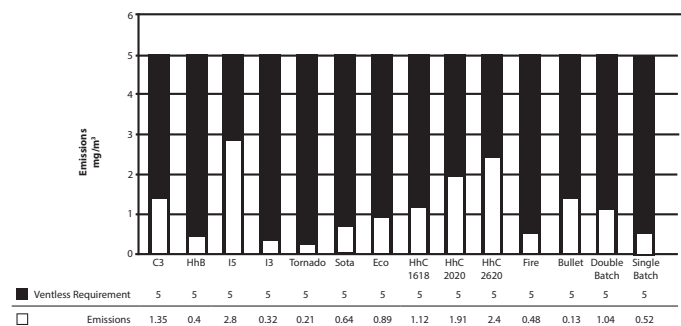
The heat load from TurboChef ovens is mostly sensible. The only latent heat present is due to evaporation during the cooking process. When installing a TurboChef oven, the space must have the following tons of AC per oven installed.

Oven	Tons of AC
Bullet	0.5
C3	0.63
Double Batch	1.15
Eco	0.89
Encore/Encore 2	0.45
Fire	0.55
HhB 2	0.84
HhC 1618	1.00
HhC 2020	1.47
HhC 2620	1.82
i1 (Panini, Söta/ Söta Single Mag, Waterless Steamer)	0.3
i3	0.9
i5	1.3
Single Batch	0.75
Tornado	0.58

## How the Ovens are Tested

TurboChef ovens are evaluated according to UL. The evaluation entails placing the test oven in an environmental chamber built to capture all emissions escaping during idle, cooking, and door-open conditions. During the eight-hour test period, a typical worst-case food item is cooked continuously, and 100% of condensable and non-condensable emissions from the product are collected and analyzed according to the EPA 202 Test Method. At the conclusion of the test, the total concentration of particulate matter (emissions) must be less than 5.0 mg/m<sup>3</sup> for the oven to be certified for ventless operation. Cooking devices that measure above the 5.0 mg/m<sup>3</sup> threshold are considered to produce grease and must be installed under Type I ventilation, according to International Mechanical Code.

TurboChef ovens are well below the 5.0 mg/m<sup>3</sup> threshold as shown below.



## Contact Information

For questions regarding a ventless installation, email [ventless.help@turbochef.com](mailto:ventless.help@turbochef.com). For questions or concerns regarding an existing installation, contact Customer Service at 1.800.908.8726, Option 1.