TurboChef Technologies Inc.

# HhB and HhB 2 Ventless Submittal Information

TURBOCHEF

Project _____

Item No. _____

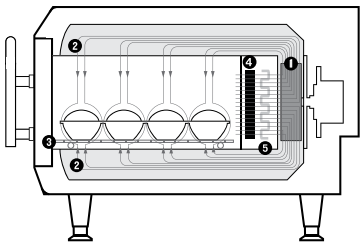
Quantity _____



THE
# HIGH h BATCH 2™

## PERFORMANCE
- Heat transfer rates (h) are 3X-4X typical convection oven
- Heat transfer rates (h) are 2X typical conveyor oven
- The High h Batch 2 offers high quality, full baking capabilities up to 5X faster than traditional cooking equipment, achieving conveyor-type results in a compact size

## VENTILATION
- UL 710B (KNLZ) listed for ventless operation.†
- EPA 202 test (8 hr):
  - Product / Results
    - Fries, Chicken Breasts, Chicken Wings, and Ground Beef Patties / 0.10 mg/m$^3$
    - Pepperoni Pizzas / 0.40 mg/m$^3$
  - Ventless Requirement: <5.00 mg/m$^3$
- Internal catalytic filtration to limit smoke, grease, and odor emissions.



1. Blower Motor
2. Impinged Air
3. Oscillating Rack
4. Catalytic Converter
5. Impingement Heater

## EXTERIOR CONSTRUCTION
- Stainless steel front, top, back, and powder-coated sides
- 4" (102 mm) matte black legs
- Ergonomic, cool to touch powder-coated door handle

## INTERIOR CONSTRUCTION
- 304 stainless steel interior
- Watertight construction
- Interchangeable jetplates for customized cooking results

## STANDARD FEATURES
- Integral recirculating catalytic converter for UL® 710B (KNLZ) listed ventless operation
- Variable-speed High h recirculating air impingement system
- Oscillating rack for high heat transfer without spotting
- Half-sheet pan/16-inch pizza capacity
- Smart Voltage Sensor Technology* (N.A. only)
- Stackable design (requires stacking kit)
- Smart menu system capable of storing up to 72 recipes
- Built-in self diagnostics for monitoring oven components and performance
- Includes plug and cord (6 ft. nominal)
- Smart card compatible
- Warranty – 1 year parts and labor

## COMES WITH STANDARD ACCESSORIES
- 1 Aluminum Paddle (NGC-1478)
- 1 Bottle Oven Cleaner (103180)
- 1 Bottle Oven Guard (103181)
- 2 Trigger Sprayers (103182)
- 1 14x16 Non-stick Screen (100018)

c UL US NSF ANSI/NSF #4 81Y5 TÜV PRODUCT SERVICE Production monitored Safety tested CE

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 the owner to supply voltage to the unit according to the specifications on the back of this sheet.

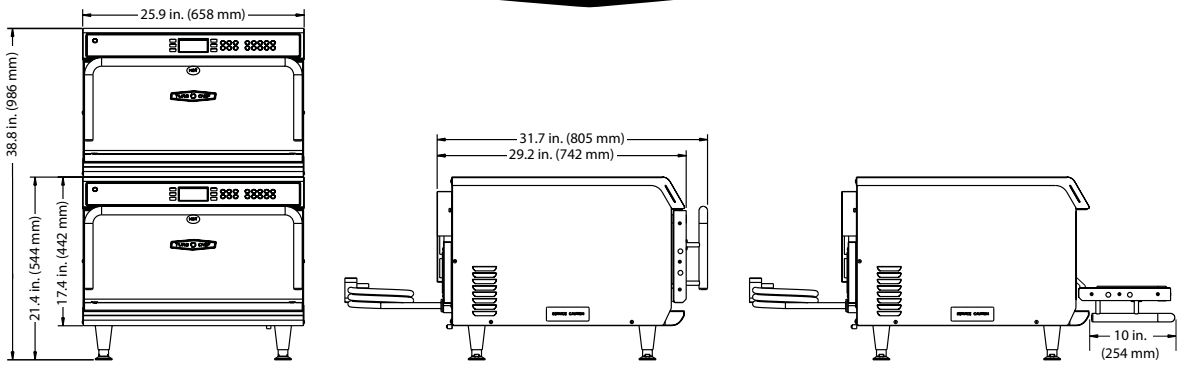
† Ventless certification is for all food items except for foods classified as "fatty raw proteins." Such foods include bone-in, skin-on chicken, raw hamburger meat, raw bacon, raw sausage, steaks, etc. If cooking these types of foods, consult local HVAC codes and authorities to ensure compliance with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

Ultimate ventless allowance is dependent upon AHJ approval, as some jurisdictions may not recognize UL certification or application. 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.

DOC-1199/Revision H/
October 2012

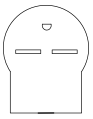
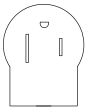
# HIGH h BATCH 2™

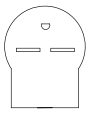



## DIMENSIONS

| | | |
|---|---|---|
| Single Units | | |
| Height | 21.4″ | 544 mm |
| Width | 25.9″ | 658 mm |
| Depth | 29.2″ | 742 mm |
| with handle | 31.7″ | 805 mm |
| Weight | 157 lb. | 71 kg |
| Stacked Units (Stacking Kit Required) | | |
| Height | 38.8″ | 986 mm |
| top unit with legs | 42.8″ | 1087 mm |
| Width | 25.9″ | 658 mm |
| Depth | 29.2″ | 742 mm |
| with handle | 31.7″ | 805 mm |
| Weight | 314 lb. | 142 kg |
| Cook Chamber | | |
| Height | 8″ | 203 mm |
| Width | 18.75″ | 476 mm |
| Depth | 16.75″ | 425 mm |
| Volume | 1.45 cu. ft. | 41.1 liters |
| Wall Clearance (Oven not intended for built-in installation) | | |
| Top | 2″ | 51 mm |
| Sides | 2″ | 51 mm |

## ELECTRICAL SPECIFICATIONS

| | | |
|---|---|---|
| UNITED STATES | | |
| HHB2 (HHB-8603-1) | |  NEMA 6-30P |
| Phase | 1 Phase | |
| Voltage | 208/240 VAC | |
| Frequency | 50/60 Hz | |
| Current / Max Circuit Requirement | 24 / 30 amp | |
| Cord | 10 gauge, 3 wire, 5 ft., SOOW | |
| Max Input | 5000 watts | |
| CANADA | | |
| HHB2C (HHB-8603-1C) | | |
| Phase | 1 Phase |  NEMA 6-50P |
| Voltage | 208/240 VAC | |
| Frequency | 50/60 Hz | |
| Current / Max Circuit Requirement | 24 / 50 amp | |
| Cord | 10 gauge, 3 wire, 5 ft., SOOW | |
| Max Input | 5000 watts | |

| | | |
|---|---|---|
| LATIN AMERICA | | |
| HHB2LA (HHB-8603-1K-2073) | |  NEMA 6-30P |
| Phase | 1 Phase | |
| Voltage | 230 VAC | |
| Frequency | 50/60 Hz | |
| Current / Max Circuit Requirement | 24 / 32 amp | |
| Cord | 10 gauge, 3 wire, 5 ft., SOOW | |
| Max Input | 5000 watts | |
| EUROPE/ASIA-PACIFIC | | |
| HHB2EW (HHB-8603-1W) | |  IEC 309 5-pin, 16 amp |
| Phase | 3 Phase | |
| Voltage | 400 VAC | |
| Frequency | 50/60 Hz | |
| Current / Max Circuit Requirement | 10 / 16 amp | |
| Cord | HO7RN-F, 5 wire | |
| Max Input | 5000 watts | |
| HHB2ED (HHB-8603-1D) | |  IEC 309 4-pin, 20 amp |
| Phase | 3 Phase | |
| Voltage | 230 VAC | |
| Frequency | 50/60 Hz | |
| Current / Max Circuit Requirement | 14 / 20 amp | |
| Cord | HO7RN-F, 4 wire | |
| Max Input | 5000 watts | |
| HHB2UK (HHB-8603-1K) | |  IEC 309 3-pin, 32 amp |
| Phase | 1 Phase | |
| Voltage | 230 VAC | |
| Frequency | 50/60 Hz | |
| Current / Max Circuit Requirement | 24 / 32 amp | |
| Cord | HO7RN-F, 3 wire | |
| Max Input | 5000 watts | |

## 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: 37″ x 32″ x 28″ (940 mm x 813 mm x 711 mm)
Crate size: 40″ x 36″ x 35″ (1016 mm x 914 mm x 889 mm)
Item class: 85 NMFC #26770 HS code 8419.81

Approximate boxed weight: 210 lb. (95 kg)
Approximate crated weight: 285 lb. (129 kg)

Minimum entry clearance required for box: 28.5″ (724 mm)
Minimum entry clearance required for crate: 35.5″ (902 mm)

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

TurboChef Global Operations
4240 International Pkwy, Suite 105 / Carrollton, Texas 75007 USA
US: 800.90TURBO (800.908.8726) / International: +1 214.379.6000
Fax: +1 214.379.6073 / turbochef.com


LISTED
81Y5

Commercial Microwave/Convection Oven
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

Underwriters Laboratories Inc.

# KNLZ.E151487
# Commercial, with Integral Systems for Limiting the Emission of Grease-laden Air

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

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

**TURBOCHEF INC** E151487
SUITE 128
10500 METRIC DR
DALLAS, TX 75243 USA

**Commercial microwave/convection ovens**, Models C3/C, HHB, NGC.

Last Updated on 2005-06-07

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UL Listed and Classified Products | UL Recognized Components | Products Certified for Canada

Underwriters Laboratories Inc.

# KNLZ.GuideInfo
# Commercial, with Integral Systems for Limiting the Emission of Grease-laden Air

View Listings Page Bottom Print-friendly version Questions? Previous Page

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

See General Information for Heaters, Cooking Appliances

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 in 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 evaluated for the limit of 5 $mg/m^3$ for the emission of grease-laden air to the room ambient in accordance with the recommendations of the National Fire Protection Association Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations, NFPA 96, 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 NFPA 96.

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

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

Appliances Listed in 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.

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

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

Appliances Listed in this category with an integral cooking oil filter have been additionally investigated to the requirements in the standard "Commercial Filters for Cooking Oil", **ANSI/UL 1889**. For cooking oil filters that are not an integral part of another appliance, see Commercial Filters for Cooking Oil (**KNRF**) in this directory.

The Listing Mark of Underwriters Laboratories Inc. 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 name and/or symbol of Underwriters Laboratories Inc. (as illustrated in the Introduction of this Directory) together with the word "LISTED," a control number and one of the following product names as appropriate: "Commercial Cooking Appliance," "Cooking Appliance," or other appropriate product identity specified in the individual Listing, along with the words "with integral system for limiting the emission of grease-laden air. "

**Last Updated** on 1999-02-19

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**UL Listed and Classified Products** | **UL Recognized Components** | **Products Certified for Canada**

# CITY OF LOS ANGELES

CALIFORNIA



DEPARTMENT OF
BUILDING AND SAFETY
201 NORTH FIGUEROA STREET
LOS ANGELES, CA 90012

ROBERT R. "BUD" OVROM
GENERAL MANAGER

RAYMOND S. CHAN, C.E., S.E.
EXECUTIVE OFFICER

**James K Pool**
**TurboChef Technologies**
**4240 International Parkway**
**Carrollton, TX 75007**
Telephone: 214-908-8726

Models:

File Number: M-100012

Effective Date: 07/06/2011

Expiration Date: 04/01/2012

Manufacturer: SAME

Item: WARMING OVEN

HHB2*, NGC, NGO (*new model added).

PLEASE REFER TO THE APPLICATION NUMBER ON ALL CORRESPONDENCE, PHONE CALLS & SAMPLES

The item processed under the above file number has been tested, examined and found to comply with applicable Los Angeles Plumbing Code (LAPC) and/or Los Angeles Mechanical Code (LAMC) and is hereby approved unless revoked for cause.

This letter or the letterhead copy may not be reproduced for use in labeling or advertising, but copies of this letter may be used within your organization and shown as evidence of approval.

CONDITIONS OF APPROVAL:

**1. This product shall be used to warm pre-cooked hot food items only. Any other type of cooking shall not be allowed.**
**2. Installation of this product is not required to have an exhaust system per Sections 95.507.1.1 and 95.507.1.2 of LAMC, 2011 Edition.**
**3. This product shall be installed, operated, and maintained in accordance with printed instructions from the manufacture and LAMC, 2011 Edition.**

Each item shall have the name or trademark of manufacturer and model number where it will be visible for inspection.

In order to renew this approval, an application and reexamination fee must be submitted on or before the expiration date shown above. Arrangement shall be made to remove any test samples remaining in the Laboratory. Samples remaining after 21 days from the date of this notice will be shipped collect by the most convenient carrier or disposed of in accordance with applicable regulation.

**Jason T Tran**
Mechanical Testing Laboratory, Test Engineer

Plumbing / Mechanical Inspection
Inspection Bureau

**Corporate Office** 1930 S. Forest Hill Place, Danville, California 94526 p: 925.838.7561 f: 925.743.1568 www.fishnick.com
**Mailing Address** P.O. Box 1247, San Ramon, California 94583

FISHER NICKEL Inc.

April 22, 2005

TurboChef Technologies, Inc.
10500 Metric Drive, Suite 128
Dallas, Texas 75243

Dear Mr. Pool:

The eight-hour cooking emissions test on the High h Batch electric oven was completed as scheduled on April 13, 2005. The test samples have been analyzed and the total particulate matter (PM) concentration ($mg/m^3$) has been determined to be 1.088 $mg/m^3$ at an applied ventilation rate of 200 cfm.

The result of this test definitively supports the use of the High h Batch oven without the benefit of a Type I dedicated exhaust hood. Set against the pass/fail criteria of UL 197, the total PM concentration produced by the oven falls well below the standard's limit of 5.0 $mg/m^3$ for allowable grease emissions. Further, the measured total PM concentration of 1.088 $mg/m^3$ is below the 1.5 $mg/m^3$ limit adopted by some regulatory agencies.

The attached table summarizes the food product specifications, cooking parameters, constant test conditions and test results of the eight-hour cooking emissions test.

Also enclosed is the letter sent to the UL representative who was present during the test, Margaret Kiefer. Attached to the letter are the test measurements and official emissions test results as determined by PG&E's Technological and Ecological Services (TES) engineer, Clem DeSilva. Also, included are the calibration certificates for the air velocity meter used by Fisher Nickel Inc. technicians to determine the sampling exhaust duct's air velocity (ft/min) and the wet gas meter used by PG&E's TES personnel during the course of the test.

Please feel free to contact me should you have any questions or would like to further discuss the results of this test.

Sincerely,

Todd Bell
Emissions Researcher
Food Service Technology Center

Enclosures: 6

Emissions Testing Summary

| Food Product Specification | |
|---|---|
| Test Food Product | Pepperoni Pizza |
| Average Total Weight of each Pizza (lb) | 1.61 |

| Cooking Parameters | |
|---|---|
| Cook Time (minutes) | 1.83 |
| Loading Time (seconds) | 20 |
| Removal Time (seconds) | 20 |
| Total Cooking Cycle (minutes) | 2.50 |
| Pre-Cooking State (°F) | 38 ± 2.0 |
| Number of Pizzas Cooked | 192 |
| Number of Pizzas per Load | 1 |

| Test Conditions | |
|---|---|
| Sampling Time (hours) | 8 |
| Exhaust Ventilation Rate (cfm) | 200 |
| Number of Probe Sampling Points | 3 |
| Time Interval at each Sampling Point (minutes) | 30 |

| Test Results | |
|---|---|
| Total PM Concentration ($mg/m^3$) | 1.088 |

2012-02-21

Mr. David Castillo
Turbochef Technologies Inc.
4240 International Pky
Carrollton, TX, 75007
United States

E-mail: David.Castillo@turbochef.com

Reference: File: TC8762 Project : 12CA05111 P.O. Number : N/A

Product: EPA 202 TEST METHOD: USING TURBOCHEF TECHNOLOGIES MODEL HHB2 CONVECTION OVEN WITH ORE-IDA FRIES, CHICKEN BREASTS, TYSON WINGS AND GROUND BEEF PATTIES AS TEST MEDIA.

Dear Mr. Castillo,

Per your request, project 12CA05111 was opened for the evaluation of grease-laden vapors produced from cooking Ore-Ida Fries, Chicken Breasts, Tyson Wings, and Ground Beef Patties in a Turbochef Technologies Model HHB2 Convection Oven in accordance with your requested food load and test protocol.

The scope of this project was to determine the grease emissions from the Turbochef Technologies convection oven in accordance with EPA Method 202 test guidelines to demonstrate ultimate results to your specified food load and test protocol, which included UL710B, the Standard for Recirculating Systems, Sec. 17 and NFPA96, the Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations, paragraph 4.1.1.2. The test was conducted at our facility in Northbrook, IL on February 9th, 2012. This letter will report the results of the EPA202 test.

For the record, the test was conducted using a UL Listed Turbochef Technologies Model HHB2 Convection oven found in E151487, Volume 1, Section 7, cooking Ore-Ida Fries, Chicken Breasts, Tyson Wings, and Ground Beef Patties as specified by Turbochef Technologies. Please see the attached page (Appendix A) for the test method and results of the test for Model HHB2. The results are considered to comply when tested with your specified food load and requested cook times since the total amount of grease-laden effluents collected was 0.10 mg/m³, which is less than 5 mg/m³ limit. No evaluation was conducted in regards to fire protection.

The issuance of this report in no way implies Listing, Classification, or Recognition by UL and does not authorize the use of UL Listing, Classification, or Recognition Marks or any other reference to UL on or in connection with the product or system.

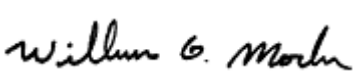
You cannot use UL's name or marks in connection with any product, packaging, advertising, promotion, or marketing without UL's prior written permission.

In no event shall UL be responsible to anyone for whatever use or nonuse that is made of the information contained in this Report and in no event shall UL, its employees or its agents, incur any obligation or liability for damages, including, but not limited to, consequential damages arising out of or in connection with the use, or inability to use, of 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 12CA05111 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,



Bill Morler
Project Engineer
Department: 3015GNBK
Tel: 847-664-1852
Fax: 847-407-1852
E-mail: William.Morler@ul.com

Reviewed by:

Fred Zaplatosch
Staff Engineer
Department: 3015GNBK
E-mail: fred.zaplatosch@ul.com

# A P P E N D I X: A

TEST FOR EVOLUTION OF SMOKE OR GREASE-LADEN AIR:

The Model HHB2 was tested using a method derived from EPA Method 202. The manufacturer also provided Ore-Ida Fries, Chicken Breasts, Tyson Wings, and Ground Beef Patties for the test.

A 12 in. by 6 in. rectangular, 108 in. tall sheet metal stack was constructed on top of a sheet metal hood and mounted above the exhaust vent of the convection oven. 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. A variable speed exhaust motor was used to maintain 500 CFM airflow through the exhaust stack.

The convection oven was operated normally by cooking the following foods:

One Complete Cooking Cycle

| FOOD | # of Individual Cycles | Cook Time (min) | Weight of Product (oz.) | # of pieces per cycle | Product Temp before cooking |
|---|---|---|---|---|---|
| Ore Ida Thick Cut Fries | 2 | 6:45 | 24 | 24 oz. Batch | Frozen |
| Chicken Breasts | 2 | 6:50 | 5-6 | 4 | 36℉ |
| Tyson Fire Wings | 2 | 11:00 | 12 | 6 | Frozen |
| Ground Beef Patties | 2 | 6:00 | 6 | 6 | 37℉ |

The product consisted Ore-Ida Fries, Chicken Breasts, Tyson Wings, and Ground Beef Patties which was cooked at the specified amount of time as indicated above. The total oz. of product per cycle was distributed evenly throughout the pan. 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 $ft^3$/min.

After being allowed to cool, the sampling equipment was disassembled; the filter was removed, and placed into a sample container labeled No. 1. The liquid in impingers Nos. 1, 2, and 3 were volumetrically measured and transferred to sample container No. 3. The silica gel and impinger No. 4 was transferred to sample container No. 5. The nozzle, probe and impingers were rinsed three times with water and the rinse was added to container No. 3. These parts were also rinsed three times with acetone and transferred to container No. 4. All additional inter surfaces of the sampling terrain glassware were rinsed with methylene chloride three times; the rinse was transferred to container No. 6. A blank of acetone approximately equivalent to the amount used for rinses was aliquoted into container No. 2, the same was done for the distilled de-ionized water and methylene chloride except that these were aliquoted into their own individual containers labeled No. 7 and 8 respectively. All containers were properly labeled and sealed, then the liquid levels in all the containers were marked.

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

# RESULTS:

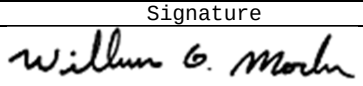
There was no visible smoke emitted from the exhaust of the hood during the normal cooking operation of the Model HHB2. There was no noticeable amount of smoke accumulated in the test room after 8 hours of continuous cooking.

There was no visible smoke was emitted from the exhaust of the hood during the normal cooking operation. There was no noticeable amount 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 <u>0.10 mg/$m^3$</u>, which is less than 5 mg/$m^3$.

| TEST LOCATION: | | | | | |
|---|---|---|---|---|---|
| **[X]**UL or Affiliate | **[]**WTDP | **[]**CTDP | **[]**TPTDP | **[]**TCP | **[]**PPP |
| | **[]**WMT | **[]**TMP | **[]**SMT | | |
| Company Name | Underwriters Laboratories | | | | |
| Address | 333 Pfingsten Rd,<br>Northbrook IL, 60069 | | | | |

| CLIENT INFORMATION | |
|---|---|
| Company Name | TurboChef Technologies Inc. |
| Address | 4240 International Pky<br>Carrollton TX, 75007 |

| AUDIT INFORMATION: | | | | |
|---|---|---|---|---|
| Description of Tests | Per Standard No. | UL-710B | Edition/ Revision Dates | 2nd / September 2nd 2011 |
| | | CSA 22.2 109-M1981 | | 1st / April-1989 (r2004) |
| Tests Conducted by + | | | Ken Kingsbury/Mike Chieffo | |
| | Printed Name | | Signature | |
| Reviewed and accepted by qualified Project Handler | William G. Morler | |  | |
| | Printed Name | | Signature | |

TESTS TO BE CONDUCTED:

| Test No. | Start | Done+++ | Test Name | Comments/Parameters **[x]**Tests Conducted by ++ |
|---|---|---|---|---|
| 1 | 2012-2-6 | 2012-2-17 | POWER INPUT TEST | |
| 2 | 2012-2-9 | 2012-2-9 | DIELECTRIC VOLTAGE-WITHSTAND | |
| 3 | 2012-2-9 | 2012-2-9 | CAPTURE TEST | |
| 4 | 2012-2-9 | 2012-02-14 | EPA 202 TEST | ++Shane M. Keller / Joe Garrett |

| | | | | |
|---|---|---|---|---|
| Description of Tests | Per Standard No. | UL-197<br>CSA 22.2 109-M1981 | Edition/ Revision Date | 10TH 2004 |
| Description of Tests | Per Standard No. | UL-710B | Edition/ Date | 2nd 2004 |

GENERAL TEST CONSIDERATIONS – ALL TESTS:

Power Supply Connections

Unless otherwise specified in the individual test methods, the appliance was connected to a 240 volt source of supply at 60 Hz.

This supply connection was based on
**[X]** The marked voltage rating
**[ ]** The highest voltage of the applicable range of voltages

RISK ANALYSIS RELATED TO TESTING PERFORMANCE:

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

| | |
|---|---|
| **[X]** Electric shock | **[ ]** Radiation |
| **[X]** Energy related hazards | **[ ]** Chemical hazards |
| **[ ]** Fire | **[ ]** Noise |
| **[X]** Heat related hazards | **[ ]** Vibration |
| **[ ]** Mechanical | **[ ]** Other (Specify)__ |

## TEST EQUIPMENT INFORMATION

| Inst. ID No. | Instrument Type | Test Number +, Test Title or Conditioning | Function /Range | Last Cal. Date | Next Cal. Date |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |

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

The following additional information is required when using client's or rented equipment, or when a UL ID Number for an instrument number is not used. The Inst. ID No. below corresponds to the Inst. ID No. above.

| Inst. ID No. | Make/Model/Serial Number/Asset No. |
|---|---|
| | |
| | |

**[X]**UL test equipment information is recorded on Meter Use in UL's Laboratory Project Management (LPM) database.

TEST SAMPLE IDENTIFICATION:

The table below is provided to provide 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 | Test No.+ | Sample No. | Manufacturer, Product Identification and Ratings |
|---|---|---|---|---|
| 1284753 | 2012-01-13 | ALL | 1 | Turbochef Technologies Inc., Model HHB2, rated 240 V, 6900 W. |

POWER INPUT TEST (110-120V):

RATING (CSA 22.2 109-M1981):

UL 710B Sec. 44 (6.2)

METHOD

**[X]** The supply voltage was adjusted to voltage and frequency as noted in "General Test Considerations", **[**_240_ V**]**, **[**_60_ Hz**]**.

**[ ]** The supply voltage was voltage adjusted to the mean of the rated voltage range at rated frequency, **[**___ V**]**, **[**___ Hz**]**.

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

**[**For appliances incorporating a general-use receptacle connected to the same electrical source supplying the appliance**]**

**[ ]** The added load placed on the receptacle was 80 percent of the current rating of the receptacle.

**[ ]** The added load placed on the duplex receptacle was 100 percent of the current rating of the receptacle.

**[ ]** The added load placed on the receptacle was the specific marked load intended to be used during operation.

**[ ]** To determine the proper test voltage for the Normal Temperature and Abnormal Heating Tests, the voltage was then adjusted to the value necessary to cause the appliance to draw its rated **[**current**]** **[**and**]** **[**power**]**.

**[**Test to determine proper test voltage for c-UL testing**]**

**[ ]** 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 ($V_t$): 125V for appliances rated between 110V-125V.

Increased Test Current ($I_t$): $I_r(V_t/V_r)$ = _____ A

Increased Test Power ($W_t$): $W_r(V_t/V_r)^2$ = _____ (W)(kW)

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: _28.8_ A; Power: __6900__ W

POWER INPUT TEST (110-120V): (CONT'D)

RATING (CSA 22.2 109-M1981):

UL 710B Sec. 44 (6.2)

RESULTS

| Operating Conditions | Rated | | | Measured | | |
|---|---|---|---|---|---|---|
| | Volts | Amps | Power, (W) | Volts | Amps | Power, (W) |
| Full power operation, rated voltage | 240 | --- | --- | 240 | 27.4 | 6576 |
| **[ ]** Full power operation, rated current | --- | | --- | | | |
| **[X]** Full power operation, rated power | --- | --- | 6900 | 256.5 | 28.9 | 6909 |

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

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

DIELECTRIC VOLTAGE-WITHSTAND TEST:
DIELECTRIC STRENGTH (CSA 22.2 109-M1981):

UL 710B Sec. 46
(6.7)

METHOD

The test was conducted with equipment employing a 500 volt-ampere or larger capacity transformer capable of manual or automatic regulation of the output voltage. The equipment used was an [Associated Research Model 3665.

The applied potential was increased from zero to the required value in a uniform rate. This potential was held at that value for 1 minute.

During the test, all contacts energizing current-carrying parts (such as conductors, relays, and thermostats) were in the closed position.

PRIMARY CIRCUITS
The appliance was operated for 8 hours, sufficient to allow it to attain maximum operating temperature under conditions of intended use.

The appliance was subjected to the application of a 40 – 70 hertz essentially sinusoidal potential for 1 minute without electrical breakdown:
**[X]** Between live parts of primary circuits and dead metal parts;
**[ ]** Between live parts of different primary circuits;
**[ ]** Between terminals of a capacitor used across-the-line
**[ ]** Between terminals of a capacitor connected between the line and the enclosure.

The test potential was 1000 volts.

RESULTS

In each case there **[**~~was~~**]** **[**was no**]** dielectric breakdown.

Operation of the test equipment was checked before and after the test by observing breaker operation with:

**[X]** leads connected together

**[ ]** a checking resistor

CAPTURE TEST:

UL 710B Sec. 58
UL 710 Sec. 31

METHOD

The model HHB2 cooking appliance was placed under a hood, located in a draft free room and is operated at the lower air flow limit (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

One Complete Cycle

| FOOD | # of Individual Cycles | Cook Time (min) | Weight of Product (oz.) | # of pieces per cycle | Product Temp before cooking |
|---|---|---|---|---|---|
| Ore Ida Thick Cut Fries | 2 | 6:45 | 24 | 24 oz. Batch | Frozen |
| Chicken Breasts | 2 | 6:50 | 5-6 | 4 | 36°F |
| Tyson Fire Wings | 2 | 11:00 | 12 | 6 | Frozen |
| Ground Beef Patties | 2 | *6:00 | 6 | 6 | 37°F |

COOKING METHOD

The product was cooked per the manufactures recommendations, as specified above.

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.

(*) Note: The cook time for the ground beef patties was changed from 5 minutes to 6 minutes due to the burgers not being cooked all the way through. mac 2012-2-17

EMISSION TEST: UL 710B Sec. 59

METHOD

TEST FOR EVOLUTION OF SMOKE OR GREASE-LADEN AIR

The model HHB2 cooking appliance was placed under a hood overall 48 by 41 by 96 in. with the hood airflow at 500 CFM, and is tested using a method derived from EPA Method 202. Underwriters Laboratories also provided the following products for the test, Ore Ida Thick Cut Fries, Chicken Breasts, Tyson Fire Wings and Ground Beef Patties.

A _12_in. by _6_ in. rectangular, _108_ in. tall sheet metal stack was constructed on top of the sheet metal hood and mounted above the exhaust vent 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:

One Complete Cycle

| FOOD | # of Individual Cycles | Cook Time (min) | Weight of Product (oz.) | # of pieces per cycle | Product Temp before cooking |
|---|---|---|---|---|---|
| Ore Ida Thick Cut Fries | 2 | 6:45 | 24 | 24 oz. Batch | Frozen |
| Chicken Breasts | 2 | 6:50 | 5-6 | 4 | 36°F |
| Tyson Fire Wings | 2 | 11:00 | 12 | 6 | Frozen |
| Ground Beef Patties | 2 | *6:00 | 6 | 6 | 37°F |

The cooking cycle was repeated for 8 hours of continuous cooking. This resulted in _8_ complete cycles.

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 $ft^3$/min.

(*) Note: The cook time for the ground beef patties was changed from 5 minutes to 6 minutes due to the burgers not being cooked all the way through. mac 2012-2-17.

EMISSION TEST: 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 ($MeCl_2$). 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 $MeCl_2$ approximately equivalent to the volume of $MeCl_2$ 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 _ 0.10 _ mg/m³, which is [less] [~~more~~] than 5 mg/m³.

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

EMISSION TEST: UL 710B Sec. 59

CONDENSIBLE MATTER
(Lab Analysis)

| Sample Bottle No. | Description | Volume, ml | Final Wt, mg |
|---|---|---|---|
| 1 | Filter Paper | - | 651.9 |
| 2 | Acetone (Blank) | 19 | 0.2 |
| 3 | Acetone (Wash) | 15 | 0.3 |
| 4&5 | Solvent Phase(Wash) | 90 | 0.7 |
| 4&5 | Water Phase (Wash) | 365 | 1.9 |
| 6&7 | Solvent Phase (Blank) | 120 | 0.8 |
| 6&7 | Water Phase (Blank) | 375 | 1.2 |

Filter paper weight before test- _652.3_ mg

EMISSION TEST: UL 710B Sec. 59

**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 $MeCl_2$ 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.

END OF DATASHEET PACKAGE.  THIS PAGE INTENTIONALLY LEFT BLANK

File: TC8762

Project: 12CA05111

Date: 2/9/2012

Client:

**Turbochef Technologies**

| Model: | Product Tested |
| --- | --- |
| HHB2 | Hamburger, Chicken, Wings, Fries |

**Turbochef Technologies**
Model: **HHB2**

Calculations needed for Nozzle Size

| | | | | |
|---|---|---|---|---|
| $\Delta H_@$ | = | 40.124 | | This number is calculated when device is calibrated |
| % Oxygen | = | 21.14 | $\%O_2$ | Oxygen inside stack during operation |
| % Carbon | = | 0.01 | %CO2 | Carbon Dioxide inside stack during operation |
| Stack Temperature | = | 25.81 | ℃ | Temperature inside stack during operation |
| Barametric Pressure | = | 749.3 | mmHg | Barametric pressure at location of meter |
| Stack Static Pressure | = | -1.016 | mm H2O | Static Pressure inside of duct |
| Average Square root ΔP | = | 1.667 | ΔP mm H2O | Enter pressure differential at each traverse point in mm H2O, the take square root of ΔP. |

| | Pressure | CFM | | Pressure |
|---|---|---|---|---|
| **1** | 2.032 | 505 | **5** | 3.048 |
| **2** | 2.54 | 505 | **6** | 3.048 |
| **3** | 2.54 | 489 | **7** | 3.048 |
| **4** | 2.794 | 510 | **8** | 3.302 |
| | | | | Average |

| **# Traverse Points** | | 8 |
|---|---|---|

| | | | | |
|---|---|---|---|---|
| Meter Temperature | = | 25 | °C | |
| Pitot Tube Coefficient | = | 0.84 | | |
| % Moisture | = | 21.58 | | |
| Sample Rate | = | 21.24 | Lpm | |
| Ideal Nozzle Size | | 9.817 | mm | When numbers are entered into calculator, ideal nozzle size will be displayed. Enter number here |
| | | 3/8 | in | |
| Actual Nozzle Size Used | | | in | If ideal nozzle size is not available, locate nearest number. Enter what nozzle size was used for testing |

Project No. 12CA05111 File: TC8762

**Turbochef Technologies**
Model: **HHB2**

Start Time: 7:30 Product Tested: **Hamburger, Chicken, Wings, Fri** Cook Time: cycle

End Time: 16:00 Barometric Pressure: 749.3 mmHg Recovery Time: n/a

Test Date: 2012/02/09 Room Ambient: 25

# IMPINGER WEIGHT

| Impinger | Start Volume/Weight | Empty Weight (lbs) | With Content (lbs) | End of Test (lbs) |
|---|---|---|---|---|
| 1 | 100mL | 1.316 | 1.538 | 1.330 |
| 2 | 100mL | 1.302 | 1.520 | 1.592 |
| 3 | 0 | 1.334 | 1.334 | 1.398 |
| 4 | 200g | 1.296 | 1.738 | 1.882 |

# FILTER WEIGHT

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | End Weight | |
|---|---|---|---|---|---|---|---|---|---|
| #1- Beginning | 0.6418 | 0.6404 | 0.6414 | 0.6426 | 0.642 | | | | g |
| #1- End | | | | | | | | | g |
| #2- Beginning | 0.6529 | 0.6541 | 0.6533 | 0.6525 | 0.6523 | | | 0.6523 | g |
| #2- End | 0.659 | 0.6573 | 0.6563 | 0.6534 | 0.6528 | 0.652 | 0.6519 | 0.6519 | g |

# Timed Meter Readings

| Traverse Point Number | Sampling Time Hr/Sec | Gas Meter Reading ($m^3$) | Orifice Pressure Differential ΔH | Velocity Head ΔP | Pump Vaccum In.hg | Stack Temp ℃ | Probe Temp ℃ | Filter Temp ℃ | Exit Temp ℃ | Gas Meter Temp ℃ |
|---|---|---|---|---|---|---|---|---|---|---|
| Initial | - | 339.883 | 40 | 1.6 | 0.0 | 26 | 121 | 121 | 10 | 22 |
| 1 | 10 | 340.088 | 41 | 1.6 | 0.0 | 26 | 121 | 121 | 12 | 23 |
| 1 | 20 | 340.295 | 42 | 1.6 | 1.0 | 26 | 121 | 121 | 14 | 24 |
| 1 | 30 | 340.503 | 42 | 1.6 | 1.0 | 26 | 121 | 121 | 16 | 25 |
| 1 | 40 | 340.712 | 42 | 1.6 | 1.0 | 26 | 121 | 121 | 12 | 26 |
| 1 | 50 | 340.922 | 42 | 1.6 | 1.0 | 25 | 121 | 121 | 12 | 27 |
| 1 | 60 | 341.131 | 42 | 1.6 | 1.0 | 25 | 121 | 121 | 14 | 27 |
| 2 | 10 | 341.341 | 42 | 2.0 | 1.0 | 26 | 121 | 121 | 14 | 28 |
| 2 | 20 | 341.551 | 42 | 2.0 | 1.0 | 26 | 121 | 121 | 15 | 28 |
| 2 | 30 | 341.761 | 42 | 2.0 | 1.0 | 27 | 121 | 121 | 13 | 28 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 40 | 341.971 | 42 | 1.8 | 1.0 | 26 | 121 | 121 | 13 | 28 |
| 2 | 50 | 342.181 | 42 | 2.0 | 1.0 | 26 | 121 | 121 | 15 | 29 |
| 2 | 60 | 342.392 | 43 | 1.8 | 1.0 | 27 | 121 | 121 | 12 | 29 |

| Traverse Point Number | Sampling Time Hr/Sec | Gas Meter Reading ($m^3$) | Orafice Pressure Differential ΔH | Velocity Head ΔP | Pump Vaccum In.hg | Stack Temp ℃ | Probe Temp ℃ | Box Temp ℃ | Impinger Temp ℃ | Gas Meter Outlet ℃ |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 10 | 342.600 | 41 | 2.0 | 1.0 | 26 | 121 | 121 | 13 | 29 |
| 3 | 20 | 342.807 | 42 | 2.0 | 1.0 | 27 | 121 | 121 | 14 | 29 |
| 3 | 30 | 343.015 | 41 | 2.0 | 1.0 | 28 | 121 | 121 | 15 | 29 |
| 3 | 40 | 343.223 | 42 | 2.0 | 1.0 | 26 | 121 | 121 | 13 | 29 |
| 3 | 50 | 343.437 | 41 | 2.0 | 1.1 | 26 | 121 | 121 | 13 | 29 |
| 3 | 60 | 343.642 | 41 | 2.0 | 1.1 | 26 | 121 | 121 | 14 | 29 |
| 4 | 10 | 343.847 | 42 | 1.6 | 1.1 | 26 | 121 | 121 | 15 | 29 |
| 4 | 20 | 344.056 | 42 | 1.6 | 1.1 | 27 | 121 | 121 | 13 | 29 |
| 4 | 30 | 344.264 | 42 | 1.8 | 1.1 | 27 | 121 | 121 | 13 | 29 |
| 4 | 40 | 344.472 | 42 | 1.8 | 1.1 | 27 | 121 | 121 | 14 | 29 |
| 4 | 50 | 344.680 | 42 | 1.8 | 1.1 | 26 | 121 | 121 | 15 | 29 |
| 4 | 60 | 344.889 | 42 | 1.8 | 1.1 | 26 | 121 | 121 | 11 | 29 |
| 5 | 10 | 345.098 | 42 | 1.8 | 1.1 | 27 | 121 | 121 | 12 | 29 |
| 5 | 20 | 345.306 | 42 | 1.8 | 1.1 | 26 | 121 | 121 | 13 | 29 |
| 5 | 30 | 345.514 | 41 | 1.8 | 1.1 | 26 | 121 | 121 | 14 | 29 |
| 5 | 40 | 345.723 | 42 | 1.8 | 1.1 | 26 | 121 | 121 | 12 | 29 |
| 5 | 50 | 345.930 | 41 | 1.8 | 1.1 | 26 | 121 | 121 | 12 | 29 |
| 5 | 60 | 346.138 | 42 | 1.8 | 1.1 | 25 | 121 | 121 | 13 | 29 |
| 6 | 10 | 346.345 | 41 | 2.1 | 1.1 | 26 | 121 | 121 | 14 | 29 |
| 6 | 20 | 346.553 | 41 | 2.0 | 1.1 | 27 | 121 | 121 | 15 | 29 |
| 6 | 30 | 346.760 | 42 | 2.0 | 1.1 | 27 | 121 | 121 | 11 | 29 |
| 6 | 40 | 346.968 | 42 | 2.0 | 1.1 | 27 | 121 | 121 | 11 | 29 |
| 6 | 50 | 347.176 | 42 | 2.0 | 1.1 | 26 | 121 | 121 | 12 | 29 |
| 6 | 60 | 347.383 | 41 | 2.0 | 1.1 | 26 | 121 | 121 | 13 | 29 |
| 7 | 10 | 347.590 | 42 | 2.0 | 1.1 | 26 | 121 | 121 | 14 | 29 |
| 7 | 20 | 347.798 | 42 | 2.2 | 1.1 | 26 | 121 | 121 | 11 | 29 |
| 7 | 30 | 348.005 | 41 | 2.2 | 1.1 | 26 | 121 | 121 | 11 | 29 |
| 7 | 40 | 348.212 | 41 | 2.2 | 1.1 | 26 | 121 | 121 | 12 | 29 |
| 7 | 50 | 384.422 | 41 | 2.2 | 1.1 | 27 | 121 | 121 | 13 | 29 |
| 7 | 60 | 348.626 | 41 | 2.2 | 1.1 | 26 | 121 | 121 | 13 | 29 |
| 8 | 10 | 348.834 | 42 | 2.0 | 1.5 | 26 | 121 | 121 | 14 | 29 |
| 8 | 20 | 349.042 | 42 | 2.0 | 1.5 | 26 | 121 | 121 | 14 | 29 |
| 8 | 30 | 349.251 | 42 | 2.0 | 1.5 | 26 | 121 | 121 | 14 | 29 |
| 8 | 40 | 349.460 | 42 | 2.0 | 1.5 | 26 | 121 | 121 | 15 | 29 |
| 8 | 50 | 349.668 | 42 | 2.0 | 1.5 | 27 | 121 | 121 | 15 | 29 |
| 8 | 60 | 349.877 | 42 | 2.0 | 1.5 | 26 | 121 | 122 | 12 | 29 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 70 | 350.086 | 42 | 2 | 1.5 | 26 | 121 | 121 | 11 | 29 |
| 8 | 80 | 350.295 | 42 | 2 | 1.5 | 25 | 121 | 121 | 12 | 29 |
| 8 | 90 | 350.503 | 42 | 2 | 1.5 | 26 | 121 | 121 | 12 | 29 |

Average Gas Meter Outlet Temperature: 28.32653 ℃

Average Gas Meter Outlet Temperature: 82.98776 ℉

Δ H = 41.7451 mm $H_2O$ Tm = 542.99 R

Δ H = 1.643508 in $H_2O$

| Project No. | 12CA05111 | File: | TC8762 |
|---|---|---|---|

| Turbochef Technologies | |
|---|---|
| Model: | **HHB2** |

# Start Volume of Sample Bottles

| Sample Bottle | Start Volume (ml) | Sample Bottle | Start Volume (ml) |
|---|---|---|---|
| 2 | 19.0 | 5 | 90.0 |
| 3 | 15.0 | 6 | 375.0 |
| 4 | 365.0 | 7 | 120.0 |

# Initial Weight of Dishes And Drying Process

| | Initial Weight (g) | Drying Process (g) | | | | | | Final Weight of Dish |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | |
| Dish 1 | | | | | | | | |
| Dish 2 | 0.9801 | 0.9802 | 0.9802 | | | | | 0.9802 |
| Dish 3 | 0.9806 | 0.9807 | 0.9807 | | | | | 0.9807 |
| Dish 4 | 1.0026 | 1.0028 | 1.0027 | | | | | 1.0027 |
| Dish 5 | 1.0018 | 1.0018 | 1.0016 | | | | | 1.0016 |
| Dish 6 | 0.9797 | 0.9799 | 0.9799 | | | | | 0.9799 |
| Dish 7 | 0.9942 | 0.9944 | 0.9944 | | | | | 0.9944 |
| Dish 8 | | | | | | | | |
| Dish 9 | | | | | | | | |
| Dish 10 | | | | | | | | |

# Initial Weight of Bottle 2 And Drying Process

| | Enter Dish # | Final Weight of Dish | Solid Phase Drying Process (g) | | | | | Final Weight After Drying |
|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | |
| Dish | 2 | 0.9802 | 0.9804 | 0.9804 | | | | 0.9804 |
| Dish | | | | | | | | |
| Dish | | | | | | | | |

# Final Weight of Bottle 2

| | Dish # | Final Weight of Dish (Pre-dry) | Final Weight of Dish (Post-dry) |
|---|---|---|---|
| Dish | 2 | 0.9802 | 0.9804 |

| Final Weight of Bottle 2 Solids | |
|---|---|
| 0.0002 | grams |

| | | | | | |
|---|---|---|---|---|---|
| Dish | 0 | 0.0000 | 0.0000 | 0.2 | milligrams |
| Dish | 0 | 0.0000 | 0.0000 | | |

## Initial Weight of Bottle 3 And Drying Process

| | Enter Dish # | Final Weight of Dish | Solid Phase Drying Process (g) | | | | | Final Weight After Drying |
|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | |
| Dish | 3 | 0.9807 | 0.9809 | 0.9810 | | | | 0.981 |
| Dish | | | | | | | | |
| Dish | | | | | | | | |

## Final Weight of Bottle 3

| | Dish # | Final Weight of Dish (Pre-dry) | Final Weight of Dish (Post-dry) | **Final Weight of Bottle 3 Solids** | |
|---|---|---|---|---|---|
| Dish | 3 | 0.9807 | 0.9810 | 0.0003 | grams |
| Dish | 0 | 0.0000 | 0.0000 | 0.3 | milligrams |
| Dish | 0 | 0.0000 | 0.0000 | | |

## Initial Weight of Bottles 4 & 5 And Drying Process (Solvent Phase)

| | Enter Dish # | Final Weight of Dish | Solid Phase Drying Process (g) | | | | | Final Weight After Drying |
|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | |
| Dish | 5 | 1.0016 | 1.0023 | 1.0023 | | | | 1.0023 |
| Dish | | | | | | | | |
| Dish | | | | | | | | |

## Final Weight of Bottles 4 & 5 (Solvent Phase)

| | Dish # | Final Weight of Dish (Pre-dry) | Final Weight of Dish (Post-dry) | **Final Weight of Bottles 4 & 5 Solids** | |
|---|---|---|---|---|---|
| Dish | 5 | 1.0016 | 1.0023 | 0.0007 | grams |
| Dish | 0 | 0.0000 | 0.0000 | 0.7 | milligrams |
| Dish | 0 | 0.0000 | 0.0000 | | |

## Initial Weight of Bottles 4 & 5 And Drying Process (Water Phase)

| | Enter Dish # | Final Weight of Dish | Solid Phase Drying Process (g) | | | | | Final Weight After Drying |
|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | |
| Dish | 4 | 1.0027 | 1.0044 | 1.0046 | | | | 1.0046 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Dish | | | | | | | | |
| Dish | | | | | | | | |

# Final Weight of Bottles 4 & 5 (Water Phase)

| | Dish # | Final Weight of Dish (Pre-dry) | Final Weight of Dish (Post-dry) |
|---|---|---|---|
| Dish | 4 | 1.0027 | 1.0046 |
| Dish | 0 | 0.0000 | 0.0000 |
| Dish | 0 | 0.0000 | 0.0000 |

| **Final Weight of Bottles 4 & 5 Solids** | |
|---|---|
| 0.0019 | grams |
| 1.9 | milligrams |

# Initial Weight of Bottles 6 & 7 And Drying Process (Solvent Phase)

| | Enter Dish # | Final Weight of Dish | Solid Phase Drying Process (g) | | | | | Final Weight After Drying |
|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | |
| Dish | 7 | 0.9944 | 0.9953 | 0.9952 | | | | 0.9952 |
| Dish | | | | | | | | |
| Dish | | | | | | | | |

# Final Weight of Bottles 6 & 7 (Solvent Phase)

| | Dish # | Final Weight of Dish (Pre-dry) | Final Weight of Dish (Post-dry) |
|---|---|---|---|
| Dish | 7 | 0.9944 | 0.9952 |
| Dish | 0 | 0.0000 | 0.0000 |
| Dish | 0 | 0.0000 | 0.0000 |

| **Final Weight of Bottles 6 & 7 Solids** | |
|---|---|
| 0.0008 | grams |
| 0.8 | milligrams |

# Initial Weight of Bottles 6 & 7 And Drying Process (Water Phase)

| | Enter Dish # | Final Weight of Dish | Solid Phase Drying Process (g) | | | | | Final Weight After Drying |
|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | |
| Dish | 6 | 0.9799 | 0.9811 | 0.9811 | | | | 0.9811 |
| Dish | | | | | | | | |
| Dish | | | | | | | | |

# Final Weight of Bottles 6 & 7 (Water Phase)

| | Dish # | Final Weight of Dish (Pre-dry) | Final Weight of Dish (Post-dry) |
|---|---|---|---|
| Dish | 6 | 0.9799 | 0.9811 |

| **Final Weight of Bottles 6 & 7 Solids** | |
|---|---|
| 0.0012 | grams |

| | | | | | |
|---|---|---|---|---|---|
| Dish | 0 | 0.0000 | 0.0000 | 1.2 | milligrams |
| Dish | 0 | 0.0000 | 0.0000 | | |

# Final Weight of All Bottles

| Sample Bottle | 2 |
|---|---|
| **0.2** | milligrams |
| Sample Bottle 4&5 | Water Ph. |
| **1.9** | milligrams |

| Sample Bottle | 3 |
|---|---|
| **0.3** | milligrams |
| Sample Bottle 6&7 | Solvent Ph. |
| **0.8** | milligrams |

| Sample Bottle 4&5 | Solvent Ph. |
|---|---|
| **0.7** | milligrams |
| Sample Bottle 6&7 | Water Ph. |
| **1.2** | milligrams |

Project No. 12CA05111 File: TC8762

**Turbochef Technologies**
Model: HHB2

Start Time: 7:30 End Time: 16:00 Test Date: 02/09/12

Cook Time: cycle Product Tested: **Hamburger, Chicken, Wings, Fries**

Recovery Time: n/a Barometric Pressure: 749.3

# Post-Test Data

| | | | | | |
|---|---|---|---|---|---|
| Gas Meter Reading initial | 339.88 | $m^3$ | | Gas Meter Reading End | 349.88 $m^3$ |
| Vm | 9.99 | $m^3$ | | | |
| | 352.93 | $ft^3$ | | | |
| Y- Constant | 0.934 | | This data is obtained during device calibration. Verify number with most recent calibration certification on LEM | | |
| Tstd constant | 528.0 | R | | | |
| Tm | 543.0 | R | Number obtained from Datasheet | | |
| Barometric Pressure | 749.3 | mmHg | Barometric Pressure on day of Test | | |
| | 29.5 | inHg | | | |
| Pstd | 30.42 | inHg | | | |
| Δ H | 1.643508 | in $H_2O$ | | | |
| **Vmstd** | 312.12 | ft3 | | | |
| | 8.838292 | m3 | | | |

# Post-Filter Data

| | | | |
|---|---|---|---|
| Filter paper | 651.9 | mg | **Weight at End of Test** |
| Filter AR | 652.3 | mg | **Weight at Begining of Test** |
| delta H | 0.4 | mg | **Change of Weight at End of Test** |

# Post-Acid Used

| | | | | | |
|---|---|---|---|---|---|
| Acetone (Blank) | 0.2 | mg | Bottle 2 | Mc | 0.5 mg |
| Acetone (Wash) | 0.3 | mg | Bottle 3 | | |
| Solvent Phase (Wash) | 0.7 | mg | Bottles 4&5 | **Mn** | 0.9 mg |
| Water Phase (Wash) | 1.9 | mg | Bottles 4&5 | | |
| Solvent Phase (Blank) | 0.8 | mg | Bottles 6&7 | | |
| Water Phase (Blank) | 1.2 | mg | Bottles 6&7 | | |

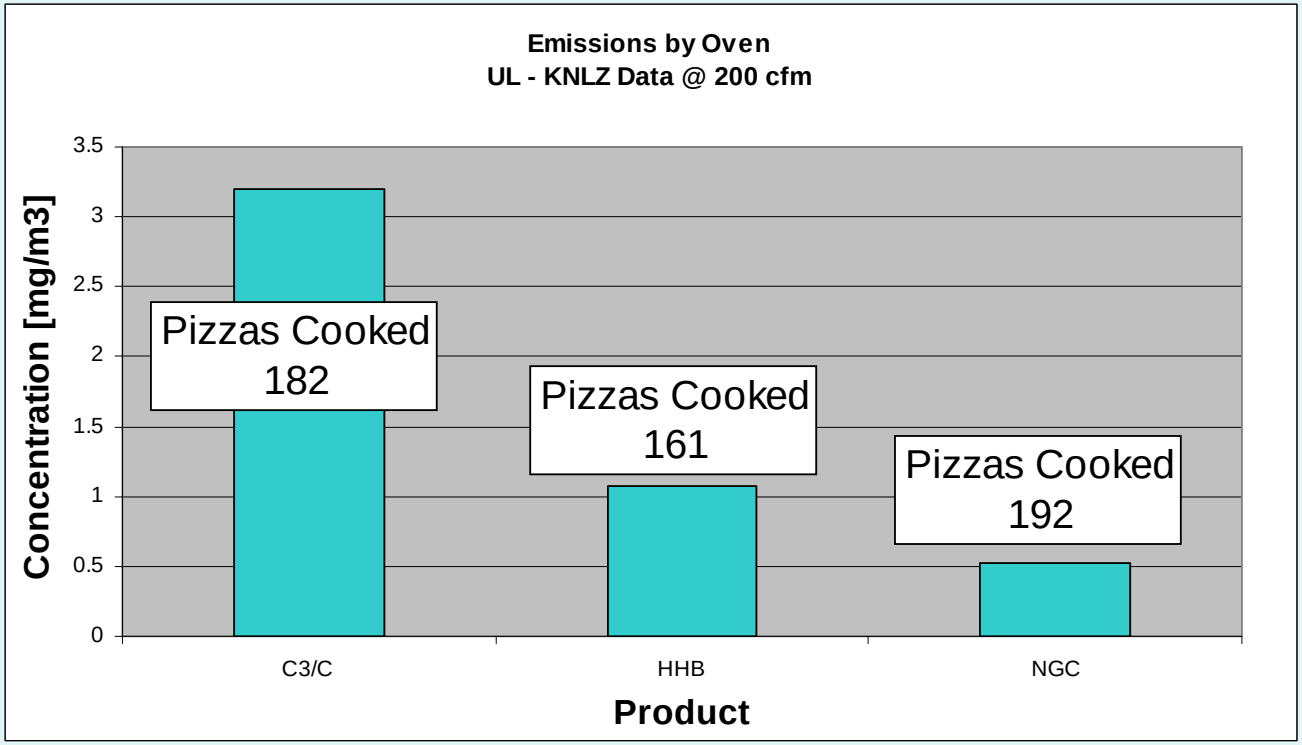
# Total Grease Emisions

**Cs=Mn/Vmstd** **0.10 mg/m3**

# Ventless Operation

- Particulate Matter Emissions During 8 hr of Pizza Barreling. UL LIMIT 5.0mg/m$^3$ @ 500 cfm

(source Food Service Technology Center/UL)



**Appliance**

| | |
|---|---|
| Make: | **TurboChef** |
| Model: | **High h Batch** |

Food Product: **Chicken Breasts**

**Preheat and Idle data (475°F)**

| | | |
|---|---|---|
| Preheat Time: | 12.9 | min |
| Preheat Energy: | 1.1 | kWh |
| Idle Energy Rate: | 1.4 | kW |

**Chicken Baking Performance**

| | | |
|---|---|---|
| Bake Time: | 8.5 | min |
| Baking Energy Rate: | 4.0 | kW |
| Baking Energy Efficiency: | 36.3 | % |
| Production Capacity: | 10.8 | lb/h |
| Product Shinkage | 33.5 | % |

Food Product: **Cheese Pizza**

**Preheat and Idle data (525°F)**

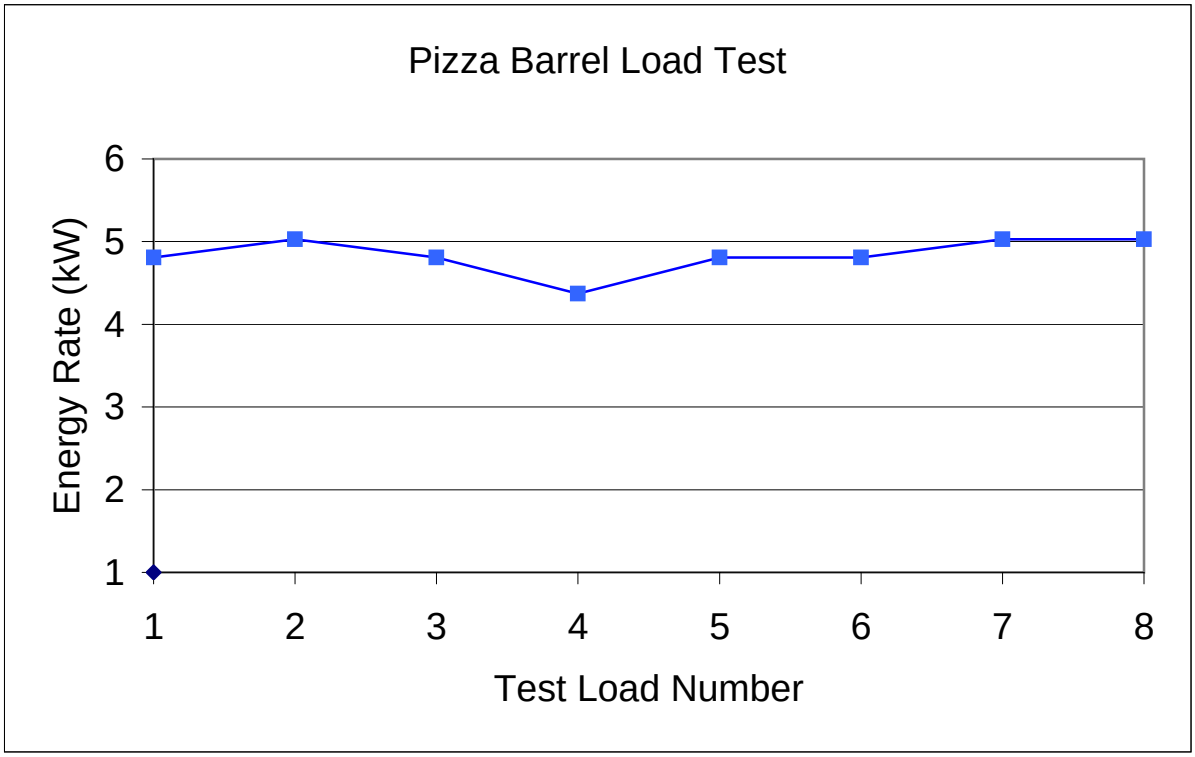
| | | |
|---|---|---|
| Preheat Time: | 14.8 | min |
| Preheat Energy: | 1.3 | kWh |
| Idle Energy Rate: | 1.5 | kW |

**Pizza Baking Performance**

| | | |
|---|---|---|
| Bake Time: | 2.0 | min |
| Baking Energy Rate: | 5.3 | kW |
| Baking Energy Efficiency: | 37.2 | % |
| Production Capacity: | 42.3 | lb/h |

**Pizza Barreling Performance**

| | | | |
|---|---|---|---|
| Baking Energy Rate: | Run#1 | 4.8 | kW |
| | Run#2 | 5.0 | kW |
| | Run#3 | 4.8 | kW |
| | Run#4 | 4.4 | kW |
| | Run#5 | 4.8 | kW |
| | Run#6 | 4.8 | kW |
| | Run#7 | 5.0 | kW |
| | Run#8 | 5.0 | kW |
| Average kW: | | 4.8 | kW |


Pizza Barrel Load Test
Energy Rate (kW)
6
5
4
3
2
1
1
2
3
4
5
6
7
8
Test Load Number

# HHB (1 OR 3 PHASE)

| Changeable Parameters | | |
|---|---|---|
| **Operating Time** | 8 | Hours |
| **Energy Costs** | $0.11 | kWHr |
| **Snooze Mode** | 0.00 | Hours |
| **Cook Cycles / Day** | 25 | Cooks/Day |
| **Typical Cook Time** | 180 | Seconds |

**Do Not Change the following values**

| | Time (min) | Power (Watts) | Cost / Day | Balance of Time (hrs) |
|---|---|---|---|---|
| **Warm up** | 15 | 5200 | $0.14 | 7.75 |
| **Cooking** | 75 | 4650 | $0.64 | 6.50 |
| **Snooze Idle** | 0 | 0 | $0.00 | 6.50 |
| **Idle** | 390 | 1450 | $1.04 | 0 |
| **Total / Day** | | | $1.82 | **Yearly** |
| **Total / Month** | | | $54.57 | **$654.89** |

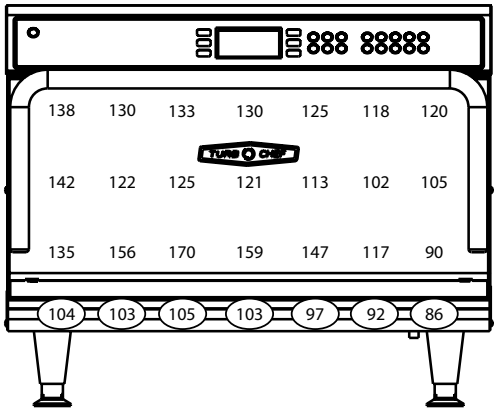
| HVAC Requirements Per Operating Time -- Note: Approximations Only | | | | | |
|---|---|---|---|---|---|
| **Average Energy Cooking And Idle (J)** | **Warmup Energy (J)** | **Total Energy (J)** | **Total average Power (W)** | **Total Environmental Load kBtu / hr** | **Average Cooling Requirement (ton of AC)** |
| 54855000 | 4680000 | 59535000 | 2067 | 7 | 0.588 |

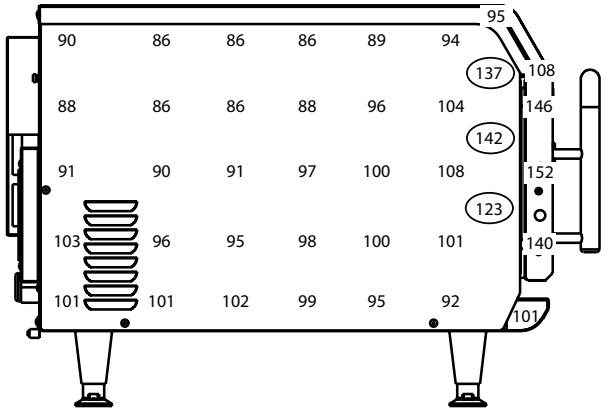
TURBOCHEF TECHNOLOGIES, INC.

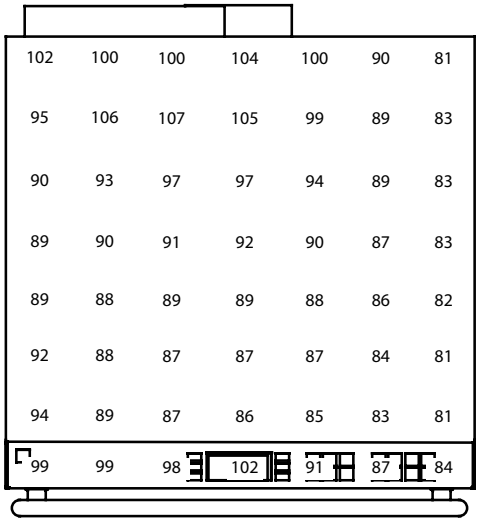
# HhB 2 Oven Surface Temperatures

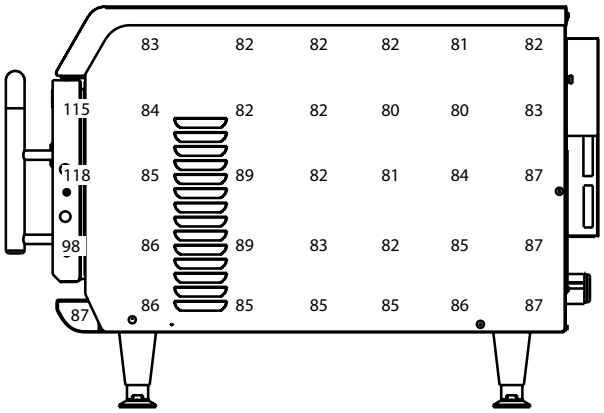
The illustrations in this document represent the surface testing data reported for the TurboChef oven model HhB 2 after four hours of idle, and then subsequently two hours of cooking.

## After Four-Hour Idle (Fahrenheit)

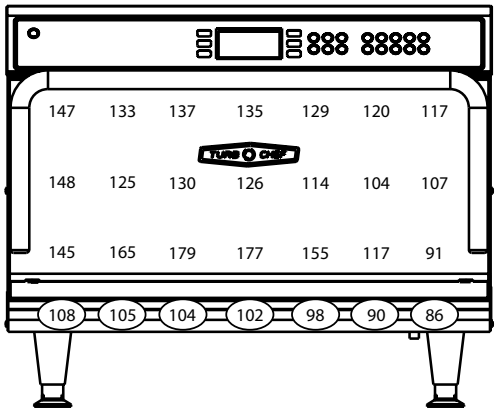


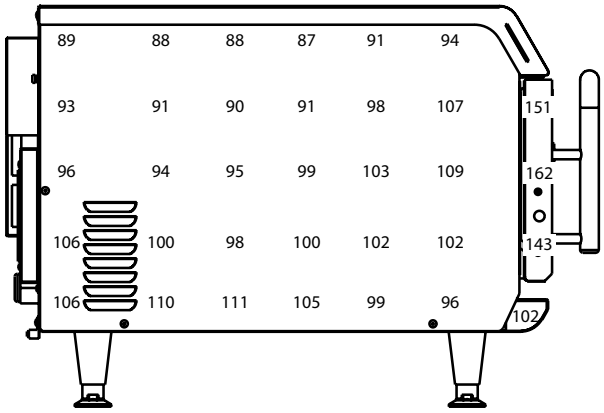



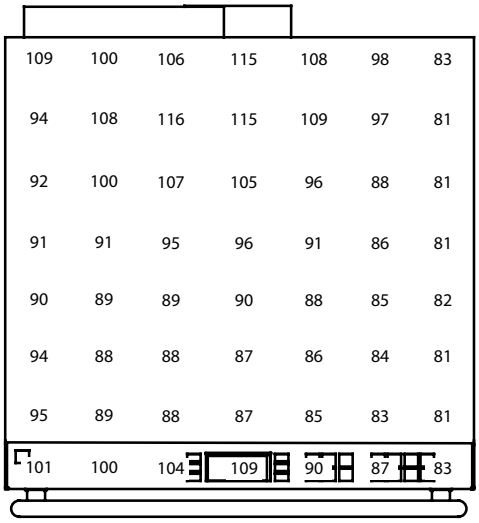



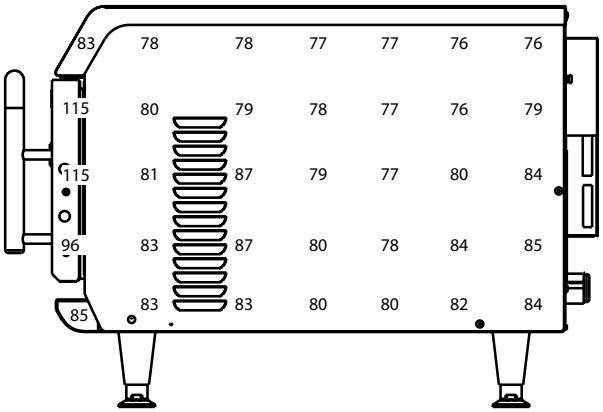



# After Four-Hour Idle, Then Two Hours of Cooking (Fahrenheit)

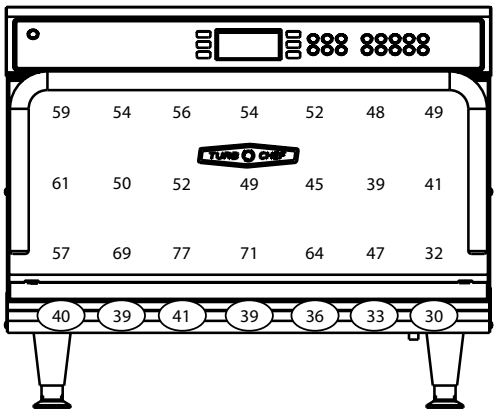


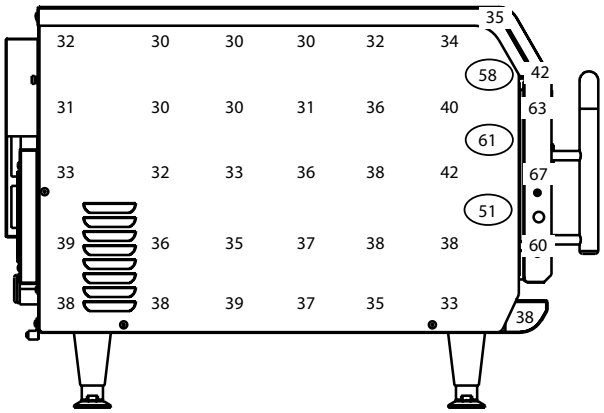



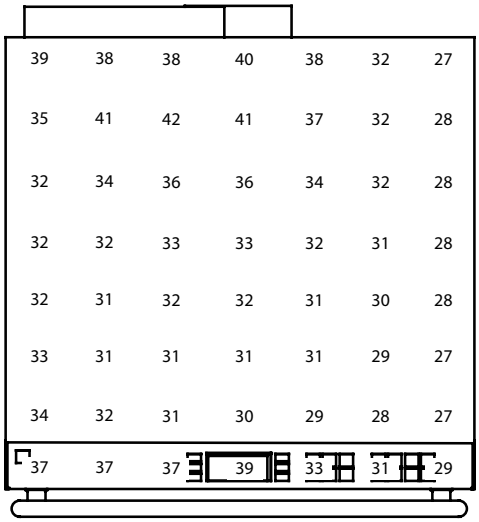



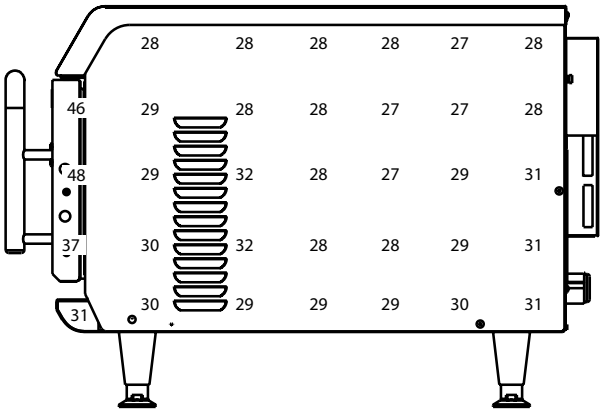



# After Four-Hour Idle (Celsius)

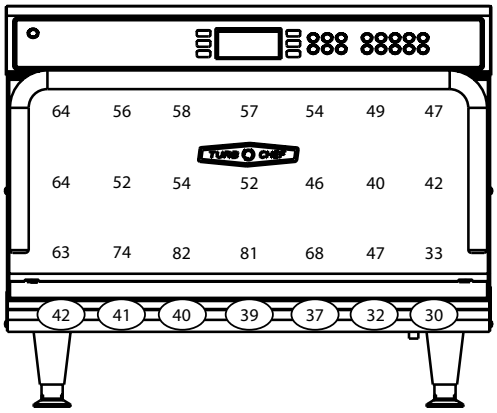


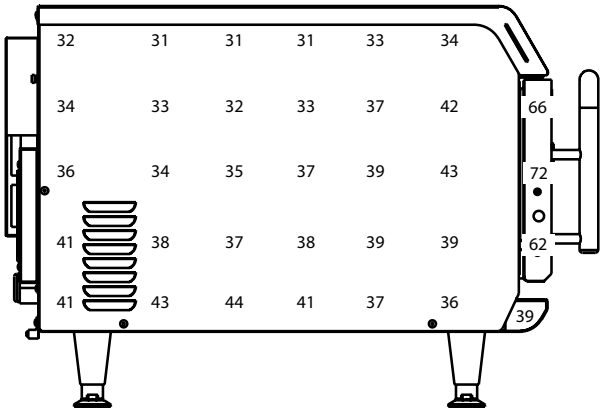



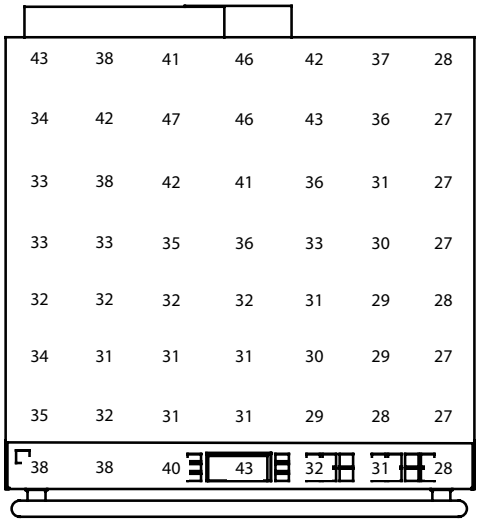



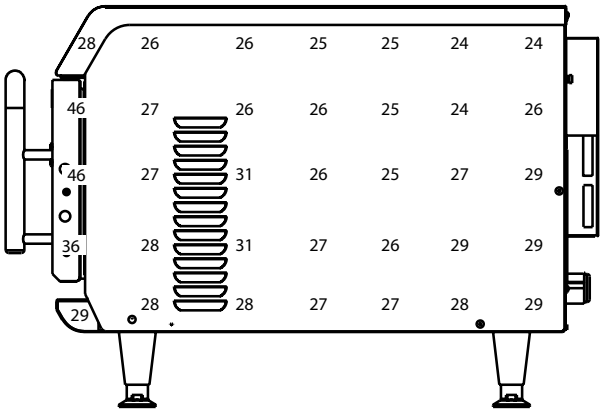



# After Four-Hour Idle, Then Two Hours of Cooking (Celsius)



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, permissable loads.

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

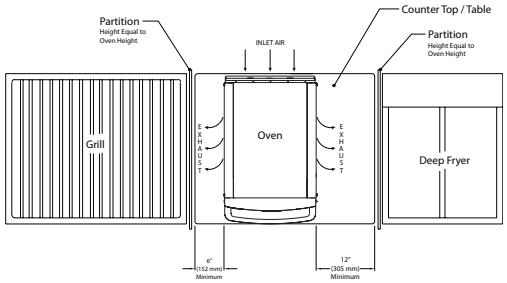
To ensure continued compliance with all health, building, and fire codes, users are required to:

- ☐ 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 |
|---|---|---|
| Sŏta / Sŏta Single Mag (i1) | 5" (127 mm) | 2" (51 mm) |
| i3 | 19" (483 mm) | 2" (51 mm) |
| i5 | 19" (483 mm) | 2" (51 mm) |
| Encore/Encore 2 | 5" (127 mm) | 2" (51 mm) |
| Tornado | 4" (102 mm) | 2" (51 mm) |
| C3 | 4" (102 mm) | 2" (51 mm) |
| HhC 2620 | 10" (254 mm) | 0" (0 mm) |
| HhC 2020 | 10" (254 mm) | 0" (0 mm) |
| HhC 1618 | 10" (254 mm) | 0" (0 mm) |
| HhB 2 | 2" (51 mm) | 2" (51 mm) |
| Double Batch | 2" (51 mm) | 2" (51 mm) |
| Waterless Steamer (i1) | 5" (127 mm) | 2" (51 mm) |
| Panini (i1) | 5" (127 mm) | 2" (51 mm) |
| Fire | 2" (51 mm) | 2" (51 mm) |
| Bullet | 5" (127 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 $m^2$) 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.

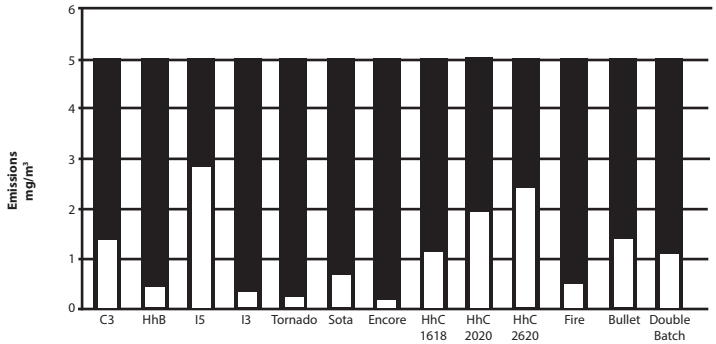
The heat load from TurboChef ovens is mostly sensible. The only latent heat present is due to evaporation during the cooking process. When installing a TurboChef oven, the space must have the following tons of AC per oven installed.

| Oven | Tons of AC |
|---|---|
| Sŏta (i1) | 0.29 |
| Sŏta Single Mag (i1) | 0.29 |
| i3 | 0.94 |
| i5 | 1.31 |
| Encore/Encore 2 | 0.45 |
| Tornado | 0.58 |
| C3 | 0.63 |
| HhC 2620 | 1.82 |
| HhC 2020 | 1.47 |
| HhC 1618 | 1.00 |
| HhB 2 | 0.84 |
| Double Batch | 1.04 |
| Waterless Steamer (i1) | 0.29 |
| Panini (i1) | 0.29 |
| Fire | 0.50 |
| Bullet | 0.13 |

## 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 $mg/m^3$ for the oven to be certified for ventless operation. Cooking devices that measure above the 5.0 $mg/m^3$ 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 $mg/m^3$ threshold as shown below.




| | C3 | HhB | I5 | I3 | Tornado | Sota | Encore | HhC 1618 | HhC 2020 | HhC 2620 | Fire | Bullet | Double Batch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ventless Requirement | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Emissions | 1.35 | 0.4 | 2.8 | 0.32 | 0.21 | 0.64 | 0.13 | 1.12 | 1.91 | 2.4 | 0.48 | 0.13 | 1.04 |

NOTE: Certain configurations of TurboChef ovens, such as a triple stacked HhC 2620, may cause emissions to be greater than 5.0 $mg/m^3$. In these situations, TurboChef recommends that the ovens be installed under a Type I or Type II hood.

## Contact Information

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