Operating Instructions

BOF Series

Mechanical Convection Ovens

BOF-30T, BOF-50T, BOF-120T, BOF-200T & BOF-400T

Generations 1, 2 & 3

Read manual before using this product. Failure to do so and observe this information can result in injury or equipment damage.

Disclaimer

BEING Scientific Inc. makes no representations or warranties concerning this manual and, to the maximum extent permitted by law, expressly limits its liability for breach of any warranty that may be implied to the replacement of this manual with another. Furthermore, BEING reserves the right to revise this publication at any time without incurring an obligation to notify any person of the revision.

The information provided in this documentation contains general descriptions and/or technical characteristics of the instrument's performance. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these instruments for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation, and testing of the instruments with respect to the relevant specific application or use thereof. Neither BEING nor its affiliates or subsidiaries shall be responsible nor liable for misuse of the information contained herein. Please notify us if you have any suggestions for improvements or amendments or have found errors in this publication.

All pertinent state, regional, and local safety regulations must be observed when installing and using this instrument. Repair of BEING instruments **SHALL BE PERFORMED IN CONSULTATION** with a BEING technical support representative by the instrument owner or their representative, or a BEING authorized service technician.

The relevant instructions must be followed when instruments are used for applications with technical safety requirements.

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Thank you for purchasing BEING Scientific's BOF series mechanical convection oven.

BEING Scientific Inc. is committed to customer service both during and after the sale. If you have questions oncerning the operation of your unit or the information in this manual, or the unit fails to operate properly, contact our Technology Support Department at +1. 800.278.1390, or through the form on our website at https://beinglab-usa.com/technical-support.

Before Continuing

Please collect the following information from your unit. You'll need it to register the oven and activate its 2-year warranty and when you have to contact customer or technical support.

Model Number: _____

Serial Number: _____

Production Date: _____

Firmware Version: _____

See section x.x.x on page xx for finding firmware version.

Dealer Purchased From: _____

Purchase Date: _____

Register Your Unit Today!

STEP 1: Find the product identification label.

Back of the oven above the power cord.

Outside of the cardboard shell.

STEP 2: Scan the QR code or visit to https://www.beinglab-usa.com/product-registration to register your oven(s).

Visit www.beinglab-usa.com/warranty for warranty details.

Table of Contents

1.0 Safety Messages

1.1 How to use These Operating Instructions

1.1.1 Introduction

This manual is intended for individuals requiring information about the use of mechanical (forced air) convection ovens. Use these operating instructions as a guide and reference for installing, operating, and maintaining your BEING BOF series, mechanical (forced air) convection ovens (hereinafter “oven” or “unit”). The purpose is to assist you in applying efficient, proven techniques that enhance equipment productivity.

These operating instructions covers only light corrective maintenance. No installation, service procedure or other maintenance should be undertaken without first contacting a service technician, nor should be carried out by someone other than a service technician with specific experience with laboratory equipment and electricity.

1.1.2 Chapter Summary

The Installation chapter includes the pertinent information for receiving, unpacking, inspecting, and setting up the unit. This section contains instructions that should be followed before operating the oven. These instructions are intended to supplement standard laboratory procedures performed daily and weekly.

The Functional Description chapter outlines the oven’s standard and safety features.

The Operation chapter includes a description of controller features, temperature, time, and fan speed setting instructions, multi-segment program setting instructions, and instructions for changing the unit of measurement and calibrating the oven.

The Data Logging chapter is intended to serve as a source for understanding how the oven’s controller collects temperature and time information during the oven’s operation and how the user can collect this data for analysis.

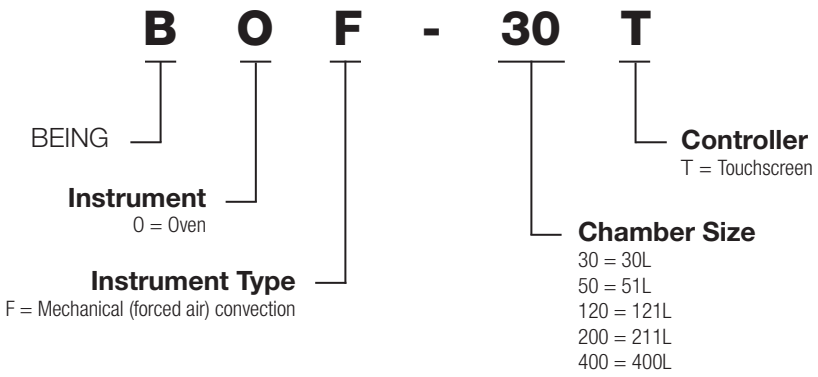
The Operational Settings Screens and Parameters chapter provides the user with all the screens for viewing real-time temperature and time performance data and data and alarm history. Additionally, it includes information on navigating the screens and settings that affect the oven’s accuracy, efficiency, and effectiveness, along with changing the unit of measurement.

The Troubleshooting and Preventive Maintenance chapter serves as a guide for identifying the most common problems. Potential problems are listed, along with possible causes and related solutions.

The Appendix contains technical specifications, schematic drawings, warranty, certification certificates, instructions for requesting a certificate of calibration and for end-of-life disposal of the unit, and BEING technical support contact information.

1.1.3 Model Number Nomenclature

These operating instructions covers all five (5) models of the BEING BOF series. The following describes the model number nomenclature used throughout these instructions.



1.2 Safety Notice

Be sure that you are completely familiar with the safe operation of the BEING BOF series oven. Improper use can cause serious or fatal injury.

Installation and repair procedures require specialized skills with laboratory equipment and electricity. Any person that installs or repairs this unit must have these specialized skills to ensure that this unit is safe to operate. Contact BEING Scientific Inc. or your local authorized distributor for repairs or any questions you may have about this unit's safe installation and operation.

The precaution statements are general guidelines for the safe use and operation of these instruments. It is not practical to list all unsafe conditions. Therefore, if you use a procedure that is not recommended in these operating instructions, you must determine if it is safe for the operator and all personnel in the proximity to the instrument. If there is any question of the safety of a procedure, please contact BEING Scientific before starting or stopping the instrument.

This equipment contains high voltages. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the startup procedure or troubleshoot this unit.

- Documentation must be available to anyone that operates this equipment at all times.
- Keep non-qualified personnel at a safe distance from this unit.
- Only qualified personnel familiar with the safe installation, operation, and maintenance of this unit should attempt startup or operating procedures.
- Always stop the instrument before making or removing any connections.

1.3 Symbols used in These Operating Instructions

The following signal word panels, safety symbols, and non-safety symbols are used to alert you to potential personal injury hazards or information of importance. Obey all safety messages that follow these symbols to avoid possible personal injury or death.

1.3.1 Signal Word Panels

Signal word panels are a method for calling attention to a safety messages or property damage messages and designate a degree or level of hazard seriousness. It consists of three elements: a safety alert symbol, a signal word and a contrasting rectangular background. The following signal word panels are in accordance with ANSI Z535.4-2111 (R2017) and ISO 3864 standards.

⚠ DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.
NOTICE	Indicates a property damage message.

1.3.2 Safety Symbols

Safety symbols are graphic representations—of a hazard, a hazardous situation, a precaution to avoid a hazard, a result of not avoiding a hazard, or any combination of these messages—intended to convey a message without the use of words. The following safety symbols are used in these operating instructions.

Mandatory


General Mandatory Symbol
General Notice Symbol


Read Manual


Earth Ground


Multi-person Lift


Disconnect Electric Plug From Outlet


Disconnect Before Maintenance or Repair


Wear Face Mask


Wear Eye Protection


Wear Protective Gloves

Prohibition


No Direct Sunlight


No Radiant Heat Exposure


No Corrosive
Fuids or Cleaners

No Explosive Gases


No Flammable Gases


No Water

Warning


General Warning Symbol
Safety Alert Symbol


Electrical Shock


Hand Crush or Pinch


Lifting Hazard


Hot Surface

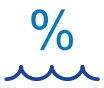
1.3.3 Miscellaneous Non-safety Symbols used in Manual

The following graphic representations are intended to convey a message without words or to bring your attention to important information about the use of the oven or a feature.


Read Information


Ambient Temperature


Atmospheric Pressure



Relative Humidity


Airborne Pollution

ETL Certification


Waste Electrical and
Electronic Equipment

1.4 Where to Locate Safety Labels on the Ovens

The safety labels are attached to the ovens to provide important information about potential hazards and how to avoid them. The following photos show where the safety labels should be attached to the oven until service of the product is discontinued. If the safety labels are damaged, please contact BEING or your local distributor to request new labels.

1.4.1 BOF-30T through BOF-200T

Figure 1.1

Figure 1.2

1.4.2 BOF-400T

Figure 1.3

Figure 1.4

1

Figure 1.5

2

Figure 1.6

1.5 Precautions for Your Oven

Our oven is designed to provide safe and reliable operation when installed and operated within design specifications. Make sure you read and understand all instructions and safety precautions listed in this manual before installing or operating your unit. If you have any questions concerning the operation of your unit or the information in this manual, contact our Technical Support Department.

To avoid possible personal injury or equipment damage when installing, operating, or maintaining this oven, use good judgment and follow these safe practices:

1.5.1 Warning Statements

The improper use of this unit may cause death or serious injury. Observe all statements.

DO NOT remove warning labels.

Check the voltage, phase and capacity of the power supply and connect properly.

Check the voltage and frequency of the power supply and ensure they are compatible with the oven power requirements prior to use. The fluctuations of the supply voltage SHALL NOT exceed ±10% of the nominal supply voltage.

This unit MUST use the included electrical cord with a dedicated electrical circuit with a confirmed electrical ground connection.

The unit MUST BE properly electrically grounded (The Hot line or the Neutral line SHOULD NOT be the grounded connection, adhere to the product's requirement before using).

Please use the receptacle connecting with the ground connection to prevent electric shock. If the receptacle does not have the ground connection, the earth ground wire must be installed by a qualified electrician. DO NOT conduct the ground connection through the gas pipe, water pipe, telephone line or lightning rod! This kind of ground connection may cause electric shock due to the incomplete loops.

DO NOT insert multiple plugs into the outlet at the same time.

Power switch and circuit breaker MUST be in the "OFF" position when connecting or disconnecting the unit's power cord to or from the power supply.

The power cord MUST BE removed from receptacle when any of the following occur:

- When the product is waiting for overhaul due to faults.
- When the product goes out of service for a long time.
- When the product is being moved.

DO NOT operate oven with damaged power cords.

DO NOT arbitrarily lengthen or shorten the power supply connection wire.

DO NOT modify the power cord in any way.

DO NOT put flammable, explosive, volatile, and corrosive substances in the oven chamber for drying and baking.

DO NOT touch the chamber door, the chamber body or the surrounding surface when the set temperature is over 176°F (80°C)!

DO NOT put fingers, hands or objects into the air intake or exhaust ports.

The unit should have routine inspections and should be serviced by a qualified service technician when needed.

1.5.2 Caution Statements

The improper use of this unit may result in minor or moderate injury.

DO NOT use doors, handles or knobs to lift or stabilize the unit.

DO NOT place heavy objects on the power cord.

DO NOT put the oven on the power cord.

DO NOT tension the power supply cord when plug in.

DO NOT operate oven when water may be in the unit. Immediately disconnect the main power supply and request service.

DO NOT sprinkle insecticide or flammable spray on the oven.

1.5.3 NOTICE Statements

The improper use of this unit may result in damage to the unit or your facility.

The oven should be located on a strong solid surface.

Take care when opening and closing the door to prevent damage to delicate internal components.

DO NOT make the oven wet while cleaning.

DO NOT pour water or put liquid on the oven when cleaning the unit.

DO NOT clean the oven with a strong cleanser (e.g., solvent type) and use a soft cloth.

304 stainless steel material is not acid resistance, please pay attention to the corrosion prevention measures. DO NOT place corrosive materials inside the unit to prevent damage.

In addition to the safety warnings listed above, safety messages are posted throughout the manual. These safety messages are designated using a signal word panel followed by text and a safety symbol where applicable. Read and follow these important instructions. Failure to observe these instructions can result in permanent damage to the unit, significant property damage, personal injury or death.

1.6 Responsibility

Our ovens are constructed for maximum operator safety when used under standard operating conditions and when recommended instructions are followed in the maintenance and operation of the machine.

All personnel engaged in the use of the oven should become familiar with its operation as described in these operating instructions.

Proper operation of the unit promotes safety for the operator and all workers in its vicinity.

Each individual must take responsibility for observing the prescribed safety rules as outlined. All caution, warning and danger labels must be observed and obeyed. All actual or potential danger areas must be reported to your immediate supervisor.

1.6.1 General Responsibility

No matter who you are, safety is important. Owners, operators, and maintenance personnel must realize that safety is a vital part of their jobs every day.

If your primary concern is loss of productivity, remember that production is always affected negatively following an accident. The following are some of the ways that accidents can affect your production:

- Loss of a skilled operator (temporarily or permanently)
- Breakdown of lab morale
- Costly damage to equipment and laboratory samples
- Downtime

An effective safety program is responsible and economically sound.

Organize a safety committee or group and hold regular meetings. Promote this group from the management level. The safety program can be continually reviewed, maintained, and improved through this group. Keep minutes or a record of the meetings.

Hold daily equipment inspections in addition to regular maintenance checks. You will keep your equipment safe for production and exhibit your commitment to safety.

Please read and use these operating instructions as a guide to equipment safety. These instructions contain safety warnings throughout, specific to each function and point of operation.

1.6.2 Operator Responsibility

The operator's responsibility does not end with efficient experimentation and production. The operator usually has the most daily contact with the equipment and intimately knows its capabilities and limitations.

Plant and personnel safety is sometimes forgotten in the desire to meet incentive rates, or through a casual attitude toward laboratory equipment formed over a period of months or years. Your employer probably has established a set of safety rules in your workplace. Those rules, these operating instructions, or any other safety information will not keep you from being injured while operating your equipment.

Learn and always use safe operation. Cooperate with co-workers to promote safe practices. Immediately report any potentially dangerous situation to your supervisor or appropriate person.

REMEMBER:

- **NEVER** place your hands or any part of your body in any dangerous location.
- **NEVER** operate, service, or adjust the equipment without appropriate training and first reading and understanding this manual.
- Before you start the portable drying/conveying system check the following:
  - Remove all tools from the oven.
  - Be sure no objects, samples or chemicals are laying on the oven.
- If your oven has been inoperative or unattended, check all settings before starting the unit.
- At the beginning of your shift and after breaks, verify that the oven is functioning properly.
- Report the following occurrences **IMMEDIATELY**:
  - unsafe operation or condition
  - unusual oven action
  - leakage
  - improper maintenance
- **DO NOT** wear loose clothing or jewelry, which can be caught while working on the equipment. In addition, cover or tie back long hair.
- Clean the equipment and surrounding area **DAILY**, and inspect the machine for loose, missing or broken parts.
- Shut off power to the oven when it is not in use. Turn the power switch to the **OFF** position, or unplug it from the power source.

1.6.3 Maintenance Responsibility

Proper maintenance is essential to safety. If you are a maintenance worker, you must make safety a priority to effectively repair and maintain equipment.

Before removing, adjusting, or replacing parts on this oven, remember to turn off all electric supplies and all accessory equipment at the machine, and disconnect and lockout electrical power. Attach warning tags where possible.

Be sure the oven is correctly connected to an earth grounded electrical outlet that complies with current codes.

When you have completed the repair or maintenance procedure, check your work, and remove your tools.

DO NOT restore power to the oven until all persons are clear of the area. **BEFORE** you turn the oven over to the operator for production, verify the unit is functioning properly.

1.6.4 Reporting a Safety Defect

If you believe that your oven has a defect that could cause injury, you should immediately discontinue its use and inform BEING Scientific or your local authorized distributor.

The principle factors that can result in injury are failure to follow proper operating procedures (i.e. lockout/tag out), or failure to maintain a clean and safe working environment.

2.0 Functional Description

2.1 Introduction

The BEING BOF Series mechanical (forced air) convection ovens are engineered for heavy workloads and continuous, 24-hour operation in a wide variety of chemistry, clinical, light industrial, pharmaceutical, and research laboratory applications, such as.

- Age testing of electronic components and devices, AKA product age acceleration
- Annealing
- ASTM testing
- Baking
- Conditioning
- Curing
- Dehydrating
- Die-bonding
- Dry sterilization
- Evaporation
- Drying - glassware and part
- Heat treating
- Heated storage
- Life cycle testing
- Moisture and stability tests
- Polymerization
- Pre-heating

The mirror-finish 304 stainless steel chamber provides a strong, corrosion-resistant, inert, and easy-to-clean environment and prevents sample contamination for any application. The wire shelves provide maximum air circulation for uniform heating. Their design prevents shelf-tilting and sample spillage. The wire's surface tension minimizes or eliminates sample- or part-slide.

The microprocessor-based PID temperature controller and 3-speed, forced convection heating system provide uniform temperature regulation without overshoot, eliminating potential sample damage. The controller provides for the programming and storage of fixed-value and multi-segment programs. *(See Section 4.0 for controller programming.)*

The adjustable exhaust allows the user to control chamber temperature uniformity by allowing humidity to escape.

System risks, like voltage spikes, short circuits, over temperature, etc., are monitored by a safety system that runs independently of the performance controller. Audible and visual alarms are set off, and the oven will shut down if a risk is identified.

The BOF Series ovens have a USB communications port for data logging. *(See Section 5.0 for extracting data information.)*

2.2 Oven Generation Comparison

Since the introduction of the BOF Series mechanical (forced air) convection ovens with a touchscreen controller display was introduced in 2021, it has gone through several improvement cycles. The following table shows the differences in the oven generations.

The feature descriptions and operational instructions in this document cover the three generations of ovens.

Feature	Generation 1	Generation 2	Generation 3
Manufacturing Date - Start			Jan 2023
Electrical			
Integrated electrical panel with easy access cover	•	•	•
Circuit breaker over-current protection - power switch combination	•	–	–
Circuit breaker current protection	–	•	•
Illuminated power switch	–	•	•
Resistive heating element	•	•	•
Controller			
Touch capactive display	•	•	•
PID automatic control	•	•	•
Automatic power on/off	•	•	•
USB data collection	•	•	•
Firmware updatable	•	•	•
Programmable functions			
Unit of measurement	•	•	•
Oven temperature calibration	•	•	•
Fixed-value programs	•	•	•
Multi-step programs	•	•	•
Program cycling	•	•	•
Timed & untimed	•	•	•
Fan speed - adjustable	•	•	•
RUN delay	•	•	•
Alarm notification			
On display	•	–	–
Alarm history in operational settings	–	•	•
Heating element on indicator	–	–	•
User interface version	–	–	•
Safety			
Resettable over-temperature switch			
Reset button inside electrical panel	•	•	–
Reset button outside electrical panel	–	–	•
Temperature limit protection	•	•	•
Power off memory	•	•	•
Anti-scalding protection	•	•	•

2.3 Oven Features

2.3.1 Compliance

The BEING BOF series mechanical (forced air) convection ovens have been tested and found to be in compliance with the requirements defined in IEC 61010: Medical Laboratory Equipment Testing.

Compliance can be identified by the ETL INTERTEK mark on the product identification label above the power cord. The testing has demonstrated.

CONFORMS TO:

UL 61010-1:2012 | Edition 3.1 | R2019: Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements

UL 61010-2-010:2019 | Edition 4: Safety requirements for electrical equipment for measurement, control and laboratory use – Part 2: Particular requirements for laboratory equipment for the heating of materials

CERTIFIED TO:

CAN/CSA 22.2 61010-1-12:2012 | Edition 3+ U1; U2; A1: Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements

CAN/CSA 22.2 61010-2-010:2019 | Edition 4: Safety requirements for electrical equipment for measurement, control and laboratory use – Part 2: Particular requirements for laboratory equipment for the heating of materials

2.3.2 Construction

2.3.2.1 BOF-30T through BOF-200T

Figure 2.1

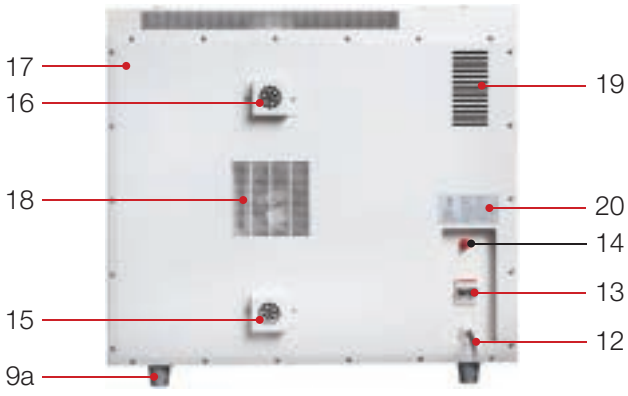
Front View

2 Chamber door
3 Door handle/latch
5 Top door hinge & hinge cover
6 Bottom door hinge
8 Touchscreen controller display with USB data collection port
9 Feet

Figure 2.2

Front Left Isometric View

1 Body
10 Electrical components access panel
11 Power switch **(Generation 2 & 3 units only)**



Back View - Generation 3

9a Stacking feet **(BOF-50T & BOF-120T only)**
12 Power cord
13 Circuit breaker **(Generations 2 & 3)**
Circuit breaker/power switch **(Generation 1)**
14 Over-temperature switch reset button **(Generation 3, see Section 2.3.2.3 for Generations 1 & 2.)**
15 Chamber air intake
16 Chamber exhaust vent
17 Back panel
18 Fan vent
19 Electrical panel vent
20 Product identification label

Back View
Close-up
Generations 1 & 2

Figure 2.3

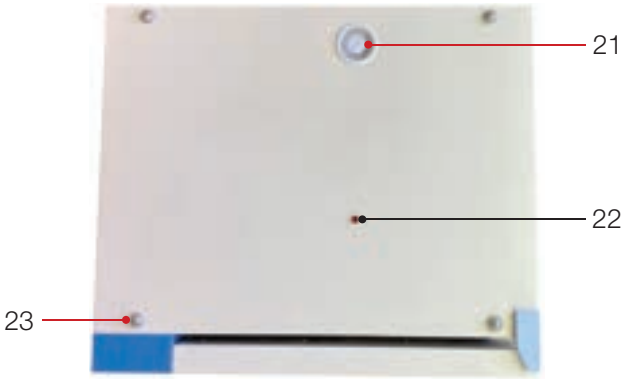


Figure 2.4

Top View

21 Chamber exhaust vent adjustment knob
22 Test hole
23 Stacking mounting button **(BOF-50T & BOF-120T only)**

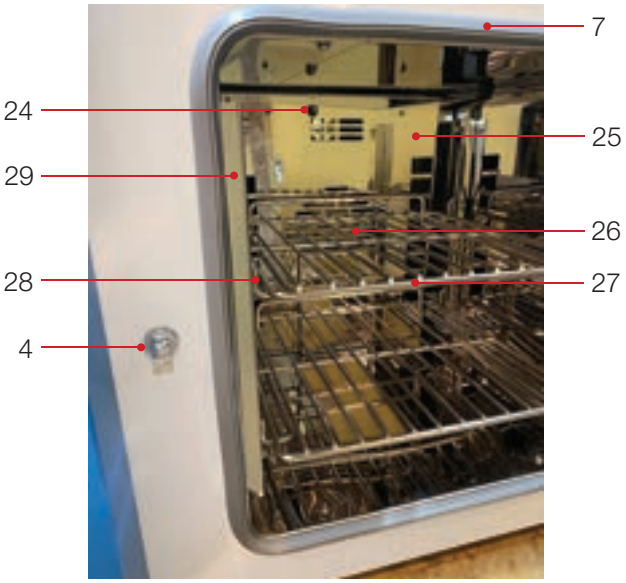
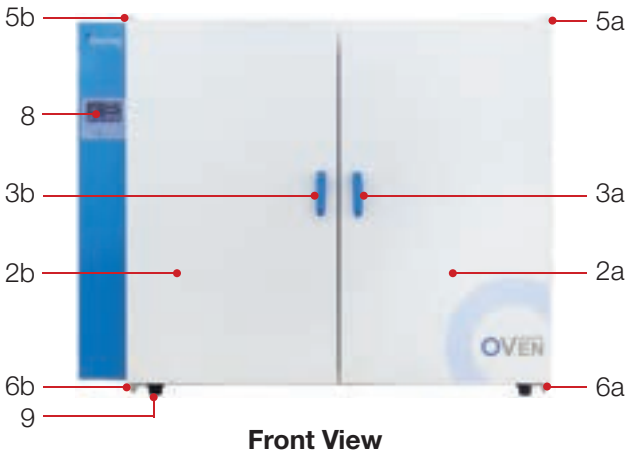


Figure 2.5

Chamber View

4 Door latch post
7 Chamber door seal
24 Chamber temperature sensor
25 Chamber back wall
26 Fan & heater
27 Shelf
28 Shelf bracket
29 Shelf bracket hanger

2.3.2.2 BOF-400T



Front View

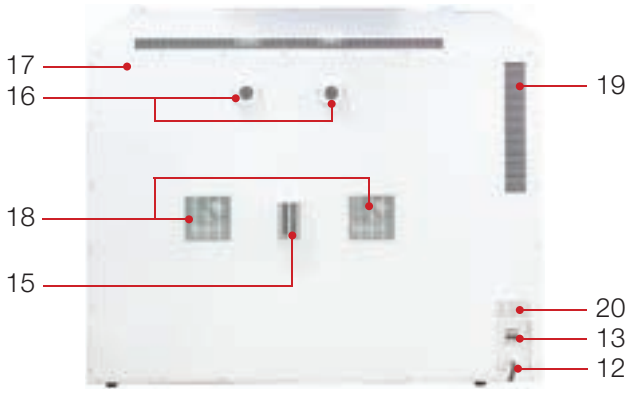
Figure 2.4

2a Chamber door - right
2b Chamber door - left
3a Door handle/latch - right
3b Door handle/latch - left
5a Top door hinge & hinge cover - right
5b Top door hinge & hinge cover - left
6a Bottom door hinge - right
6b Bottom door hinge - left
8 Touchscreen controller display with USB data collection port
9 Feet

Figure 2.5

Front Left Isometric View

1 Body
10 Electrical components access panel
11 Power switch **(Generation 2 & 3 units only)**



Back View - Generation 2

12 Power cord
13 Circuit breaker
14 Over-temperature switch reset button **(Generation 3, see Section 2.3.2.3 for Generations 1 & 2.)**
15 Chamber air intake
16 Chamber exhaust vent
17 Back panel
18 Fan vent
19 Electrical panel vent
20 Product identification label

Back View
Close-up
Generation 3

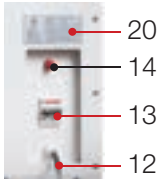


Figure 2.6

Figure 2.7

Top Isometric View

20a Chamber exhaust vent adjustment knob - left
20b Chamber exhaust vent adjustment knob - right
21 Test hole

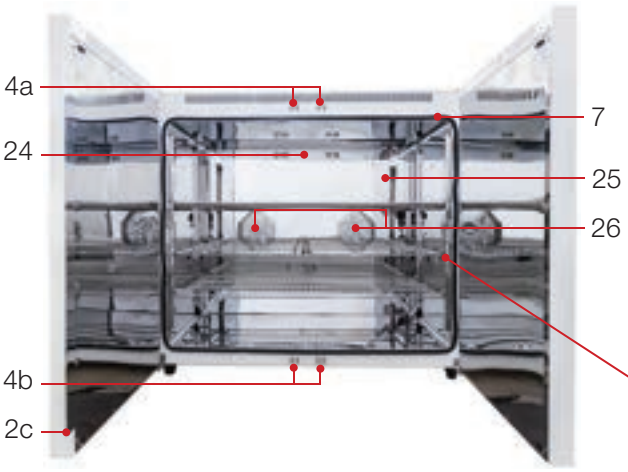
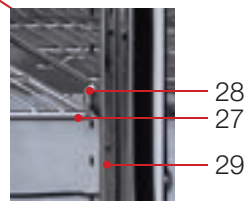


Figure 2.8

Chamber View

2c Chamber doors seal
4a Door latch hook - top
4b Door latch hook - bottom
7 Chamber door seal
24 Chamber temperature sensor
25 Chamber back wall
26 Fan & heater
27 Shelf
28 Shelf bracket
29 Shelf bracket hanger



Shelf Components

2.3.2.3 Oven Controls

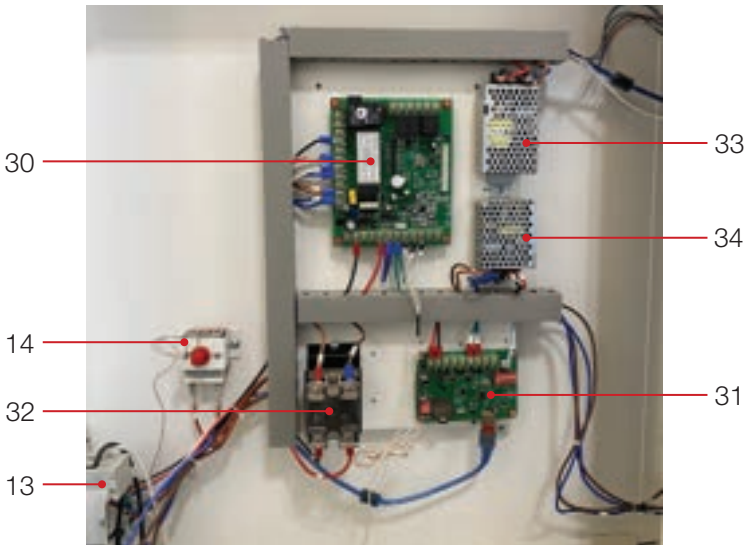


Figure 2.9

Electrical Panel View

13 Circuit breaker
14 Over-temperature switch
30 Temperature controller
31 Data logger
32 Relay - heating element
33 Controller display power supply
34 Data logger power supply

2.3.2.4 Component Functionality

1 Body

The body of the BOF Series mechanical (forced air) convection ovens is constructed of electrostatic painted steel.

2, 2a, 2b & 2c Chamber door & door seal

The door(s) is(are) an integral part of the oven's chamber. They allow the user to place and remove samples and products in the chamber to be heated. When closed, they are the chamber front.

The door exterior is electrostatic painted steel, and the interior is mirror-polished 304SS. The doors are insulated to minimize heat loss. They swivel on a pin hinge (5 & 6) and can open past 180° to allow unencumbered chamber access. The BOF-30T through BOF-200T has a single door.

The BOF-400T has a left and right door. The left door includes a silicone door seal (2c) to seal the two doors and the chamber. The right door must be opened first to allow the left door to be opened.

Figure 2.10

3, 3a, 3b, 4, 4a & 4b Door handle/latch, latch post & hook

The heavy-duty door latching system is designed to maintain a tight chamber seal and prevent accidental opening during operation.

Figure 2.11

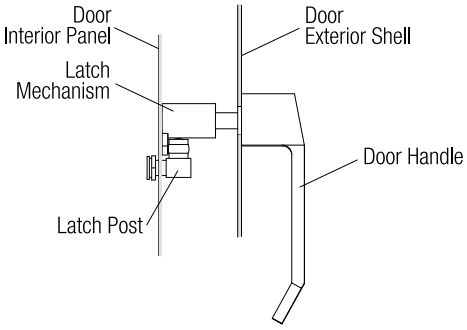


Figure 2.12

On the BOF-30T through BOF-200T, the latching mechanism is specially designed to hook behind the latch post and draw the door tightly against the chamber door seal (7). To unlock the door, turn the door handle counterclockwise. Locking and unlocking the door takes some effort.

Figure 2.13

The BOF-400T has a latch for each door. The latch hook enters the door frame through a slot in the inner door panel, and rotating the door handle drives the latching mechanism behind the hook. The right door handle turns counterclockwise, and the left door handle clockwise.

5, 5a, 5b, 6, 6a & 6b Door hinges & cover

The top and bottom hinges are made of 304SS. They are robustly built for a long, trouble-free life. They are secured to the top and bottom of the oven's frame and shell.

Their design permits maximum door swing, and the friction between the hinge bracket and the door pin lets the door stay put where the user stops it if the oven is sitting on a level surface.

The top hinge is protected by a plastic cover to block debris from getting into the hinge and make for easy cleaning.

7 Chamber door seal

The silicone gasket absorbs impact during door closing and provides a tight, leak-free chamber/door seal to prevent chamber air from escaping or ambient air from infiltrating the chamber. The door seal is attached to the oven's shell and can be replaced when worn out.

A Viton seal can be purchased from your local BEING distributor if necessary.

8 Touchscreen controller display with USB data collection port

This 4.3-inch, touch-capacitive, multi-function color display is the user interface with the oven's temperature controller. A USB-A port for exporting operational data from the data logger's (31) storage is in the display's frame.

See Sections 4.0 and 5.0 for more information on the display's functionality and instructions for exporting data.

9 & 9a Feet

The feet hold the oven's bottom off the surface where it sits. It allows for airflow around the oven's shell. The BOF-30T, BOF-200T, and BOF-400T feet are made of hard rubber.

The stacking feet (9a) on the BOF-50T and BOF-120T are molded plastic with a concave bottom that matches the mounting button's (23) dome.

See Section 3.3.1 for more details on the stacking feet.

10 Electrical components access panel

This piece of electrostatic-painted steel provides users access to the electrical and electronic components of the control system *(see Section 2.3.2.3)* when they need to troubleshoot the control system or clean it. A Phillips screwdriver required to remove the panel.

11 Power switch
(Generation 2 & 3 units only)

It controls the power supplied to the microprocessor controller. The switch illuminates when the power is ON.

Figure 2.14

12 Power cord

The 2-meter-long cord has a molded male plug to ensure safe operation and continuity with the main power supply. The plug type varies based on voltage and the oven's current draw.

See Section 8.1 – Specifications for the NEMA plug type used on your unit.

13 Circuit breaker/power switch
(Generation 1)
Circuit breaker (Generations 2 & 3)

It is the primary disconnect to the power supply. It protects the oven's electrical circuit from damage caused by overcurrent/overload or short circuits. On generation 1 ovens, it also acts as the power switch controlling the power supplied to the microprocessor temperature controller.

14 Over-temperature switch

This safety device is designed to cut electricity flow to the heating element in case the heating element relay (32) fails closed or the temperature controller's safety functions fail to maintain a safe operating range. This switch works independently of any other safety features. Its temperature probe is mounted in the chamber. If it trips, the switch can be reset once corrective measures have been performed by removing the red cap and pressing the red button.

Figure 2.15

In generation 1 and 2 ovens, the access panel (10) must be removed to reset the switch. Starting with generation 3 ovens, the switch's reset button will be accessible without opening the electrical panel.

See Figures 2.3, 2.6, and 2.9 for the over-temperature switch's reset button location.

15 Chamber air intake

Ambient air is drawn into the chamber through this port. It is guided over and around the heating element as it enters. The fan (26) mixes the new heated air with the existing chamber air.

16, 21, 21a & 21b Chamber exhaust vent & adjustment knob

The adjustable exhaust vent near the top of the chamber uses a butterfly valve (damper) design. It works with the 3-speed fan (26) to circulate and control the hot air and vapor in the chamber. The vent promotes temperature uniformity by reducing 'hot spots."

Rotating the adjustment knob counterclockwise will close the vent. It can also throttle airflow to the user's preference. Placing the pointer in the center fully opens it. Turning it clockwise until the damper hits the stop will throttle airflow out of the vent at a factory-determined rate.

Figure 2.16 Top: Closed; Middle: Open; Bottom: Throttled

17, 18 & 19 Back panel, fan vent & electrical panel vent

This piece of electrostatic painted steel provides easy access to the fan motor, the heating element connections, the air intake (15) and exhaust ports (16), and the electrical panel for troubleshooting and repairing the oven. It has vents cut into it to allow airflow to the fan's motor (17) and heat to escape from the electrical panel (18). It is attached to the oven's shell with Phillips head screws.

The air intake and exhaust port protective covers are attached to this panel. The protective covers can be removed if the ports require pipe extensions.

See Section 8.4.1 for our oven ventilation statement.

20 Product identification label

Identifies oven's model number, serial number, production date, voltage, frequency, and current draw, and a safety message is included.

22 Test hole

The test hole is the red port on the top of the oven's shell. It's used to insert the thermocouple from an independent, certified, calibrated thermometer into the chamber to check and ensure the chamber temperature matches the present value (PV) temperature shown on the touchscreen display (8). The test hole can accommodate up to Ø5mm probe.

23 Stacking mounting button (BOF-50T & BOF-120T only)

These specially designed buttons allow the feet (9a) of another oven to sit on and hold the top oven in place when the user stacks two ovens to save laboratory space.

See Section 3.3.1 for more details on the buttons and how to stack ovens.

24 Chamber temperature sensor

The chamber temperature sensor is a PT100 RTD (Resistance Temperature Detector), and based on the heat in the chamber, it sends a resistance value to the temperature controller (30), which converts it to a temperature value. The sensor (AKA, thermocouple) is protected by a 304SS thermocouple well with a mirror-polished finish.

25 & 26
Chamber back wall, fan & heater

The chamber back wall is constructed of 304SS with a mirror-polished finish on one side. It covers the fan and heating element and is specially designed to promote even air circulation in the chamber and over the heating element to provide a uniform temperature throughout the chamber.

A 3-speed DC motor drives the fan. It draws ambient air into the chamber through the air intake vent (15). As the air passes over and around the heating element, its temperature rises, and the fan pushes it into the chamber.

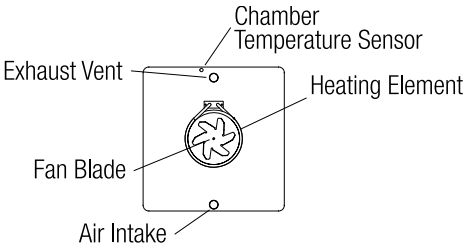


Figure 2.17

Figure 2.18

The BOF-400T has two fans and heating elements.

Figure 2.18 shows how the back wall and the chamber design work with the fan to circulate the air.

27, 28 & 29
Shelf, shelf bracket & shelf bracket hanger

The shelf, shelf bracket, and shelf bracket hanger are constructed of 304SS. The shelf bracket hanger has a mirror-polished finish. The shelf bracket hanger attaches to the chamber's wall's mounting stud. It has an array of even-spaced holes to hold the shelf bracket and allow for adjustable heights between the shelves.

The shelves slide in and out of the oven on the shelf bracket. The shelves' design incorporates an anti-tilt bar and a physical stop to eliminate shelf tilt and the potential for sample spillage by pulling the shelf entirely out of the chamber with samples or products on it. Its wire design also maximizes air circulation and temperature uniformity in the chamber.

The wire shelves' and shelf bracket's finish and shelves' weight cause friction between the two items and the samples or products on the shelf. This surface friction reduces the potential for sample spillage or damage due to rapid acceleration when pulling on the shelf.

To remove the shelf, pull it until the stop meets the bracket end, raise it, and continue pulling. To remove the shelf bracket, lift it, allowing it to rotate and pull out. To remove the shelf bracket hanger, slide it upward until its large mounting hole aligns with the mounting stud's button and pull it out.

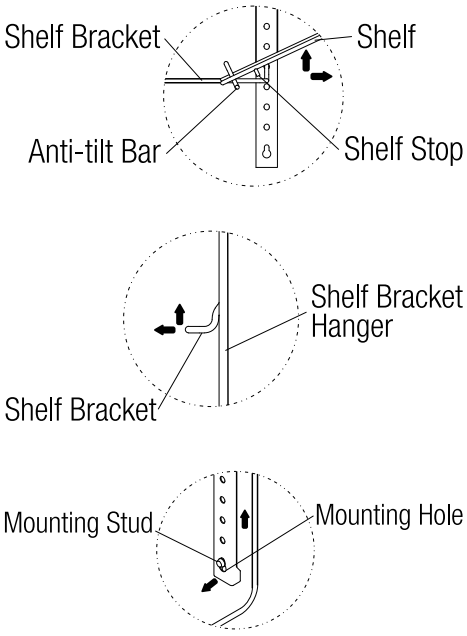


Figure 2.19

30 Temperature controller

The oven is equipped with a micro-processor-based PID temperature controller. It controls the setpoint, fan speed, and heating time, along with program cycling and RUN/START delay. It has a series of safety features built in. It can store and run up to 8 multi-step programs with up to 8 steps per program.

The controller stores up to 50,000 records that can be reviewed and analyzed on the touch-screen (8). It also sends these records to the data logger (31) for storage and exporting.

31 Data logger

This self-contained data acquisition system has a built-in processor that monitors operating condition changes over time and records and stores up to 500,000 records in its memory. The stored data can be exported to a USB drive through the USB-A port (8).

32 Relay - heating element

When the temperature controller (30) sends a 1-12VDC signal to the relay, it closes, allowing voltage to flow to the heating element(s) through the independent over-temperature switch (14). When receiving signal voltage, the red LED illuminates.

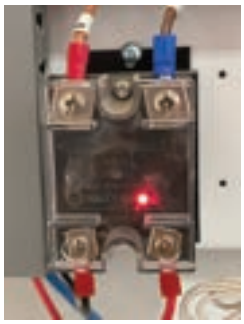


Figure 2.20

33 & 34 Controller display & data logger power supply

Converts 120VAC (BOF-30T through BOF-120T) or 240VAC (BOF-200T & BOF-400T) to DC voltage to power the data logger.

3.0 Installation and Setup

3.1 Inspecting and Uncrating

3.1.1 Inspecting Oven's Packaging Before Removal

After receiving your BEING BOF-30T, BOF-50T, BOF-120T, BOF-200T, or BOF-400T mechanical (forced air) convection oven, inspect the shipping container carefully for any damage that may have occurred during shipping. Report any damage to the carrier and to your local BEING distributor from which the oven was purchased. If the container and packing materials are in re-usable condition, save them for reshipment if necessary.

3.1.2 Removing Oven from Shipping Container

All BEING BOF Series mechanical (forced air) convection ovens are shipped attached to a wood pallet with a cardboard shell and a plywood cover. See Figure 3.1. Surrounded by foam padding and pads under the oven held in place by the oven's feet. It is covered in a plastic sleeve that is held in place with a piece of string. See Figure 3.2. Use the following instructions to remove the oven from its packaging.

Tools Required

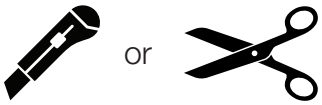


Figure 3.1.

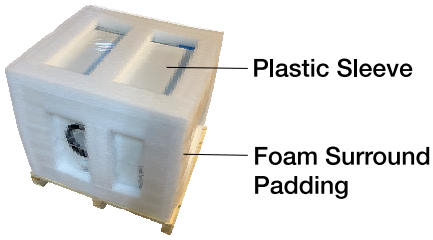


Figure 3.2.

STEP 1: Cut and remove straps.

Cut the packaging straps using a sharp scissors or utility knife.

CAUTION

Be careful when cutting straps. Straps may spring back and cause injury!

STEP 2: Remove the wood and cardboard covers.

Lift the plywood and cardboard covers upward.

STEP 3: Remove the cardboard shell.

Lift the cardboard shell upward.

STEP 4: Place oven on floor or work surface.

Carefully lift the oven up and place it on the floor or a work surface strong enough to carry the its weight.

Multiple people are required to lift ovens.

Model	Weight (lbs / kg)	Model	Weight (lbs / kg)
BOF-30T	94.8 / 43	BOF-200T	246.9 / 112
BOF-50T	112.4 / 51	BOF-400T	463.0 / 210
BOF-120T	183.0 / 83		

⚠ CAUTION

LIFTING HAZARD. THIS IS A 4-PERSON LIFT. Use assistance when lifting or moving. Single person lift could cause injury. To avoid muscle strain or back injury, use lifting aids and proper lifting techniques when removing unit from skid.

STEP 5: Remove the foam padding.

Lift upward and stretch to get it past the door handle(s).

STEP 6: Remove the plastic cover.

The plastic cover may come off as you remove the foam padding.

3.1.3 Inspect Oven after Removing Packaging

Thoroughly check the oven for any damage that might have occurred during transit, such as broken or loose wiring and components, loose hardware and mounting screws, etc. In case of breakage, damage, shortage, or incorrect shipment, contact your local BEING distributor from which it was purchased.

3.1.4 In the Event of Shipping Damage

If the oven was damaged during transport, use the following procedure to file a claim.

Step 1: Document the damage by taking photos.

Step 2: Contact the transportation company immediately.

Step 3: Contact the local BEING distributor you purchased the oven from.

Step 4: Hold the damaged goods and packing material for the examining agent's inspection. DO NOT return any goods to BEING or the local distributor you purchased the oven from before the transportation company inspection and authorization.

Step 5: Within 15 days, file a written claim against the transportation company. Substantiate the claim by referring to the agent's report.

Step 6: Advise the local BEING distributor you purchased the oven from regarding your replacement request and obtain an RMA (return material authorization) number.

3.2 Preparing the Location

3.2.1 Space Requirements

The surface where you place the BEING BOF-30T, BOF-50T, BOF-120T, BOF-200T, and BOF-400T oven should be smooth, level and sturdy. *See Section 8.1 — Specifications for oven weights.*

It is essential that the oven be situated in an area where there is sufficient space for the oven's power cord, access to the circuit breaker, power switch, and the electrical panel, and the door swing. Figures 3.3 to 3.7 show the minimum space requirements needed to properly operate and maintain the oven.

Clearance

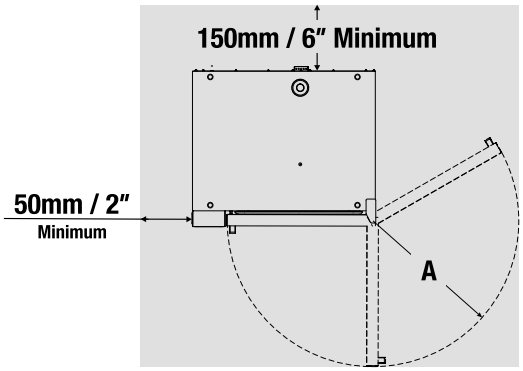


Figure 3.3. BOF-30T through BOF-200T

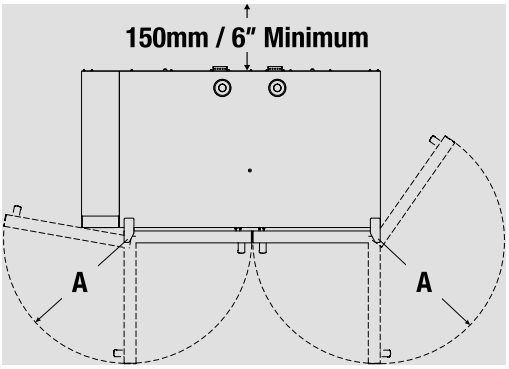


Figure 3.4. BOF-400T

Generation 1 units, with only a circuit breaker/power switch requires more than 50mm (2") of space on the left side for the BOF-30T, BOF-50T, BOF-120T, and BOF-200T to reach the switch.

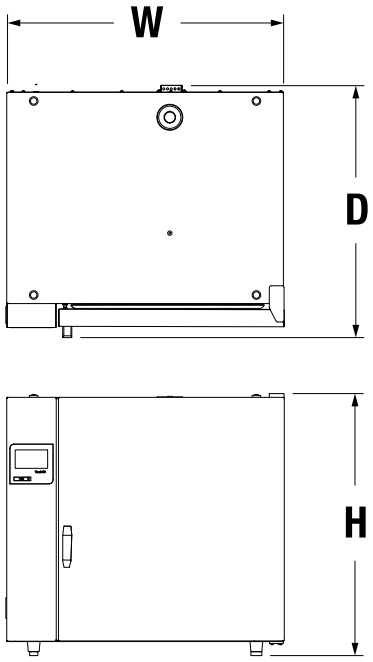


Figure 3.5. BOF-30T through BOF-200T

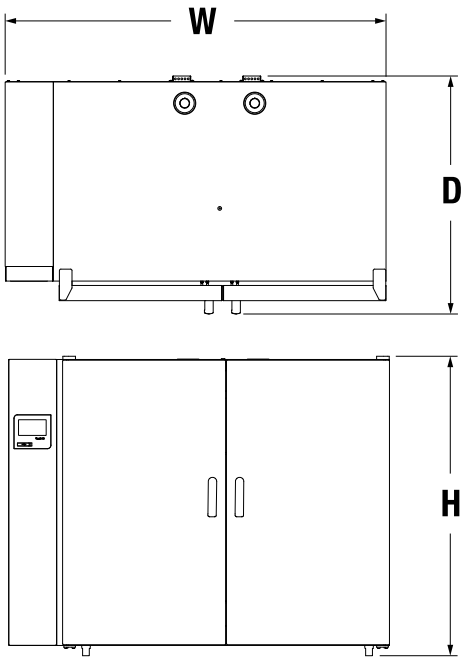


Figure 3.6. BOF-400T

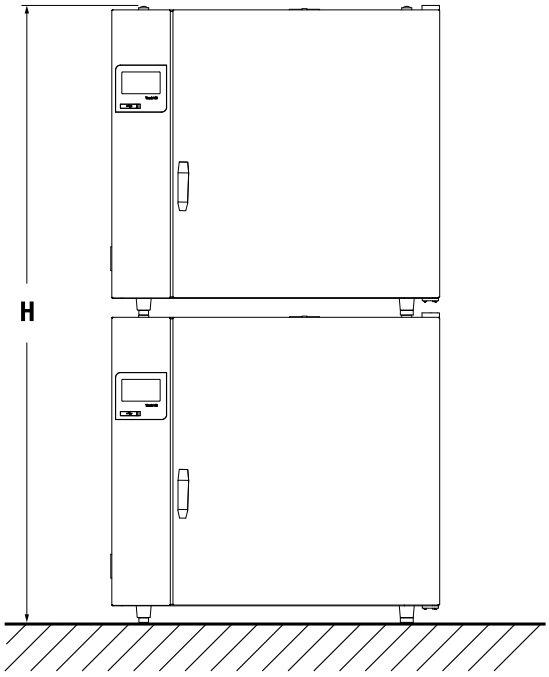


Figure 3.7. BOF-50T and BOF-120T Stacked

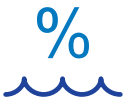
Model	A (mm / in)	H (mm / in)	W (mm / in)	D (mm / in)	H (Stacked) (mm / in)
BOF-30T	470 / 18.5	540 / 20.1	610 / 24.0	550 / 21.7	—
BOF-50T	550 / 21.7	640 / 25.2	690 / 27.2	560 / 22.1	1280 / 50.4
BOF-120T	670 / 26.4	755 / 29.7	810 / 31.9	685 / 27.0	1510 / 59.4
BOF-200T	800 / 31.5	875 / 34.4	940 / 37.0	750 / 29.5	—
BOF-400T	430 / 16.9	1060 / 41.7	1285 / 50.6	750 / 29.5	—

3.2.2 Oven Environment

The environment in which your BEING BOF Series mechanical (forced air) convection oven operates greatly impacts its accuracy, efficiency, reliability, and longevity. Keeping your oven in the following conditions will maximize its trouble-free operation.

Ambient temperature: 41°F to 95°F / 5°C to 35°C

Atmospheric pressure: 11.6 psi – 15.4 psi / 80kPa – 106kPa



Relative humidity not to exceed 80%

Pollution degree: ≤2 per IEC 60947-1 and IEC 60664-1 where normally, only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation may be expected. Greater than Degree 2, the oven's electrical components need to be cleaned more frequently.

No direct sunlight on oven.

No direct radiation from other heat sources

No corrosive liquids or gases

No explosive gas or liquid (high concentration or weakened)

No flammable gas or liquid (high concentration or weakened)

Connect the oven to earth grounded terminals or outlets only rated at or greater than the oven's current draw.

3.3 Oven Setup

3.3.1 **Stacking Ovens** (BOF-50T and BOF-120T Only)

Figure 3.8.

The BEING BOF-50T and BOF-120T are designed to allow two ovens to be stacked, as shown in Figure 3.8, to save space while being easy to operate.

Each oven has four (4) mounting buttons on its top as shown in Figure 3.9. The convex head of the button is designed to fit into the concave portion of the oven's feet, see Figures 3.10 and 3.11.

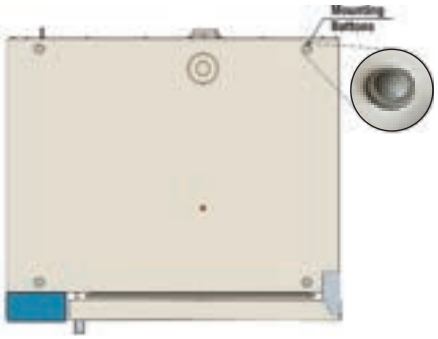


Figure 3.9. Stacking mounting buttons

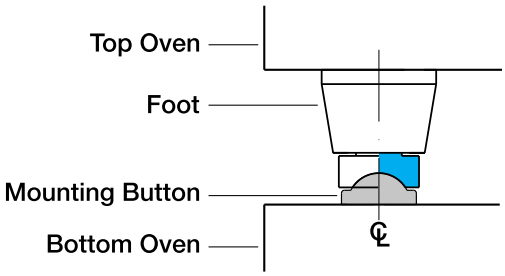


Figure 3.10. Mounting button and oven foot cross-section.

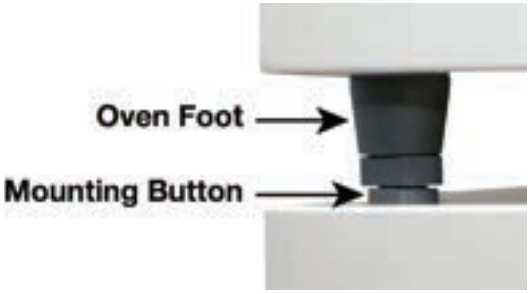


Figure 3.11. Closeup photo of oven foot sitting on top of the mounting button.

STEP 1: Position bottom oven.

Place bottom oven on the floor in close proximity of the ovens' final position.

STEP 2: Set bottom oven's exhaust.

Adjust the bottom oven's exhaust valve to its desired position before setting the second unit on top it.

Stacking BOF ovens causes the bottom oven to lose its exhaust airflow adjustability. Access to the test hole for temperature calibration may be impeded.

When stacking ovens, ensure they are on a separate circuit rated for the combined current draw of the ovens. Place the outlets near the oven's junction this will ensure there will be no tension or stress on their power cords. If necessary, use separate outlets and circuits.

STEP 3: Place second oven on top of the bottom oven.

Grab the bottom of the second oven between between the feet. Lift and place its feet on top of the mounting buttons of the bottom oven.

An extra set of eyes may be required to help guide the oven into position.

⚠ CAUTION

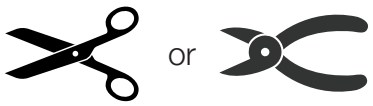
LIFTING HAZARD. THIS IS A MULTI-PERSON LIFT. Use assistance when lifting or moving. Single person lift could cause injury. To avoid muscle strain or back injury, use lifting aids and proper lifting techniques when removing unit from skid.

PINCH, CRUSH HAZARD. Having hands near the oven's feet could cause injury. To avoid hand injury, keep hands away from the oven's feet or mounting buttons.

3.3.2 Preparing Oven for Use

The BEING BOF Series mechanical (forced air) convection ovens are shipped with the doors locked and the shelves zip-tied to the shelf brackets in four (4) places. The shelf bracket hangers are attached to their mounting posts. The power cord is zip-tied to the exhaust vent cover at the back of the oven. The oven's circuit breaker is in the off position. Use the following instructions to prepare the oven for use.

Tools Required



STEP 1: Unlock and open door(s).

For BOF-30T, BOF-50T, BOF-120T & BOF-200T: Rotate the door handle counterclockwise 90° to unlock the door and **carefully pull the door open**.

Figure 3.12. BOF-30T, BOF-50T, BOF-120T and BOF-200T door handle.

For BOF-400T: Rotate the right door handle counterclockwise 90° and the left door handle clockwise 90° to unlock the door and **carefully pull the door open**.

Open the right door first then the left door.

Figure 3.13. BOF-400T door handles

STEP 2: Remove the zip ties, shelving, and shelf hardware.

Cut the zip ties using a very sharp scissors or wire cutter.

Each shelf has one zip tie in each corner and on the front. Each shelf bracket hanger has one.

It's recommended to start with the top shelf and remove the shelf afterwards to make it easier to get to the rest of the zip ties.

Figure 3.14.

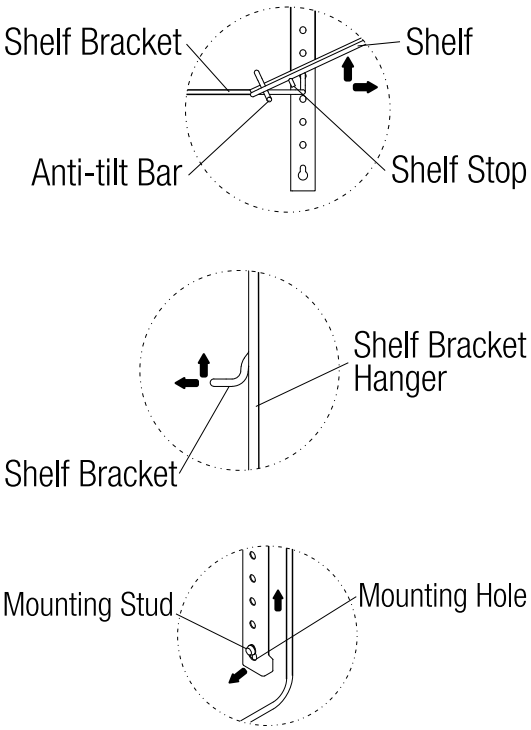


Figure 3.15.

Top: Pull shelf out to the stop meets the shelf bracket end. Lift shelf to clear the stop and continue pulling out.
Middle: Rotate the shelf bracket by lifting it up and pulling it out.
Bottom: Using two hands, lift the shelf bracket hanger until the post aligns with large hole. Pull out.

STEP 3: Clean oven interior, shelving, and shelving hardware.

Clean the chamber, shelving, and shelving hardware per instructions in Section 7.2.2.

STEP 4: Reassemble shelving.

STEP 5: Remove power cord zip tie.

Cut the zip tie using a very sharp scissors or wire cutter.

Figure 3.16.

STEP 6: Check the power receptacle.

Ensure the power receptacle has the appropriate terminal arrangement to accept the oven's power cord, and it is rated for the oven's current draw.

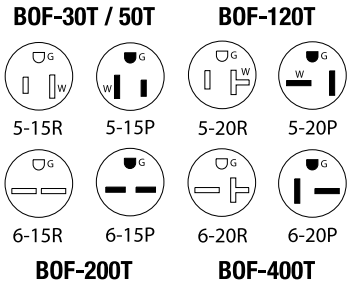


Figure 3.17.

STEP 7: Plug the oven's power cord into appropriate receptacle.

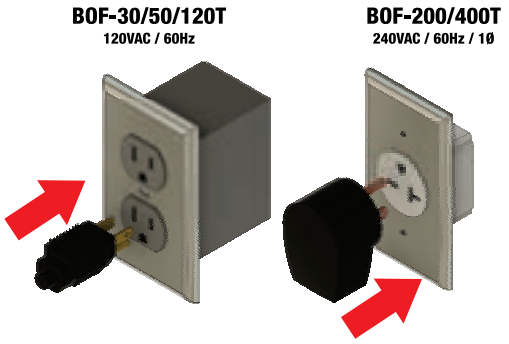


Figure 3.18.

STEP 8: Turn on unit power.

Generation 1: Push the circuit breaker's lever up to turn the oven's power on.

The circuit breaker is located on the bottom left corner above the power cord on the rear of the oven.

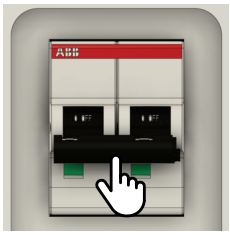


Figure 3.19. Circuit breaker acts as power on/off switch.

Generations 2 & 3: Push the circuit breaker's lever up to turn the oven's power on.

The circuit breaker is located on the bottom left corner above the power cord on the rear of the oven.

Push the power switch located on the oven's left side toward the front bottom.

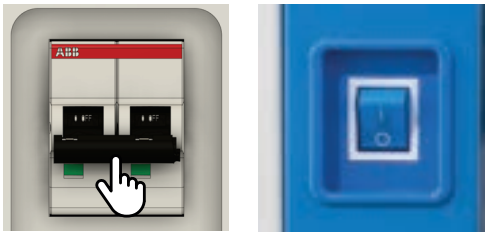


Figure 3.20. Circuit breaker and power on/off switch are separate power controls.

⚠ CAUTION

ELECTRICAL SHOCK HAZARD. Improper electrical connections can damage unit and cause serious injury. **DO NOT** plug the power cord into electrical receptacle with wet hands or while standing on wet floor.

⚠ DANGER

HIGH VOLTAGE ELECTRICAL SHOCK HAZARD. Improper electrical connnections can damage the unit and cause serious injury or death. **DO NOT** plug the power cord into with wet hands or while standing on wet floor.

3.3.3 Setting Controller Date and Time

All BEING BOF Series mechanical (forced air) convection ovens are shipped set to the factory's local date and time. For correct operation and data collection, it is recommended to check the date and time, and change it if necessary prior to use in your facility.

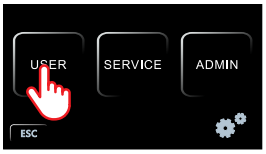
The controller's time uses a 24-hour format (e.g., 9:30 pm = 21:30).

> Check date and time, and update as needed if the oven's power is off for extended periods. Date and time may be off due to memory battery drain.

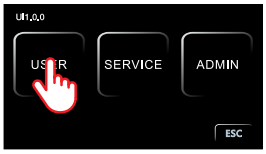
STEP 1: Enter the Operational Settings.

Press the Operational Settings button (gears) in the lower right corner of the home screen.

STEP 2: Enter the USER section.



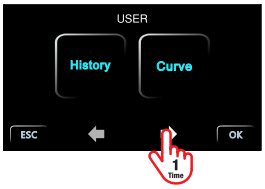
Generation 1 & 2.



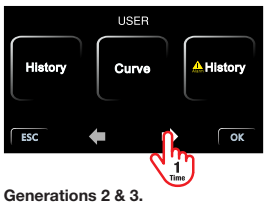
Generation 3.

Press the USER button.

STEP 3: Scroll to the Date and Time screen.



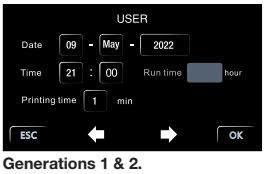
Generation 1.



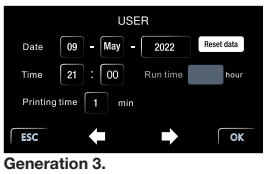
Generations 2 & 3.

Press the FORWARD button once.

STEP 4: Change Date and Time if necessary.



Generations 1 & 2.

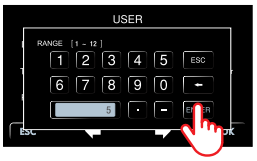


Generation 3.

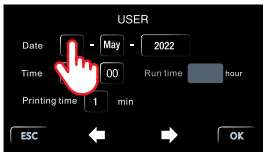
Move to Step 6 if no changes.

To change date.

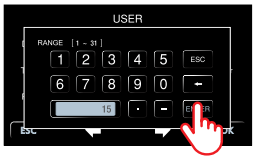
Press Month.



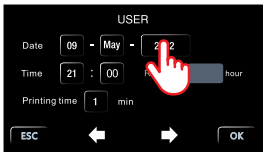
Enter 1 - 12 using the keypad and press ENTER.



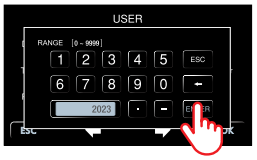
Press Day.



Enter 1 - 31 using the keypad and press ENTER.

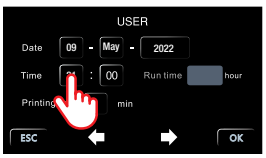


Press Year.

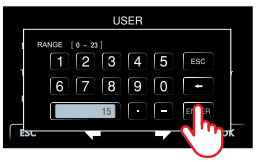


Enter the year using the keypad and press ENTER.

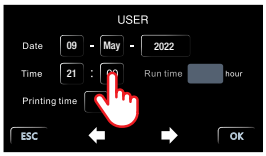
To change time.



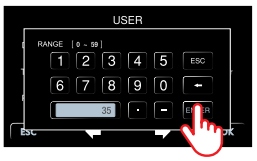
Enter Hours.



Enter 0 - 23 using the keypad and press ENTER.

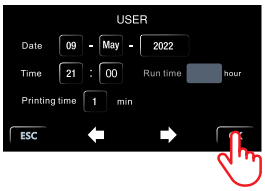


Tap Minutes.

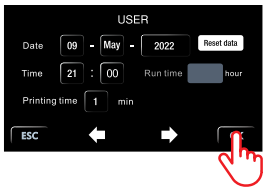


Enter 0 - 59 using the keypad and press ENTER.

STEP 5: Confirm Date and Time.



Generations 1 & 2.

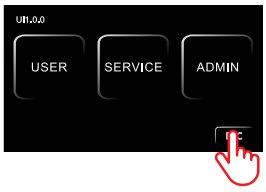


Generation 3.

Press OK.

STEP 6: Return to controller home screen.

Generations 1 & 2.



Generation 3.

Press ESC.

Controller Home Screen

4.0 Operation

This section provides the user instructions on changing the touch capacitive controller's internal parameters to allow the instrument to work more effectively and efficiently for your operation, process, or experiment.

4.1 Controller Display Overview

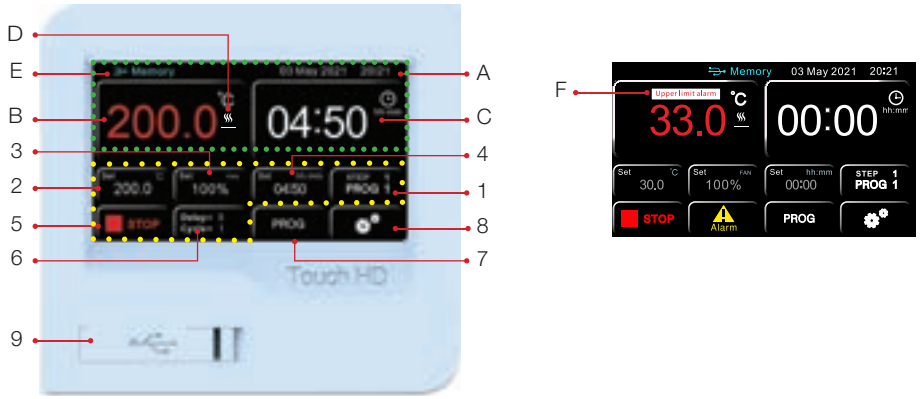


Figure 4.1.

The BEING controller's touch capacitive display is highly sensitive and can be used even while wearing gloves. It is broken into three sections: current conditions (green dotted rectangle), buttons, and USB port. The buttons are divided into multi-function (yellow dotted polygon) and single function.

4.1.1 Current Conditions

A: **Date & Time:** The date is shown in dd-mmm-yyyy format. The time of day is shown in a 24-hour format.

B: **Chamber Temperature:** (AKA: PV or Present Value) The value shown will change colors based on the condition in the chamber. The following table show the four (4) states the chamber temperature can be in and the associated color the value will be in.

Condition	Generation 1 & 2	Generation 3
PV < SV	Yellow	Yellow
Countdown starts*	Yellow	Yellow
PV in range of SV‡	Green	Green
PV ≥ SV	Red	Yellow†
PV > SV + AL	Red	Red

*The countdown timer begins when the temperature is within 0.5° of setpoint.
‡In range is -0.4° to +0.4° of setpoint.
†PV changes to yellow when PV is greater than +0.5° above the setpoint.

C: **Time** (hh:mm)**:** The time left on the program and RUN delay countdown timers. It will read 00:00 if the program timer is set to infinity.

D: **Heating Element Indicator:** Appears when the heating element is energized.

E: **Memory Indicator:** Indicates a USB drive has been inserted into the port and is ready for collecting the oven's data. It also indicates the stored data has been transferred to the USB drive.

F: **Alarm & Error Messages:** In generation 1 controllers, alarm messages are shown here. All generation controllers show system error messages on the display.

4.1.2 Buttons

4.1.2.1 Multi-function buttons

Multi-function buttons function as a button and a display.

1: **Mode:** The BEING microprocessor controller provides the user with nine (9) programs (modes) to choose from. One mode (PROG 0) is a fixed-value program. A fixed-value program will run the oven at a specific temperature and fan speed for a specified time once the temperature setpoint is reached.

The other eight (8) programs allow users to run up to eight (8) steps in a program. Each step has a specified temperature, fan speed, and run time.

Pressing this button creates a pop-up window allowing to user to choose which program to run. Once selected and confirmed, the controller will show which program is being run. In the case of multi-step programs, it will also show which step is currently running. For example, if program 2, step 5 is running, the user will see PROG 2 with Step 5 above it, as shown in Figure 4.1.

All BEING oven's default mode is PROG 0.

See section 4.4 for instructions on selecting program to run.

2: **Temperature Setpoint:** Fixed-value program mode: Pressing the button creates a pop-up window allowing the user to set the oven's temperature. Once set, it will display the oven's temperature setpoint.

Multi-step program mode: The button is disabled and becomes a display only, showing the step's temperature setpoint. For example, if Step 3 is running and its temperature setpoint is 250^{O}, the user will see 250.0 here.

See sections 4.5.1 for instructions on setting the fixed-value program temperature, and section 4.6.3.1 for multi-step programs.

3: **Fan Speed Setpoint:** Fixed-value program mode: Pressing the button creates a pop-up window allowing the user to choose one of three (3) fan speeds: 100%, 75%, and 50%. Once set, it will display the oven's fan speed setpoint.

Multi-step program mode: The button displays the step's setpoint. For example, if Step 2 is running and its fan speed setpoint is 75%, the user will see it here.

See section 4.5.2 for instructions to select the fixed-value program fan speed and section 4.6.3.2 for multi-step programs.

4: **Program Run Setpoint:** Fixed-value program mode: Pressing the button creates a pop-up window allowing the user to set the oven's program run time at the temperature setpoint. Once set, it will display the oven's setpoint.

Multi-step program mode: The button displays the step's run time. For example, if Step 1's run time is 1 hour, 20 minutes, the user will see 01:20 here.

Both modes: Once the set temperature is reached and the count-down begins, the remaining time left for the program or step is shown here.

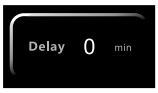
See section 4.5.3 for instructions on setting the fixed-value program run time and section 4.6.3.3 for multi-step programs.

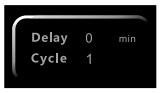
5: **START / STOP:**

This button starts and stops a program. After pressing the START button and the program begins, the controller automatically switches to the STOP button. The STOP button will automatically change to START when the user presses it or when the run time runs out.

During a RUN delay, the START button will remain on screen until the RUN delay times out. The START button must be pressed a second time to stop the program.

6: **Alarm Silence:**





The alarm silence button has the most functionality.

RUN Delay: Is shown when fixed-value programs are run. It shows the RUN delay time in minutes from zero (0) to 5999 (99:59 hh:mm). As the RUN delay time counts down, it is represented on the button's display.

RUN Delay / Cycle: Is shown when multi-step programs are run. It shows the RUN delay time in minutes from zero (0) to 5999 (99:59 hh:mm) and the number of cycles from zero (0) to 99 the program steps will run. As the RUN delay time counts down and a cycle is completed, the time and cycle number reduce and are represented on the button's display.

END: The END indicator appears when the countdown timer runs out for fixed-value programs and when the cycles counter and the count-down timer reach zero (0) for multi-step programs. For all generation controllers, an audible alarm fires when END appears and requires the user to press the button to silence the audible alarm.

END also appears when the user presses the STOP button. An audible alarm fires on the 1st generation controller and requires the user to press the button to silence the audible alarm. On generation 2 and 3 controllers, the audible alarm doesn't fire.

ALARM: The ALARM indicator appears, and an audible alarm fires when one (1) of four (4) conditions occurs. The user must press the button to silence the audible alarm. The alarm symbol will go away, and the audible alarm will shut off automatically when two of the conditions correct themselves.

4.1.2.2 Single-function buttons

Single-function buttons are for navigation only.

7: **PROG** (Multi-step programming)**:** This button is for programming step parameters for multi-step programs. Pressing it creates a screen showing the eight (8) steps and their associated temperature, time and fan speed settings.

See section 4.6.2 for instructions on setting multi-step program temperature, fan speed, and step run time.

8: **Operational Settings:** Pressing this (gears) button will take the user to operational settings and parameters home page in the back end of the controller.

See section 6.0 for details on each screen of the controller's operational parameters.

4.1.3 Data Collection Port

9: **USB Data Collection:** The data collection port consist of a port cover, communication connection indicator, USB-A port and port cover lock. The communications connection indicator blinks multiples as after the USB drive is inserted. The light is steady when the drive and controller are ready to send and receive running data from a program. This light also blinks during the controller boot cycle.

See section 5.0 for complete details on the controller's data collection capabilities.

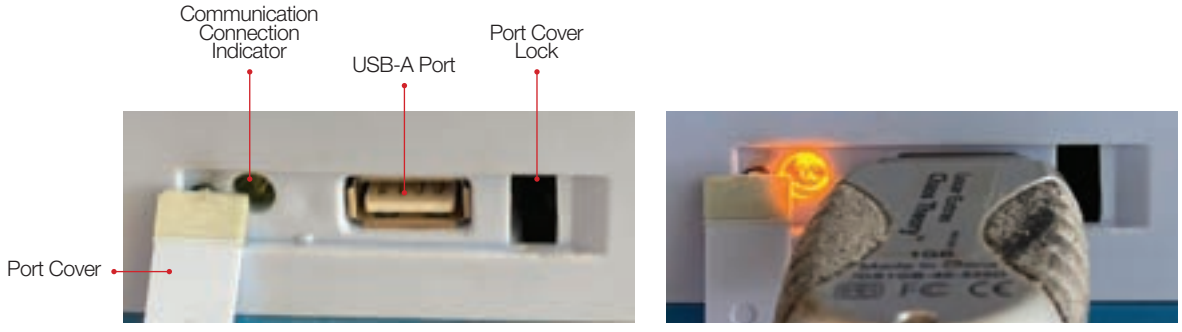


Figure 4.2.

4.1.4 Program Settings Value Entry Methods

There are several methods for entering program settings based on the controller generation and the type of program.

	How Program Settings are Entered					
	Generation 1		Generation 2		Generation 3	
Setting	**Fixed-value**	**Multi-step**	**Fixed-value**	**Multi-step**	**Fixed-value**	**Multi-step**
Temperature	+/- Buttons	Keyboard Field	Keyboard Field	Keyboard Field	+/- Buttons	Keyboard Field
Time	+/- Buttons	Keyboard Field	Keyboard Field	Keyboard Field	+/- Buttons	Keyboard Field
Fan Speed	3 Buttons	Cycling Button	3 Buttons	Cycling Button	3 Buttons	Cycling Button

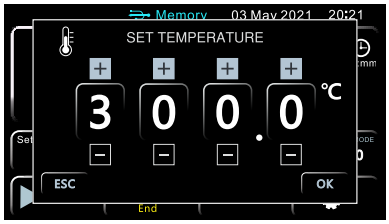


Figure 4.3. Setting temperature for fixed-value programs in Celsius. Generation 1 & 3. When in Fahrenheit 300 changes to 572 and °C changes to °F. In Generation 3, the temperature fills the entire window.

Figure 4.4. Setting temperature for fixed-value programs. Generation 2; Farhenheit. When in Celsius the range changes to 0 - 300. The set temperature cannot be greater than the high-end of the range.

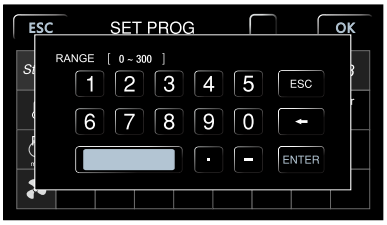


Figure 4.5. Setting temperature for multi-step programs. Celsius. When in Fahrenheit the range changes to 32 - 572. The set temperature cannot be greater than the high-end of the range.

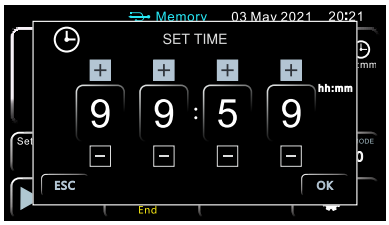


Figure 4.6. Setting time for fixed-value programs. Generation 1 & 3. In Generation 3, the time fills the entire window.

Figure 4.7. Setting time (hours) for fixed-value programs. Generation 2.

Figure 4.8. Setting time (minutes) for fixed-value programs. Generation 2.

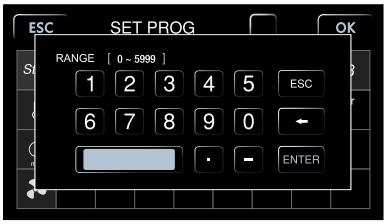


Figure 4.9. Setting time for multi-step programs.

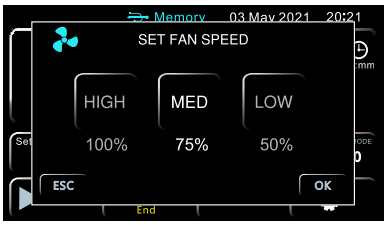


Figure 4.10. Setting fan speed for fixed-value programs for all generations. In Generation 3, the fan speed fills the entire window.

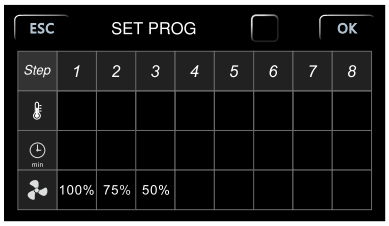


Figure 4.11. Setting fan speed for multi-step programs. Touch the speed and it will cycle up one level. Factory default is 75%.

4.2 Changing Unit of Measurement

All BEING BOF Series mechanical (forced air) convection ovens can operate and control temperature in Celsius and Fahrenheit. The ovens are shipped with Celsius being the default unit of measurement.

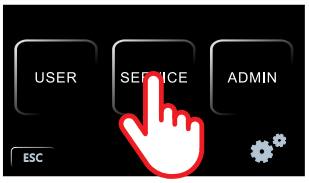
When the temperature setpoint button's unit of measurement changes, **the value will not change**. For example, if the user sets the temperature to 100°C, then changes the unit of measurement to °F, the button will read 100°F. The user **must manually convert the setpoint value**.

> Changes to the unit of measurement **MUST BE MADE PRIOR TO SETTING AND RUNNING A PROGRAM.**

Step 1: Enter the Operational Settings.

Press the Operational Settings (gears) button in the lower right corner of the home screen.

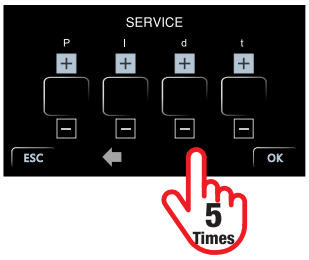
Step 2: Enter the SERVICE section.



Press the SERVICE button.

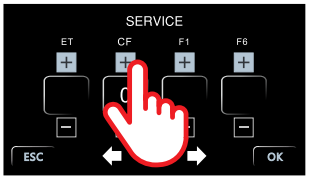
Step 3: Enter 88 and press ENTER.

Step 4: Scroll to parameter CF.

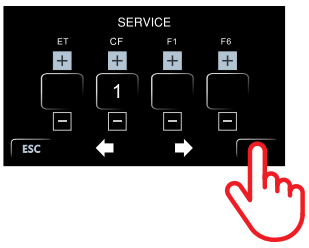


Press the FORWARD button five (5) times.

Step 5: Change the CF parameter

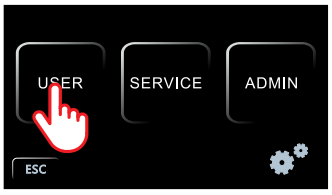


Press the PLUS (+) or MINUS (-) button.
0 = Celsius; 1 = Fahrenheit



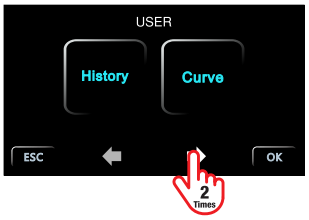
Press OK.

Step 6: Enter the USER section.

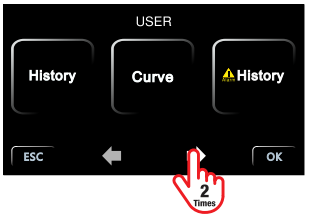


Press the USER button.

Step 7: Scroll to parameter tM.



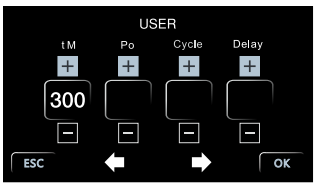
Generation 1.



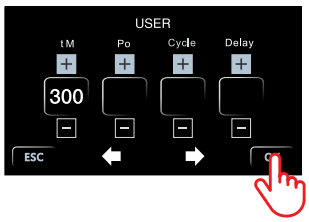
Generation 2 & 3.

Press the FORWARD button two (2) times.

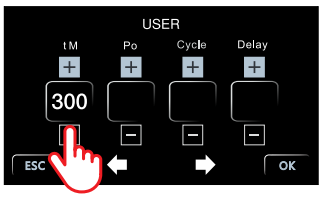
Step 8: Confirm or change parameter tM.



tM=300 Celsius (°C)
tM=572 Fahrenheit (°F)

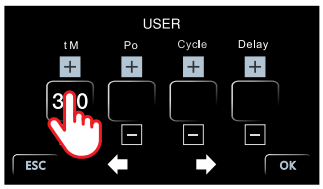


Press OK if correct.

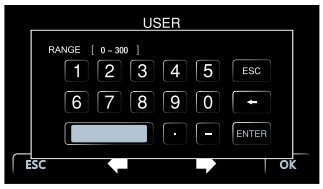


Press the PLUS (+) or MINUS (-) button if the tM parameter needs correction. Press and hold to rapidly cycle to the maximum temperature required.

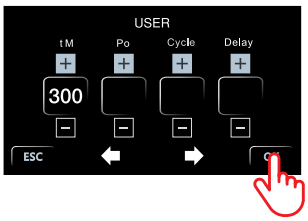
or



Press the tM value.



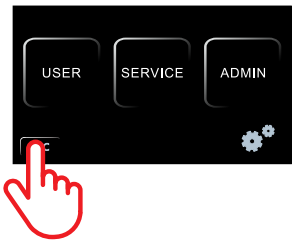
Use the keyboard to enter the desired value. Press Enter.



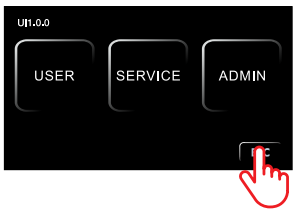
Press OK.

This will take you back to the Operational Settings home screen.

Step 9: Return to the home screen.



Generation 1 & 2.



Generation 3.

Press ESC.

4.3 Calibration

The BEING BOF oven's touchscreen controller occasionally requires it to be calibrated, especially after changing units of measurement. The following instructions are designed to help users ensure specimens are exposed to the appropriate temperature and the oven is working correctly.

Tools Needed:

A remote-monitoring thermocouple thermometer with a Ø5mm probe and NIST-traceable calibration certificate.

4.3.1 Testing for TV_1 and TV_2

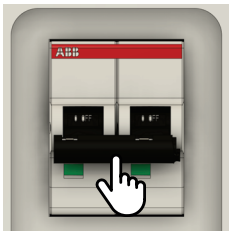
Before modifying the controller's Pb and PK parameters, which control temperature accuracy, the user must obtain two temperatures on a NIST-traceable calibrated external thermometer inserted into the oven's test hole. These temperatures are called TV_1 and TV_2.

Compare the thermometer's and probe's temperature ratings against the oven's operating range to ensure compatibility. Probe should be Ø5mm or less.

STEP 1: Insert samples, specimens, or products in the chamber.

STEP 2: Insert thermometer's probe into the test hole.

STEP 3: Turn on unit power.



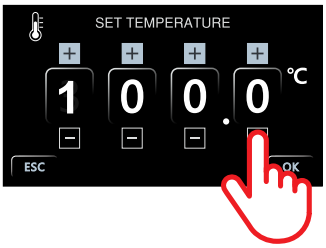
Generation 1: Push the circuit breaker's lever up to turn the oven's power on.

The circuit breaker is located on the bottom left corner above the power cord on the rear of the oven.

Generations 2 & 3: Ensure the circuit breaker's lever is in the up position.Then, push the power switch on the bottom left side of the unit.

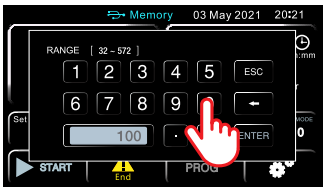
Step 4: Set temperature for a fixed-value program.

Press the set temperature button.

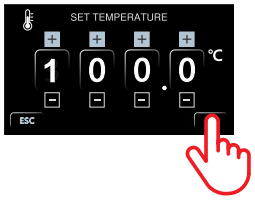


Generation 1 & 3. Set the desired temperature by pressing the + or – button for each digit.

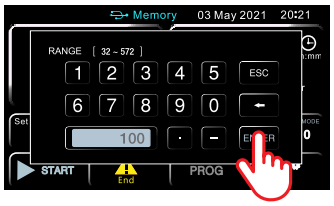
Press and release to do one digit at a time. Press and hold to rapidly scroll to the digit.



Generation 2: Enter the temperature using the keyboard.



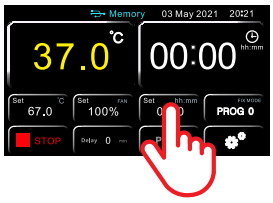
Generation 1 & 3: Press OK to finish setting the temperature and return to the home screen.



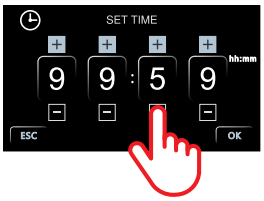
Generation 2: Press ENTER to finish setting the temperature and return to the home screen.

Step 5: Set time for a fixed-value program.

Make sure the RUN time is set for at least 15 minutes to ensure chamber temperature stabilization.



Press the set RUN time button.



Generation 1 & 3: Set the desired time by pressing the + or – button for each digit. Maximum run time is 99:59.

Press and release to do one digit at a time. Press and hold to rapidly scroll to the digit.

Generation 2: Set the desired run time by using the keyboard. The time is split into hours and minutes. Each has a keyboard for setting.

Start by pressing the minutes side on the home screen. Maximum run time is 99:59.

Generation 1 & 3: Press OK to finish setting the time and return to the home screen.

Generation 2: Press ENTER to finish setting the time and return to the home screen.

Countdown timer will not start until PV = SV - 0.5°.

Fan speed has no impact on chamber temperature. Therefore it can be set to any value.

Step 6: Run the program.

Press the START button.

STEP 7: Run test again at a second set temperature (SV2) at least 10°C (18°F) greater than the first.

Make sure thermometer is stable. Then record the set temperature (SV1 & SV2), present measured value (PV1 & PV2), and thermometer reading (TV1 & TV2).

STEP 8: Compare thermometer readings to set and real temperatures (PV). If SV1≠PV1≠TV1 or SV2≠PV2≠TV2, move to STEP 9.

4.3.2 The Math

STEP 9: Perform the following calculations to determine Pb and PK.

For example:

SV1= 37°C TV1 = 36°C
SV2= 50°C TV2 = 48°C

Full Scale Adjustment (Slope)

PK = {[(TV2-TV1) ÷ (SV2-SV1)] - 1} x 4000

PK = {[(48-36) ÷ (50-37)] - 1} x 4000

PK = -308

Zero Adjustment (Intercept)

Pb = TV2 - {[PK ÷ (4000 ÷ SV2)] + SV2}

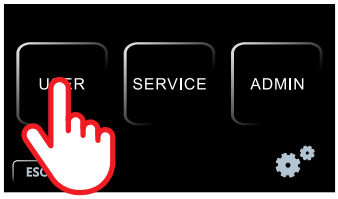
Pb = 48 - {[-308 ÷ (4000 ÷ 50)] + 50}

Pb = 1.9

4.3.3 Programming Correction

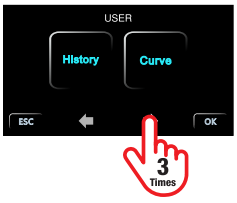
STEP 10: Enter the controller's Operational Setings.

Press the Operational Settings (gears) button.

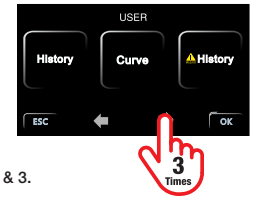


Press the USER button.

STEP 11: Scroll to Pb and PK parameters.



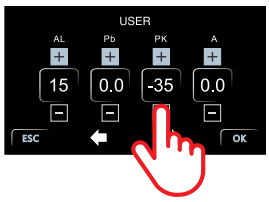
Generation 1.



Generation 2 & 3.

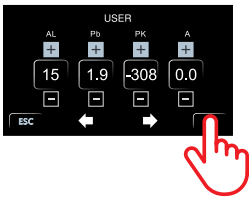
Press the FORWARD button 3 times.

STEP 12: Change parameters Pb and PK.



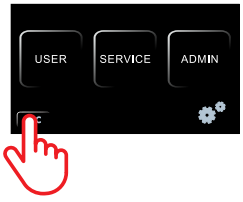
Set the desired Pb and PK parameters by pressing the + or – key for each digit.

Press and release to do one digit at a time. Press and hold to rapidly scroll to the digit.



Press OK to finish setting the parameter changes and return to the Operational Settings home screen.

STEP 13: Return to the controller's home screen.



Press ESC to return to the controller's home screen.

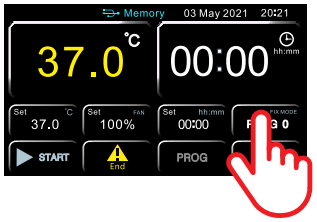
4.4 Selecting Program Mode

The user can select one of 9 programs to run. The default mode setting is PROG 0.

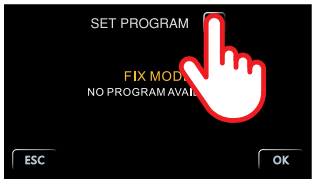
Programs

PROG 0 - Fixed Value Temperature, RUN Time, and Fan Speed
PROG 1 - Multi-step, Step 1 to Step 8
PROG 2 - Multi-step, Step 1 to Step 8
PROG 3 - Multi-step, Step 1 to Step 8
PROG 4 - Multi-step, Step 1 to Step 8
PROG 5 - Multi-step, Step 1 to Step 8
PROG 6 - Multi-step, Step 1 to Step 8
PROG 7 - Multi-step, Step 1 to Step 8
PROG 8 - Multi-step, Step 1 to Step 8

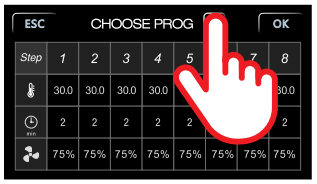
Step 1: Enter Program Mode setting.



Press the Mode button.



Fix mode screen.



Multi-step program mode screen.

Press the number button.

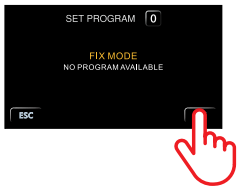
Step 2: Enter the program number.

Enter program number using the keyboard.

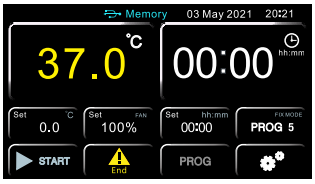
Press ENTER to confirm your selection.

Step 3: Confirm program number.

Upon entering a multi-step program number, that program's current settings will appear. See Section 4.6.2 to change the program's settings.



Press OK to confirm program number and return to the home screen.



Example of home screen upon selecting a multi-step program to run.

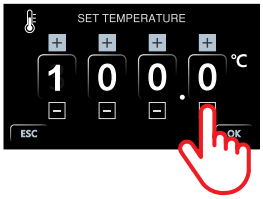
4.5 Setting Fixed-value Programs

A fixed-value program is designated by PROG 0. They consist of a temperature, RUN time and fan speed and are easy to set.

4.5.1 Program Temperature

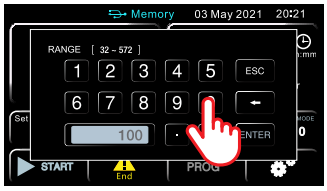
Step 1: Press the set temperature button.

Step 2: Enter temperature setpoint.



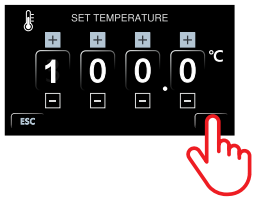
Generation 1 & 3. Set the desired temperature by pressing the + or – button for each digit.

Press and release to do one digit at a time. Press and hold to rapidly scroll to the digit.

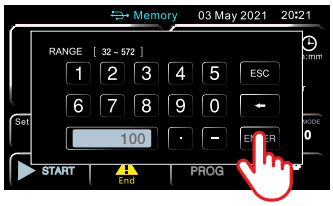


Generation 2: Enter the temperature using the keyboard.

Step 3: Confirm temperature setpoint.



Generation 1 & 3: Press OK to finish setting the temperature and return to the home screen.

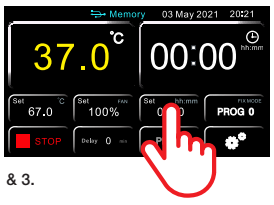


Generation 2: Press ENTER to finish setting the temperature and return to the home screen.

If the tM parameter is < 300 or 572, the set temperature CANNOT be > tM.

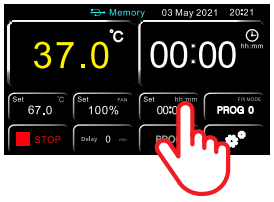
4.5.2 Program RUN Time

Step 1: Press the set RUN time button.



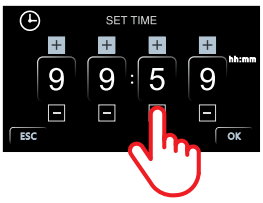
Generation 1 & 3.

Generation 2: The time is split into hours and minutes. Each has a keyboard for setting.



Press the left side of the RUN time button to set hours (hh) or right side to set minutes (mm).

Step 2: Enter the program's RUN time.



Generation 1 & 3: Set the desired time by pressing the + or – button for each digit. Maximum run time is 99:59.

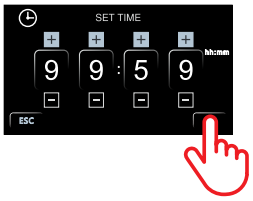
Press and release to do one digit at a time. Press and hold to rapidly scroll to the digit.

Set time to 00:00 for the oven to run indefinitely.

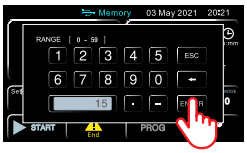
Step 2: Enter the program's RUN time.

Generation 2: Enter the run time using the keyboard. Maximum run time (minutes) is 59.

Step 3: Confirm RUN time setting.



Generation 1 & 3: Press OK to finish setting the time and return to the home screen.



Generation 2: Press ENTER to finish setting the time and return to the home screen.

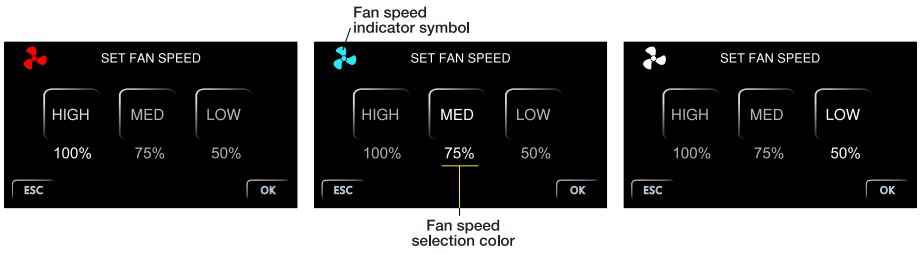
Repeat to set the run time (hours) parameter. Maximum run time (hours) is 99.

> **Countdown timer will not start until PV = SV - 0.5⁰.**

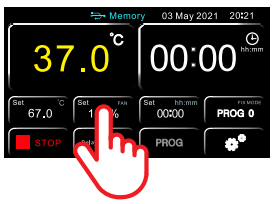
4.5.3 Program Fan Speed

The fan speed controls the velocity and turbulence of the airflow circulating around the chamber, samples, specimens, or products, and the drying or heating time required. Running at a lower speed will reduce the noise emitted and power consumed while increasing reliability and fan life.

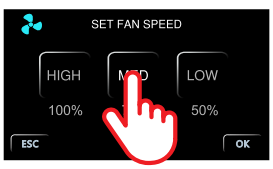
The oven has three fixed fan speeds: HIGH - 100%, MED - 75%, and LOW - 50%. The fan speed selection screen shows three buttons. The currently selected speed is indicated by the button being in bright white and by the fan symbol color: HIGH - red, MED - blue, and LOW - white.



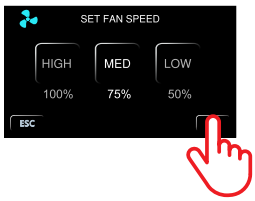
Step 1: Press the set fan speed button.



Step 2: Press the HIGH, MED, or LOW button.



Step 3: Confirm fan speed setting.



Press OK to finish setting the fan speed and return to the home screen.

4.6 Multi-step Programs

4.6.1 What is a Multi-step Program

Numerous applications — like materials testing, quality assurance, environmental simulation, and many more — in many industries require precise, multi-temperature (heating or cooling) testing.

BEING's touchscreen controller allows the user to easily program up to 8 multi-step (multi-temperature) programs with up to 8 steps (temperature, run time, and fan speed) per program. Each program can be cycled from 1 to 99 times.

The multi-step programs can also be used to install multiple fixed-value programs into the controller's memory for quick recall and and running.

The following chart shows a 3-step program, where for example, Step 1 is 25°C for 60 minutes, Step 2 is 99°C for 45 minutes, and Step 4 is 199°C for 99 minutes.

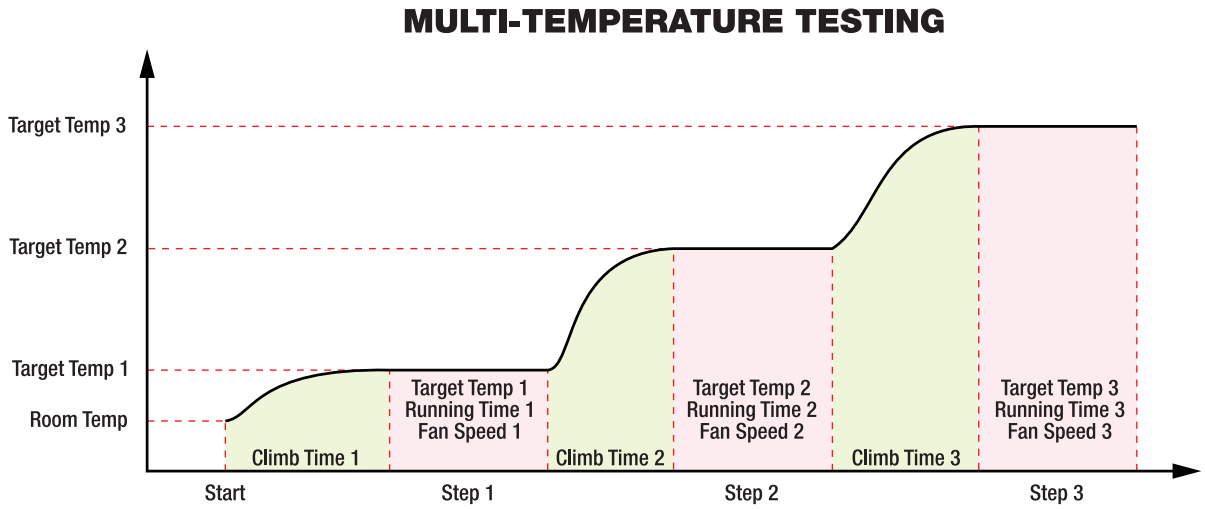


Figure 4.12.

Legend

Target temp: The temperature you want to run as planned. (Input / set temperature)

Climb time: The time it takes to reach your target temperature setting. *The temperature rise rate will be controlled automatically based on the controller's settings. The step's run time will not start counting down until the chamber reaches ±0.5 °C / °F of the set temperature.*

Running time: The time you want the chamber to run at the set temperature. *The controller automatically launches the next step when time runs out unless it is the last step in the program then the unit shuts down and the audible and visual alarm goes off.*

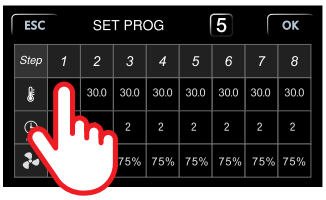
4.6.2 Setting Program Steps

Step 1: Select Mode 1 through 8 by following the instructions in section 6.4.

Step 2: Press the PROG button.

4.6.2.1 Program Step Temperature Setpoint

Step 3: Set Step 1 temperature setpoint.



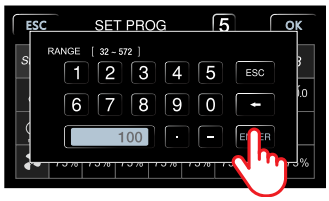
Press the Step 1 temperature value.

Step 4: Enter the temperature setpoint.

Set the temperature using the keyboard.

Ensure the temperature entered is ≥ the user's Ambient+10°C or Ambient+18°F and ≤300°C or 572°F.

Step 5: Confirm the temperature setpoint.



Press ENTER to finish setting the temperature and return to the program's home screen.

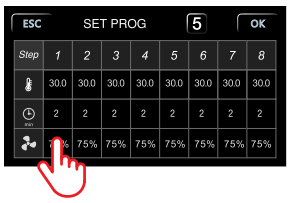
Step 6: Repeat steps 1 through 3 for all steps in the program.

If the tM parameter is < 300 or 572, the set temperature CANNOT be > tM.

If a step's temperature is higher than the previous step, it's temperature setting must be 10°C/18°F greater than the previous step.

4.6.2.2 Program Step Fan Speed

Step 7: Set Step 1 fan speed.



Press the Step 1 fan speed value.

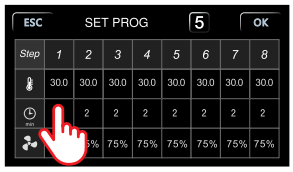
Pressing the FAN Speed value will cycle the value up one level (i.e., 75% to 100%, if 100% to 50%).

The factory default fan speed is 75% for each step.

Step 8: Repeat for all steps in the program.

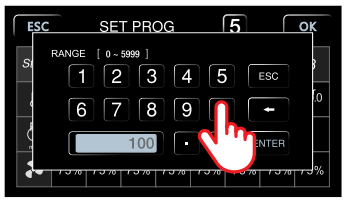
4.6.2.3 Program Step RUN Time

Step 9: Set Step 1 RUN time.



Press the Step 1 RUN time value.

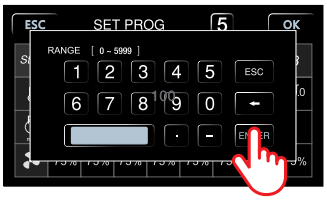
Step 10: Enter the run time.



Set the run time using the keyboard. The maximum run time is 5999 minutes.

Entering zero (0) in Step 1 will run this step indefinitely.

Step 11: Confirm the RUN time.



Press ENTER to finish setting the RUN time and return to the program's home screen.

Step 12: Repeat steps 1 through 3 for all steps in the program.

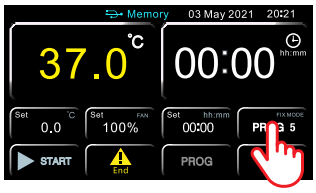
Stopping Program	
Steps in Program	**Enter 0**
1	Step 2
2	Step 3
3	Step 4
4	Step 5
5	Step 6
6	Step 7
7	Step 8

Enter zero (0) in the RUN time to stop executing the multi-step program. The table above shows where to enter 0.

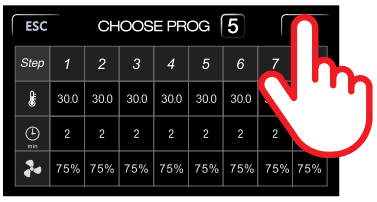
Step 13: Confirm program settings.

Press OK to finish programming the program's settings and return to the home screen.

Step 14: Lock in program settings. **Generations 1 & 2 ONLY!**



Press the Mode select button.



Press OK to lock in the program's settings and return to the home screen.

4.6.3 Program Cycling

4.6.3.1 Overview

Some testing applications require samples, specimens, or products to repeat applications of a specific multi-step program. The controller can run a multi-step up to 99 times. The factory default setting is 1.

The figure below shows a 4-step program cycled 25 times. At the end of RUN time 4, if target temperature 4 is greater than target temperature 1, the next cycle run will not start until the chamber temperature naturally decays below temperature 1. The fan speed 4 will continue until Step 1 starts.

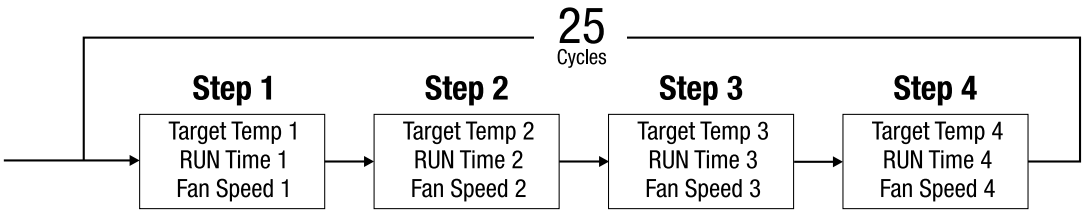
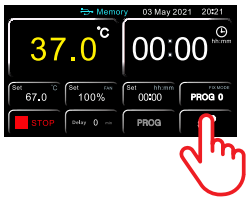


Figure 4.13.

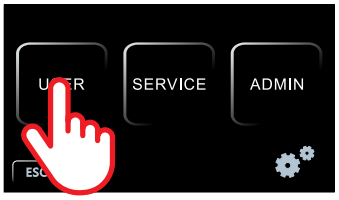
4.6.3.2 Setting Number of Cycles

Step 1: Enter the Operational Settings.



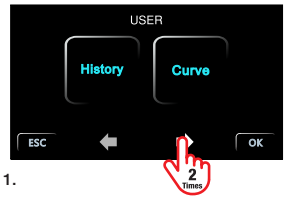
Press the Operational Settings (gears) button.

Step 2: Enter the USER Settings.

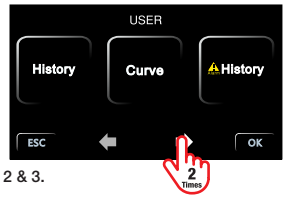


Press the USER settings button.

Step 3: Scroll to the tM, Po, Cycle, Delay screen.



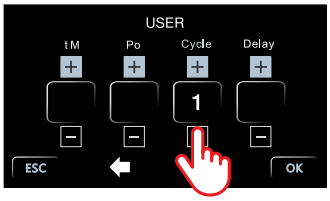
Generation 1.



Generation 2 & 3.

Press the FORWARD button twice.

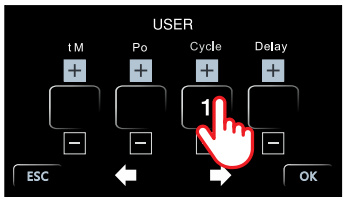
Step 4: Enter the number of cycles.



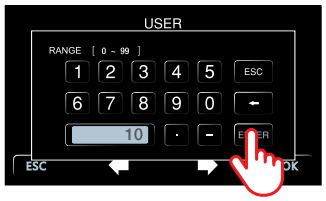
Set the number of cycles by pressing the + or – button for each digit. Maximum number of cycles is 99.

Press and release to do one digit at a time. Press and hold to rapidly scroll to the digit.

Or



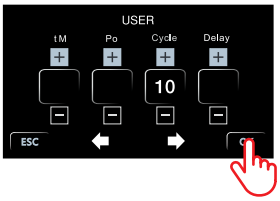
Press the Cycle value.



Enter the number of cycles using the keyboard. Maximum number of cycles is 99.

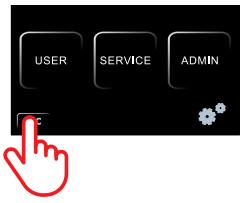
Press ENTER.

Step 5: Confirm the number of cycles.

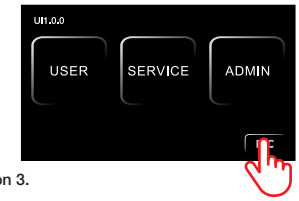


Press OK to finish setting the number of cycles and return to the Operational Settings home screen.

Step 6: Return to controller's home screen.



Generation 1 & 2.



Generation 3.

Press ESC to return to the controller's home screen.

4.7 Setting RUN/START Delay Timer

4.7.1 Overview

The RUN delay timer is a productivity tool and a safety device that allows you to preset the start-up and running times for unattended operation.

The timer delays the start of the oven's temperature profile for a selected time from one (1) minute to 99 hours and 59 minutes (5999 minutes) in 1-minute increments. Once the delay times out, the program will start operation. After each occasion, the RUN/START delay timer expires, or a program is stopped, the timer returns to zero (0).

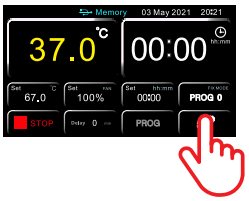
A laboratory could save money on utility costs by establishing and running a program during off-peak hours. Check with your local utility provider about potential savings.

Example: It is currently 4:50 PM. The oven's current temperature is at the lab's ambient temperature. You've loaded the chamber with various products for a 150-baking-and-annealing process that takes 7.5 hours to complete. The ramp time to reach the setpoint is approximately 30 minutes. It must be completed by 8:00 AM the next morning.

The constraints above estimate that the program should start at 12:00 AM with a RUN/START delay timer set for 430 minutes.

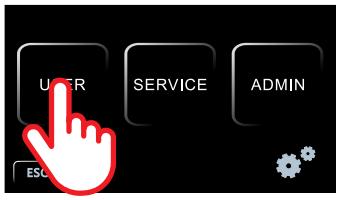
4.7.2 Programming RUN/START Delay Timer

Step 1: Enter the Operational Settings.



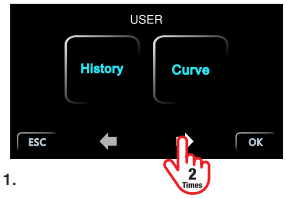
Press the Operational Settings (gears) button.

Step 2: Enter the USER Settings.

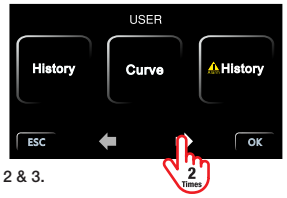


Press the USER settings button.

Step 3: Scroll to the tM, Po, Cycle, Delay screen.



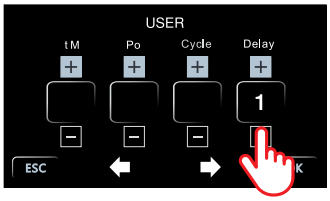
Generation 1.



Generation 2 & 3.

Press the FORWARD button twice.

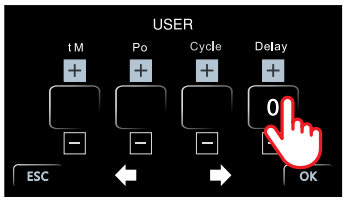
Step 4: Enter the delay time.



Set the number of cycles by pressing the + or – button for each digit. Maximum number of delay minutes is 5999.

Press and release to do one digit at a time. Press and hold to rapidly scroll to the digit.

Or

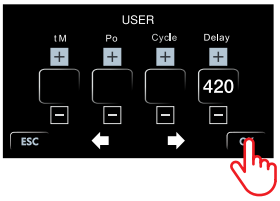


Press the Cycle value.

Enter the number of delay minutes using the keyboard. Maximum number of delay minutes is 5999.

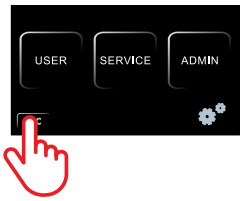
Press ENTER.

Step 5: Confirm the number of delay minutes.

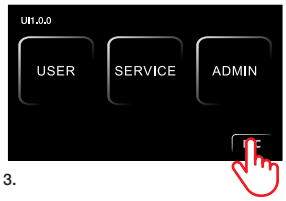


Press OK to finish setting the number of delay minutes and return to the Operational Settings home screen.

Step 6: Return to controller's home screen.



Generation 1 & 2.



Generation 3.

Press ESC to return to the controller's home screen.

4.8 Setting Low-temperature & High-temperature Alarms

Whether you are conducting aging tests, baking and curing, dehydrating, dry sterilization, glassware drying, moisture and stability tests, processing electronics, or regenerating desiccants and catalysts, your products, samples or specimens may be sensitive to temperature variations.

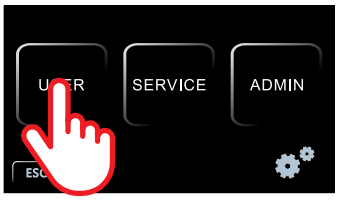
BEING included low-temperature and high-temperature alarms to help minimize potential damage or harm to the contents in the chamber if the temperature drops below or rises above the setpoint by a chosen value. Both alarms are controlled by the AL parameter, which is adjustable from 0° to 100° in 0.1° increments. The factory default setting is 15.0°.

Use the following instructions to modify the AL (alarm) parameter to fit your application.

Step 1: Enter the Operational Settings.

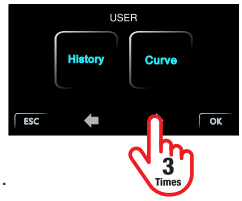
Press the Operational Settings (gears) button.

Step 2: Enter the USER Settings.

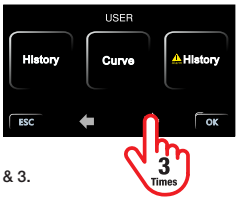


Press the USER settings button.

Step 3: Scroll to the tM, Po, Cycle, Delay screen.



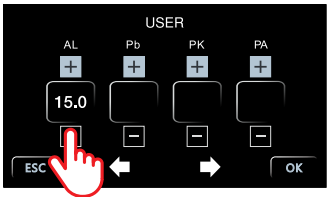
Generation 1.



Generation 2 & 3.

Press the FORWARD button three times.

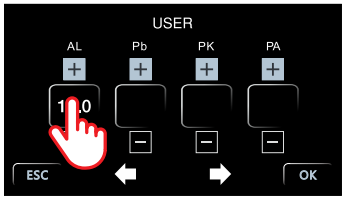
Step 4: Enter the alarm (AL) parameter.



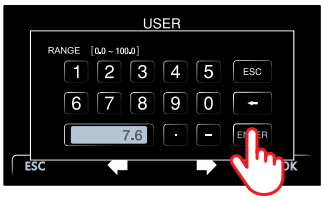
Set the alarm (AL) value by pressing the + or – button for each digit. Maximum alarm value is 100.0.

Press and release to do one digit at a time. Press and hold to rapidly scroll to the digit.

Or



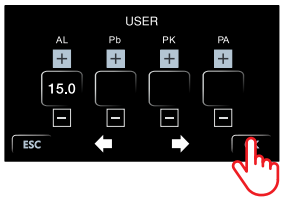
Press the alarm (AL) value.



Enter the alarm (AL) value using the keyboard. Maximum alarm value is 100.0.

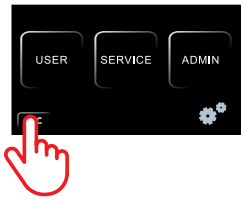
Press ENTER.

Step 5: Confirm the alarm (AL) value.

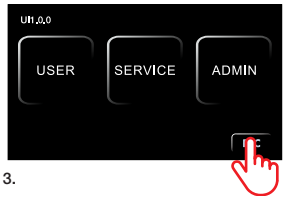


Press OK to finish setting the alarm (AL) value and return to the Operational Settings home screen.

Step 6: Return to controller's home screen.



Generation 1 & 2.



Generation 3.

Press ESC to return to the controller's home screen.

5.0 Data Collection

To help laboratories meet today's global regulatory requirements and protocols, BEING has equipped the BOF series mechanical (forced air) convection ovens with data collection capabilities. The following describes the types of data collected, how it's collected, and how to export it for importation into your laboratory information management system.

5.1 Overview

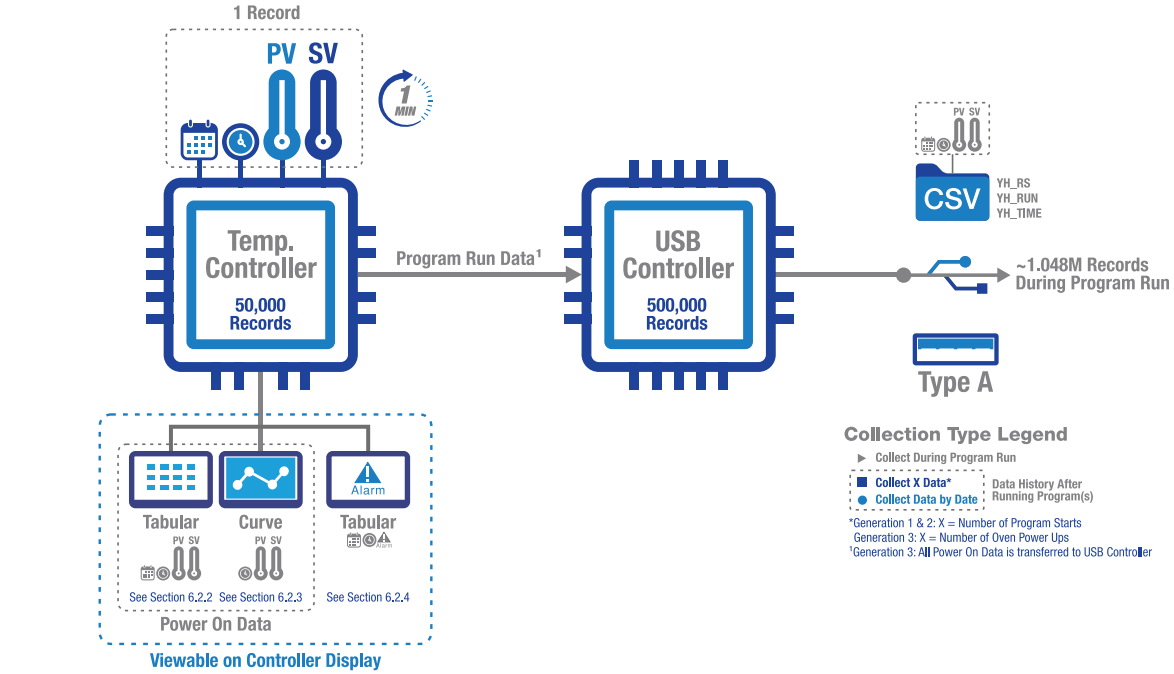


Figure 5.1.

The controller collects the following information in 1-minute increments when power is supplied to the controller.

- Date (YY-MM-DD format - CSV file | YYYY-MM-DD format - Display)
- Time (24-hour format)
- SV (setpoint temperature)
- PV (present value temperature)

This assembly of data is defined as one (1) record.

In generation 2 and 3 (AKA UI1.0.0) controller firmware, when one of five (5) issue/fault types (see Section 6.2.4) is triggered, the following information is recorded by the controller and placed in the alarm history.

- Date (YY-MM-DD format)
- Time (24-hour format)
- Issue/Fault (See Section 6.2.4)

Each collection of date, time, and issue/fault becomes one (1) record.

5.2 Storage Capacity

The controller stores the recorded information in its memory and simultaneously sends it to the data logger's memory.

The controller's memory holds 50,000 records. These records include all temperature-related data collected while the controller is energized (power on), whether a program is running or not.

The data logger stores up to 500,000 records. In generation 1 and 2 firmware, the data logger only collects and stores those records collected while a program runs. However, the generation 3 (AKA UI1.0.0) firmware sends all power-on, temperature-related data to the data logger's memory.

The data logger can write up to 1.048 million records — the maximum number of rows in a Microsoft Excel spreadsheet — to an inserted USB drive as the program runs in generation 1 and 2 firmware. In generation 3 (AKA UI1.0.0) firmware, the data logger sends all power-on, temperature-related records to the USB drive as long as the drive is inserted into the port.

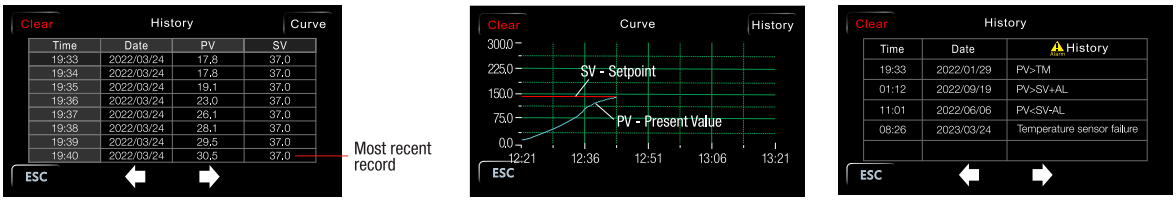
The controller starts overwriting its memory's existing data with new data upon collecting record 50,001. The data logger starts overwriting its memory upon collecting record 500,001.

DO NOT remove USB drive while the program runs. Data may be lost.

In generation 2 and 3 firmware, an alarm history record counts toward the 50,000 records held in the controller's memory.

5.3 Viewing Data

Lab technicians and administrators can view and review power-on, temperature-related, and alarm history data in real-time on the controller's display by entering the USER Data section of the operational settings. Viewing data as a program runs will not impact the program's operation.



Temperature-related data is viewable in two formats: table and curve. The alarm history data is presented in a table format. For more details see Sections 6.2.2, 6.2.3, and 6.2.4.

The temperature-related data home screen shows the most recent record at the bottom of the screen. The SV and PV are numeric-only with no unit of measurement.

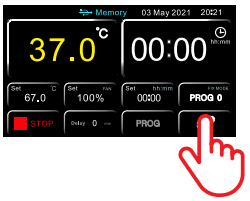
The screens of records are scrollable to view collected data back in time. The temperature curve is not. It shows one (1) hour of data.

The curve shows SV and PV as lines. SV is red, and PV is blue. Time is the X-axis in 15-minute divisions. Time advances every minute after collecting 1 hour of data after power is turned on.

For both the temperature-related data formats, during the program-not-running periods, the SV data collected is the temperature setting from the last program that ran. If a multi-step program is the previous program run, SV will be zero (0) since setpoints are only shown after a program has started. The PV data is the actual chamber temperature.

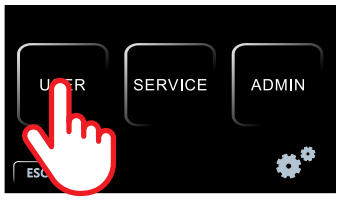
To view data use the following instructions.

Step 1: Enter the Operational Settings.



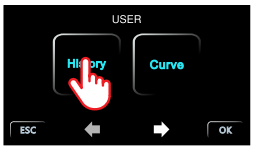
Press the Operational Settings (gears) button.

Step 2: Enter the USER Settings.

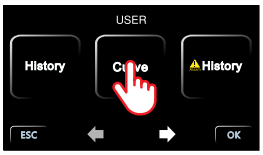


Press the USER settings button.

Step 3: Enter History, Curve, or Alarm History.



Generation 1.



Generation 2 & 3.

Press either the History, Curve or Alarm History Button.

5.4 Exporting Data

5.4.1 File Types

YH_CFG.txt: The controller instructions for the data type and quantity to export from the data logger's memory. A blank file is created when the user inserts an empty USB drive into the data collection port.

The user can remove the drive, edit and save it, and reinsert the drive, or they can create the file before inserting the drive the first time.

Program runs (Generation 1 & 2 firmware): Enter a numeric value for the last number of programs that have run to be exported.

Power ons (Generation 3 firmware): Enter a numeric value for the last number of times the oven's power has been turned on.

Start (R) / Stop (S): Enter a start and stop day and time.

R=yy-mm-dd-hh-mm (start date & time)
S=yy-mm-dd-hh-mm (stop date & time)

For example.

R=19-6-30-12-30 means 2019-June-30th at 12:30 (24-hour format)

Not entering a stop date and time in the instructions will cause the data logger to export data up to the date and time the USB drive is inserted.

YH_RS.csv: History data file based on the last X program runs (Generation 1 and 2 firmware) or power ons (Generation 3).

YH_RUN.csv: Data collected during a program run.

YH_TIME.csv: History data file based on a start and stop date and time.

In the file, each set of data collected starts with ‘New start!’.

	A	B	C	D
1	DATE	TIME	TEMP.PV	TEMP.SV
2				
3				
4	New start!			
5	22-03-24	19:33	17.8 C	37.0 C
6	22-03-24	19:34	17.8 C	37.0 C
7	22-03-24	19:35	19.1 C	37.0 C
8	22-03-24	19:36	23.0 C	37.0 C
9	22-03-24	19:37	26.1 C	37.0 C

Figure 5.2. This example table shows the headings and data for five records in an exported CSV file.

It indicates.

Generation 1 and 2 firmware: Start of a program run.

Generation 3 firmware: Power was turned on.

The data files don’t require large amounts of USB disk space. An approximately 5,000 record file is around 120Kb.

5.4.2 Collecting Data During Program Run

Users can collect up to 1.048 million records of temperature-related data as a program runs. This is ideal for long-term experiments. To collect data, use the following instructions.

Step 1: Turn the oven’s power on if it isn’t already on. Wait for the controller to boot up.

Step 2: Open the USB port door.

Step 3: Insert the USB drive into the oven’s USB port.

Step 4: Select a fixed or multi-step program and set its parameters while the USB drive light flashes and turns steady.

Step 5: When the drive light is on continuously, press START.

When the program has timed out or the user presses STOP, data collection will stop, and the drive can be removed. The drive will have two files, YH_CFG.txt and YH_RUN.csv. Your data is found in the YH_RUN.csv file.

5.4.3 Collecting Data History by Date

This data history collection option lets the user extract all the temperature-related data between two dates. To collect data, use the following instructions.

Step 1: Create a YH_CFG.txt file or edit an existing one.

Input the start (R) and end (S) values as

R=yy-mm-dd-hh-mm (start date & time)
S=yy-mm-dd-hh-mm (stop date & time)

For example

R=19-6-30-12-30 means 2019-June-30th at 12:30 (24-hour format)

See Section 5.4.1 for more details.

Step 2: Open the USB door.

Step 3: Insert a USB drive into the oven's USB port.

Step 4: Wait for the blinking drive light to turn solid.

Step 5: Remove the USB drive.

The USB drive will have an updated YH_CFG.txt file and YH_RS.csv and YH_TIME.csv files. Your data is found in the YH_TIME.csv file.

5.4.4 Collecting Data History by Number of Program Starts or Power-ons

This data history collection option allows the user to extract all the temperature-related data for the last X number of program starts (generation 1 & 2 firmware) or power-ons (generation 3 firmware). To collect data, use the following instructions.

Step 1: Create a YH_CFG.txt file or edit an existing one.

Input a number ≥ 1.

See Section 5.4.1 for more details.

Step 2: Open the USB door.

Step 3: Insert a USB drive into the oven's USB port.

Step 4: Wait for the blinking drive light to turn solid.

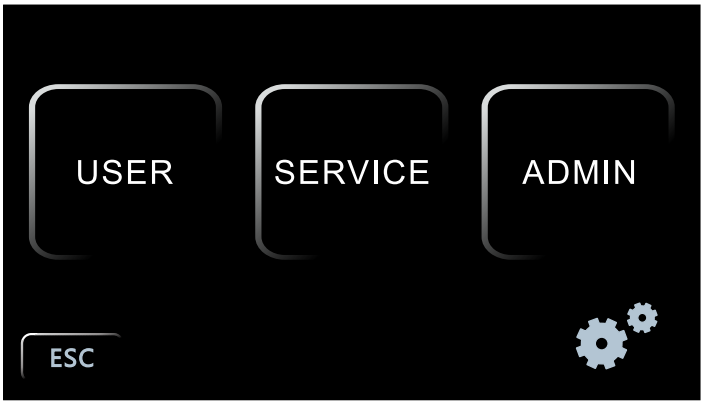
Step 5: Remove the USB drive.

The USB drive will have an updated YH_CFG.txt file and a YH_RS.csv file. Your data is found in the YH_RS.csv file.

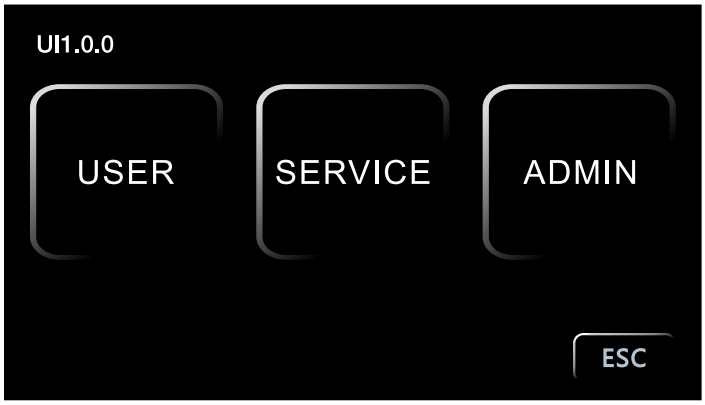
6.0 Operational Settings Screens and Parameters

This section provides detailed information on all the screens available to the oven's user, how to navigated through the screens, and the parameters that can be viewed or changed.

6.1 Operational Settings Home Screen



Generation 1 and 2.



Generations 3.

After pressing the Operational Settings button on the controller's home screen, the Operational Settings home screen will appear. This will allow the user to choose the oven's USER, SERVICE, or ADMIN settings.

USER: This section is not password protected. Any user at any time can enter this section of the controller. This section allows the user to::

- access stored operation data (time, date, PV (Present Value), and SV (Setpoint) temperatures,
- sets the controller's date and time, turns off USB data collection, and view the oven's running hours, temperature limits, RUN delays, and multi-step program cycling, and
- allows adjustments to alarm and calibration parameters.

SERVICE: **This section is password protected.** This section allows the oven's administrator to change parameters that will affect the oven's accuracy, efficiency, and effectiveness, along with changing the unit of measurement.

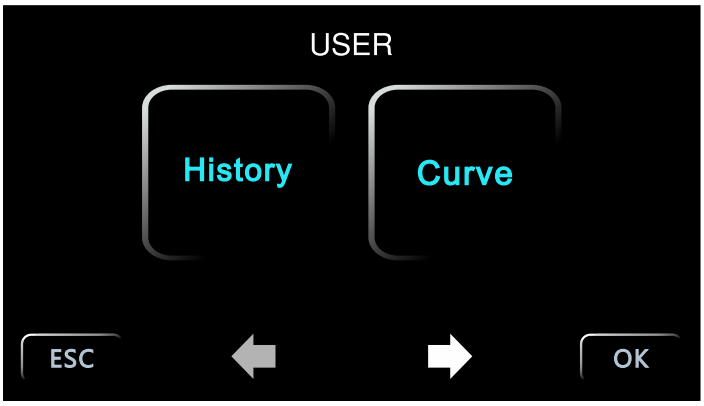
ADMIN: **This section of the controller's operational settings is password protected and only for BEING authorized service personnel.**

Pressing the ESC button takes you back to the controller's home screen.

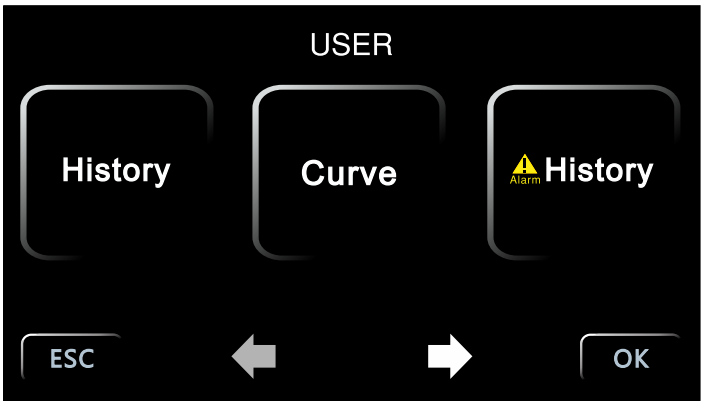
Starting January 2023, with the 3rd generation of the oven, the firmware will be updateable through the data logging's USB Port. Your oven's firmware version is located above the USER button.

6.2 User Settings

6.2.1 Screen 1 | Operational Data Home



Generation 1.



Generations 2 and 3.

Upon pressing the USER level settings button, the user will arrive to the oven's stored operational data home screen. Depending on the oven generation the user will see 2 or 3 data options to choose from.

History: Time, date, PV (Present Value) temperature, and SV (Setpoint temperature) are presented in tabular format with the most recent collected data show in the bottom row.

Curve: PV (Present Value) temperature and SV (Setpoint temperature) are presented in graph format. PV is in real time.

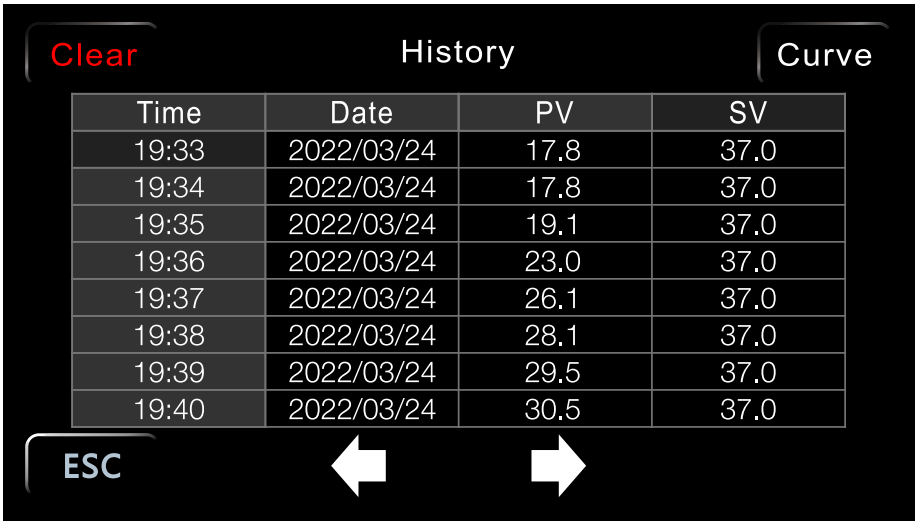
Alarm History: (Generation 2 and 3 units only) The time, date, and the fault alarm are shown in tabular format with the most recent alarm shown last.

Pressing the ESC button will take you back to the Operational Setting's home screen.

Pressing the FORWARD button will forward you to the date and time settings screen.

Pressing the OK button will take you back to the Operational Setting's home screen.

6.2.2 Screen 1 | History



The HISTORY screen allows the user to view the oven's setpoint and present value in a real time tabular format. The graph shows all data while the oven's power is on whether running a program or not.

The data is shown as values without ^{O}C or ^{O}F. The most current reading is the bottom row on the HISTORY home screen.

Pressing the ESC button will take you back to the Operational Setting's home screen.

Pressing the BACK button will scroll backward in time to view recorded and stored time, date, PV, and SV data.

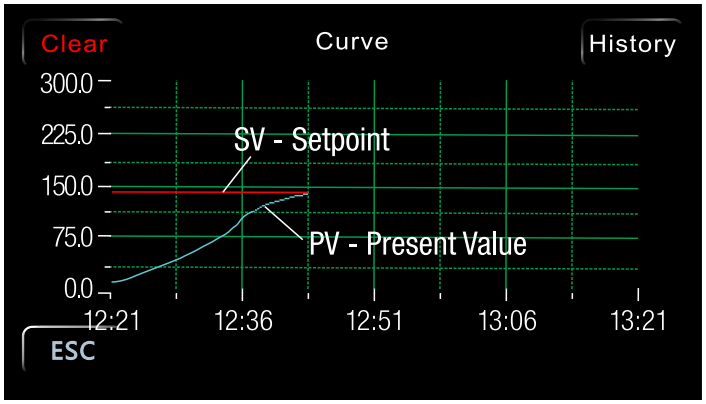
Pressing the FORWARD button will 1) scroll forward in time to view recorded and stored time, date, PV, and SV data, or 2) at the data history home screen forward you to the date and time screen.

Pressing the Curve button will take you to the oven's set temperature and present value shown as a curve in realtime.

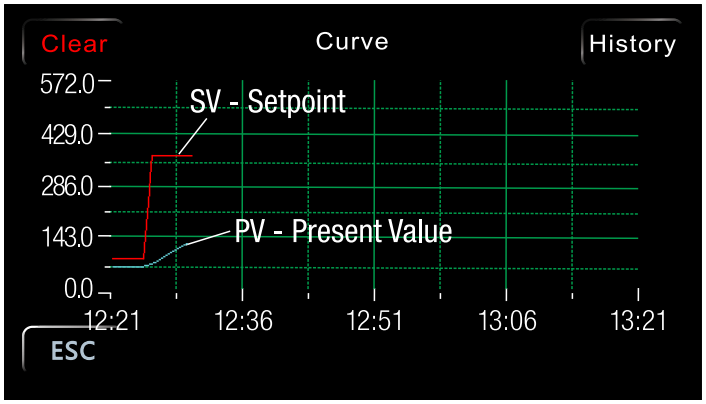
Pressing the Clear button will remove all stored data from the controller's memory, and allow you to start recording fresh data. This function is password protected since once pressed the process cannot be terminated and the stored data recovered.

The passcode to Clear the controller's memory of data points is 8888.

6.2.3 Screen 1 | Present Value vs Setpoint Curve - Real Time



Generation 1 & 2.



Generation 3.

The CURVE screen allows the user to view the oven's setpoint and present value in a real time line chart format. The graph shows all data while the oven's power is on whether running a program or not.

The time axis is broken into 15-minute divisions. The curve's timeline starts at the time the oven's power is turned on. For example, the screens above show the oven was turned on at 12:21. After collecting one (1) hour of data, the time will advance every minute, always showing 1 hour of data.

Generation 1 & 2: The temperature is only shown in ^{O}C with a 0.0 to 300. If running a program in ^{O}F the setpoint and PV will run off the graph unless their values are under 300.

Generation 3: The temperature axis switches between ^{O}C and ^{O}F. The ^{O}C values are shown from -20 to 300, and ^{O}F are shown from 0.0 to 572.

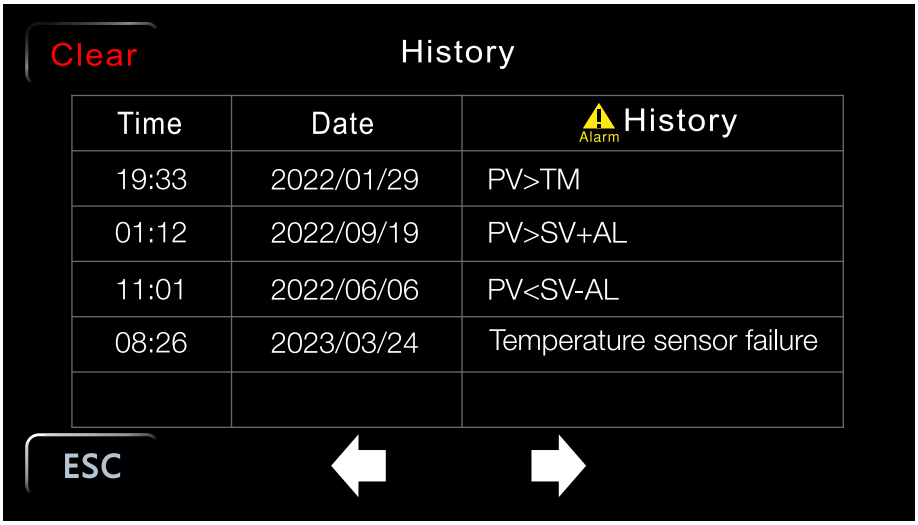
Pressing the ESC button will take you back to the Operational Setting's home screen.

Pressing the Curve button will take you to the oven's set temperature and present value shown as a curve in realtime.

Pressing the Clear button will remove all stored data from the controller's memory, and allow you to start recording fresh data. This function is password protected since once pressed the process cannot be terminated and the stored data recovered.

The passcode to Clear the controller's memory of data points is 8888.

6.2.4 Screen 1 | Alarm History



Users can examine the Alarm History screen to determine what type of alarm is firing or has previously fired. If no data is shown, no flaws have occurred.

Five (5) alarm types could be shown.

Shown on screen	Issue/Fault
PV>TM	The oven's temperature exceeds the maximum temperature (tM) setting allowed
PV>SV+AL	High temperature deviation from setpoint
PV<SV-AL	Low temperature deviation from setpoint
Temperature sensor failure	The temperature sensor failed or is out of measurement range
Ambient temperature over 55°C	Control board's ambient temperature exceeds 55°C

Pressing the ESC button will take you back to the Operational Setting's home screen.

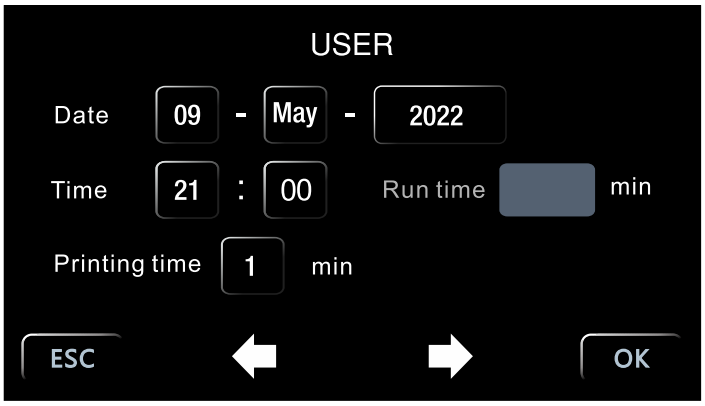
Pressing the BACK button will scroll backward in time to view recorded and stored time, date, and alarm message.

The FORWARD button is only active when there are more than five (5) alarms and you have already scrolled backward in time.

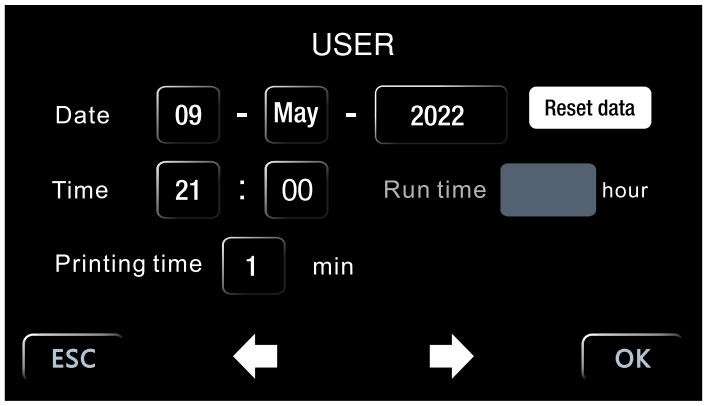
Pressing the Clear button will remove all stored data from the controller's memory, and allow you to start recording fresh data. This function is password protected since once pressed the process cannot be terminated and the stored data recovered.

The passcode to Clear the controller's memory of data points is 8888.

6.2.5 Screen 2 | Date & Time



Generation 1 and 2.



Generations 3.

This screen manages the controller's date, time, and data collection.

Date: Inputted in DD-MMM-YYYY format. **Time:** Based on a 24-hour format.

Run time: Shows the number of hours the oven has run. It's not a changeable field.

Printing time: Data logging related. It **MUST** be set to 1 for data to be sent to the USB data collection port.

Pressing the ESC button will take you back to the Operational Setting's home screen without recording any parameter change(s).

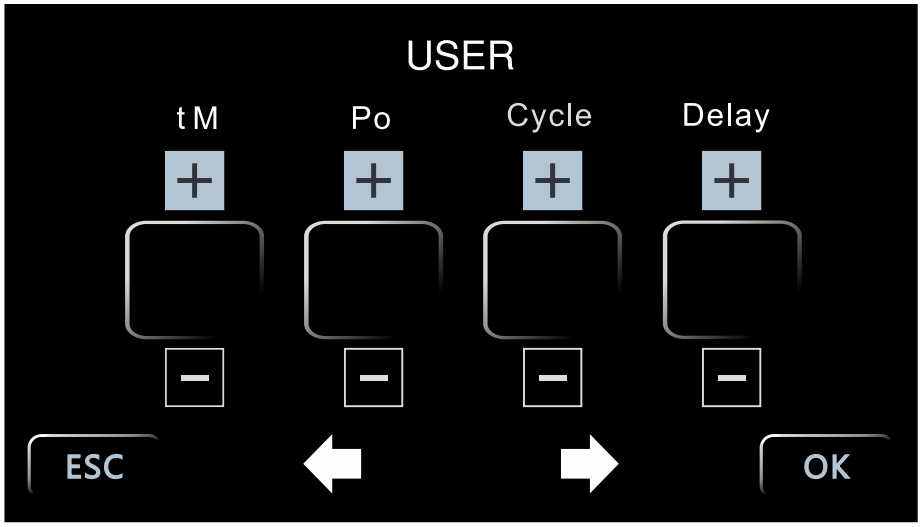
Pressing the BACK button will forward you to the date and time settings screen 1 | Home screen.

Pressing the FORWARD button will forward you to the date and time settings screen.

Pressing the OK button registers the parameter change(s) and takes you back to the Operational Setting's home screen.

Pressing the Reset data button will take the controller back to uncalibrated status, including all setting parameters, menus, and PID.

6.2.6 Screen 3 | tM, Po, Cycle, Delay Parameters



PROMPT	FUNCTION NAME	FUNCTION RANGE	EXPLANATION	INITIAL VALUE
tM	Maximum Allowable Temperature Setting	Set within the measuring range	Stop heating and alarm when the maximum temperature is exceeded **NOTE:** Automatically switches values based on the CF parameter setting.	^{0}C: 300 ^{0}F: 572
Po	Power-up Mode	0 – 2	Po=0000: Controller is in a stopped state after power-on. User must start the operation by pressing the START button. Po=0001: Controller automatically starts the step operation after power-on. Po=0002: Controller starts running from the last power-off.	0
Cycle	No. of Cycles	0 – 99	Controls number of times a multi-step program runs. When Cycle is 0, the instrument has been running between the work groups. When Cycle **IS NOT** 0, the instrument will automatically stop after cycling Cycle times in the work group. The value will automatically return to 1 after shutdown.	0
Delay	Run Delay	00:00 – 99:59 (hh:mm)	00:00 - No delay. Other values - Start of a program will be delayed by the time set after pressing the START button.	0

This parameter impacts the BOF Series mechanical (forced air) convection oven's operation. This parameter is not applicable to the BOF Series mechanical (forced air) convection oven's operation.

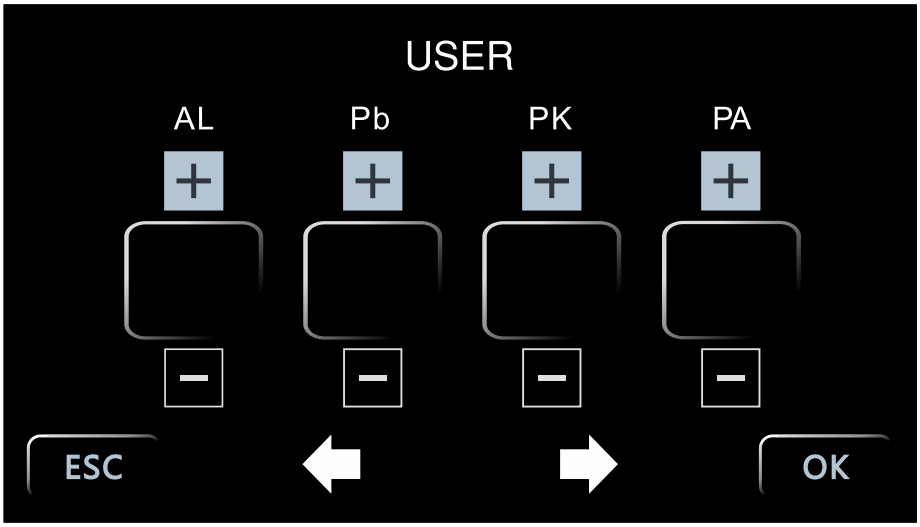
Pressing the ESC button will take you back to the Operational Setting's home screen without recording any parameter change(s).

Pressing the BACK button will forward you to the date and time settings screen 2.

Pressing the FORWARD button will forward you to the parameter settings screen 4.

Pressing the OK button registers the parameter change(s) and takes you back to the Operational Setting's home screen.

6.2.7 Screen 4 | AL, Pb, PK, PA Parameters



PROMPT	FUNCTION NAME	FUNCTION RANGE	EXPLANATION	INITIAL VALUE
AL	Alarm Setting	0.0 – 100.0	Alarm illuminates with audible output (and HOLD function) when the temperature exceeds the Setpoint+AL value.	15.0
Pb	Zero Adjustment (Intercept)	-100.0 – 100.0	When the zero error of the meter is large and the full-scale error is small, adjust this value. Generally, PT100 rarely adjusts this value.	0
PK	Full Scale Adjustment (Slope)	-1000 – 1000	When the zero error of the meter is small and the full-scale error is large, adjust the value. PK=4000 x (mercury thermometer value-display value)/display value, generally PT100 fi rst adjust this value.	35
PA	Ambient Temperature Correction	-80 – 80	When there is an error between the actual ambient temperature and the controller display ambient temperature, adjust the value	0.0

This parameter impacts the BOF Series mechanical (forced air) convection oven's operation. This parameter is not applicable to the BOF Series mechanical (forced air) convection oven's operation.

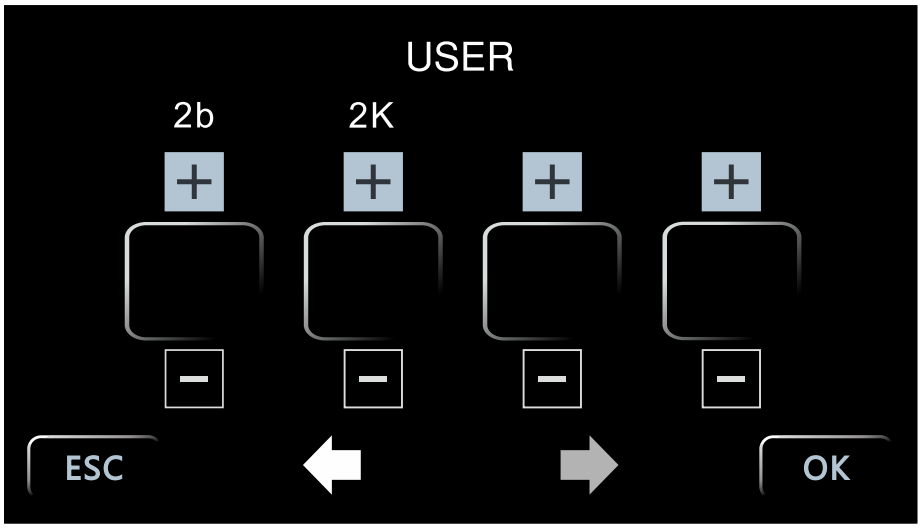
Pressing the ESC button will take you back to the Operational Setting's home screen without recording any parameter change(s).

Pressing the BACK button will forward you to the date and time settings screen 3.

Pressing the FORWARD button will forward you to the parameter settings screen 5.

Pressing the OK button registers the parameter change(s) and takes you back to the Operational Setting's home screen.

6.2.8 Screen 5 | 2b, 2K Parameters



PROMPT	FUNCTION NAME	FUNCTION RANGE	EXPLANATION	INITIAL VALUE
2b				0
2K				0

This parameter impacts the BOF Series mechanical (forced air) convection oven's operation. This parameter is not applicable to the BOF Series mechanical (forced air) convection oven's operation.

Pressing the ESC button will take you back to the Operational Setting's home screen without recording any parameter change(s).

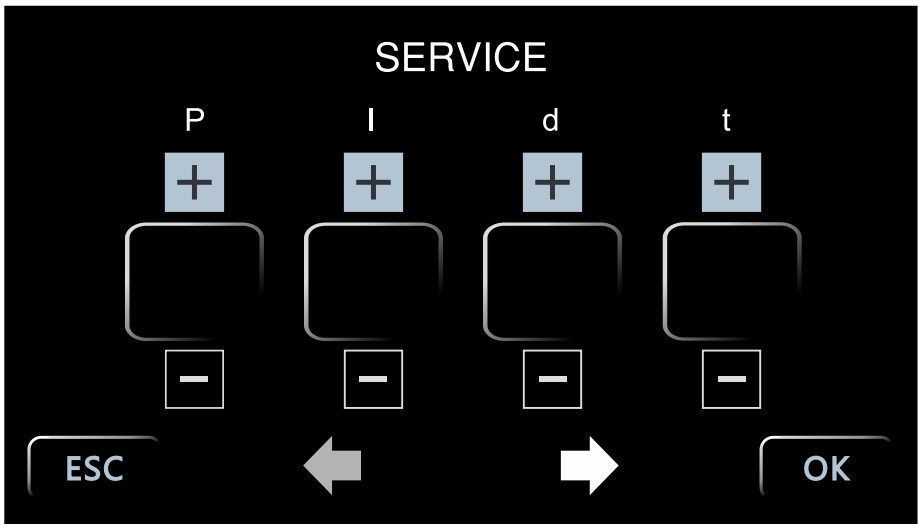
Pressing the BACK button will forward you to the date and time settings screen 4.

Pressing the OK button registers the parameter change(s) and takes you back to the Operational Setting's home screen.

6.3 Service Level

The Operational Settings' SERVICE section is password protected to protect against accidental changes to parameters that will affect the oven's accuracy, efficiency, and effectiveness. A user MUST use passcode 88 to enter this section.

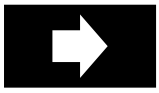
6.3.1 Screen 1 | P, I, d, t Parameters



PROMPT	FUNCTION NAME	FUNCTION RANGE	EXPLANATION	INITIAL VALUE
P	Proportional Band	2.0 – 300.0	Proportional effect adjustment, the greater the P, the smaller the proportional effect, the lower the system gain.	15
I	Integral Time	2 – 3600 seconds	Integral action time constant, the greater the I, the weaker the integral action.	300
d	Derivative Time	0 – 3600 seconds	Derivative action time constant, the greater the d, the stronger the derivative action.	300
t	Heating Cycle	1 – 100 seconds	Relay output <20s, SSR and thyristor switch <3s.	3

This parameter impacts the BOF Series mechanical (forced air) convection oven's operation. This parameter is not applicable to the BOF Series mechanical (forced air) convection oven's operation.

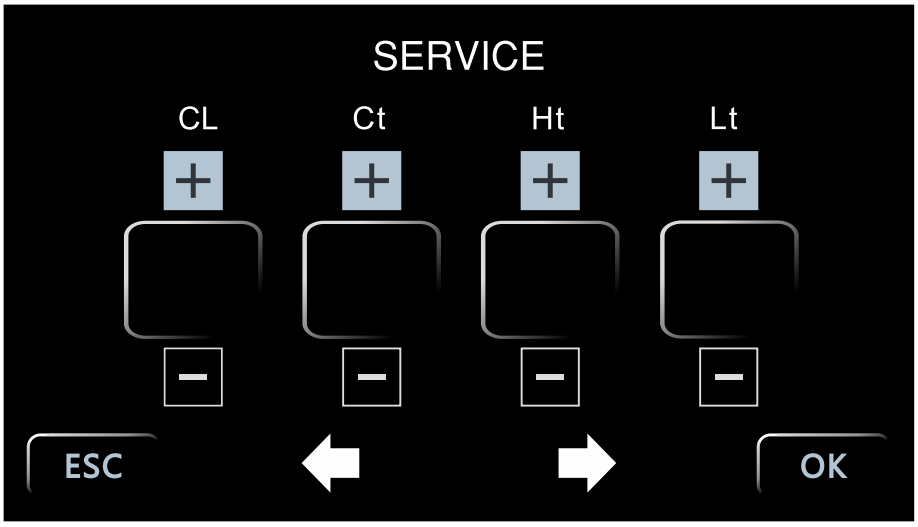
Pressing the ESC button will take you back to the Operational Setting's home screen without recording any parameter change(s).



Pressing the FORWARD button will forward you to the parameter settings screen 2.

Pressing the OK button registers the parameter change(s) and takes you back to the Operational Setting's home screen.

6.3.2 Screen 2 | CL, Ct, Ht, Lt Parameters

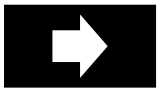


PROMPT	FUNCTION NAME	FUNCTION RANGE	EXPLANATION	INITIAL VALUE
CL	Cooling Control Set Up	-5.0 – 60.0	When the compressor is started and stopped for cooling, when the temperature exceeds the CL value and the compressor cooling control delay is met, the cooling light is on, the cooling contact is turned on, and the compressor is started.	45
Ct	Cooling Control Delay	0 – 300 seconds	The delay time required to start the compressor twice, Ct=0 cancels the compressor function.	0
Ht	Temperature Upper Limit Setting	(-80.0 – 320.0)	Set the upper limit of measurement temperature.	Celsius: 300 Fahrenheit: 572
Lt	Temperature Lower Limit Setting	(-80.0 – 320.0)	Set the lower limit of measurement temperature.	0

This parameter impacts the BOF Series mechanical (forced air) convection oven's operation. This parameter is not applicable to the BOF Series mechanical (forced air) convection oven's operation.

Pressing the ESC button will take you back to the Operational Setting's home screen without recording any parameter change(s).

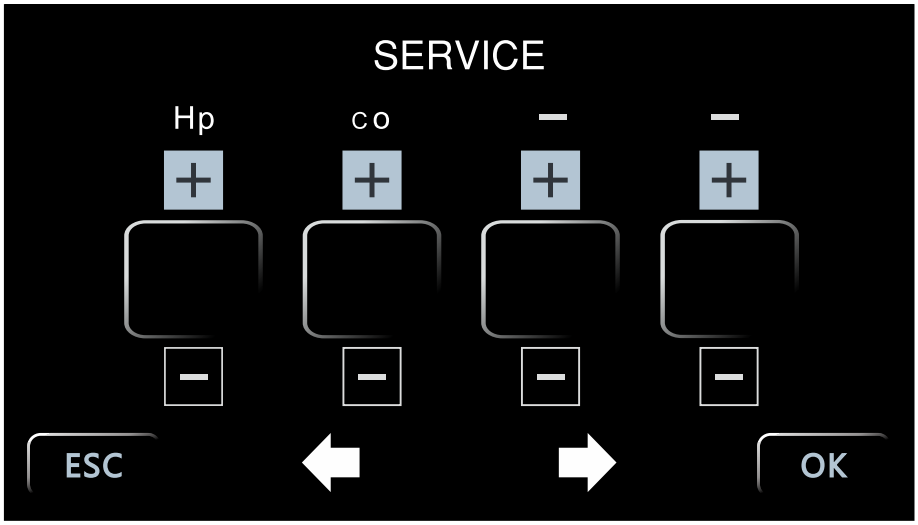
Pressing the BACK button will take you back to the parameter settings screen 1.



Pressing the FORWARD button will forward you to the parameter settings screen 3.

Pressing the OK button registers the parameter change(s) and takes you back to the Operational Setting's home screen.

6.3.3 Screen 3 | Hp, Co Parameters



PROMPT	FUNCTION NAME	FUNCTION RANGE	EXPLANATION	INITIAL VALUE
Hp	Overshoot Suspression	0 – 100%	Controller has stronger ability to suppress temperature overshoot when the value of Ar is smaller.	100
Co	Cooling Options	0 – 2	Co=0000: RUN/Stop type Co=0001: Balanced type, related to ambient temperature Co=0002: Balanced type, related to CL	0

This parameter impacts the BOF Series mechanical (forced air) convection oven's operation. This parameter is not applicable to the BOF Series mechanical (forced air) convection oven's operation.

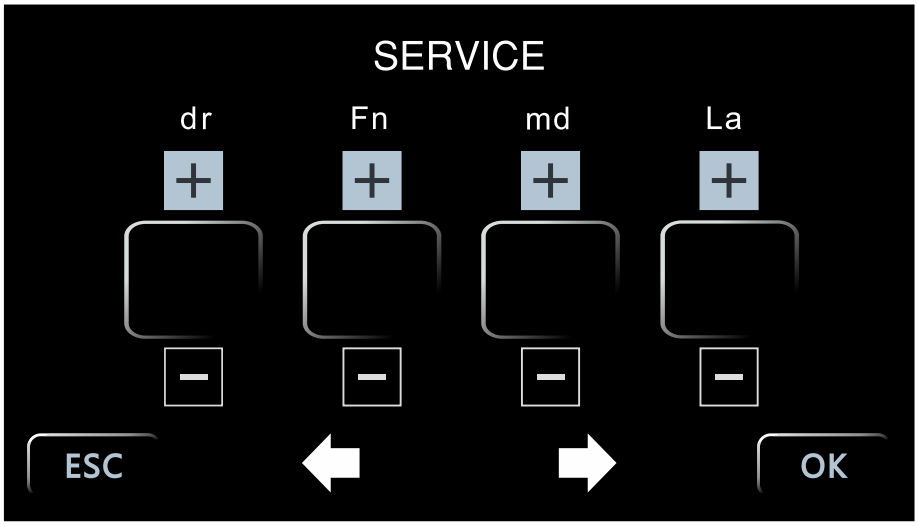
Pressing the ESC button will take you back to the Operational Setting's home screen without recording any parameter change(s).

Pressing the BACK button will take you back to the parameter settings screen 2.

Pressing the FORWARD button will forward you to the parameter settings screen 4.

Pressing the OK button registers the parameter change(s) and takes you back to the Operational Setting's home screen.

6.3.4 Screen 4 | dr, Fn, md, La Parameters

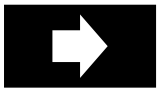


PROMPT	FUNCTION NAME	FUNCTION RANGE	EXPLANATION	INITIAL VALUE
dr	Gating Options	0 – 2	dr=0000: No gating; dr=0001: Close the door; dr=0002: Open the door	0
Fn	Fan Speed Conversion Value	0 – 300.0	• When the measured temperature is greater than the set temperature +Fn or when the measured temperature is less than the set temperature -Fn, the high-speed fan starts. • When the measured temperature is higher than the set temperature -Fn and the measured temperature is lower than the set temperature +Fn, the low-speed fan start. • This parameter is only valid when the circulating fan parameter md is selected as 0. Fn=0, no fan output; Fn=300.0, first gear fan output.	300
md	Circulation Fan Selection	0 – 1	md=0000: Automatic circulation fan md=0001: Manual circulation fan	1
LA	Lower Limit Absolute Value Alarm	Full Range	Alarm illuminates with audible output when the measured temperature is lower than this value.	10.0

This parameter impacts the BOF Series mechanical (forced air) convection oven's operation. **NOTE:** Parameters md, Fn, and FA are group parameters for fans. See table below. This parameter is not applicable to the BOF Series mechanical (forced air) convection oven's operation.

Pressing the ESC button will take you back to the Operational Setting's home screen without recording any parameter change(s).

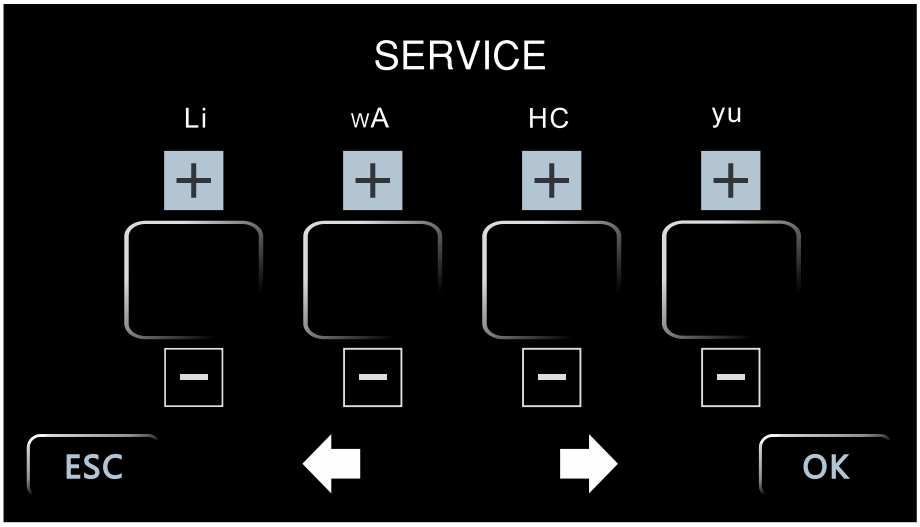
Pressing the BACK button will take you back to the parameter settings screen 3.



Pressing the FORWARD button will forward you to the parameter settings screen 5.

Pressing the OK button registers the parameter change(s) and takes you back to the Operational Setting's home screen.

6.3.5 Screen 5 I LI, wA, HC, yu Parameters



PROMPT	FUNCTION NAME	FUNCTION RANGE	EXPLANATION	INITIAL VALUE
Li	Program heating and cooling	0-1	Li=0:Free heating and cooling Li=1: Linear heating and cooling	0
wA	Water level input option	0-2	0: No input 1:Connected valid 2:Disconnected valid	0
HC	Compressor start and stop settings	0-1	0: Conpressor won't stop 1: When the measured temperature is lower than the set temperature 5 degrees, stop the compressor, and start the compressor after the temperature reaches the set value	1
yu	Cooling solenoid valve switching value	-80 to 320	When working, when the set or measured temperature is less than this value, the output is low; when the set or measured temperature is greater than or equal to this value, the output is high.	45

This parameter impacts the BOF Series mechanical (forced air) convection oven's operation. This parameter is not applicable to the BOF Series mechanical (forced air) convection oven's operation.

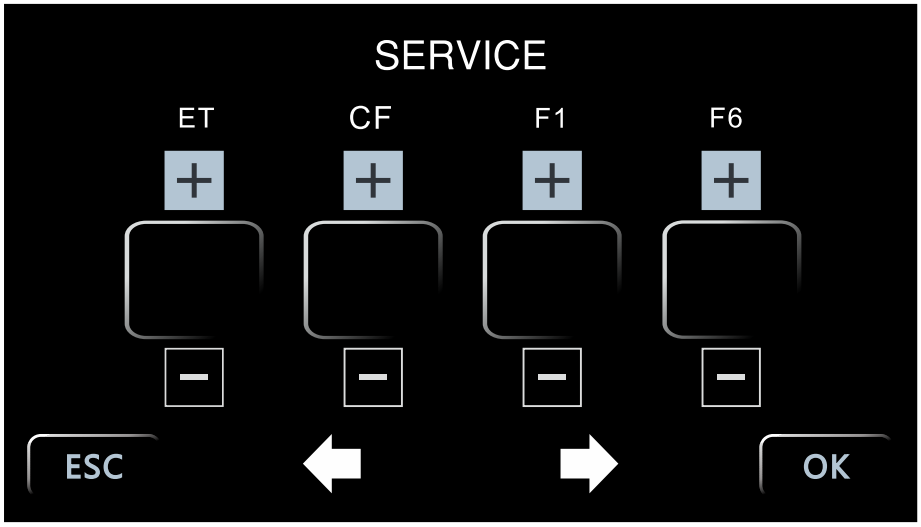
Pressing the ESC button will take you back to the Operational Setting's home screen without recording any parameter change(s).

Pressing the BACK button will take you back to the parameter settings screen 4.

Pressing the FORWARD button will forward you to the parameter settings screen 6.

Pressing the OK button registers the parameter change(s) and takes you back to the Operational Setting's home screen.

6.3.6 Screen 6 | ET, CF, F1, F6 Parameters



PROMPT	FUNCTION NAME	FUNCTION RANGE	EXPLANATION	INITIAL VALUE
ET				20
CF	Unit of Temperature Measurement	0 – 1	CF=0000: Celsius CF=0001: Fahrenheit	0
F1	OUT1 Output option	0-14	0: LA low temperature output 1: AL or tM alarm 2: cooling output 3: high-speed fan 4: medium-speed fan 5: low-speed fan 6: lighting 7: low output (for set temperature) 8: UV output 9: high Output (for set temperature) 10: LA high output 11: yu low output (for measurement temperature) 12: yu high output (for measured temperature) 13: Mu measurement low output 14: Mu measurement high output 15: Manual output (no Output indicator) 16: Manual output, no output indicator, output is forced to close due to lack of water or door opening.	8
F6	OUT6 Output option	0-14		7

This parameter impacts the BOF Series mechanical (forced air) convection oven's operation. This parameter is not applicable to the BOF Series mechanical (forced air) convection oven's operation.

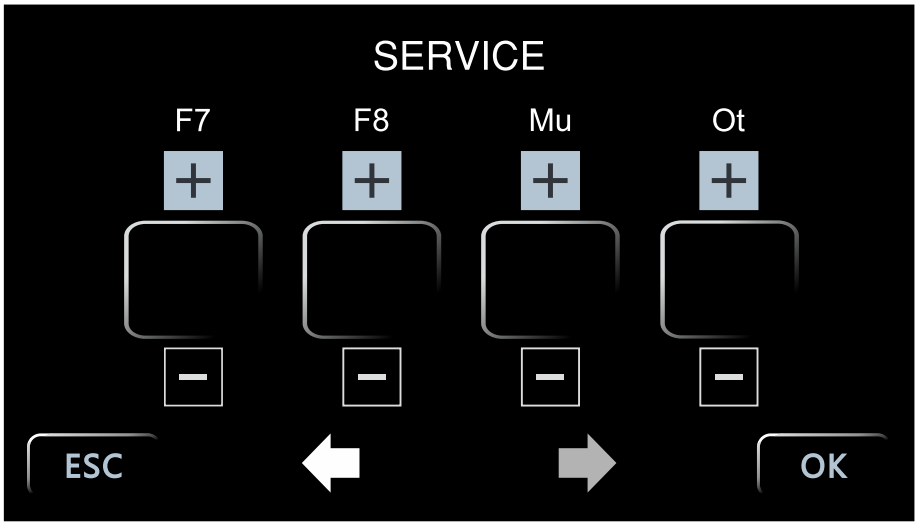
Pressing the ESC button will take you back to the Operational Setting's home screen without recording any parameter change(s).

Pressing the BACK button will take you back to the parameter settings screen 5.

Pressing the FORWARD button will forward you to the parameter settings screen 7.

Pressing the OK button registers the parameter change(s) and takes you back to the Operational Setting's home screen.

6.3.7 Screen 7 | F7, F8, Mu, Ot Parameters



PROMPT	FUNCTION NAME	FUNCTION RANGE	EXPLANATION	INITIAL VALUE
F7	OUT7 Output option	0-14	0: LA low temperature output 1: AL or tM alarm 2: cooling output 3: high-speed fan 4: medium-speed fan 5: low-speed fan 6: lighting 7: low output (for set temperature) 8: UV output 9: high Output (for set temperature) 10: LA high output 11: yu low output (for measurement temperature) 12: yu high output (for measured temperature) 13: Mu measurement low output 14: Mu measurement high output 15: Manual output (no Output indicator) 16: Manual output, no output indicator, output is forced to close due to lack of water or door opening.	0
F8	OUT8 Output option	0-14		0
Mu	Cooling solenoid valve switching value	-80 to 320	When working, when the measured temperature is less than this value, the output is low; when the measured temperature is greater than or equal to this value, the output is high.	45
Ot	allowable opening time	0-600 secs	When the door opening time exceeds Ot seconds, the buzzer will give an alarm, and the cooling fan will be stopped. If it is 0, there is no door open time exceeding alarm.	180

This parameter impacts the BOF Series mechanical (forced air) convection oven's operation. This parameter is not applicable to the BOF Series mechanical (forced air) convection oven's operation.

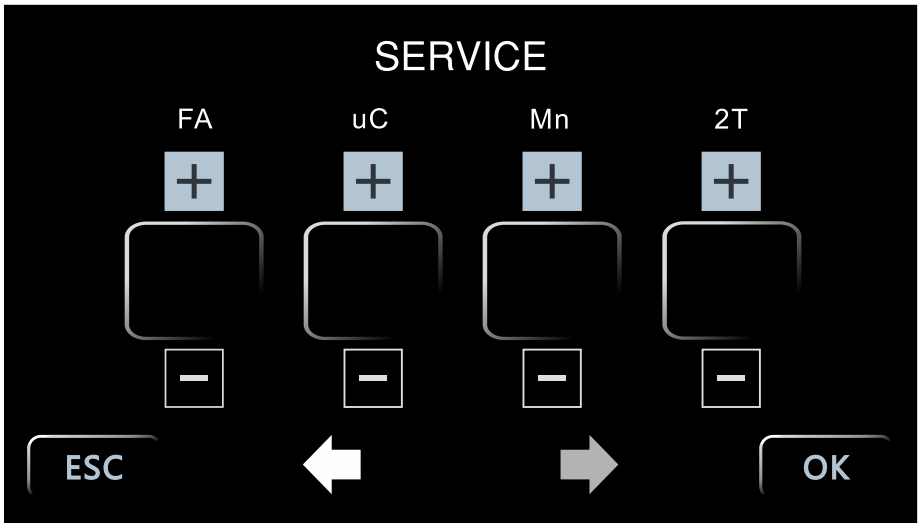
Pressing the ESC button will take you back to the Operational Setting's home screen without recording any parameter change(s).

Pressing the BACK button will take you back to the parameter settings screen 6.

Pressing the FORWARD button will forward you to the parameter settings screen 8.

Pressing the OK button registers the parameter change(s) and takes you back to the Operational Setting's home screen.

6.3.8 Screen 8 | FA, uC, Mn, 2T Parameters



PROMPT	FUNCTION NAME	FUNCTION RANGE	EXPLANATION	INITIAL VALUE
FA	Fan motor combination option	0-2	0:Low Speed or no Fan 1:Mid and low speed combination 2:High and low speed combination 3:High and mid speed combination,when md =1, this parameter is invalid.	0
UC	UV Light selection	0-1	0:No UV light 1: UV light is ready	0
MN				0
2T	Second temperature sensor	0-2	0: No second sensor connect 1: Second sensor used to test ambient temp 2: Second sensor used to test samples' temp	0

This parameter impacts the BOF Series mechanical (forced air) convection oven's operation. **NOTE:** Parameters md, Fn, and FA are group parameters for fans. See table below. This parameter is not applicable to the BOF Series mechanical (forced air) convection oven's operation.

Parameter	Parameter Group 1	Parameter Group 2	Parameter Group 3	Parameter Group 4	Parameter Group 5
md	1	0	0	0	0
Fn	N/A	0	1	2	3
FA	N/A	Fn=0 low speed Fn=150 mid speed Fn=300 high speed Fn=any other value, the fan will not work	**Medium and low combination:** 1) When the measured temperature is greater than the set temperature + Fn or when the measured temperature is less than the set temperature - Fn, the medium speed fan starts. 2) Otherwise the low speed fan starts.	**High and low combination:** 1) When the measured temperature is greater than the set temperature +Fn or when the measured temperature is less than the set temperature -Fn, the high-speed fan starts. 2) Otherwise, the low-speed fan starts.	**High and low combination:** 1) When the measured temperature is greater than the set temperature +Fn or when the measured temperature is less than the set temperature -Fn, the high-speed fan starts. 2) Otherwise, the medium-speed fan starts.
			Fn means Δ temperature (T) for these parameter groups.		
	Under special requirement	Mostly use on Ovens	Rarely use	Mostly use on heating and cooling incubators	

Pressing the ESC button will take you back to the Operational Setting's home screen without recording any parameter change(s).

Pressing the BACK button will take you back to the parameter settings screen 7.

Pressing the OK button registers the parameter change(s) and takes you back to the Operational Setting's home screen.

7.0 Troubleshooting and Maintenance

7.1 Troubleshooting

SYMPTONS	POSSIBLE CAUSES	REMEDIES
Controller display (touchscreen) is not illuminated.	1. Electrical receptacle (outlet) is not energized. 2. Power cord is not properly connected.	1. Check the outlet's circuit breaker. 2. Check the oven's plug. Ensure it is seated fully.
	1. Power cord is broken 2. Power cord is not properly connected.	1. Check power cord for broken wires or terminals. 2. Check the oven's plug. Ensure it is seated fully.
	1. Power switch is not turned on. 2. Power switch is broken.	1. Turn the power switch on. 2. Conduct BEING or local distributor to have a BEING-authorized service technician repair or replace the switch.
	1. Oven's circuit breaker wasn't turned on. 2. Oven's circuit breaker is tripped.	1. Check circuit breaker status and turn on. 2. If the circuit breaker trips after energization, check the power switch, heater, or temperature controller for a short-circuit or leakage (insulation resistance of 0) and restart after repairing.
'Temperature sensor failure' error message appears on the screen.	1. Sensor is defective 2. Wiring burnt or broken at sensor 3. Wiring disconnected	1. Check wiring and reconnect. 2. Repair or replace the Pt100 sensor.
Oven is not heating.	1. START wasn't pushed. 2. Program timer wasn't set up. 3. Program timer expired.	Refer to Section 5.
	Controller failed. No signal voltage output to heating element relay.	Replace controller.
	Heating element relay failed. No output voltage.	Replace relay.
	Over-temperature switch was tripped.	Reset the switch.
	Heating element failed.	Replace heating element.
	Temperature setpoint is lower than the chamber temperature.	Open the door until the internal temperature is lower than the setting temperature.
	Fan is not working.	Replace the fan motor.
	Pt100 thermocouple's resistance becomes large.	Reconnect thermocouple.
	Ar, P & other parameters are not set correctly.	Reset these parameters.
	Pb & Pk parameters adjusted incorrectly.	Calibrate the unit to set Pb & Pk correctly.
Temperature control is inaccurate (static difference is large).	The difference between room temperature and set temperature is less than 10^0C (18^0F).	Ensure minimum temperature setpoint is ambient+10^0C (18^0F).
Abnormal noise.	1. Fan motor is defective. 2. Lacks lubricating oil.	1. Replace fan motor. 2. Add lubricating oil.
	Fan blade is rubbing against on rear air duct plate.	Repair or add washer.
Date (Year) on controller display reads 2000.	Battery on controller display failed.	Replace battery.
Inaccurate date and time information in CSV file.	Battery on data logger failed.	

7.2 Preventive Maintenance

7.2.1 Calibration

The oven's touchscreen controller should be calibrated at least once per year. More frequent calibration may be need if the unit is set to a singular setting for long periods.

7.2.2 Cleaning

7.2.2.1 Cleaning the Exterior

All surfaces should be cleaned regularly per laboratory protocols. These surfaces can be cleaned with any all-purpose cleaner. The cleaner should be sprayed onto a soft, non-abrasive cloth, making it moist but not wet.

7.2.2.2 Cleaning the Chamber

The chamber surfaces are 304 stainless steel. They should be cleaned regularly per laboratory protocols using a non-corrosive cleaner (soapy water, stainless steel cleaner/polish, or like) and a soft, non-abrasive cloth, making it moist but not wet.

Step 1: Disconnect Power.

Turn the power switch and circuit breaker off. Unplug the power cord if necessary.

Step 2: Remove Shelves, Shelf Brackets, and Bracket Hangers.

Step 3: Moisten Cloth.

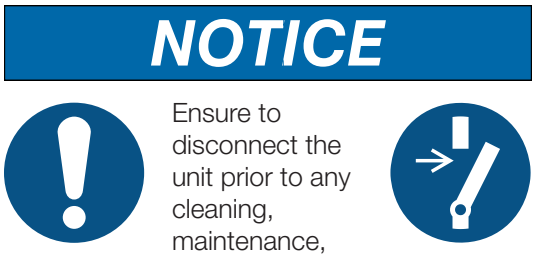
Spray cleaning solution onto a soft, non-abrasive cloth. Ring out excessive cleanser.

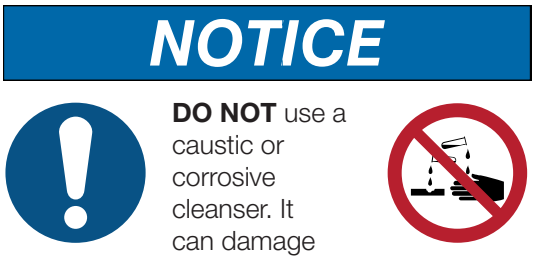
Step 4: Clean, Rinse, and Dry all Surfaces.

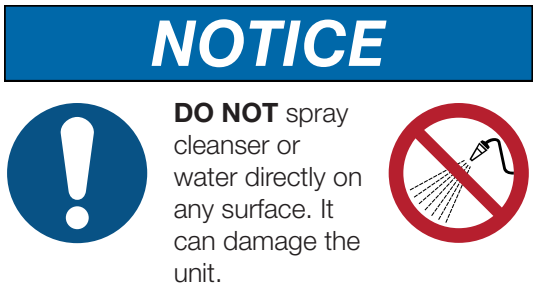
Clean shelves, shelf brackets, bracket hangers, and chamber walls. Rinse all surfaces with a clean moist cloth. Dry all surfaces.

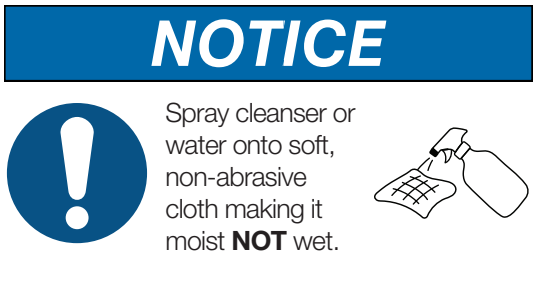
Step 5: Reassemble Chamber.

Step 6: Reconnect Power.









7.2.2.3 Cleaning the Electronics

To maintain the proper and efficient functioning of the oven, periodic cleaning of the oven's electronics should be performed to prevent dust buildup that can damage the electronics. When the oven is used in an environment with a pollution level greater than 2 that is prescribed for the oven, cleaning should be performed more frequently.

Use compressed air or vacuum cleaner with soft brush attachment to clean the electronics. It is recommended to wear appropriate personal protective devices to prevent inhalation of dust particles.

Step 1: Disconnect Power.

Turn the power switch and circuit breaker off. Unplug the power cord if necessary.

Step 2: Remove Access Panel.

Use Phillips screwdriver to remove the two (2) screws holding the access panel in place.

Step 3: Clean Electrical Panel.

Spray compressed air on all electronic components and the chamber itself or use vacuum cleaner with soft bristle brush attachment.

Step 4: Reattach Access Panel.

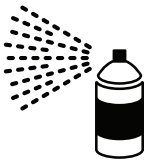
Step 5: Reconnect Power.

NOTICE

Ensure to disconnect the unit prior to any cleaning, maintenance, or repair.

NOTICE

Use canned compressed air to clean dust and debris in electrical panel and its electronics.



7.2.2.4 Cleaning Before Returning Unit

If, for any reason, the oven is returned to BEING or your local authorized distributor, and specimens have been placed in the chamber, the user **MUST** clean all surfaces and decontaminate them of any potential pathogens before packaging the unit for shipment.

7.2.3 Storage

If the unit will not be used for extended periods, the circuit breaker should be turned off, the power cord unplugged from the electrical receptacle, and the oven should be covered.

The controller's date and time will become inaccurate due to battery drain from long periods of nonuse. During storage, the oven's power should be turned on periodically for several minutes to maintain battery life.

8.0 Appendix

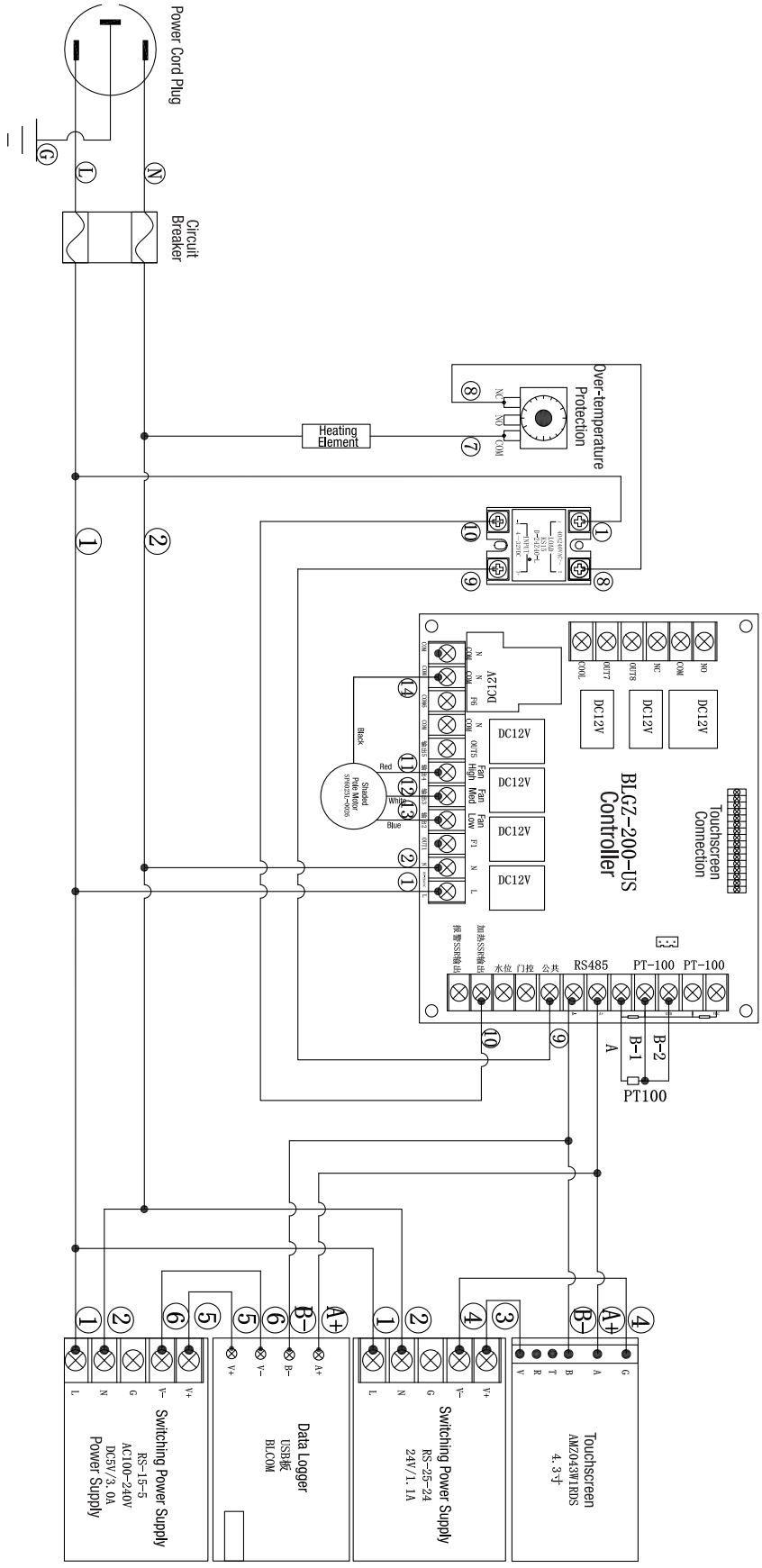
8.1 Specifications

Model	BOF-30T	BOF-50T	BOF-120T	BOF-200T	BOF-400T
Chamber Volume (ft^3 / L)	1.05 / 30	1.8 / 51	4.2 / 121	7.5 / 211	14.1 / 400
Operating Environment	Indoors				
Environ. Temp. Range	41°F to 95°F / 5°C to 35°C				
Rel. Humidity (%RH)	≤80%				
Atmospheric Pressure	11.6 psi – 15.4 psi / 80kPa – 106kPa				
Pollution Degree*	≤2				
Exposure	No direct sunlight or direct radiation from other heat sources No explosive gas (high concentration or weakened)				
Oper. Temp. Range	Ambient + 18°F - 572°F / Ambient + 10°C - 300°C				
Uniformity (@100°C)	±1.5	±2.5	±3.0	±3.0	±3.5
Temperature Stability	±0.5 (@100°C)				
Time to reach 100°C	30 min		40 min		
Controller Type	PID w/ touch capative display				
Display Resolution	0.1				
Data Collection	USB-A port				
Fan Speed	3-speed DC Brushless Motor (100%, 75% & 50%)				
Timer (hh:mm)	Infinite (00:00) or 00:01 – 99:59				
Electrical Requirement	120V/60Hz	120V/60Hz	120V/60Hz	240V/60Hz/1Ø	240V/60Hz/1Ø
Electrical Plug Type	NEMA 5-15	NEMA 5-15	NEMA 5-20	NEMA 6-15	NEMA 6-20
Power Consumption	900W	1100W	2050W	2500W	3200W
Safety Features	over-temperature protection, temperature limit protection, over-current protection, power off memory, and anti-scalding protection				
Stackable	–	•	•	–	–
Shelves (Std. / Max.)	2 / 5	2 / 9	3 / 12	3 / 16	3 / 16
Shelf Part Number	P19267	P19193	P19194	P19248	
Shelves Loading (lb / Kg)	44.1 / 20				
Internal Dimension (W×H×D) (in / mm)	12.6 × 12.6 × 11.6 320 × 320 × 295	15.8 × 16.3 × 12.2 400 × 415 × 310	20.5 × 20.9 × 17.3 520 × 530 × 440	25.6 × 25.6 × 19.6 650 × 650 × 500	39.3 × 31.4 × 19.6 1000 × 800 × 500
External Dimension (W×H×D) (in / mm)	24.0 × 21.3 × 21.7 610 × 540 × 550	27.2 × 25.2 × 22.1 690 × 640 × 560	31.9 × 29.7 × 27.0 810 × 755 × 685	37.0 × 34.4 × 29.5 940 × 875 × 750	50.6 × 41.7 × 29.6 1285 × 1060 × 750
Net Weight (lb / Kg)	94.8 / 43	112.4 / 51	183.0 / 83	246.9 / 112	463.0 / 210
Catalog number	BO212030U	BO212050U	BO212120U	BO212200C	BO212400C

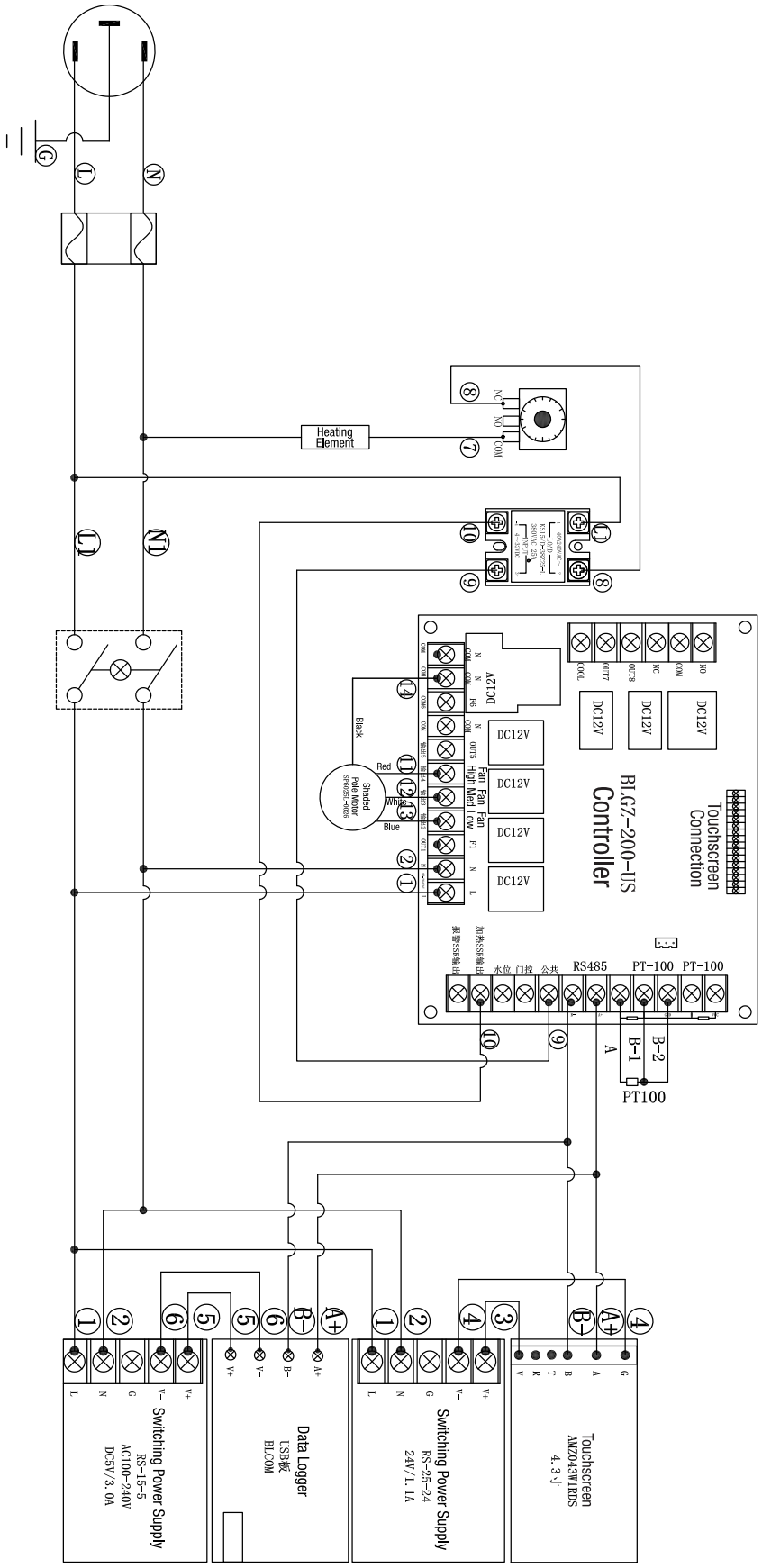
*Pollution degree is per IEC 60947-1 and IEC 60664-1.

8.2 Electrical Schematics

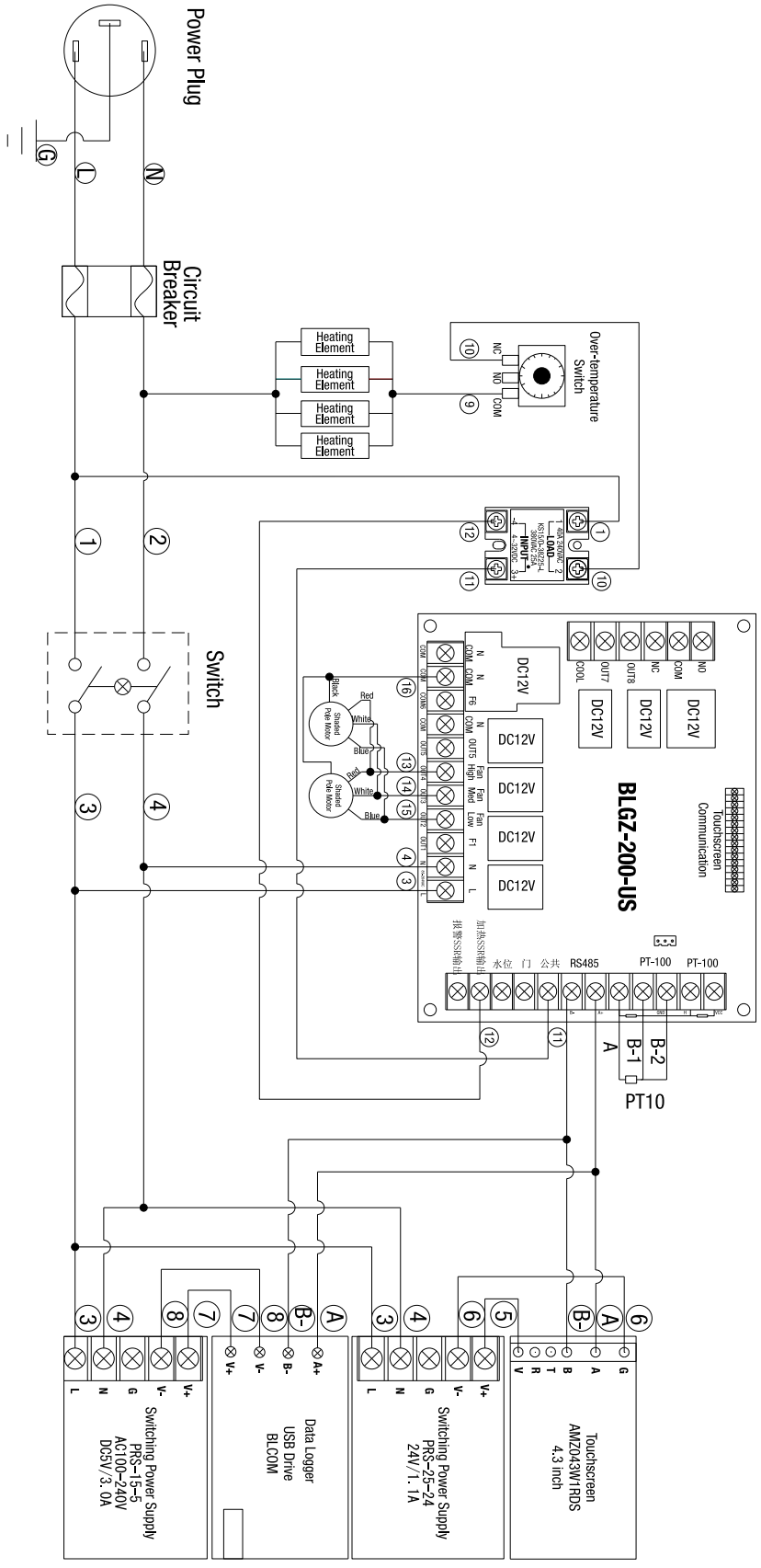
8.2.1 **BOF-30T to BOF-200T** - Generation 1



8.2.2 **BOF-30T to BOF-200T** - Generation 2 & 3

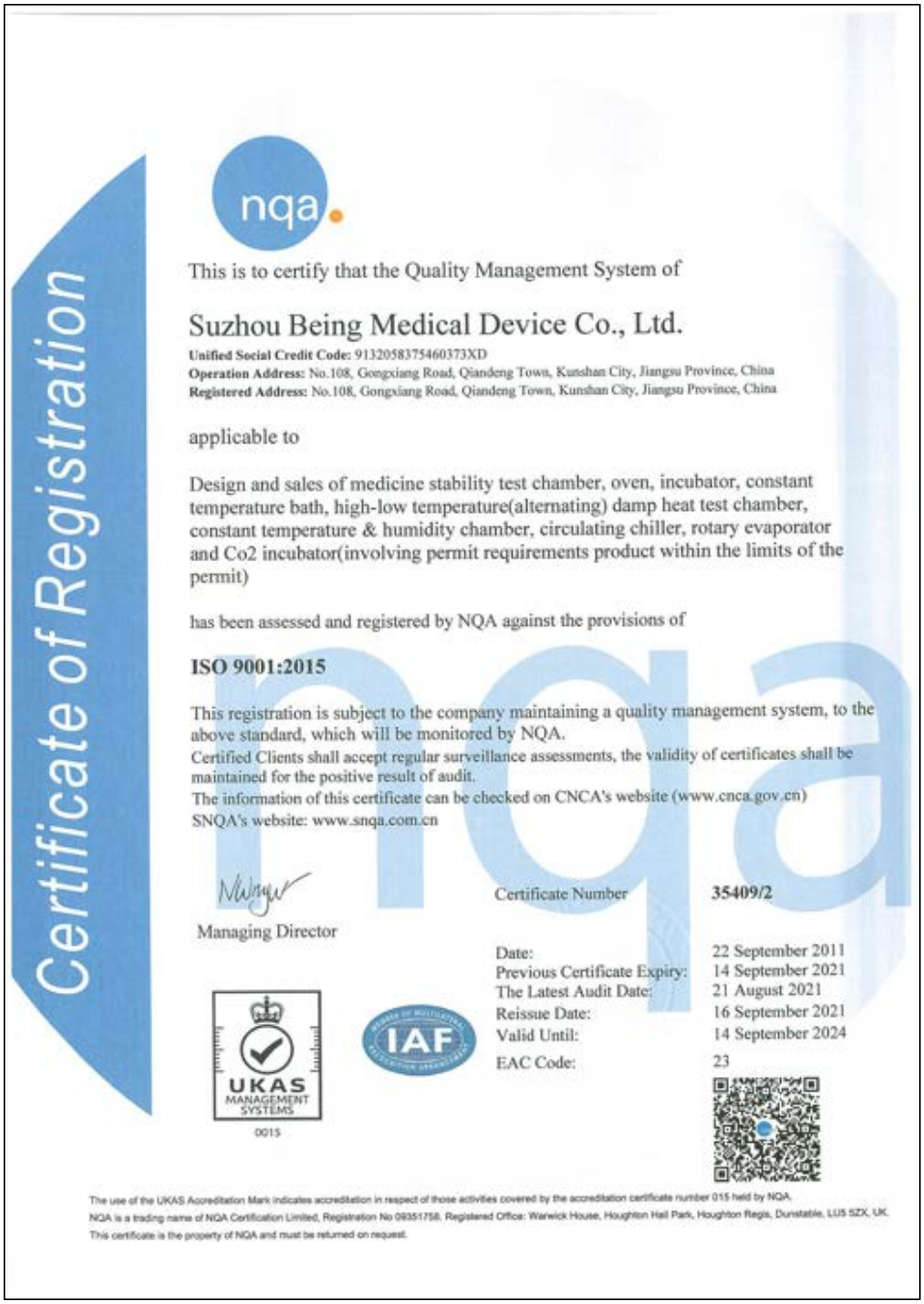


8.2.3 **BOF-400T** - Generation 2 & 3



8.3 Certification and Certificates

8.3.1 ISO 9001 Certificate



Certificate of Registration

nqa.

This is to certify that the Quality Management System of

Suzhou Being Medical Device Co., Ltd.

Unified Social Credit Code: 9132058375460373XD
Operation Address: No.108, Gongxiang Road, Qiandeng Town, Kunshan City, Jiangsu Province, China
Registered Address: No.108, Gongxiang Road, Qiandeng Town, Kunshan City, Jiangsu Province, China

applicable to

Design and sales of medicine stability test chamber, oven, incubator, constant temperature bath, high-low temperature(alternating) damp heat test chamber, constant temperature & humidity chamber, circulating chiller, rotary evaporator and Co2 incubator(involving permit requirements product within the limits of the permit)

has been assessed and registered by NQA against the provisions of

ISO 9001:2015

This registration is subject to the company maintaining a quality management system, to the above standard, which will be monitored by NQA.
Certified Clients shall accept regular surveillance assessments, the validity of certificates shall be maintained for the positive result of audit.
The information of this certificate can be checked on CNCA's website (www.cnca.gov.cn)
SNQA's website: www.snqa.com.cn

Managing Director

Certificate Number **35409/2**

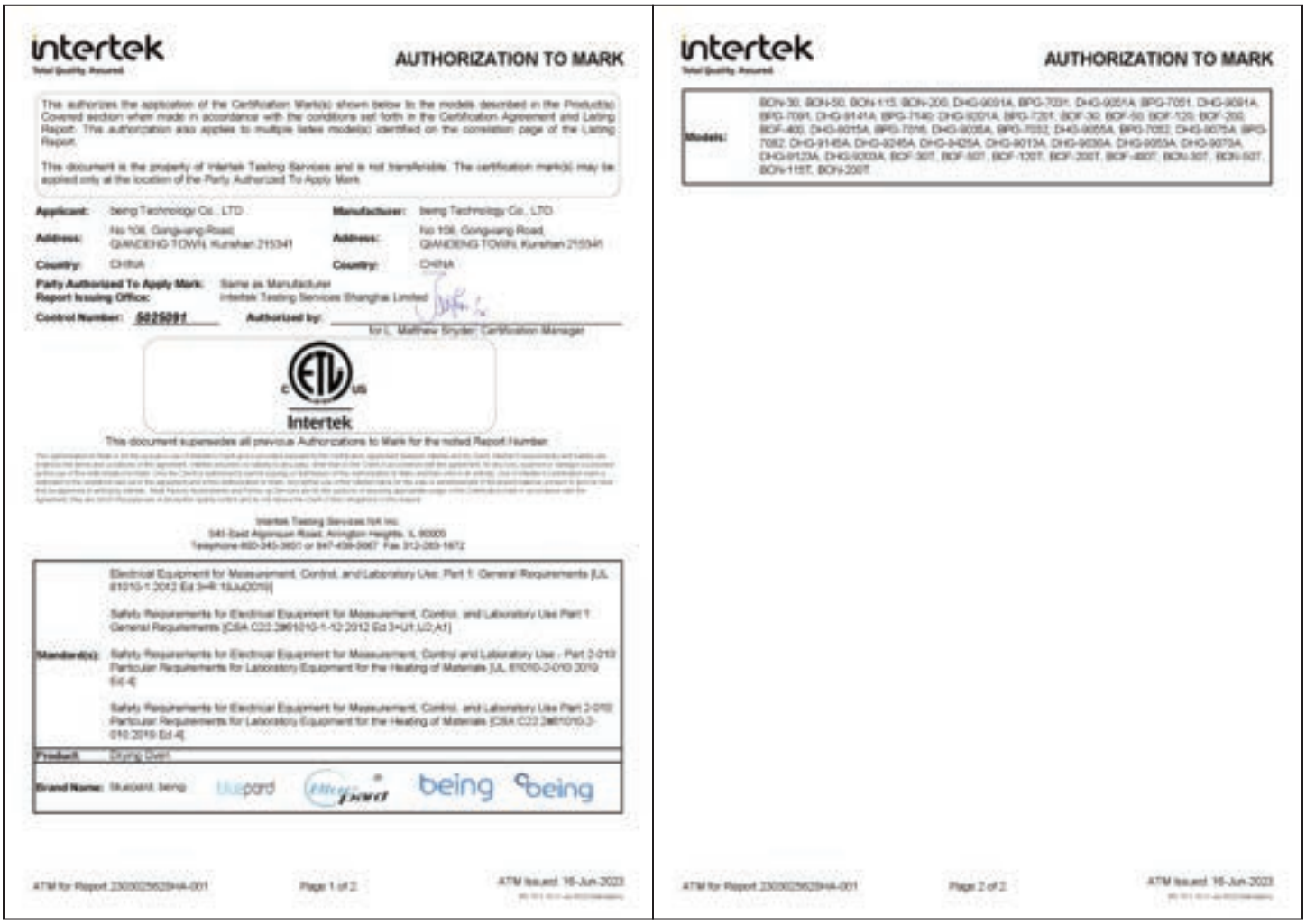
Date:	22 September 2011
Previous Certificate Expiry:	14 September 2021
The Latest Audit Date:	21 August 2021
Reissue Date:	16 September 2021
Valid Until:	14 September 2024
EAC Code:	23

UKAS MANAGEMENT SYSTEMS
0015

IAF

The use of the UKAS Accreditation Mark indicates accreditation in respect of those activities covered by the accreditation certificate number 015 held by NQA.
NQA is a trading name of NQA Certification Limited, Registration No 09351758. Registered Office: Warwick House, Houghton Hall Park, Houghton Regis, Dunstable, LU5 5ZX, UK.
This certificate is the property of NQA and must be returned on request.

8.3.2 ETL Certificate



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AUTHORIZATION TO MARK

This authorizes the application of the Certification Mark(s) shown below to the models described in the Product(s) Covered section when made in accordance with the conditions set forth in the Certification Agreement and Listing Report. This authorization also applies to multiple listee model(s) identified on the correlation page of the Listing Report.

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Applicant:	being Technology Co., LTD	**Manufacturer:**	being Technology Co., LTD
Address:	No 108, Gongyang Road, QIANDENG TOWN, Kunshan 215341	**Address:**	No 108, Gongyang Road, QIANDENG TOWN, Kunshan 215341
Country:	CHINA	**Country:**	CHINA

Party Authorized To Apply Mark: Same as Manufacturer
Report Issuing Office: Intertek Testing Services Shanghai Limited
Control Number: 5025091 **Authorized by:**
for L. Matthew Snyder, Certification Manager

c ETL us
Intertek

This document supersedes all previous Authorizations to Mark for the noted Report Number.

Intertek Testing Services NA Inc.
545 East Algonquin Road, Arlington Heights, IL 60005
Telephone 800-345-3851 or 847-439-5667 Fax 312-283-1672

Standard(s):	Electrical Equipment for Measurement, Control, and Laboratory Use; Part 1: General Requirements (UL 61010-1 2012 Ed.3+R:19Jul2019) Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use Part 1 General Requirements (CSA C22.2#61010-1-12 2012 Ed.3+U1;U2;A1) Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 2-010 Particular Requirements for Laboratory Equipment for the Heating of Materials (UL 61010-2-010 2019 Ed.4) Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use Part 2-010 Particular Requirements for Laboratory Equipment for the Heating of Materials (CSA C22.2#61010-2-010 2019 Ed.4)
Product:	Drying Oven
Brand Name:	blueard, being, bluepard, being, being

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AUTHORIZATION TO MARK

Models:	BON-30, BOH-50, BON-115, BON-205, DHG-9031A, BPG-7031, DHG-9051A, BPG-7051, DHG-9091A, BPG-7091, DHG-9141A, BPG-7140, DHG-9201A, BPG-7201, BOF-30, BOF-50, BOF-125, BOF-205, BOF-400, DHG-9015A, BPG-7016, DHG-9035A, BPG-7032, DHG-9055A, BPG-7052, DHG-9075A, BPG-7082, DHG-9145A, DHG-9245A, DHG-9425A, DHG-9013A, DHG-9030A, DHG-9053A, DHG-9073A, DHG-9123A, DHG-9203A, BOF-307, BOF-507, BOF-1207, BOF-2007, BOF-4807, BON-307, BON-507, BON-1157, BON-2007

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8.3.3 Certificate of Calibration

Every BEING BOF Series oven is calibrated before leaving our factory. The following is a sample of the calibration certificate generated and supplied with the oven. The certificate includes the model number, serial number, manufacturing date, and testing values.

If your unit didn't have a calibration certificate included or needed a replacement, please email us at techsupport@beinglab-usa.com. Use the subject line Calibration Certificate, and include the model number, serial number, and manufacturing date listed on the product identification label above the power cord, along with the dealer you purchased it from. We will send you a copy of the certificate within three (3) business days.

being Professional Instrument Supplier

Test Confirmation

Model:
Type:
S/N:
Manufacture date:

We hereby certify that the equipment mentioned below has been properly tested using calibration equipment traceable to the JJF standard and that the entire process has been carried out under the ISO 9001quality assurance system, this testing ensures that the product meets or exceeds the published performance and safety specifications to your satisfaction.
(According 1) ISO 9001 Certificate Number 35409/5 *2) ISO 13485 Certificate Number 04721Q10000653)*

Test conditions.
The tests were carried out in accordance with BEING's test instructions and the instrument was left empty inside (shelf only) for the duration of the tests.

Temperature measurement (with a probe PT100):

Set Value (SV)	*Practical Value (PV)*	*Center Value*

- *Center Value: center point is in the middle of shelf.*

Environmental conditions:

Temperature	25℃/77℉	±5℃/9℉
Humidity	50% RH	±20% RH

- ***Specification plate checked***
- ***Accessories checked, please see attached packing list.***

Inspector:

Manager Final Inspection/Date:

BEING Scientific, Inc. http://www.beinglab-usa.com/ +1(800)278.1390

8.4 Statements

8.4.1 Oven Ventilation

Applications such as aging tests, baking and curing, dehydrating, dry sterilization, glassware drying, moisture and stability tests, processing electronics, and regenerating desiccants and catalysts can create toxic vapors and fumes based on the specimens' composition or the residual organic solvents on the glassware. It's essential to avoid exposure to these vapors and fumes.

Therefore, it may be necessary to:

- place the oven in a fume hood or cabinet with adequate capacity, or
- attach exhaust piping or tubing to the oven's exhaust port.

8.4.2 California Proposition 65 Compliance

The California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986) law requires businesses to notify Californians about significant chemicals that cause cancer, or birth defects or other reproductive harm. The law requires that no person doing business knowingly and intentionally expose an individual to a chemical known to the state of California to cause cancer, birth defects, or reproductive toxicity without first giving a clear and reasonable warning. The Proposition 65 list can be accessed at http://www.oehha.ca.gov/prop65.

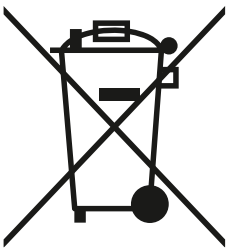
BEING Scientific Inc. confirms the BOF Series mechanical (forced air) convection ovens have been evaluated against California Proposition 65. The oven(s) **DO NOT CONTAIN** any of the California Proposition 65 listed substances.

8.4.3 Waste Disposal

8.4.3.1 Packaging

Packaging materials must be disposed of as prescribed by the current local regulations.

8.4.3.2 Unit



The product contains electronic and other industrial waste products. Disposal with household waste (sorted or unsorted waste) or similar collections of municipal waste is not permitted!

The unit must be disposed of as prescribed by the current local regulations. Contact a local authorized waste disposal contractor for assistance in properly disposing of the unit.

8.5 Warranty

2-YEAR LIMITED WARRANTY

BEING Scientific Inc. warrants that all products manufactured by BEING and sold in North America are free from defects in materials and workmanship.

Visit www.beinglab-usa.com/warranty for warranty details.

NOTES:

being®

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