HIGH-PERFORMANCE OVENS

SHEL LAB®

220 – 240 Voltage

Installation – Operation Manual

SMO38HP-2 SMO14HP-2

These ovens require permanent connect wiring (also known as hardwiring) to a power supply.

Pictured on front cover, left to right: SMO38HP-2, SMO14HP-2

Warning: This product contains chemicals, including triglycidyl isocyanurate, known to the State of California to cause cancer as well as birth defects or other reproductive harm. For more information, go to www.P65Warnings.ca.gov.

¡Advertencia! Este producto contiene sustancias químicas, incluido el triglicidil isocianurato, que el estado de California sabe que causa cáncer, así como defectos de nacimiento u otros daños reproductivos. Para obtener más información, visite www.P65Warnings.ca.gov**.**

Avertissement! Ce produit peut vous exposer à des produits chimiques, dont l'isocyanurate de triglycidyle, reconnu par l'État de Californie pour provoquer le cancer, des anomalies congénitales ou d'autres problèmes de reproduction. Pour plus d'informations, visitez le site www.P65Warnings.ca.gov

SMO High-Performance Ovens

220 – 240 Voltage

Part Number (Manual): 4861705

Revised: November 22, 2019

SHEL LAB is a brand of Sheldon Manufacturing, INC, an ISO 9001 certified manufacturer.

Safety Certifications

These units are CUE listed by TÜV SÜD as forced air ovens for professional, industrial, or educational use where the preparation or testing of materials is done at an ambient air pressure range of 22.14 – 31.3 inHg (75 – 106 kPa) and no flammable, volatile, or combustible materials are being heated.

The units have been tested to the following requirements:

CAN/CSA-22.2 No. 61010-1:2012
CAN/CSA-C22.2 No. 61010-2-010:2015
UL 61010-1:2012
UL 61010-2-010:2015
EN 61010-1:2010
EN 61010-2-010:2014

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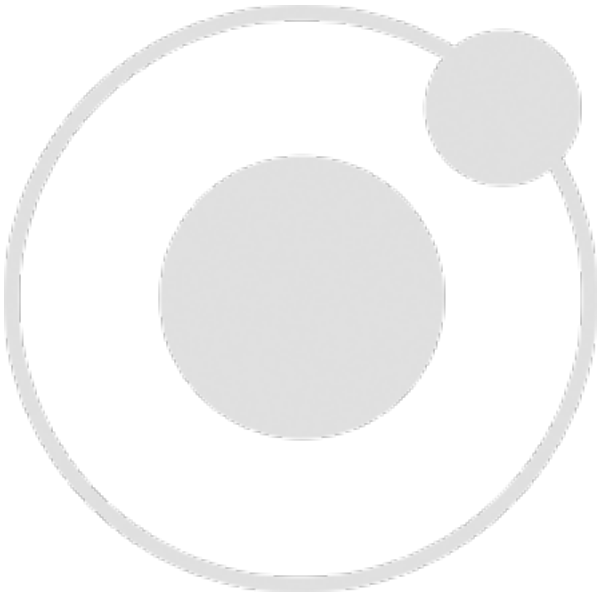


INTRODUCTION

Thank you for purchasing a SHEL LAB oven. We know you have many choices in today's competitive marketplace when it comes to constant temperature equipment. We appreciate you choosing ours. We stand behind our products and will be here if you need us.

READ THIS MANUAL

Failure to follow the guidelines and instructions in this user manual may create a protection impairment by disabling or interfering with the unit safety features. This can result in injury or death.

Before using the unit, read the manual in its entirety to understand how to install, operate, and maintain the unit in a safe manner. Ensure all operators are given appropriate training before the unit begins service.

Keep this manual available for use by all operators.

SAFETY CONSIDERATIONS AND REQUIREMENTS

Follow basic safety precautions, including all national laws, regulations, and local ordinances in your area regarding the use of this unit. If you have any questions about local requirements, please contact the appropriate agencies.

SOPs

Because of the range of potential applications this unit can be used for, the operator or their supervisors must draw up a site-specific standard operating procedure (SOP) covering each application and associated safety guidelines. This SOP must be written and available to all operators in a language they understand.

Intended Applications and Locations

SMOHP ovens are engineered for constant temperature, forced-air drying, curing, and baking applications in professional, industrial, and educational environments. The ovens are not intended for use at hazardous or household locations.

Power

Your unit and its recommended accessories are designed and tested to meet strict safety requirements.

- Always hardwire the unit power feed to a protective earth-grounded electrical source that conforms to national and local electrical codes. If the unit is not grounded, parts such as knobs and controls may conduct electricity and cause serious injury.
- Position the unit so the operator can quickly and easily disconnect or uncouple the power feed in the event of an emergency.
- Do not bend the power feed excessively, step on it, or place heavy objects on it.
- A damaged power feed can be a shock or fire hazard. Never use a power feed if it is damaged or altered in any way.
- Use only approved accessories. Do not modify system components. Any alterations or modifications to your unit not explicitly authorized by the manufacturer can be dangerous and will void your warranty.

CONTACTING ASSISTANCE

Phone hours for Sheldon Technical Support are 6 am – 4:30 pm Pacific Coast Time (west coast of the United States, UTC -8), Monday - Friday. Please have the following information ready when calling or emailing Technical Support: the **model number, serial number** and **part number** (see page 15).

support@sheldonmfg.com
+1-800-322-4897 extension 4
+1-(503) 640-3000 extension 4
FAX: +1-(503) 640-1366

Sheldon Manufacturing, INC.
P.O. Box 627
Cornelius, OR 97113

MANUFACTURING WARRANTY

For information on your warranty and online warranty registration please visit:

- sheldonmanufacturing.com/warranty

ENGINEERING IMPROVEMENTS

Sheldon Manufacturing continually improves all of its products. As a result, engineering changes and improvements are made from time to time. Therefore, some changes, modifications, and improvements may not be covered in this manual. If your unit's operating characteristics or appearance differs from those described in this manual, please contact your SHEL LAB dealer or customer service representative for assistance.

REFERENCE SENSOR DEVICE

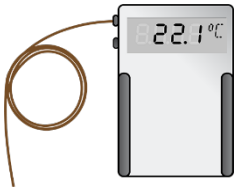
Must be purchased separately

A reference sensor device is required for calibrating the oven temperature display.

Reference devices must meet the following standards:

- Accurate to at least 0.1°C

The device should be regularly calibrated, preferably by a third party.



Temperature Reference

Temperature Probes

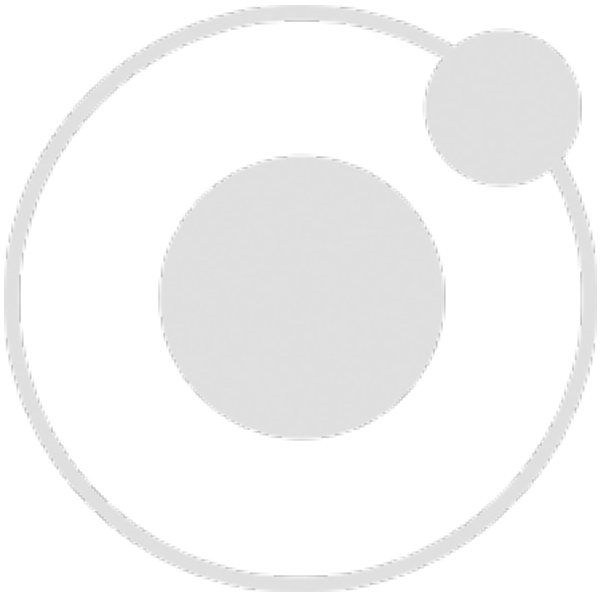
Use a digital device with wire thermocouple probes that can be introduced into the unit chamber through the door space or chamber access port. Select thermocouples suitable for the application temperature you will be calibrating at.

Why Probes?

Reference readings taken outside the chamber using wire temperature probes avoid chamber door openings. Openings disrupt the chamber temperature. Each disruption requires **a minimum 1-hour wait** to allow the atmosphere to re-stabilize before continuing.

No Alcohol or Mercury Thermometers

Alcohol thermometers do not have sufficient accuracy to conduct accurate temperature calibrations. **Never place a mercury thermometer in the unit chamber.** Always use thermocouple probes.



INSPECT THE SHIPMENT

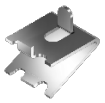
- When a unit leaves the factory, safe delivery becomes the responsibility of the carrier.
- **Damage sustained during transit is not covered by the manufacturing defect warranty.**
- Save the shipping carton until you are certain that the unit and its accessories function properly.

When you receive your unit, inspect it for concealed loss or damage to its interior and exterior. If you find any damage to the unit**, follow the carrier's procedure for claiming damage or loss**.

1. Carefully inspect the shipping carton for damage.
2. Report any damage to the carrier service that delivered the unit.
3. If the carton is not damaged, open the carton and remove the contents.
4. Inspect the unit for signs of damage. Use the orientation images in this chapter as a reference.
5. The unit should come with an Installation and Operation Manual and a Profile Programming Guide.
6. Verify that the correct number of accessories has been included.
7. Carefully check all packaging for accessories before discarding.

Included Accessories

Model	Shelves	Shelf Clips	Leveling Feet
SMO14HP-2	6	24 Clips	4
SMO38HP-2	12	48 Clips	4



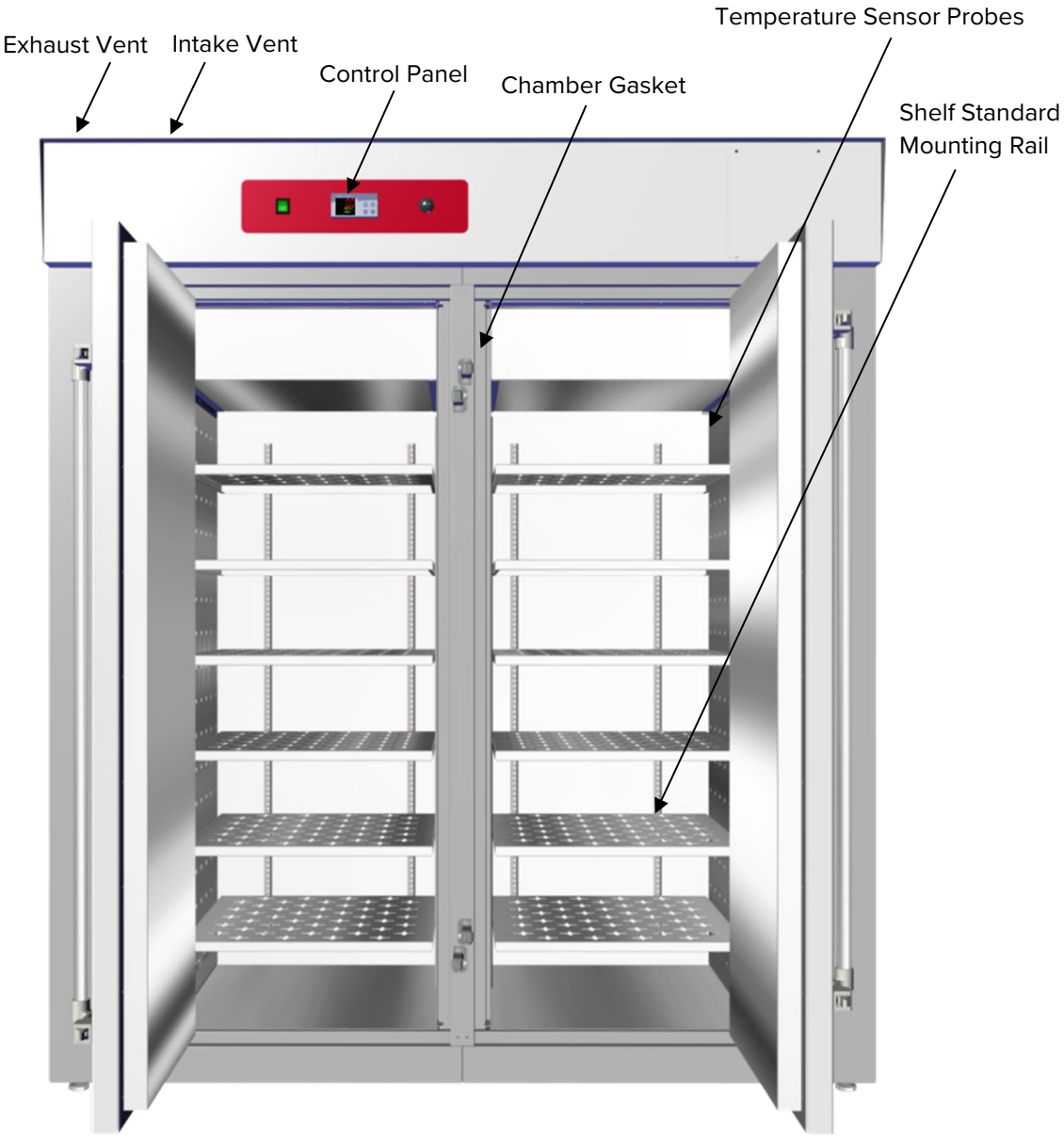
Shelf Types

SMO14HP-2

SMO38HP-2

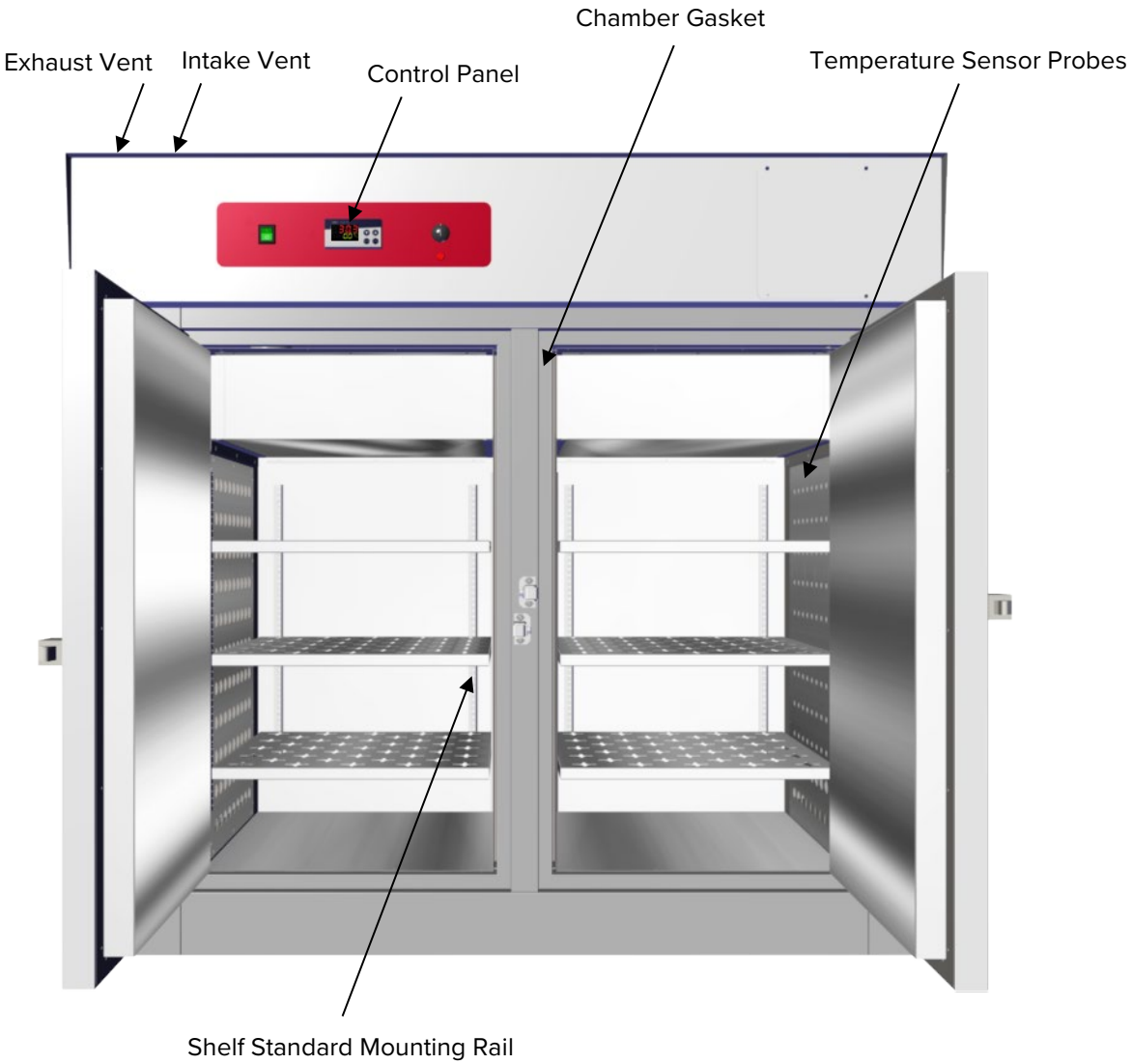
ORIENTATION IMAGES

SMO38HP-2



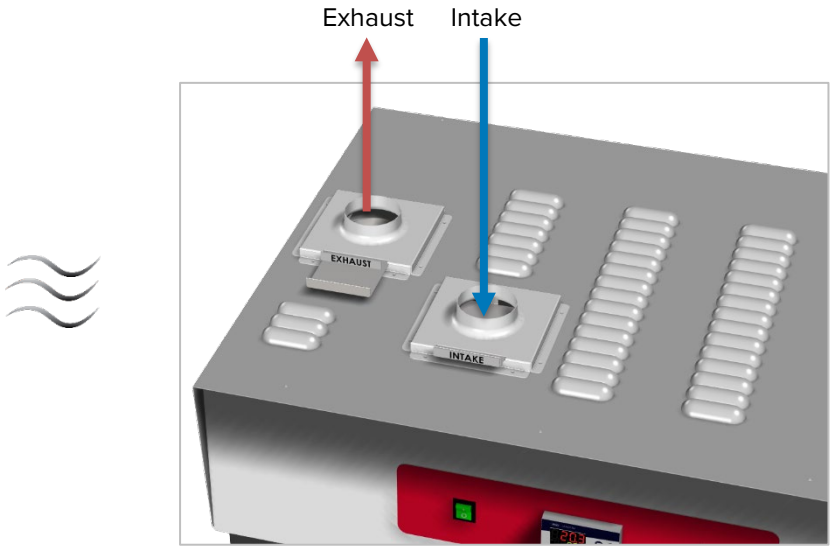
Note: The unit has one oven chamber.

SMO14HP-2

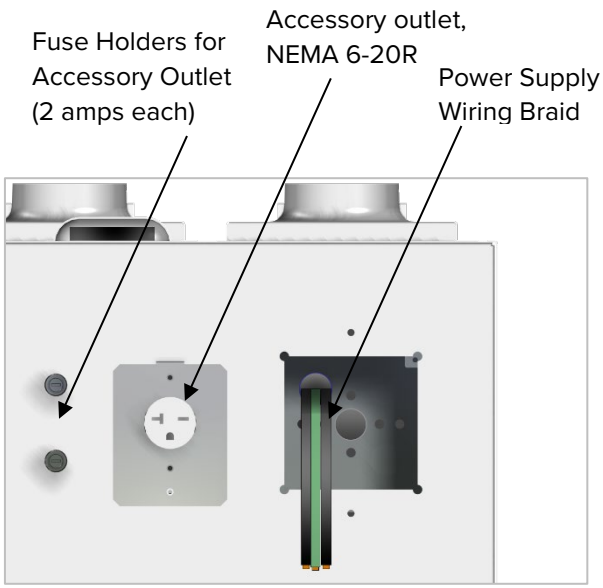


Note: The unit has one oven chamber.

Oven Vents



Power Panel (back of the oven)



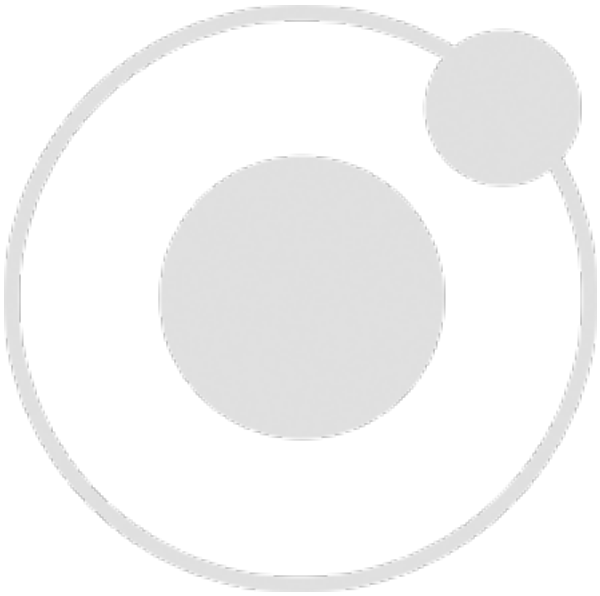
Permanent Connect Wire Braid 6 gauge, 6 inches (150 mm)

RECORDING DATA PLATE INFORMATION

Record the unit **model number**, **serial number**, and **part number** below for future reference. Tech Support needs this information to provide accurate help during support calls and emails.

- The data plate is located on the back of the oven, above the power feed inlet.

MODEL NO:	
SERIAL NO:	
PART NO:	



HARDWIRE REQUIREMENT

The oven requires permanent connect wiring (commonly known as hardwiring). Wiring to the power source **must be performed by a qualified electrical technician.** All other Installation steps can be performed by the end-user.

INSTALLATION CHECKLIST

For installing the unit in a new workspace location.

Pre-Installation

- ✓ Check that the required ambient conditions for the unit are met, page 18.
- ✓ Check that the spacing clearance requirements are met, page 18.
    - Unit dimensions may be found on page 49.
- ✓ Check that a suitable permanent connect electrical power supply is present, page 19.

Install the oven in a suitable workspace location

- ✓ Review the lifting and handling instructions, page 20.
- ✓ Install the unit leveling feet, page 21.
- ✓ Install the oven in its workspace location, page 21.
    - The oven may be connected to its power supply after this procedure.

Set up the oven for use

- ✓ Clean and disinfect the unit and shelving (recommended), page 22.
- ✓ Install the shelving, page 23.

Required Ambient Conditions

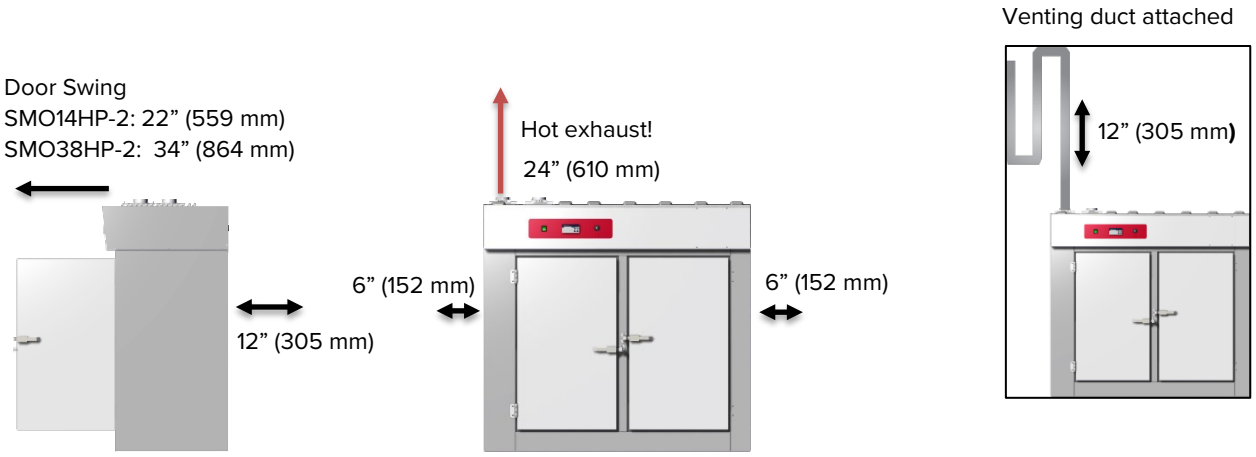
These units are intended for use **indoors**, at room temperatures between **15°C and 40°C (59°F and 104°F)** at no greater than **80% Relative Humidity** (at 25°C / 77°F). Operating outside these conditions may adversely affect the unit temperature performance.

When selecting a location to install the unit, consider all environmental conditions that can affect its temperature performance. These include:

- Proximity to other ovens, autoclaves, and any device producing significant radiant heat
- Heating and cooling vents or other sources of fast-moving air currents
- High-traffic areas
- Direct sunlight

Required Clearances

These clearances are required to provide air flows for ventilation and cooling.



6 inches (152 mm) of clearance is required on the sides of the unit.

12 inches (305 mm) of clearance is required on the back of the unit.

24 inches (620 mm) of headspace clearance is required between the exhaust vent and any overhead cover or partition.

- **12 inches (305 mm)** of headspace clearance will suffice if the oven exhaust is vented from the workspace through a duct or other channeling.

Do not place objects on top of the oven. Exception: A power exhaust blower may be mounted on the top exhaust vent.

The chamber access port is located on the back of the oven. Leave sufficient clearance for end-users to safely access this port.

POWER SOURCE REQUIREMENTS

When selecting a location for the oven, verify that each of the following requirements is satisfied:

Power Supply: The power supply must meet the power requirements listed on the oven data plate. These ovens are intended for **220 – 240V, 50/60 Hz** applications at the following amperages:

Model	Amperage	Model	Amperage
SMO14HP-2	26.0	SMO38HP-2	50.0

- The power source must be **single (1) phase** and **protective earth grounded**.
- The power source must conform to all national and local electrical codes.
- **The unit may be damaged if the supplied voltage varies by more than 10% from the data plate rating.**
- Use a separate circuit to prevent loss of the unit due to overloading or circuit failure. The circuit must meet or exceed the amperage requirements listed on the oven data plate.

Switch or circuit breaker: A switch or circuit-breaker must be used in the building installation to protect against overcurrent conditions.

- The recommended circuit-breakers are: SMO14HP-2 **30 amps**; SMO38HP-2 **60 amps**

Power Feed Disconnect: The oven must be positioned so that all end-users have access to the power feed disconnect in case of emergencies.

- The disconnect must be in close proximity to the equipment and within easy reach of the end-user.
- The disconnect must be marked as the disconnecting device for the equipment.

Accessory Outlet Fuses: The oven is also provided with a pair (2) of 2-amp fuses installed adjacent to the external power receptacle used to power accessory blower fans.

- The fuses protect against overcurrent conditions related to the operation of any attached exhaust blower.
- If one fuse blows, the receptacle will depower. Always find and fix the cause of a blown fuse prior to putting the unit back into operation.

These fuses do not provide protection against overcurrent events associated with major components of the oven. Overcurrent protection for the oven must be set up in the location power supply external to the unit. See the circuit breaker requirements.

Power Feed Wiring

The oven comes provided with an integral 6-inch (150 mm) wire braid consisting of:

- SMO14HP-2 – two 6-gauge hot wires and a 6-gauge earth ground.
- SMO38HP-2 – two 6-gauge hot wires and a 6-gauge earth ground.

The wires for power source connection should be in accordance with the following for all units: Green/Yellow – Earth; Black – Hot; Black – Hot.

The oven must be earth grounded using the protective conductor terminal (green with yellow stripe wire). Do not remove the protective conductor (earth connection). Removing the protective conductor will negate the oven protections against potentially dangerous electric shocks and create a possible fire hazard.

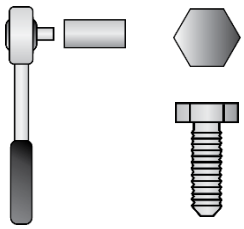
Lifting and Handling

The unit is heavy. Use appropriate lifting devices that are sufficiently rated for these loads. Follow these guidelines when lifting the unit.

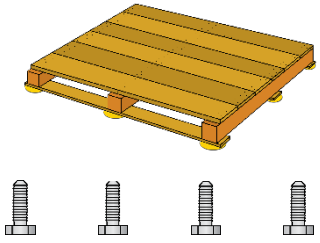
- Lift the unit only from its bottom surface.
- Doors, handles, and knobs are not adequate for lifting or stabilization.
- Restrain the unit completely while lifting or transporting so it cannot tip.
- Remove all moving parts, such as shelves and trays, and lock doors in the closed position during transfers to prevent shifting and damage.

Removing from the Pallet

The unit comes secured to a shipping pallet with hex bolts inserted through the 4 leveling feet holes on the bottom of the oven. Use a socket wrench to remove the bolts and release the unit from the pallet.

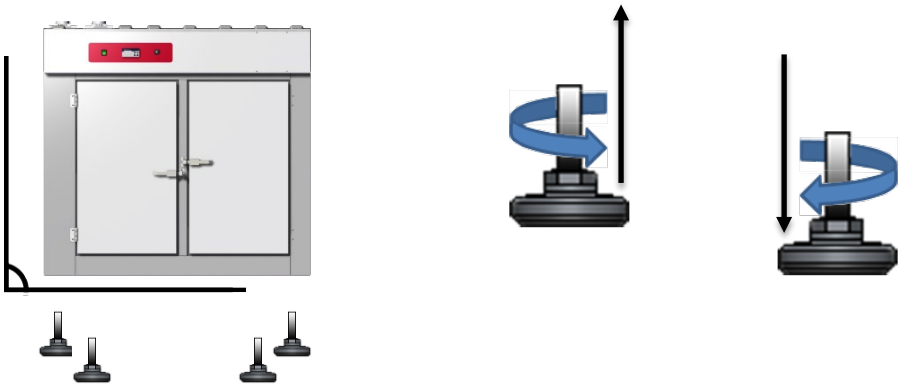


0.5 inch (13 mm)



LEVELING

Install the 4 leveling feet in the corner holes on the bottom of the oven. The unit must be level and stable for safe operation.



Note:	To prevent damage when moving the unit, turn all 4 leveling feet so that the leg of each foot sits inside the unit.

INSTALL THE OVEN

Place the unit in a workspace location that meets the criteria discussed in the previous entries of the Installation chapter.

- Verify that the oven stands level and does not rock. Adjust the leveling feet as needed.
- **A qualified technician may now connect the oven to its power source**.

Deionized and Distilled Water

Do not use deionized water to clean the unit, even if DI water is readily available in your laboratory.

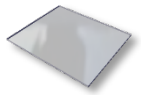
- Use of deionized water may corrode metal surfaces and **voids the manufacturing warranty**.
- The manufacturer recommends the use of distilled water in the resistance range of 50K Ohm/cm to 1M Ohm/cm, or a conductivity range of 20.0 uS/cm to 1.0 uS/cm, for cleaning applications.

Installation Cleaning and Disinfecting

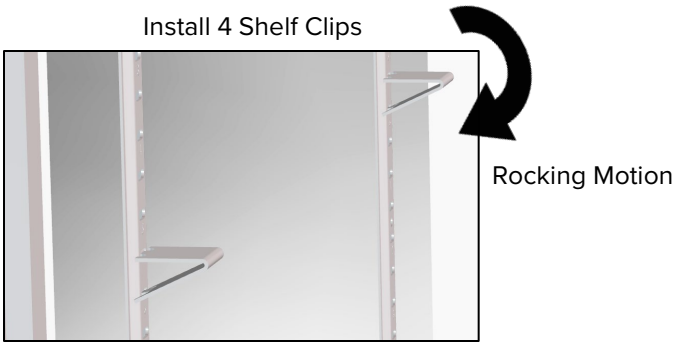
The manufacturer recommends cleaning and disinfecting the shelving and oven chamber prior to installation of the shelving in the chamber. The unit was cleaned at the factory but may have been exposed to contaminants during shipping.

- Remove all wrappings and coverings from shelving prior to cleaning and installation. **Do not clean the shelving with deionized water.**
- See the **Cleaning and Disinfecting** procedure in the User Maintenance section (see page 41) for more information on how to clean the oven chamber and shelving.

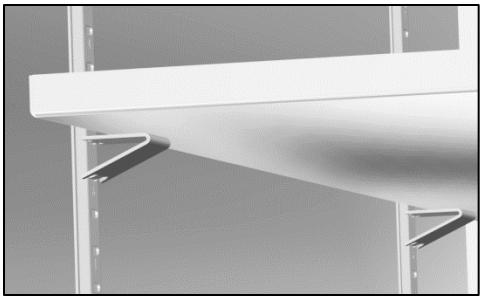
SHELVING INSTALLATION



Install 4 Shelf Clips



Place the Shelf

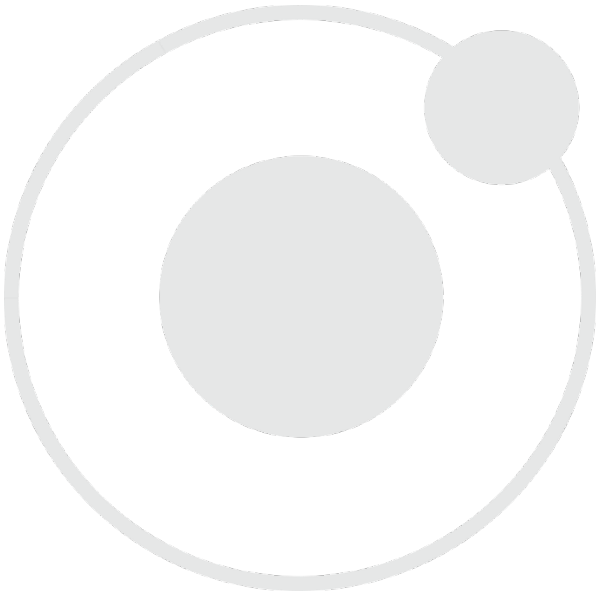


1. Install the 4 shelf clips in the slots of the shelf standard mounting rails located on the sides of the chamber interior.

    a. Squeeze each clip, insert the top tab first, and then the bottom tab using a rocking motion.

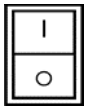
2. Set the shelf on the clips.

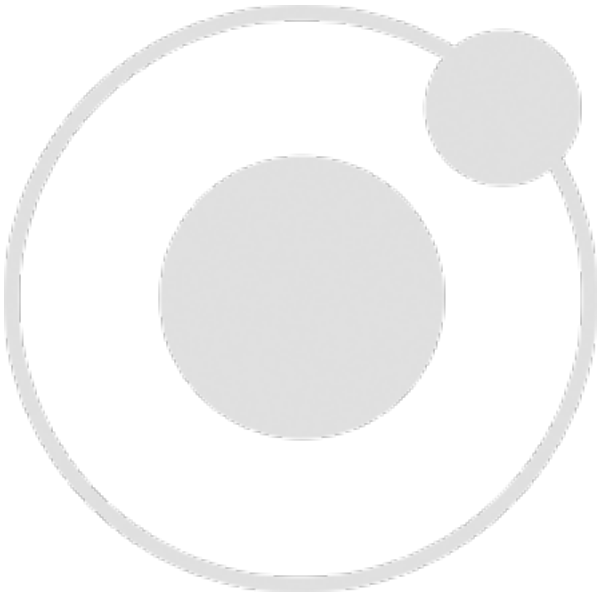
    a. Verify the shelf is level.



GRAPHIC SYMBOLS

The unit is provided with graphic symbols on its exterior. These identify hazards and adjustable components as well as important notes in the user manual.

Symbol	Definition
	Consult the user manual Consulter le manuel d'utilisation
	Indicates adjustable temperature Indique température réglable
	AC Power Repère le courant alternatif
	I/ON O/OFF I indique que l'interrupteur est en position marche. O indique que le commutateur est en position d'arrêt.
	Protective earth ground Terre électrique
	Adjusts UP and DOWN Ajuster le haut et vers le bas
	Potential shock hazard Risque de choc électrique
	Caution hot surface Attention surface chaude
	Recycle the unit. Do not dispose of in a landfill. Recycler l'unité. Ne jetez pas dans une décharge.



CONTROL OVERVIEW

Control Panel

Power Switch

Controls all power to the oven. Illuminates when in the On (I) position.

Set Temperature Display

The homepage shows the current oven chamber air temperature in red (top), and the current temperature setpoint in green (bottom). **Degrees Celsius** is the default unit of measurement.

Current Oven Temperature

Current Setpoint

Homepage

Heating Profile Indicator

The orange numerical numbers on the lowest level of the display indicate internal communication processes. An orange ramp symbol illuminates when the oven is running a heating profile.

Resting Temperature: When powered, with chamber doors closed, and the setpoint set to 0, the oven chamber resting temperature is typically several degrees above the ambient room temperature. This is largely due to waste heat from the blower fans and the compression of air in the heating ducts.

Arrow Buttons

Constant Temperature Functions: Pushing the **Down** arrow button while on the homepage when a profile is not running unlocks the green constant temperature setpoint. Both arrow buttons can then be used to adjust the unlocked setpoint. After an adjustment is entered, and no button is pushed for 3 seconds, the green setpoint will blink and lock, and the oven will begin to heat or passively cool to match the adjusted setpoint. It will then run indefinitely at that setpoint until adjusted again or until a heating profile is launched.

Profiles: While on the homepage, the **Up** arrow button launches the heating profile, if one has been programmed. The **Up** arrow also aborts a heating profile, if pushed while the profile is running. After completion of a profile, the oven operates at the last temperature setpoint of the profile.

Programming Functions: When the display is showing menu pages, the **Up** and **Down** arrow buttons advance or move back through menu options. On a heating profile programming pages, the **Up** arrow returns the display to the previous parameter page. The **Down** arrow advances to the next parameter page. When a Temperature, Time, or Option Control parameter has been unlocked and is in the blinking adjustable mode, the arrow buttons adjust the parameter setting.

Program and Exit Buttons

On the homepage, pushing the **Program** button (PGM) changes the display to show the Operations menu page. When programming a heating profile, the Program button advances between parameters and unlocks the Temperature, Time, and Option parameters for adjustment. Parameters blink continually when unlocked. Pushing the Program button while a parameter is blinking will save the **currently shown value** as the new parameter value and advance to the next parameter.

The **Exit** button returns the display to the previous page and can also be used to take a parameter out of its flashing adjustable mode. Doing so also restores the parameter to its **last saved value**, rather than saving the last shown value.

Set Over Temperature

This graduated dial sets the mechanical heating cut off for the Over Temperature Limit system (OTL). The OTL helps prevents unchecked heating of the chamber in the event of an electronics failure or external heat spike. For details, please see the **Over Temperature Limit System** description in the Theory of Operations (page 31).

The red Over Temperature Activated light illuminates when the OTL system cuts off heating to the unit chamber by rerouting power away from the heating elements.

Safe operation of the oven is dependent on the actions and behavior of the oven operators. **Operating personnel must read and understand the Operating Precautions in this section prior to operating the oven.** The operators must follow these instructions to prevent injuries and to safeguard their health, environment, and the materials being treated in the oven, as well as to prevent damage to the oven. Failure to adhere to the Safety Guidelines and Operating Precautions, deliberately or through error, is a hazardous behavior on the part of the operator.

Le fonctionnement sûr du four dépend des actions et du comportement des opérateurs du four. Le personnel d'exploitation doit lire et comprendre les consignes de sécurité et les précautions d'utilisation de cette section avant d'utiliser le four. Les opérateurs doivent suivre ces instructions pour prévenir les blessures et protéger leur santé, leur environnement et les matériaux traités dans le four, ainsi que pour éviter d'endommager le four. Le non-respect des consignes de sécurité et des précautions d'utilisation, délibérément ou par erreur, est un comportement dangereux de la part de l'opérateur.

OPERATING PRECAUTIONS

- Do not use this oven in unsafe improper applications that produce flammable or combustible gases, vapors, liquids, or fuel-air mixtures in quantities that can become potentially explosive.
- Outgassed byproducts may be hazardous to or noxious for operating personnel. Exhaust should be vented to a location outside the workspace in a safe manner in accordance with all applicable laws, ordinances, and regulations. Do not operate the oven in an unsafe area with noxious fumes.
- Do not use this oven for applications heating hazardous fibers or dust. These materials can become airborne and come into contact with hot surfaces.
- Individual ovens are not rated to be explosion proof. Follow all building certification requirements and laws for Class I, II, or III locations as defined by the US National Electric Code.
- The bottom surface of the chamber should not be used as a work surface. It runs hotter than the shelf temperatures. Never place samples or product on the oven chamber floor.
- Do not place sealed or filled containers in the oven. These may burst open when heated.
- Do not place alcohol or mercury thermometers in the oven. These devices may rupture under heat or other improper uses.
- Do not move the oven until it has finished cooling.

Warning: The vent dampeners may be hot to the touch. These areas are marked with Hot Surface labels. Proper PPE should be employed to minimize risk of burns.

Avertissement: Les clapets d'aération peuvent être chauds au toucher. Ces zones sont marqués avec des étiquettes de Surface chaude. Les EPI approprié devraient être employée pour réduire au minimum le risque de brûler.

THEORY OF OPERATIONS

Heating

When powered, the oven heats to and maintains a user-selected target setpoint in the oven chamber. The oven senses the chamber air temperature using a solid-state probe mounted on the right chamber wall. When the oven detects that the chamber temperature has dropped below the target setpoint, it pulses power to the heating elements.

The unit uses Proportional – Integral – Derivative (PID) control to avoid significantly overshooting the setpoint. The rate of heating will slow as the chamber temperature approaches the target temperature. If the chamber temperature is above the setpoint, the unit uses minimum heating to control the rate of cooling and avoid dipping below the setpoint.

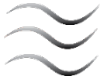
Additionally, the PID loops also optimize heating rates to compensate for the temperature environment around the unit. If the unit is operating in a cool room, the controller will increase the length of the heating pulses. Likewise, when operating in a warm room the unit uses shorter pulses. If the ambient temperature conditions change significantly, there may be minor over or undershoots as the unit adapts.

SMOHP ovens rely on natural heat radiation for cooling. The ovens can achieve a low-end operating temperature of the ambient room temperature plus the internal waste heat of the oven.

Heating Options

The oven can either heat to and run at a constant temperature setpoint or execute a programmable multistep heating profile with ramp up, heat soak, and ramp down intervals.

Air Circulation



The oven continually circulates air internally while powered in order to maintain temperature uniformity and stability in the oven chamber and to speed drying rates. Air is forced through vent holes on the right side of the chamber, blows across the shelf space, and is then pulled into a duct that makes up the left chamber wall. From there, the air is drawn upward into a heating duct by the action of the blower fan. The oven is intended to be run as a closed air-cycle system.

Vents: Intake and Exhaust

The oven is provided with an intake vent and an exhaust vent that may be opened or closed using dampener slides located on the vents. The dampeners are intended to be opened **after** the heat treatment or bake out phases of an application are complete. Opening the dampener vents during the treatment or bake out may speed the rate of material drying, depending on the nature of the sample material, outgassed byproducts, and ambient conditions. However, running the oven with the dampeners open introduces a significant flow of cool air into the chamber while allowing heated air to exit. This will impact the temperature uniformity and stability of the chamber and lower the operational temperature ceiling.

Accessory Power Exhaust Outlet

SMOHP ovens come with an external accessory power outlet to supply electricity to a power exhaust blower attached to the oven exhaust vent. The outlet and any attached blower are either activated by the temperature controller as part of an end-user programmed heating recipe profile or can be activated from the homepage options when the oven running at a constant temperature setpoint. The primary application of the power exhaust fan is to positively vent exhaust out of the workspace around the oven. The standard receptacle is a 240 volt, North American 6-20R.

The operation of the fan affects the oven chamber temperature, significantly lowering the temperature ceiling by boosting the rate that cooler outside air is brought in.

The Over Temperature Limit System (OTL)

The OTL is a mechanical heating cutoff that operates independently of the oven microprocessor temperature controller. The OTL helps safeguard the unit by preventing runaway heating in the event of electronics failures or a sudden external heat spike. The OTL is connected to a hydrostatic sensor probe located inside the oven chamber and is intended to be set by the user to approximately 10°C above the target temperature setpoint.

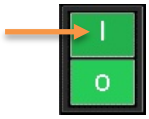
If the chamber temperature exceeds the OTL cutoff setting, the OTL routes power away from the chamber heating elements. It will continue to do so as long as the chamber air temperature is higher than the OTL cutoff setting. A red indicator illuminates when the OTL is rerouting power.

Note: There may be light smoking the first time when the oven is run hotter than 150°C.

PUT THE OVEN INTO OPERATION

Perform the following steps and procedures to put the unit into operation after installing it in a new workspace environment.

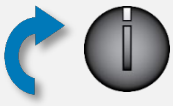
1. Turn on the oven



Place the oven **Power Switch** in the ON (I) position.

- The controller display will show the current firmware revision number, then default to the homepage.

2. Set the Over Temperature Limit backup system



Set the Over Temperature Limit, page 33.

- The oven will be run at your hottest planned application temperature during this procedure.

3. Set an operating temperature

Set a Constant Temperature Setpoint. See page 35.

Or

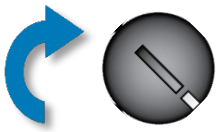
Program a multistep heating recipe profile. See page 35.

SET THE OVER TEMPERATURE LIMIT

Note: Test the OTL system for functionality at least once per year. **Failure to set the OTL voids the manufacturing defect warranty if over temperature damage occurs.**

This procedure sets the mechanical heating cutoff to approximately 10˚C above the chamber temperature. The OTL will then prevent the oven from heating above this temperature.

1. Set OTL control to its maximum setting, if not already set to max.



- This prevents the OTL heating cutoff from interfering with the first part of this procedure.

2. Set the constant temperature setpoint. See **page 35.**

- Set the oven to the **hottest temperature** of your heating application.
- This prepares the oven to set the OTL heating cutoff.

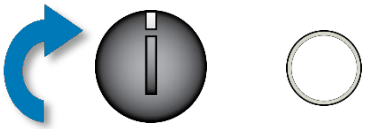
3. Allow the oven to reach temperature and stabilize.

- Wait 30 minutes **after** the oven reaches your application temperature.

4. Turn the dial counterclockwise until the Over Temperature Activated light illuminates.

- There is a soft click when the OTL begins rerouting power away from the heating elements.

5. Slowly turn the dial clockwise until the Over Temperature light turns off.



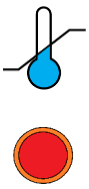
- The Over Temperature Limit is now set approximately 10˚C above the current chamber air temperature.

6. Leave the OTL dial set just above the activation point.

Optional: Turn the dial slightly to the left (counterclockwise).

- This sets the cutoff threshold nearer to the current chamber temperature.

Over Temperature Limit Activation



Possible causes:

- A user has set the Over Temperature Limit below the current setpoint.
    - This can be an issue when running heating profiles. The most common cause is the OTL being set to a temperature lower than the **highest** setpoint of a profile.
- An external heat source or heat source inside the chamber is causing the chamber air temperature to spike.
- The oven controller or its chamber sensor probe has failed and must be replaced.

If the OTL activates during normal operations, you may adjust it **once**, very slightly clockwise to increase the setting. If the OTL continues to interrupt heating of the oven chamber and there are no obvious external sources of external heat, turn off the oven and allow it to cool to room temperature before opening the oven door or troubleshooting.

Reminder: The intake and exhaust vents must be closed for the oven to meet its temperature specifications.

Set the Constant Temperature Setpoint

The process runs the oven at a constant temperature.

1. **Unlock the setpoint on the homepage.**

- Push the **Down** arrow button.

2. **Set the temperature**

- The arrow buttons adjust the green setpoint.

Note: After 3 seconds or more of no activity, the setpoint will blink once, lock, and store the displayed value as the new constant temperature setpoint.

3. **Wait for 3 seconds after adjusting the setpoint.**

- The oven will save and lock the new setpoint.
- The oven will then begin heating to the setpoint and run at this temperature until a new setpoint is selected or until heating profile is launched.

Heating Profiles

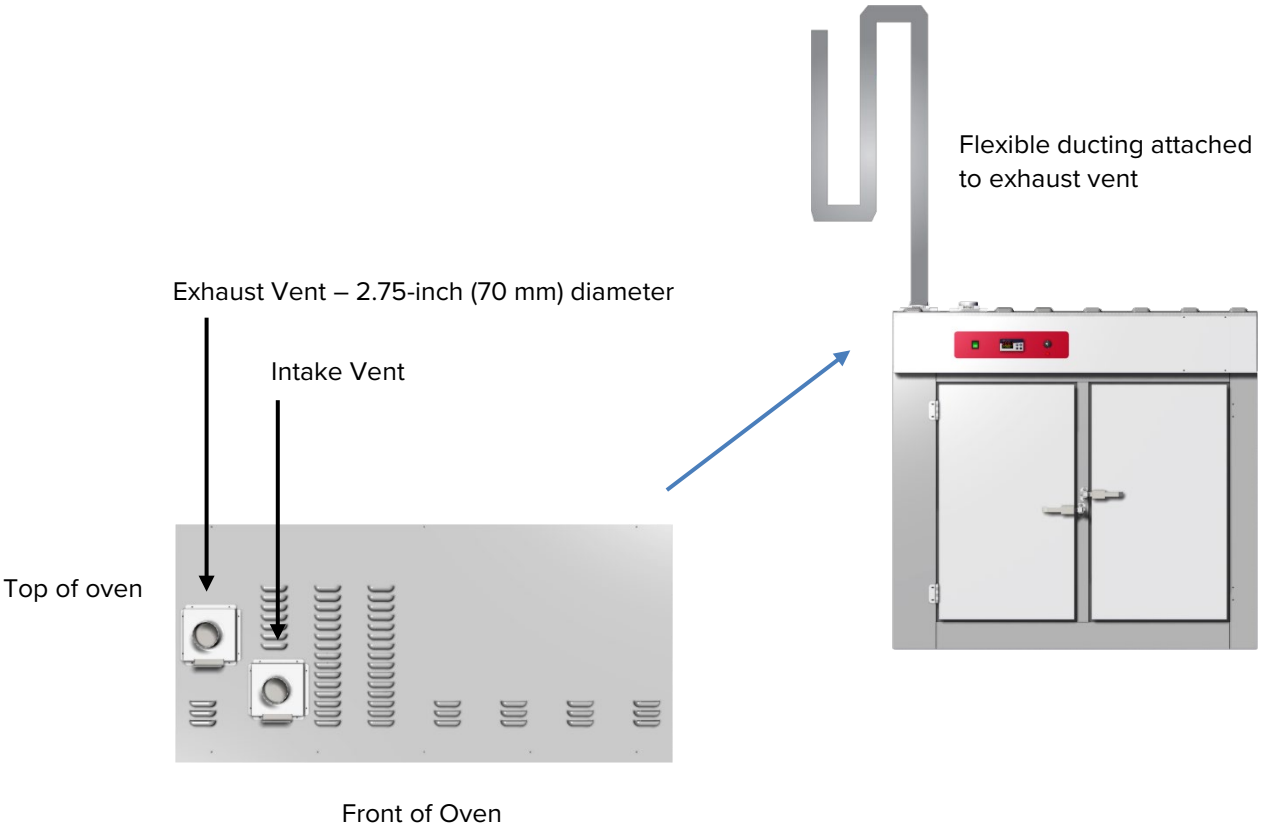
Please see the *Profile Programming Guide* for how to program automated heating recipe profiles. The guide comes included with the oven and provides illustrated explanations for all major heating profile functions and programming steps.

Heating profiles allow the oven to be run at multiple temperatures for set durations with cool down and ramp up periods.

VENTING THE EXHAUST PORT

Optional: The oven does not require venting to operate. However, evacuating exhaust out of the workspace can help prevent elevated ambient temperatures and the buildup of unpleasant odors.

- Obtain flexible, non-insulated ducting.
- Attach the ducting to the lip of the exhaust port on the top, right side of the oven. See the images below.
    - Secure the ducting to the lip using a clamp (for example a crimp clamp).
- Include a U-shaped bend in the duct to prevent moisture condensate in the ducting from sliding back down into the oven chamber.
- Position or connect the free end of the ducting so that it safely channels exhaust away from the workspace and any areas occupied by personnel.
- Make sure the exhaust port is open when venting.

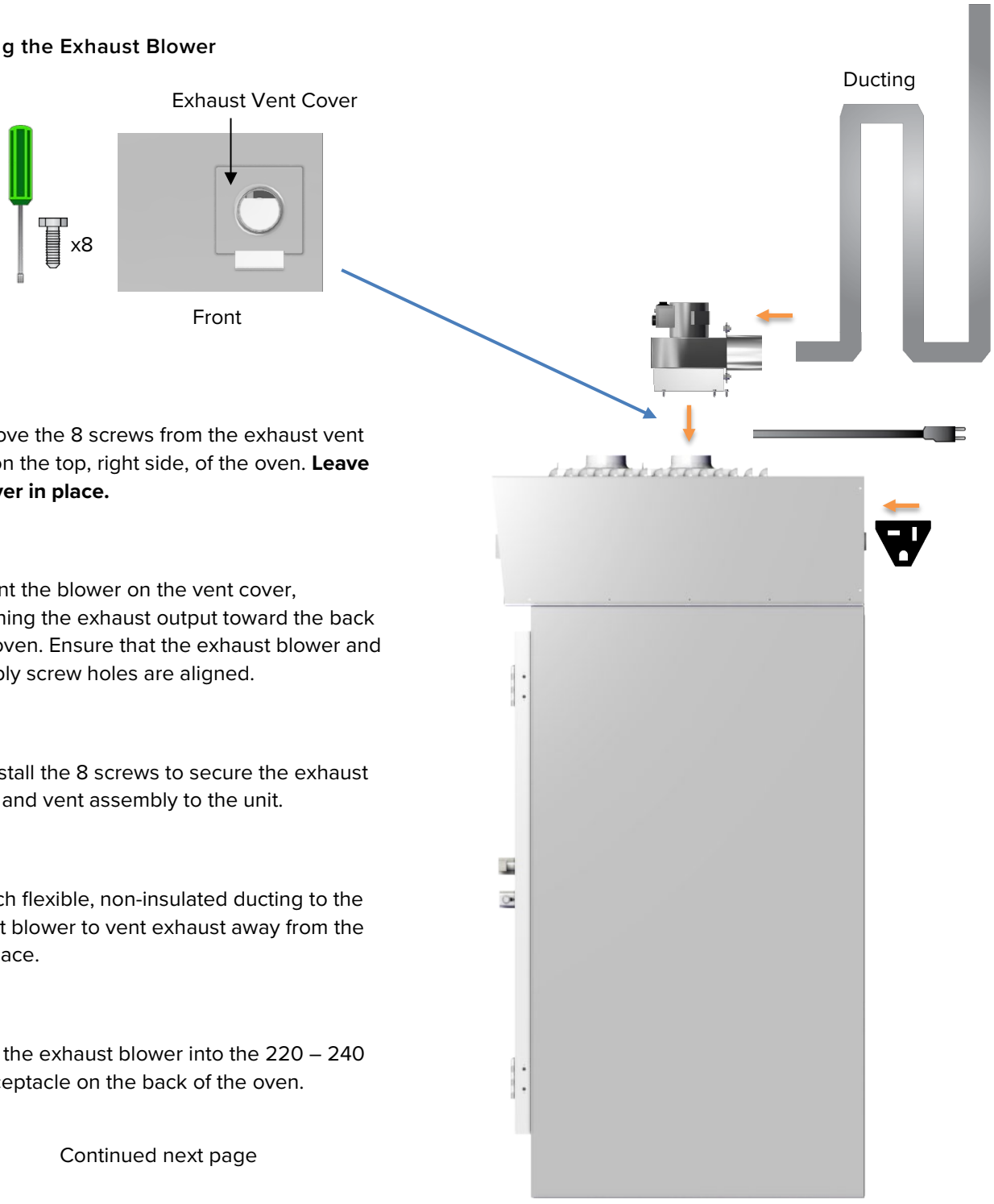


POWER EXHAUST BLOWER

Note: Exposure to sustained oven chamber temperatures above 80°C will damage the exhaust blower while it is turned off. Leave the oven exhaust vent closed until it is time to turn on the blower.

SHEL LAB offers an accessory forced-air power exhaust blower that can be mounted directly on the exhaust vent cover. The blower is self-cooling when powered and running.

Mounting the Exhaust Blower



1. Remove the 8 screws from the exhaust vent cover on the top, right side, of the oven. **Leave the cover in place.**

2. Mount the blower on the vent cover, positioning the exhaust output toward the back of the oven. Ensure that the exhaust blower and assembly screw holes are aligned.

3. Reinstall the 8 screws to secure the exhaust blower and vent assembly to the unit.

4. Attach flexible, non-insulated ducting to the exhaust blower to vent exhaust away from the workspace.

5. Plug the exhaust blower into the 220 – 240 volt receptacle on the back of the oven.

Continued next page

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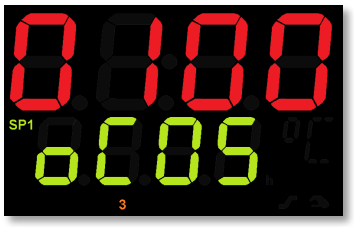
Activating and Deactivating the Power Exhaust

The power exhaust may be run during any step of a heating profile except the terminating step.

To run the exhaust blower, change the option control parameter of the step from 0000 to 0100 while programming the profile. 0000 is the default off state; 0100 activates the external electrical outlet on the back of the oven.

The blower will run for the full duration of the step. The option control parameter must be set to 0100 for **each** step you wish it to run.



Example: Power exhaust blower set to On during the 5th step of a profile.

AUTOTUNING

The JUMO oven controller was autotuned at the factory to 150°C. Use this procedure to autotune the controller to the temperature you will be running the oven at **when running the oven with a large volume or mass of product in the oven chambe**r.

The autotuning process is affected by the amount off mass in the chamber. Always tune with the oven shelving installed.

Note: Autotuning will not allow the oven to exceed its maximum specified heating rates. The oven will use the autotune-optimized PID settings until the controller is either tuned to different conditions or restored to the factory configuration.

Prepare for the Autotune

Prior to autotuning, set up the oven to match the conditions of your baking process.

- The oven should be turned off and resting at room temperature prior to starting the autotuning.
- Set the oven intake and exhaust vent to match your process configuration (both closed, both open, one slightly open, etc.).
- Install the shelving used in your baking application.
- Product or samples must be present in the chamber in the volume, mass, and distribution (spacing) of your recipe or heat application process.
    - The manufacturer strongly recommends using wasting or sacrificial product for the autotuning. Temperature spikes may occur in the chamber.

Continued next page

Perform the Autotuning Procedure

1. Turn on the oven.

Homepage

2. Push the **Down** arrow button to access the Setpoint menu.

Setpoint Menu

3. Set the constant temperature setpoint to the temperature you wish to optimize for.

4. While still in the setpoint menu, press and hold the **Up** and **Down** arrow buttons simultaneously.
   a. The green setpoint line will begin flashing “tUnE”.

Tuning

5. The screen will cease flashing “tUnE” when the autotuning procedure is complete. **Do not push any controller buttons during the autotune procedure.**
   - The total autotuning time is dependent on the oven temperature and product mass being heated.

End of Procedure

Warning: Disconnect the unit from its power supply prior to performing maintenance or services.

Avertissement: Débranchez cet appareil de son alimentation électrique avant d'effectuer la maintenance ou les services.

CLEANING AND DISINFECTING

- Periodic cleaning is required.
- Do not use spray on cleaners or disinfectants. These can leak through openings and coat electrical components.
- Do not use cleaners or disinfectants that contain solvents capable of harming paint coatings or stainless steel surfaces. **Do not use chlorine-based bleaches or abrasives; these will damage the chamber liner.**
- Consult with the manufacturer or their agent if you have any doubts about the compatibility of decontamination or cleaning agents with the parts of the equipment or with material contained in it.
- If a hazardous material or substance has spilled in the unit, immediately initiate your site Hazardous Material Spill Containment protocol. Contact your local Site Safety Officer and follow instructions per the site policy and procedures.

Warning: Exercise caution if cleaning the unit with alcohol or flammable cleaners. Always allow the unit to cool down to room temperature prior to cleaning and make sure all cleaning agents have evaporated or otherwise been completely removed prior to putting the unit back into service.

Avertissement: Soyez prudent lorsque vous nettoyez l'appareil avec de l'alcool ou des produits de nettoyage inflammables. Laissez toujours refroidir l'appareil à la température ambiante avant le nettoyage et assurez-vous que tous les produits de nettoyage se sont évaporés ou ont été complètement enlevés avant de remettre l'appareil en service.

Cleaning

1. Disconnect the unit from its power supply.
2. Remove all removable interior components such as shelving and accessories.
3. Clean the unit with a mild soap and water solution, including all corners.
    - **Do not use an abrasive cleaner**. These will damage metal surfaces.
    - **Do not use deionized water to rinse or clean with.**
    - Take special care when cleaning around the temperature sensor probes in the chamber to prevent damage. Do not clean the probes.
4. Rinse with distilled water and wipe dry with a soft cloth.

Disinfecting

Disinfect the oven if algae, mold, bacteria, or other biological contaminants are an issue. For maximum effectiveness, disinfection procedures are typically performed after cleaning.

Keep the following points in mind when disinfecting the oven:

- Turn off and disconnect the unit to safeguard against electrical hazards.
- Disinfect the oven chamber using commercially available disinfectants that are non-corrosive, non-abrasive, and suitable for use on stainless steel and glass surfaces. Contact your local Site Safety Officer for detailed information on which disinfectants are compatible with your applications.
- If permitted by your protocol, remove all removable interior accessories (shelving and other non-attached items) from the chamber when disinfecting.
- Disinfect all surfaces in the chamber, making sure to thoroughly disinfect the corners. Exercise care to avoid damaging the sensor probes.
- When disinfecting external surfaces, use disinfectants that will not damage painted metal, glass, and plastic.

Door Gaskets and Chamber Integrity

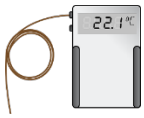
Periodically, inspect the door latch, trim, catch, and gasket for signs of deterioration. Failure to maintain the integrity of the door system shortens the lifespan of the oven.

These units use snap-in fiberglass door gaskets. The only tool required for swapping out these gaskets is a cutting implement for tailoring the length of the new gasket. Use proper PPE for handling exposed fiberglass when making the cuts.

Electrical Components

Electrical components do not require maintenance. If the oven fails to operate as specified, please contact your SHEL LAB distributor or **Technical Support** for assistance.

Calibrating the Temperature Display



Note: Performing a temperature display calibration requires a temperature reference device. Please see the **Reference Sensor Devices** entry on page 9 for device requirements.

Temperature calibrations match the temperature display to the actual air temperature inside the oven chamber. The actual air temperature is supplied by a reference sensor device. Calibrations compensate for software drifts in the controller as well as deviations caused by the natural material evolution of the sensor probe in the heated chamber space. Calibrate as often as required by your laboratory or production protocol, or regulatory compliance schedule. Always calibrate to the industry or regulatory standards required for your application.

A Suggested Calibration Set Up

Use non-marking, heat-resistant polyamide tape to hold the thermocouple probe in place. The oven manufacturer recommends Kapton brand tape, 0.5 inches width (12.7 mm), 2 mil thickness.

1. Introduce the reference device thermocouple sensor probe into the oven chamber through the access port.

- There must be at least 12 inches (305 mm) of wire in the chamber to prevent heat sinking, which would result in a false low temperature reading.

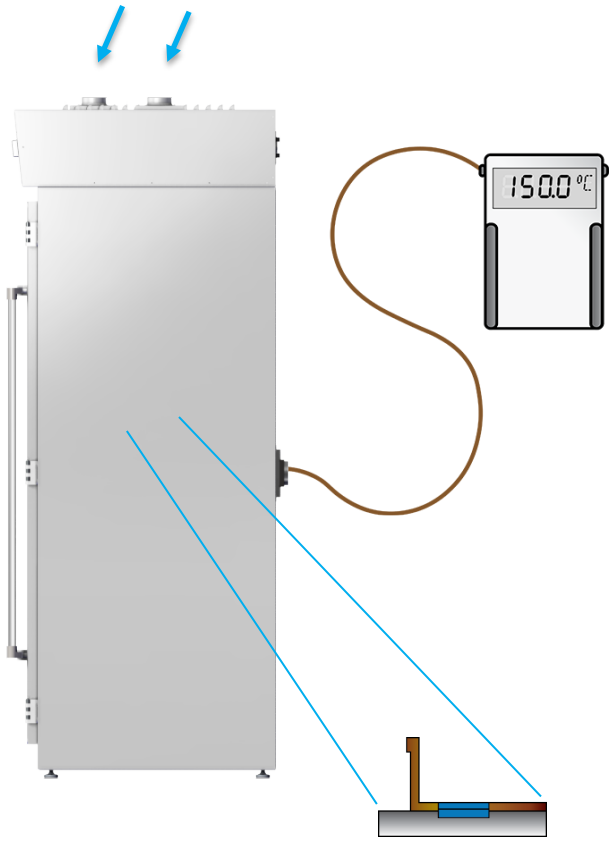
2. Position the probe in the chamber.

- Place the probe head as close as possible to the geometric center point of the chamber.
- The probe head must be at least 2 inches (51 mm) from the surface of the shelving to prevent heatsinking.

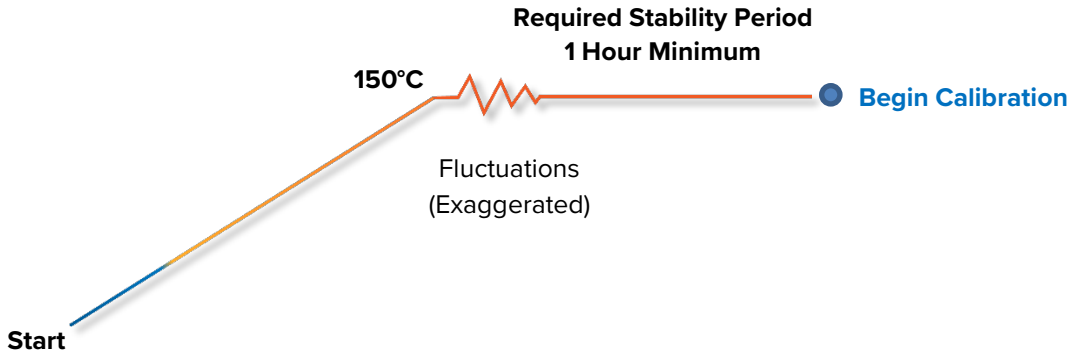
3. Secure the probe head in position with the non-marking, heat-resistant tape.

4. Close and latch the oven door.The door must be sealed to carry out an accurate calibration.

5. Verify the intake and exhaust vents are closed. Both vents **must be closed** for an accurate calibration.



6. The oven temperature must be stable in order to perform an accurate calibration. The temperature is considered stabilized when the oven chamber has operated with the doors closed at your calibration temperature for at least one hour with no fluctuations greater than the specified stability of the oven (see page 51).



Oven Chamber Heat Up and Stabilization Phases

Suggested Calibration Procedure

1

Once the chamber has stabilized, compare the reference temperature device and chamber temperature display readings.

- If the readings are the same, or the difference between the two falls within the acceptable range of your protocol, the display is accurately showing the chamber temperature. **The Temperature Calibration procedure is now complete**.

-OR-

- See Step 2 if a difference falls outside the acceptable range of your protocol.

Reference Device

2

The display requires a calibration adjustment.

- The difference between the reference device and the display is an **offset value**.
- Examples of offset values:

Reference Sensor Reading	Oven Temp Display	Offset Value
152.0°C	150°C	2
147.0°C	150°C	-3

- **Note the offset value for use in Step 9.**

Reference Device

Continued next page

Calibration continued

3

Enter the Operations Menu.

PGM

a. Push the **Program** button.

Operations Menu

4

Advance to Configuration.

a. Push the **Up** arrow to advance to “ConF”.

Configuration

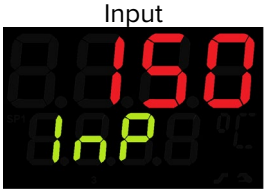
5

Enter the Configuration menu.

PGM

a. Push the **Program** button. The “InP” Input option will be the first to appear in the menu.

Input



6

Enter the Input menu.

PGM

a. Push the **Program** button. The ”InP1” Input 1 option will be the first to appear in the Input menu.

Input 1

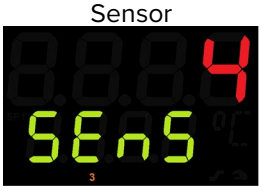
7

Enter the Input 1 Menu.

PGM

a. Push the **Program** button. “SenS” will be the first option to appear in Input 1 menu.

Sensor



Continued next page

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Calibration continued

8

Select the Offset calibration parameter

a. Push the **Down** arrow button two times to advance to “OFFS”.

Offset Parameter

9

Input the temperature offset.

a. Push the **Program** button to unlock the Offset parameter and place it in its blinking adjustable mode.

b. Use the arrow buttons to adjust the offset.

-3 Offset Entered

10

After entering the offset, wait 2 to 3 seconds.

- The green “OFFS” parameter name will cease flashing.
- The newly inputted red offset value will blink once, confirming that it has been saved.

Offset Saved

11

Return to the Homepage.

a. Push the **Exit** button four times to return to the homepage.

- The oven will begin heating or passively cooling to the match the offset.

Homepage, Heating

Continued next page

Calibration continued

12

Once the temperature has stabilized, compare the reference device and the oven display temperature readings.

- If the readings are the same or the difference between the two falls within the acceptable range of your protocol, the oven is calibrated for temperature. **The Temperature Calibration procedure is complete**.
- See next step if the difference between the readings stills falls outside your protocol acceptable range.

Reference Device*

Homepage

13

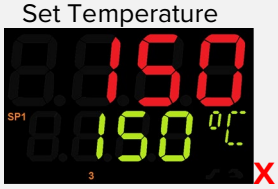
If the two readings still fall outside your protocol acceptable range, repeat steps 2 – 12 up to two more times.

- If the temperature reading difference fall outside your protocol after three calibration attempts, contact **Technical Support** or your distributor for assistance.

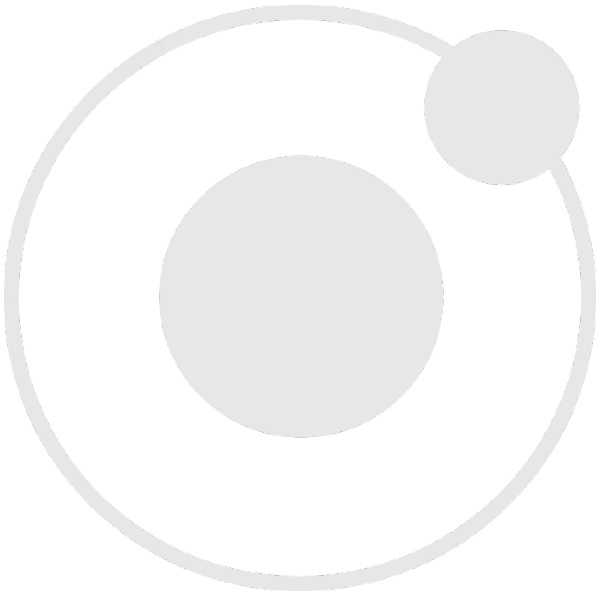
Three calibration attempts may be required to successfully calibrate units that are more than ±2°C out of calibration.

Reference Device*

Set Temperature



End of Procedure



UNIT SPECIFICATIONS

These ovens are 220 – 240 voltage single phase units. Please refer to the oven data plate for individual electrical specifications.

Technical data specified applies to units with standard equipment at an ambient temperature of 25°C and at nominal voltage. The temperatures specified are determined in accordance to factory standard following DIN 12880 respecting the recommended wall clearances of 10% of the height, width, and depth of the inner chamber. All indications are average values, typical for units produced in the series. We reserve the right to alter technical specifications at all times.

WEIGHT

Model	Shipping	Net
SMO14HP-2	563 lb / 255 kg	NA
SMO38HP-2	1078 lb / 489 kg	NA

DIMENSIONS

By Inches

Model	Exterior W × D × H	Interior W × D × H
SMO14HP-2	59.0 x 29.0 x 57.0 in	30.8 x 24.8 x 30.0 in
SMO38HP-2	68.5 x 33.0 x 78.5 in	48.0 x 25.5 x 54.0 in

By Millimeters

Model	Exterior W × D × H	Interior W × D × H
SMO14HP-2	1498 x 736 x 1448 mm	782 x 630 x 762 mm
SMO38HP-2	1740 x 838 x 1994 mm	1219 x 648 x 1372 mm

CAPACITY

Model	Cubic Feet	Liters
SMO14HP-2	14.6	413.0
SMO38HP-2	38.0	1083.0

Shelf Capacity by Weight

Model	Per Shelf	Total Weight
SMO14HP-2	75.0 lb / 34.0 kg	450.0 lb / 204.0 kg
SMO38HP-2	75.0 lb / 34.0 kg	900.0 lb / 408.0 kg

Maximum Number of Shelves

Model	Max Shelves
SMO14HP-2	14
SMO38HP-2	20

Air Flow Performance

Ventilation Rates

Model	Cubic Feet per Minute @150°C	Liters per Minute @150°C
SMO14HP-2	51	1444
SMO38HP-2	44	1246

Air Changes per Hour

Model	@150°C
SMO14HP-2	304
SMO38HP-2	95

Air Velocity Across Shelf Space

Model	Linear Feet per Minute	Meters per Minute
SMO14HP-2	144	43.9
SMO38HP-2	476	145.0

TEMPERATURE PERFORMANCE

Range

Model	Operating Range
SMO14HP-2	Ambient +15° to 260°C
SMO38HP-2	Ambient +15° to 260°C

Uniformity

Model	@ 80°C	@ 150°C	@ 260°C
SMO14HP-2	1.5°C	2.5°C	5.5°C
SMO38HP-2	1.5°C	2.5°C	5.5°C

Stability

Model	@ 80°C	@ 150°C	@ 260°C
SMO14HP-2	± 0.2°C	± 0.3°C	± 0.4°C
SMO38HP-2	± 0.2°C	± 0.3°C	± 0.4°C

Heat Up Times from Ambient (25°C)

Model	To 150°C
SMO14HP-2	14 Minutes
SMO38HP-2	15 Minutes

Continued next page

Temperature Performance Continued

Recovery Times from a 30 Second Door Opening

Model	@ 80°C	@ 150°C	@ 260°C
SMO14HP-2	3 Minutes	3 Minutes	6 Minutes
SMO38HP-2	3 Minutes	3 Minutes	5 Minutes

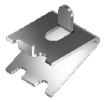
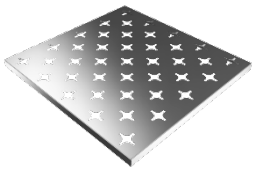
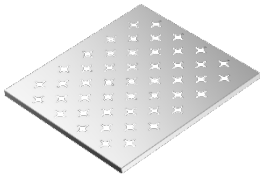
Recovery Times from a 60 Second Door Opening

Model	@ 80°C	@ 150°C	@ 260°C
SMO14HP-2	5 Minutes	6 Minutes	10 Minutes
SMO38HP-2	5 Minutes	5.5 Minutes	10 Minutes

POWER

Model	AC Voltage	Amperage	Frequency	Phase
SMO14HP-2	220 – 240	26.0	50/60 Hz	1
SMO38HP-2	220 – 240	50.0	50/60 Hz	1

PARTS LIST

Description	Parts Number	Description	Parts Number
Adjustable Leveling Feet:	 **2700506**	Shelf Clip, 1 each	 **1250512**
Door Gasket Fiberglass with clips, 1ft section SMO14HP-2 Requires 9 feet for each door SMO38HP-2 Requires 28 feet for each door	 **3450642**	Shelf 18.6 x 19.5 inches, SMO14HP-2	 **5120871**
Power Exhaust Blower Unit 220 Volt, all models	 **9990741**	Shelf 21 x 23 inches, SMO38HP-2	 **5120941**

Ordering

Accessories and replacement parts can be ordered online at **parts.sheldonmfg.com**.

If the required item is not listed online, or if you require assistance in determining which part or accessory you need contact SHEL LAB by emailing parts@sheldonmfg.com or by calling 1-800-322-4897 ext. 4 or (503) 640-3000 ext. 4.

Please have the **model, serial,** and **part** numbers of the unit ready. Tech Support needs this information to match your unit to its correct part.

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