

HIGH-PERFORMANCE OVENS



220 – 240 Voltage

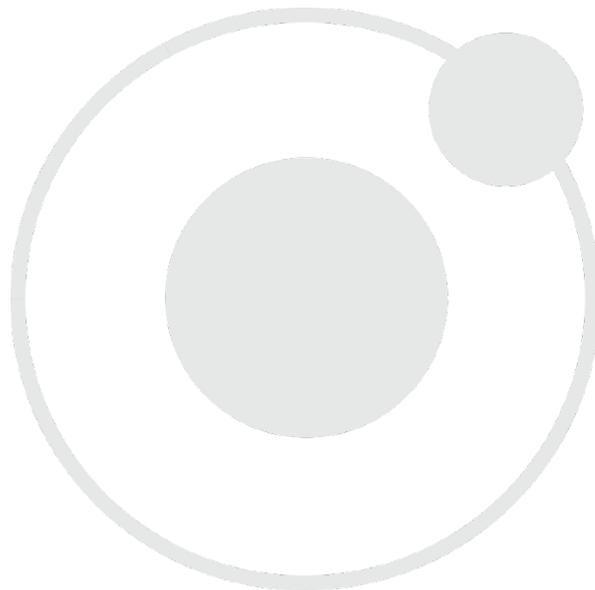


Installation – Operation Manual

SMO38HP-2, SMO14HP-2

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

Pictured on front cover: SMO38HP-2 (left) and SMO14HP-2 (right)



SMO High-Performance Ovens 220 – 240 Voltage

Part number (Manual): 4861705

Revision: April 6, 2018



SHEL LAB is a brand of Sheldon Manufacturing, INC.

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.

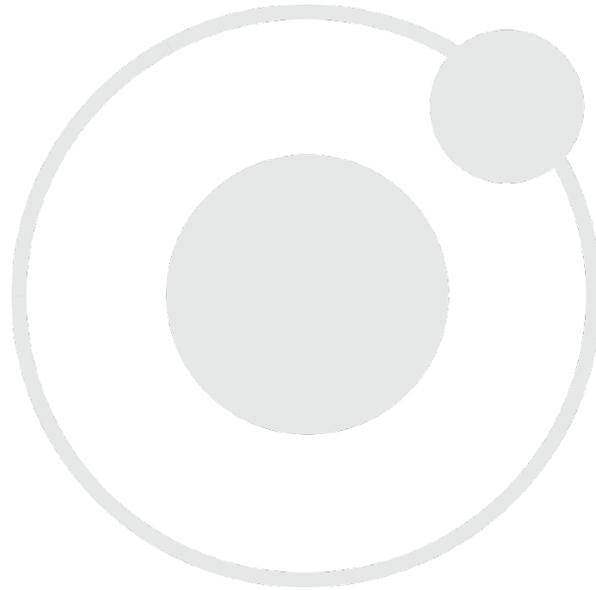
The units have been tested to the following requirements:

- 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. Keep this manual available for use by all operators. Ensure all operators are given appropriate training before the unit begins service.

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.

Locations and Intended Applications Range

SMOHP forced-air 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.

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.

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.
- 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.

INTRODUCTION

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** and the **serial number** (see page 10).

EMAIL: support@sheldonmfg.com

PHONE: 1-800-322-4897 extension 4, or (503) 640-3000

FAX: (503) 640-1366

Sheldon Manufacturing, INC.

P.O. Box 627

Cornelius, OR 97113

ENGINEERING IMPROVEMENTS

Sheldon Manufacturing, Inc. 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.

RECEIVING YOUR OVEN

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. The unit should come with an Installation and Operation Manual.
5. Verify that the correct number of accessories have been included. Carefully check all packaging for accessories before discarding

Included accessories

Model	Shelves	Shelf Slides / Clips	Leveling Feet	Port Stopper*
SMO14HP-2	6	24 Clips	4	1
SMO38HP-2	12	48 Clips	4	1

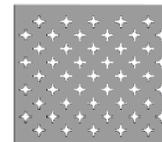


Shelf Styles

SMO14HP-2



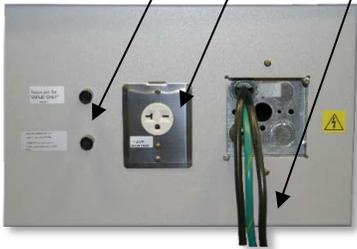
SMO38HP-2



*A high-temperature access port stopper ships installed in the port located on the back of the oven.

RECEIVING YOUR OVEN

Fuse Holders for External Receptacle (2 amps each) Power Exhaust Outlet 6-20R Power Supply Feed



Power Panel (Back)

Permanent Connect Wire Braid 6 gauge, 6 inches (15 cm)

Exhaust Vent Intake Vent

Control Panel

Chamber Ceiling Liner Chamber Liner Gasket

Temperature Sensor Probes

Shelf Standard Mounting Rail

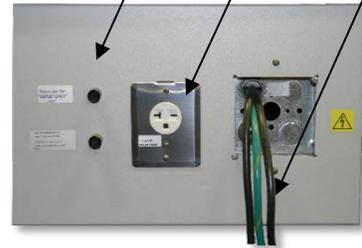


Figure 1: SMO38HP-2

RECEIVING YOUR OVEN

Power Panel (Back)

Fuse Holders for External Receptacle (2 amps each) Power Exhaust Outlet 6-20R Power Supply Feed



Permanent Connect Wire Braid
10 gauge, 6 inches (15 cm)

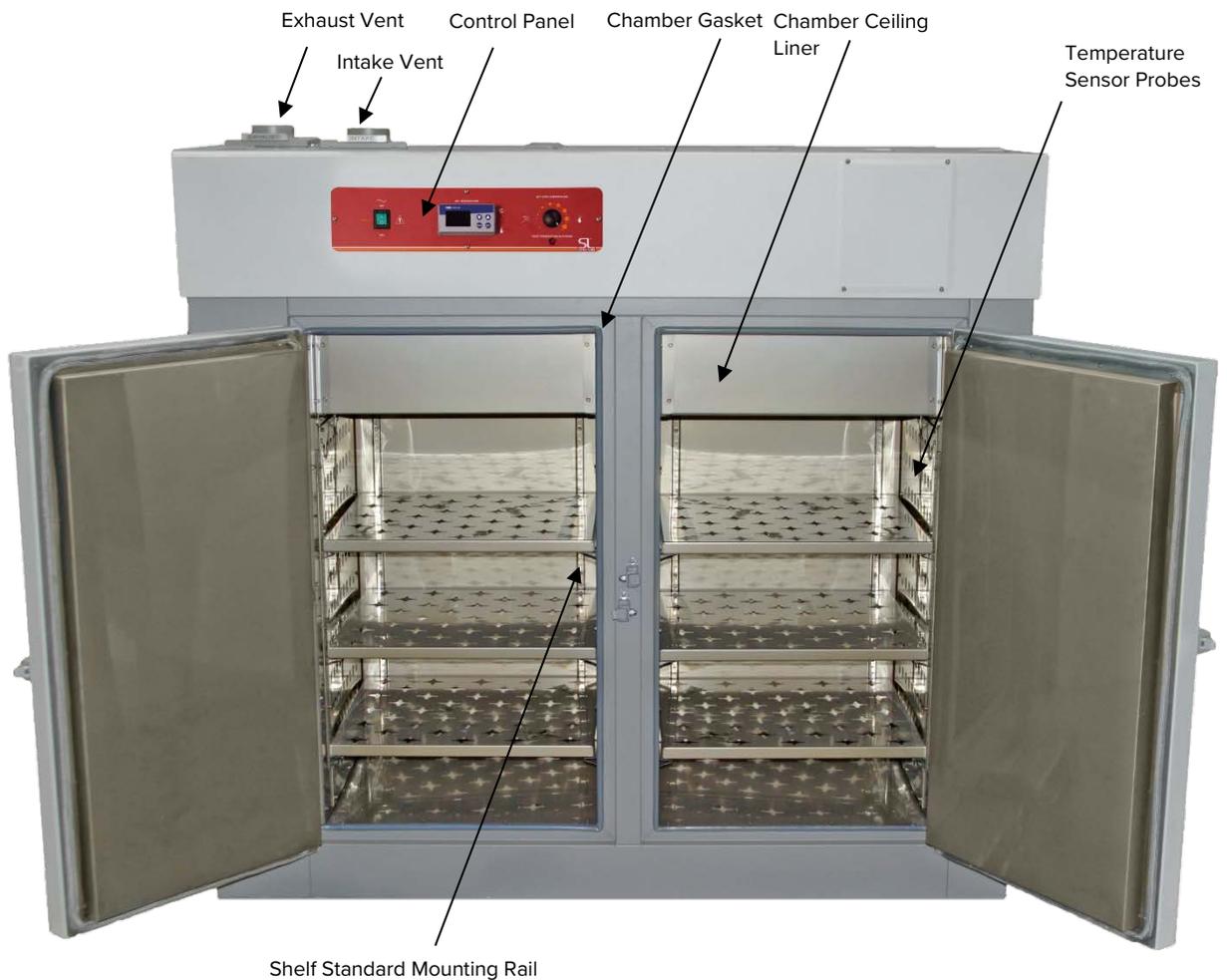


Figure 2: SMO14HP-2

RECEIVING YOUR OVEN

RECORDING DATA PLATE INFORMATION

Locate the data plate on the back of the oven next to the power inlet. The data plate contains the oven model number and serial number. Enter this information below for future reference.

Date Plate Information

Model Number	
Serial Number	

TEMPERATURE REFERENCE SENSOR DEVICE

The oven does not come with a temperature reference device. A reference sensor device must be purchased separately for performing accuracy verifications or calibrations of the oven temperature display.

The reference device must be accurate to at least 0.1°C, and should be regularly calibrated, preferably by a third party.

For best results, use a digital device with a thermocouple or other remote reading probe. Remote readings avoid oven chamber door openings during verification and calibration procedures. This avoids subsequent waits for the chamber temperature to re-stabilize. Select a probe suitable for the application temperature you will be calibrating or verifying the display accuracy at.

Alcohol thermometers are insufficient for conducting accurate verifications and calibrations. Do not use a mercury thermometer. **Never place a mercury thermometer in the oven chamber.**

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

Carry out the procedures and steps listed below to install the oven in a new workspace location and prepare it for use. All procedures are found in the Installation section of this manual.

Pre-Installation

- ✓ Check that the required ambient conditions, ventilation, and spacing for the oven are met, page 14.
 - Unit dimensions may be found on page 41.
- ✓ Check for performance-disrupting heat and cold sources in the environment, page 14.
- ✓ Check that a suitable electrical power supply is present. The oven requires permanent connect wiring (hardwiring) to the power supply, page 14.

Install the oven in a suitable workspace location

- ✓ Review the lifting and handling instructions, page 16.
- ✓ Install the oven in its workspace location, page 16.
- ✓ Make sure the oven is level, page 17.

Set up the oven for use

- ✓ Clean the oven chamber if needed, page 17.
- ✓ Install the shelving in the oven chamber, page 18.
- ✓ Verify that the rubber stopper is installed in the access port inside the incubation chamber, page 18.

REQUIRED AMBIENT CONDITIONS

This oven is 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).

Clearances

- Allow **24 inches (600 mm)** of vertical headspace clearance above the top of the oven for unobstructed airflow and cooling.
 - If the oven exhaust will be vented from the workspace through a duct or other channeling, **12 inches (300 mm)** of vertical clearance will suffice. Make sure the exhaust vent remains unobstructed.
 - Do not place objects on top of the oven.
- Allow a minimum of **12 inches (300 mm)** of horizontal clearance between the oven and any walls or partition.
 - Allow at least **12 inches (300 mm)** from the fan on the back of the oven to the nearest wall or partition. Keep the fan unobstructed at all times.

Operating the unit outside of these conditions may adversely affect its temperature range and stability. For conditions outside of those listed above, please contact your distributor to explore other oven options suited to your laboratory or production environment.

ENVIRONMENTAL DISRUPTION SOURCES

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

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

INSTALLATION

POWER SOURCE REQUIREMENTS

When selecting a location for the oven, check that **each** of the following requirements are satisfied:

The power supply must meet the power requirements listed on the oven data plate (located on the back of the unit, beneath the power feed inlet).

- These ovens are intended for 220 – 240 volt, 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.
- **Supplied voltage must not vary more than 10% from the data plate rating.** Damage to the oven may result if supplied voltage varies more than 10%.
- 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.

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

- The required circuit-breakers are: SMO14HP-2 30 amps; SMO38HP-2 60amps.

The oven must be positioned so that all operators 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 operator.
- The Disconnect must be marked as the disconnecting device for the equipment.

INSTALLATION

Receptacle Fuses

The oven is also provide with a pair (2) of 2 amp fuses installed adjacent to the external power receptacle. The fuses protect against overcurrent conditions related to the operation of the receptacle and an attached power exhaust blower. If one fuse blows, the receptacle will depower. The cause of a blown fuse should be determined prior to replacing it.

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 above.

POWER FEED WIRING

The oven comes provided with an integral 6 inch (15 cm) wire braid of:

- SMO14HP-2 – two 10 gauge hot wires and a 10 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's protections against potentially dangerous electric shocks and create a possible fire hazard.

LIFTING AND HANDLING

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

- Lift the oven only from its bottom surface.
- Doors, handles, and knobs are not adequate for lifting or stabilization.
- Restrain the oven 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.

INSTALLATION

INSTALL THE OVEN

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

LEVELING

Install the leveling feet shipped with the unit. The unit must be level and stable for safe operation.

1. Insert one leveling foot into each of the four holes in the bottom corners of the unit.
2. Adjust the foot at each corner until the unit stands level and solid without rocking. To raise a foot, turn it in a counterclockwise direction.
3. To lower a foot, turn it in a clockwise direction.



Figure 3:
Leveling Foot

Note: To prevent damage when moving the unit, turn each of the four leveling feet completely clockwise.

INSTALLATION CLEANING

The unit was cleaned at the factory, but not sterilized. It may have been exposed to contaminants en route during shipping. See the [Cleaning and Disinfecting](#) topic in the User Maintenance section (see page 35) for more information on how to clean the oven chamber prior to putting the unit into operation. Remove all wrappings and coverings from shelving prior to cleaning and installation.

INSTALLATION

SHELVING INSTALLATION

The horizontal airflow within the chamber moves from the small duct holes on the right-hand side of the chamber, to the large holes on the left side. Place the shelves so they do not obstruct the duct holes on either side in order to maximize airflow across the shelf space.

Perform the following steps to install the SMO-HP shelves:

1. Install the shelf clips in the slots of the shelf standard rails located on the sides and rear of the chamber interior.
 - a. Squeeze each clip.
 - b. Insert the top tab first, then the bottom tab using a rocking motion.
2. Hang the shelves from the clips.
 - a. Space the shelves out evenly in the incubation chamber to ensure the best possible air circulation and temperature uniformity.

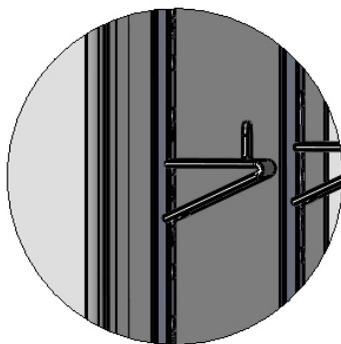


Figure 5: Installing Shelf Clip

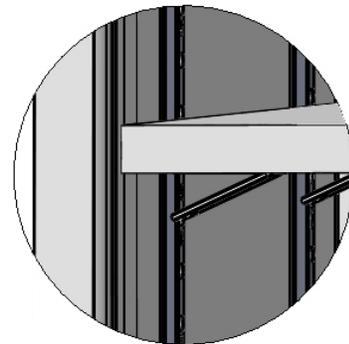


Figure 4: Shelf Hung

ACCESS PORT STOPPER

Verify the port stopper is installed in the access port on the back of the unit. The oven will not meet its temperature performance specifications without the stopper installed.

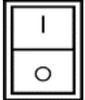
The stopper must always be installed on the outside of the oven.

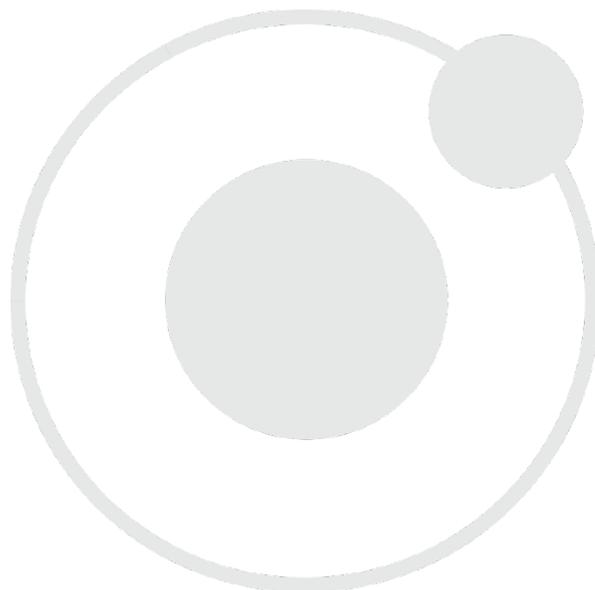


Figure 6: Port Stopper in Access Port

GRAPHIC SYMBOLS

The oven is provided with multiple graphic symbols on its external and internal surfaces. The symbols identify hazards and the functions of the adjustable components, as well as important notes found in the user manual.

Symbol	Definition
	Indicates that you should consult your service manual for further instructions. Indique que l'opérateur doit consulter le manuel d'utilisation pour y trouver les instructions complémentaires.
	Indicates Adjustable Temperature Indique température réglable
	Indicates AC Power Repère le courant alternative
	Indicates I/ON and O/OFF I repère de la position MARCHÉ de l'interrupteur d'alimentation O repère de la position ARRÊT de l'interrupteur d'alimentation
	Indicates protective earth ground Repère terre électrique
	Indicates UP and DOWN respectively Touches de déplacements respectifs vers le HAUT et le BA
	Indicates a Potential Shock Hazard Signale danger électrique
	Indicates the unit should be recycled (Not disposed of in land-fill) Indique l'appareil doit être recyclé (Ne pas jeter dans une décharge)
	Indicates: Caution hot surface Indique: Avertissement symbole de surface chaude



CONTROL PANEL OVERVIEW



Figure 7: Control Panel

Power Switch



Labeled Power, this illuminated switch controls all power to the oven. It must be in the On (I) illuminated position before any systems are operational.

Set Temperature: The Temperature Display and Controller Unit

The temperature display and controller unit for large capacity SMOHP-2 ovens is a JUMO dTRON. After booting up, the display shows **the homepage**. The homepage shows the current oven chamber air temperature in red (top), and the current temperature set point in green (bottom). Both are in degrees Celsius. The chamber temperature will heat up to match the current set point. Note that the lowest temperature the oven chamber can achieve and sustain while powered is 10°C above the ambient room temperature due to waste heat.



Current Oven Temperature

Current Set Point

Figure 8: Display Home Page

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



While on the home page, the **up arrow button** launches the heating profile, if one has been programmed. The up arrow also aborts a heating profile, if pressed while the profile is running.



Pressing the **down arrow** unlocks the green temperature set point **when a profile is not running**. Both arrow keys can then be used to adjust the unlocked set point. After an adjustment is entered, and no key is pressed for 3 seconds, the green set point will blink and lock, and the oven will begin to heat or passively cool to match the adjusted set point. It will then run indefinitely at that set point until adjusted again, or until a heating profile is launched.

After completion of a profile, the oven will continue to run at the temperature set point of the final step in the profile.

CONTROL PANEL OVERVIEW

Other Arrow Key Uses

When the display is showing menu pages, the up and down arrow buttons are used to scroll through menu options. On a heating profile programming pages, the up arrow is used to return 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 keys adjust the parameter setting.



Program and Exit Buttons.

On the home page, pressing the **Program button** (PGM) changes the display to show the Operations menu page. When programming a heating profile, the Program button is used to advance between parameters and unlocks the Temperature, Time, and Option parameters for adjustment. Parameters blink continually when unlocked. Pressing 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 temperature cut-off point for the OTL heating cut off system. The OTL is a redundant mechanical system that reroutes power away from the heating elements whenever the chamber temperature exceeds the current OTL cut off setting. This prevents unchecked heating of the chamber in the event of a failure of the digital controller unit or its sensor probe while in heating mode.



The red Over Temp Activated light illuminates whenever the Over Temperature Limit system is routing power away from the 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 Cautions, 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 items 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 dampers may be hot to the touch. These areas are marked with Hot Surface labels. Proper PPE should be employed to minimize risk to burn.

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

The operation of each SMOHP-2 oven is controlled by a JUMO dTRON digital controller, wired to a solid state temperature probe located on the right wall of the oven chamber. The controller employs proportional-integral-derivative analytical feedback-loop functions when measuring and controlling the chamber air temperature. PID-controlled heating pulse intensities and lengths are proportional to the difference between the measured chamber temperature and the current set point. The frequency of pulses is derived from the rate of change in that difference. The integral function slows the rate of pulses when the temperature nears the set point to avoid overshooting.

The user controls the heating of the oven by either programming and launching a heating profile or manually setting a set point on the home page. The lowest temperature the oven can achieve for either single set point or a heating profile is the room temperature (ambient) +15°C.

The JUMO controller stores a **one heating profile** with **twenty-four (24) programmable steps**. Each step has three programmable parameter values: the **temperature set** point, the **time period**, and an **option controller value**. The option controller value activates or deactivates an exhaust blower plugged into the external power outlet on the oven and mounted on the exhaust vent. The exhaust blower must be purchased separately. Please see the *Operation and Programing JUMO dTRON Guide* for how to program a heating profile.

The heating rates given for the oven are for a 25°C environment. The ambient temperature of the workspace around the oven affects heating and cooling rates.

Airflow and Applications

During normal operations, an internal blower fan motor circulates air through the chamber and a heating duct located above the chamber in a closed circuit. Heated air is routed into a duct that makes up the right wall of the chamber. Air exits through small holes and blows horizontally across the shelf space. This helps create temperature uniformity and enhances drying. The air then enters a duct on the left side of the chamber through larger holes and is pulled back up into the heating duct above the oven chamber. If one or both vents are open, the rate of atmosphere exchange between the chamber and surrounding workspace depends on several variable factors. These include ambient conditions, the volume of material in the oven chamber, and if an active power exhaust unit is connected to the exhaust vent.

To achieve stated performance specs, the **oven intake and exhaust vents must be fully closed**. Operating the oven with the vents open impacts the oven chamber temperature uniformity and stability. This may speed drying rates, depending on the nature of your samples or product. Running the oven with an active power exhaust blower attached will reduce the oven chamber temperature. The vents are intended to be open **after** completion of a heating profile or other baking application to speed drying.

Power Exhaust Outlet

SMOHP-2 Ovens come provided with an external power outlet that can be used to power an exhaust blower attached to the oven exhaust vent. The power outlet and attached fan can be activated by the oven controller as part of the heating profile. The primary application of an external blower is to force noxious or hazardous oven exhaust away from the oven workspace through a duct or other venting. A power exhaust increases the rate of air exchange in the oven chamber and impacts temperature performance and cooling rates by removing heated chamber air.

The Over Temperature Limit System

The OTL is a backup mechanical heating cut off system that operates independently of the oven digital controller. It consists of a mechanical thermostat control wired by a fluid capillary to an independent hydrostatic temperature probe located on the right wall of the oven chamber. The OTL system prevents runaway heating by routing power away from the oven heating elements whenever the air temperature in the chamber exceeds the OTL cutoff setting. The OTL is set by the end-user, typically at 5°C above the current application or process temperature. The OTL should be reset each time the temperature is changed.

OPERATION

PREPARING THE OVEN FOR USE

Perform the following steps to prepare the oven for use after installing it in a new workspace environment.

The First Use Burn-In procedure is intended to remove any traces of protective oil coatings from the oven elements and prevent smoking during your first application or heating profile run above 150°C. This also removes any residual cleaning agents left on the oven chamber surfaces. The procedure only needs to be performed once, after receiving the oven from the factory.

1. Open the intake and the exhaust vents of the First Use Burn-in Procedure.
2. Attach any ducting to the exhaust vent at this time.
3. Place the Power Switch to the ON position.
 - a. The controller display will illuminate and load its homepage.
4. Set up the oven for use by carrying out the following procedures in order, found in the Operation section:



Homepage

Prepare for First Use Burn-In, page 26.

Set the Temperature Set Point for the burn-in, page 27.

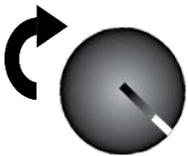
First Use Burn-In, page 28.

Optional: Temperature Verification, page 29.

Set the Over Temperature Limit for your application temperature, page 31.

PREPARE FOR FIRST USE BURN-IN

If the oven is being run for the first time, perform the steps below followed by the Burn-In procedure to burn off the protective oil coating from the oven heating element.



1. If not already set to its maximum position, turn the OTL control dial all the way to the right (clockwise) so that it does not interfere with the Burn-In process.
 - a. The OTL should come from the factory set to its maximum position.
2. Positively vent the oven exhaust outside of its workspace environment during the Burn-In Procedure. The procedure will produce light smoking.
 - a. The smoke should be non-toxic, but may be noxious.
3. Use the Set the Temperature Set Point procedure on the next page to set the oven to run at 200C°.

OPERATION

SET THE TEMPERATURE SET POINT

Note: Set the oven temperature to 200°C for the First Use Burn-In Process.

There are two ways to set the oven chamber temperature. You may use either of these for the Burn-In procedure.

- **Program and launch a heating profile.** A profile can run the oven at a single steady state temperature.
 - Please see pages 5 – 15 of the *Operation and Programming Guide – JUMO dTRON* that came with this oven for how to program and launch or abort a heating profile.
- **Unlock and adjust the home page temperature set point.** This is the simplest option when performing the First Use Burn-In. See below.

Unlock and Adjust the Temperature Set Point	
 <ol style="list-style-type: none">1. Unlock the Set Point<ol style="list-style-type: none">a. Press and hold the down arrow button until the green set point (bottom) begins to blink.	<p>Home Page</p> 
 <ol style="list-style-type: none">2. Adjust the blinking set point to your application set point (200°C for the First Use Burn-In).<ol style="list-style-type: none">a. Use the Up and Down arrow keys. <p>Note: After 3 seconds or more of no activity, the set point will lock, cease blinking, and store the last displayed value as the new set point.</p>	<p>New Set Point</p> 
<ol style="list-style-type: none">3. After adjusting to the set point, wait 3 seconds.<ol style="list-style-type: none">a. The controller will save and lock the new set point valueb. Allow the oven time to heat to the set point. The oven will run indefinitely at this temperature.	<p>Heating</p> 

FIRST USE BURN IN

Employ appropriate personal protective equipment (PPE) when handling the vent dampener slides.

1. Verify that oven exhaust is positively vented from the workspace area.
2. Allow the oven to heat to 200°C.
3. After reaching 200°C, allow the oven run for a minimum of 1 hour at temperature.
 - a. If still producing smoke after 1 hour, run at 200°C until smoke from the heating elements dissipates.



Wait 1 Hour

After the Burn-In is complete, you may set the oven to run at a constant temperature set point and program a heating profile. You may also perform the optional accuracy verification of the temperature display.

Always set the Over Temperature Limit before starting normal operations.

TEMPERATURE ACCURACY VERIFICATION

Note: Performing an accuracy verification of the temperature display requires a temperature reference device. Please see the [Reference Sensor Devices entry](#) on page 12 for device requirements.

Optional: A verification of the temperature display accuracy may be carried out when preparing the oven for use if required by your production or laboratory protocol. The verification compares the displayed temperature of the oven chamber with the actual temperature of the chamber air as provided by a reference sensor device.



Figure 9: Damper in Closed Position

If a difference between the actual and displayed temperatures is discovered, perform a temperature calibration. Please see the [Calibrate Temperature Display procedure](#) on page 37 in the User Maintenance section.

Vents

The intake and exhaust vents must be closed in order to perform an accurate temperature verification. Chamber temperature uniformity and stability are too disrupted when operating with the vents open to verify the accuracy of the temperature display.

Probes

A reference device sensing probe may be introduced through the through the chamber door space. Use heat-resistant, non-marking tape to secure the wires and probe heads, and seal any gaps in the door space. The door must close and latch fully.

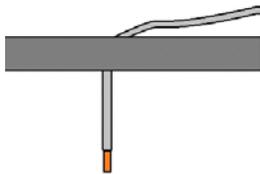


Figure 10: Probe End 2 inches (5cm) From Shelf Surface

Place the sensor probe of the temperature reference device as close as possible to the geometric center of the oven chamber. A thermocouple sensor probe sleeve may be taped to the shelving, as long as the exposed copper end is 2 inches (5cm) away from the shelf (see Figure 10). An exposed sensor probe in direct contact with the shelving may experience heat sinking, which can result in an inaccurate temperature reading.

Pre-Heating

For best accuracy, set the oven temperature set point to that of your application. If you will be running a multi-set point heating profile, set the oven to run at the average temperature of your profile. Let the oven heat to the constant temperature set point and run for at least 1 hour undisturbed in order to stabilize.



Wait 1 Hour

Temperature Stability

The oven chamber is thermally stabilized when no fluctuations of $\pm 0.2^{\circ}\text{C}$ or greater have been detected with the verification reference device **for a minimum of 30 minutes**. Failure to wait for stabilization will result in a failure to verify the accuracy of the oven temperature display reading.



Wait 30 Minutes

Verifying the Temperature Display Accuracy	
<ol style="list-style-type: none">1. Once the chamber temperature has stabilized, compare the reference device and the oven display temperature readings.<ol style="list-style-type: none">a. If the readings are the same, or the difference between the two (2) falls within the acceptable range of your protocol, the display is accurately showing the oven chamber air temperature. The Temperature Verification procedure is now complete.b. See step 2 if a difference falls outside the acceptable range of your protocol.	<p>Reference Device</p>  <p>Oven Display</p> 
<ol style="list-style-type: none">2. Perform a temperature calibration to match the controller display to the actual chamber temperature if a difference falls outside your protocol range.<ol style="list-style-type: none">a. Please see 37 in the User Maintenance section.	<p>Reference Device</p>  <p>Oven Display</p> 

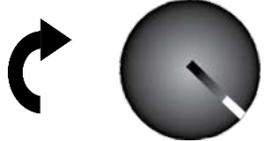
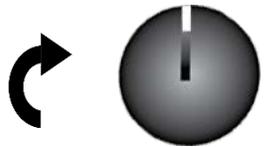
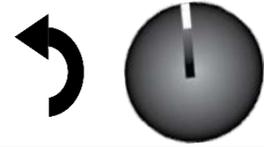
End of procedure

OPERATION

SET THE OVER TEMPERATURE LIMIT

Note: Test the OTL system for functionality at least once per year.

This procedure sets the Over Temperature Limit heating cut off to approximately 5°C above the current chamber temperature.

Set the OTL Cutoff Temperature	Example
<p>1. Turn the Set Over Temperature Limit control dial clockwise to the maximum position, if it is not already set to maximum.</p>	
<p>2. Set the oven to run at either your single set point application temperature or a set point equal to the highest temperature of your application heating profile.</p>	
<p>3. Wait 30 minutes after the oven has achieved the set point for the chamber to stabilize, before setting the OTL</p> <p> Wait 30 Minutes</p>	
<p>4. Turn the Over Temperature Limit control dial counterclockwise until the red Over Temperature Limit Activated light illuminates.</p>	
<p>5. Slowly turn the dial clockwise until the Over Temperature Limit Activated light turns off. Stop turning the control.</p> <p>a. The Over Temperature Limit is now set approximately 5°C above the current chamber temperature.</p>	
<p>6. Optional: You may turn the dial slightly to the left to bracket in closer to the set point temperature. This sets the OT Limit nearer to the current chamber temperature.</p>	
<p>7. Leave the OTL dial set just above the activation point.</p>	

If the OTL sporadically activates after setting the control, you may turn the dial very slightly to the right (clockwise).

OTL ACTIVATION DURING NORMAL OPERATIONS

The following may be taking place if the OTL system activates during normal operations:

- A user has set the Over Temperature Limit below the current set point for either an active heating profile or single constant temperature set point.
- An external heat source or heat source inside the chamber is causing the chamber air temperature to spike.
- The temperature controller and display unit or its sensor probe has failed, and must be replaced in order to maintain safe operation of the oven.

If the OTL activated during normal operations adjust it very slightly clockwise to increase the setting. If the OTL continues to interrupt heating of the oven chamber and there no obvious external sources of nearby heating (autoclaves, another oven), depower the oven and allow the oven chamber to cool before opening the oven door or troubleshooting.

PROGRAMMING A HEATING PROFILE

Please see the *Operation and Programing JUMO dTRON Guide* included with the oven for how to program, launch, and abort a heating profile.

POSITIVE VENTING OF EXHAUST

Exhaust ducting can be connected to the oven exhaust port in order to channel outgassed products out of the workspace around the oven. An attached exhaust duct should not extend straight up from the oven, but should include a steep bend sufficient to stop condensation in the ducting from sliding down into the oven.

Shel Lab offers a 230 volt High-Performance Power Exhaust that can be mounted directly on the oven exhaust vent and attached to exhaust ducting. This allows for positive venting. When plugged into the oven's external power outlet, the operation of the exhaust blower is controlled by the heating profile.



Figure 11: High Performance Power Exhaust
(Part Number 9990741)

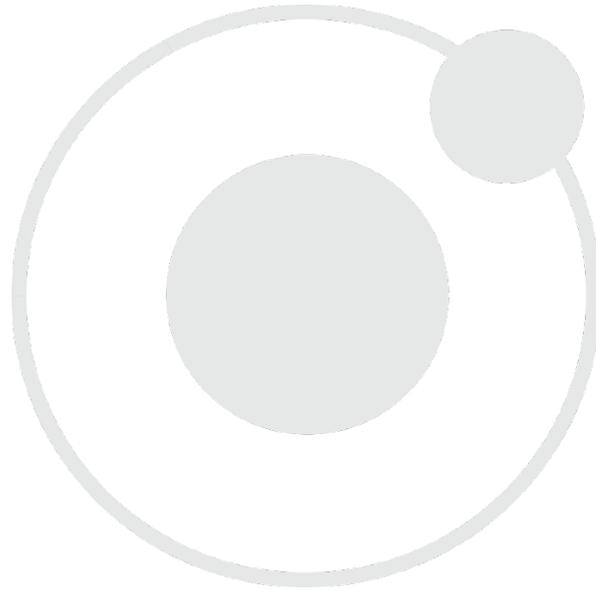
Mounting the Power Exhaust

1. Remove the screws on the cover of the exhaust vent assembly on the top of the oven, but leave the assembly in place.
2. Mount the exhaust blower on the exhaust vent cover assembly, aligning the blower and the assembly's screw holes.
 - a. The open side of the blower's mounting body should go over the sliding handle of the exhaust port's vent cover.
3. Reinstall the screws to secure the exhaust vent assembly and exhaust blower to the oven.
4. Plug the power exhaust into the 230-volt outlet on the back of the oven.

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.





Warning: Prior to maintenance or service on this unit, disconnect the power feed from the power supply.

Avertissement: Avant d'effectuer toute maintenance ou entretien de cet appareil, débrancher le cordon secteur de la source d'alimentation.

CLEANING AND DISINFECTING

If a hazardous material or substance has spilled in the unit, immediately initiate your site's Hazardous Material Spill Containment protocol. Contact your local Site Safety Officer and follow instructions per the site policy and procedures.

- The unit chamber should be cleaned and disinfected prior to first use.
- Periodic cleaning is required.
- Do not use spray on cleaners or disinfectants. These can leak through openings and coat electrical components.
- 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.
- 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.**



Warning: Never clean the oven with alcohol or flammable cleaners.

Avertissement: Ne jamais nettoyer l'appareil à l'alcool ou avec des nettoyeurs inflammables.

Cleaning

1. Remove all removable interior components such as shelving and accessories.
2. Clean the unit with a mild soap and water solution, including all corners. **Do not** use an abrasive cleaner that will damage metal surfaces. **Do not use deionized water to rinse or clean with.**
3. Rinse with distilled water and wipe dry with a soft cloth.
4. Take special care when cleaning around the Main Temperature and Over Temperature Limit sensor probes on the side of the chamber to prevent damage.

Disinfecting

1. Turn the unit off. Carry out your disinfection protocol.
2. If allowed by your protocol, remove all shelving. Disinfect all corners. Take special care not to damage the temperature sensor probes when disinfecting.
3. Disinfect the unit using commercially available disinfectants that are non-corrosive, non-abrasive, and suitable for use on stainless steel surfaces. Contact your Site Safety Officer for detailed information on the disinfectants compatible with your study or production protocol.

USER MAINTENANCE

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 and removal of gross matter contamination. Perform the following steps to manually disinfect the oven:

1. Turn the unit off. Open all doors and carry out your laboratory or production space disinfection protocol.
2. Disinfect the oven chamber using commercially available disinfectants that are non-corrosive, non-abrasive, and suitable for use on stainless steel surfaces. If disinfecting external surfaces use disinfectants that will not damage painted cold roll metal or plastic. Contact your local Site Safety Officer for detailed information on the disinfectants compatible with your application or process.
3. If permitted by your protocol, remove all interior accessories (shelving and other non-attached items) from the chamber when disinfecting.
4. Disinfect all surfaces in the chamber, making sure thoroughly disinfect the corners. Exercise care to avoid damaging the sensor probes.

ELECTRICAL COMPONENTS

Electrical components do not require maintenance. If the oven fails to operate as specified, please contact your Shel Lab distributor or Sheldon Manufacturing Technical Support for assistance.

DOOR GASKETS AND CHAMBER INTEGRITY

Periodically, inspect the door latch, trim, catch, and silicon door gasket for signs of deterioration. Failure to maintain the integrity of the door system shortens the life span of the Oven and affects temperature performance.

CALIBRATE THE TEMPERATURE DISPLAY

Note: Performing a temperature display calibration requires a temperature reference device. Please see the [Reference Sensor Devices entry](#) on page 12 for device requirements.

Temperature calibrations are performed to 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 drifts in the controller as well as those caused by the natural material evolution of the sensor probe under temperature in the chamber space. Calibrate as often as required by your laboratory or production protocol, or regulatory compliance schedule.



Figure 12: Vent Damper in Closed Position

Vents

The vent dampeners must be close in order to perform an accurate display calibration. Chamber temperature uniformity and stability are too disrupted when operating with the vents open to verify the accuracy of the oven temperature display.

Probes

A reference device sensing probe may be introduced through the through the chamber door space. Use heat resistant non-marking tape to secure the wires and probe heads, and seal any gaps. The door must close and latch fully.

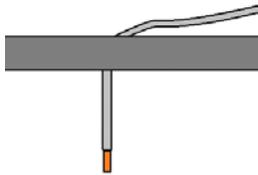


Figure 13: Probe End 2 inches (50 mm) From Shelf Surface

Secure the wiring and cover any gaps in the door space using heat-resistant, non-stick tape.

Place the sensor probe of the temperature reference device as close as possible to the geometric center of the oven chamber. A thermocouple sensor probe sleeve may be taped to the shelving, as long as the exposed copper end is 2 inches (5cm) away from the shelf (see Figure 13). An exposed sensor probe in direct contact with the shelving may experience heat sinking, which can result in an inaccurate temperature reading.

Pre-Heating

For best accuracy, set the oven temperature set point to that of your application. If you will be running a multi-set point heating profile, set the oven to run at the average temperature of your profile. Let the oven heat to the constant temperature set point and run for at least 1 hour undisturbed in order to stabilize.



Wait 1 Hour

Temperature Stability

The oven chamber is thermally stabilized when no fluctuations of $\pm 0.2^\circ\text{C}$ or greater have been detected with the verification reference device **for a minimum of 30 minutes**. Failure to wait for stabilization will result in an inaccurate calibration and oven temperature display reading.



Wait 30 Minutes

USER MAINTENANCE

Temperature Calibration

1. Once the chamber has stabilized with no fluctuations of $\pm 0.2^{\circ}\text{C}$ or greater compare the reference temperature device and chamber temperature display readings.
 - a. If the readings are the same, or the difference between the two (2) falls within the acceptable range of your protocol, the display is accurately showing the chamber temperature. **The Temperature Verification procedure is now complete.**
 - b. See step 2 if a difference falls outside the acceptable range of your protocol.

Reference Device



Home Page



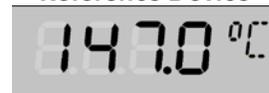
2. The display requires calibration.
 - a. The difference (also known as an error) between the reference device and the display is an **offset**.

Examples of offset values:

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

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

Reference Device



Home Page



Correcting an Offset

3. Jump to the Operations Menu.



- a. Press the Program button.

Operations Menu



4. Scroll to the Configuration Option.



- a. Press the up arrow button until the "Conf" option appears.

Configuration Option



Continued on next page

USER MAINTENANCE

Temperature Calibration (Continued)		
<p>5. Enter the Configuration menu.</p> <p> a. Press the Program button to enter the Configuration menu.</p> <p>b. The Input option “InP” will be the first to appear in the Configuration menu.</p>	<p>Configuration Menu</p> 	
<p>6. Enter the Input menu.</p> <p> a. Press the Program button to enter the Input menu.</p> <p>b. The Input 1 option will be the first to appear in the Input menu.</p>	<p>The Input Menu</p> 	
<p>7. Enter the Input 1 Menu.</p> <p> a. Press the Program button to enter the Input 1 menu.</p> <p>b. Sens will be the first option to appear in this menu.</p>	<p>Sens Option</p> 	
<p>8. Use the arrow keys to scroll to the “OFFS” Offset parameter.</p> <p> a. Scroll to the Offset calibration parameter to enter the offset.</p>	<p>Offset Parameter</p> 	
<p> 9. Enter the temperature offset.</p> <p> a. Press the Program button unlock the Offset parameter and place it in its blinking adjustable mode.</p> <p> b. Use the arrow keys to enter the offset.</p>	<p>-3 Offset Entered</p> 	

Continued on next page

USER MAINTENANCE

Temperature Calibration (Continued)	
<p>10. After entering the offset wait two to three seconds.</p> <ol style="list-style-type: none"> The green “OFFS” parameter will cease flashing. The newly input red offset will blink once, confirming that it has been saved. 	<p style="text-align: center;">Offset Saved</p> 
<p>11. Return to the Homepage.</p>  <ol style="list-style-type: none"> Press the Exit button four times to return to the home page. The oven will begin to adjust to the match the offset. 	<p style="text-align: center;">Homepage, Heating</p> 
<p>12. Once the temperature has stabilized, compare the reference device and the oven display temperature readings.</p> <ol style="list-style-type: none"> 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. 	<p style="text-align: center;">Reference Device*</p>  <p style="text-align: center;">Set Temperature</p> 
<p>13. If the two readings still fall outside your protocol acceptable range, repeat 2 – 12 up to two more times.</p> <ol style="list-style-type: none"> 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 $\pm 2^{\circ}\text{C}$ out of calibration. 	<p style="text-align: center;">Reference Device*</p>  <p style="text-align: center;">Set Temperature</p> 

End of procedure

UNIT SPECIFICATIONS

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

Technical data specified applies to units with standard equipment at an ambient temperature of 25°C and a voltage fluctuation of $\pm 10\%$. 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 31.0 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 788 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

UNIT SPECIFICATIONS

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

UNIT SPECIFICATIONS

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

UNIT SPECIFICATIONS

Temperature Performance Continued

Recovery Times from a 30 Second Door Opening

Model	@ 80°C	@ 150°C	@ 306°C
SMO14HP-2	3 Minutes	3 Minutes	6 Minutes
SMO38HP-2	3 Minutes	3 Minutes	5 Minutes

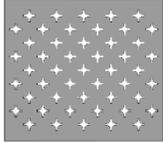
Recovery Times from a 60 Second Door Opening

Model	@ 80°C	@ 150°C	@ 306°C
SMO14HP-2	5 Minutes	6 Minutes	10 Minutes
SMO38HP-2	5 Minutes	5.5 Minutes	10 Minutes

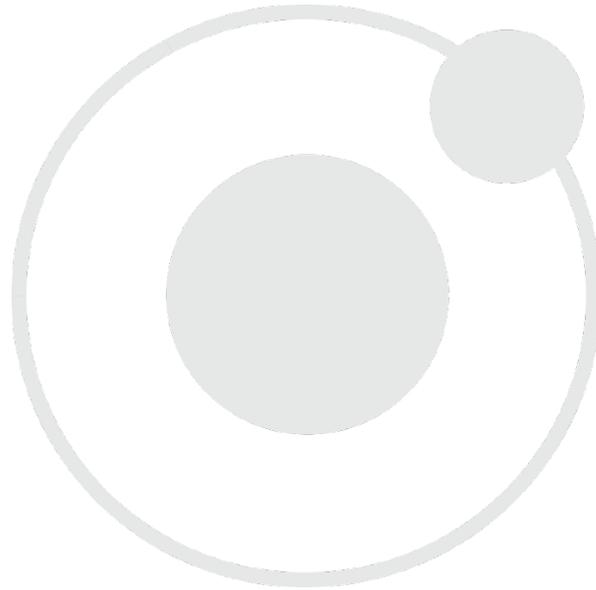
POWER

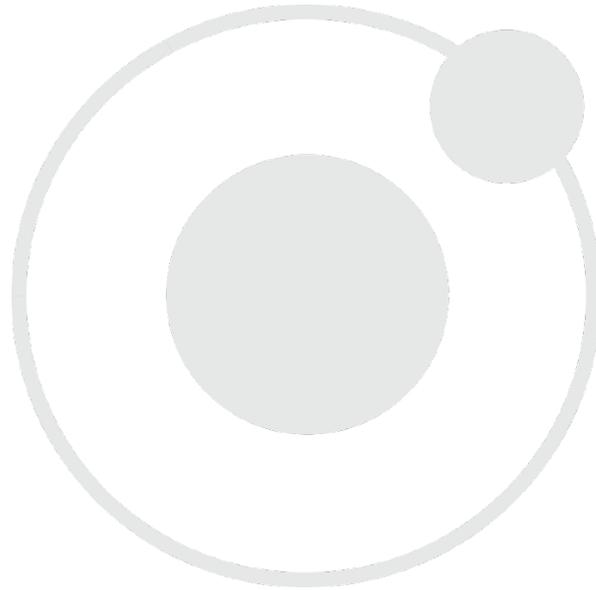
Model	AC Voltage	Amperage	Frequency	Phase
SMO14HP-2	220 – 240	26.0	50/60 Hz	1
SMO38HP-2	220 – 240	50.0	50/60 Hz	1

PARTS LIST

Description	Parts Number	Description	Parts Number
Adjustable Leveling Feet:	 2700506	Shelf Clip	 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, SMO14HP-2 (HF15-2)	 5120871
Power Exhaust Blower Unit 220 Volt, all models.	 9990741	Shelf 21 x 23, SMO38HP-2 (HF37-2)	 5120941

If you have the Part Number for an item, you may order it directly from Sheldon Manufacturing by calling 1-800-322-4897 extension 3. If you are uncertain that you have the correct Part Number, or if you need that specific item, please contact Sheldon Technical Support for help at 1-800-322-4897 extension 4 or (503) 640-3000. Please have the **model number** and **serial number** of the unit ready, as Tech Support will need this information to match your oven with its correct part.







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