FORCED-AIR OVENS

SHEL LAB®

110 – 120 Volts

Installation - Operation Manual

SMO1 SMO3 SMO5

Pictured on the front cover, left to right: SMO1, SMO3, SMO5

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 Forced Air Ovens

110 – 120 Voltage

Part Number (Manual): 4861878

Revision: November 13, 2024

Sheldon Part ID Numbers:

Model	SMO1	SMO3	SMO5
Part ID	SLF123	SLF323	SLF523

The Part ID denotes the specific build type of the model.

SHELDON MANUFACTURING.INC

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

Safety Certifications

Certification is based on the TUV SUD "Testing, Certification, Validation and Verification Regulations (TCVVR)". TUV SUD America Inc. is an OSHA-recognized NRTL for the USA and a Standards Council of Canada ISO/IEC 17065 accredited Certification body of Canada. These units are not intended for use in hazardous or household locations.

These units have been tested to the following standards:

IEC 61010-1:2010
IEC 61010-1:2010/AMD1:2016
IEC 61010-2-010-2019
CSA C22.2 No. 61010-1:2012/U3:2023-06
CSA C22.2 No. 61010-2-010:2019
UL 61010-1:2012/R:2023-06
UL 61010-2-00-10:2019
EN 61010-1:2010/A1:2019
EN IEC 61010-2-010:2020

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SHEL LAB®

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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 end-users are given appropriate training before the unit begins service.

Keep this manual available for use by all end-users.

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 end-user 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 end-users in a language they understand.

Intended Applications and Locations

SMO 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.

Power

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

- The unit is designed to connect to a power source using the specific power cord type shipped with the unit.
- Always plug the unit power cord into a protective earth grounded electrical outlet conforming to national and local electrical codes. If the unit is not grounded properly, parts such as knobs and controls can conduct electricity and cause serious injury.
- Do not bend the power cord excessively, step on it, or place heavy objects on it.
- A damaged cord can be a shock or fire hazard. Never use a power cord if it is damaged or altered in any way.
- Use only approved accessories. Do not modify system components. Any alterations or modifications to your oven can be dangerous and void your warranty.

CONTACTING ASSISTANCE

Phone hours for Sheldon Customer 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 Customer Support: the **model number, part number,** and the **serial number** (see page 17).

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

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

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

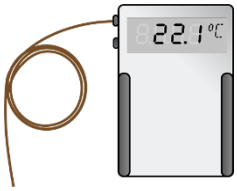
Must be purchased separately

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

Reference devices must meet the following standards:

- Accurate to at least 1°C

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



Temperature Reference

Temperature Probes

Use a digital device with a wire thermocouple probe that can be introduced into the oven chamber through the unit access port. Select a thermocouple 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 oven chamber.** Always use thermocouple probes.

RECEIVING YOUR UNIT

INSPECT THE SHIPMENT

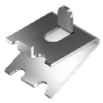
- When a unit leaves the factory, **safe delivery becomes the responsibility of the carrier**.
- **Damage sustained during transit is not covered by the manufacturing defect warranty.**
- Save the shipping carton until you are certain the unit and its accessories function properly.

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. See the orientation depictions on the following pages as a reference.
5. The unit should come with an Installation and Operation Manual.
6. Verify that the correct number of accessories has been included.
7. Carefully check all packaging for accessory items before discarding.

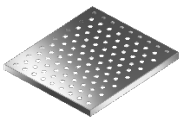
Included Accessories:

Model	Shelves	Shelf Clips	Leveling Feet	Power Cord US	Power Cord EUR
SMO1	2	8	4	1	1
SMO3	2	8	4	1	1
SMO5	2*	8*	4	1	1



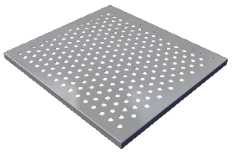

Shelves

SMO1



SMO3

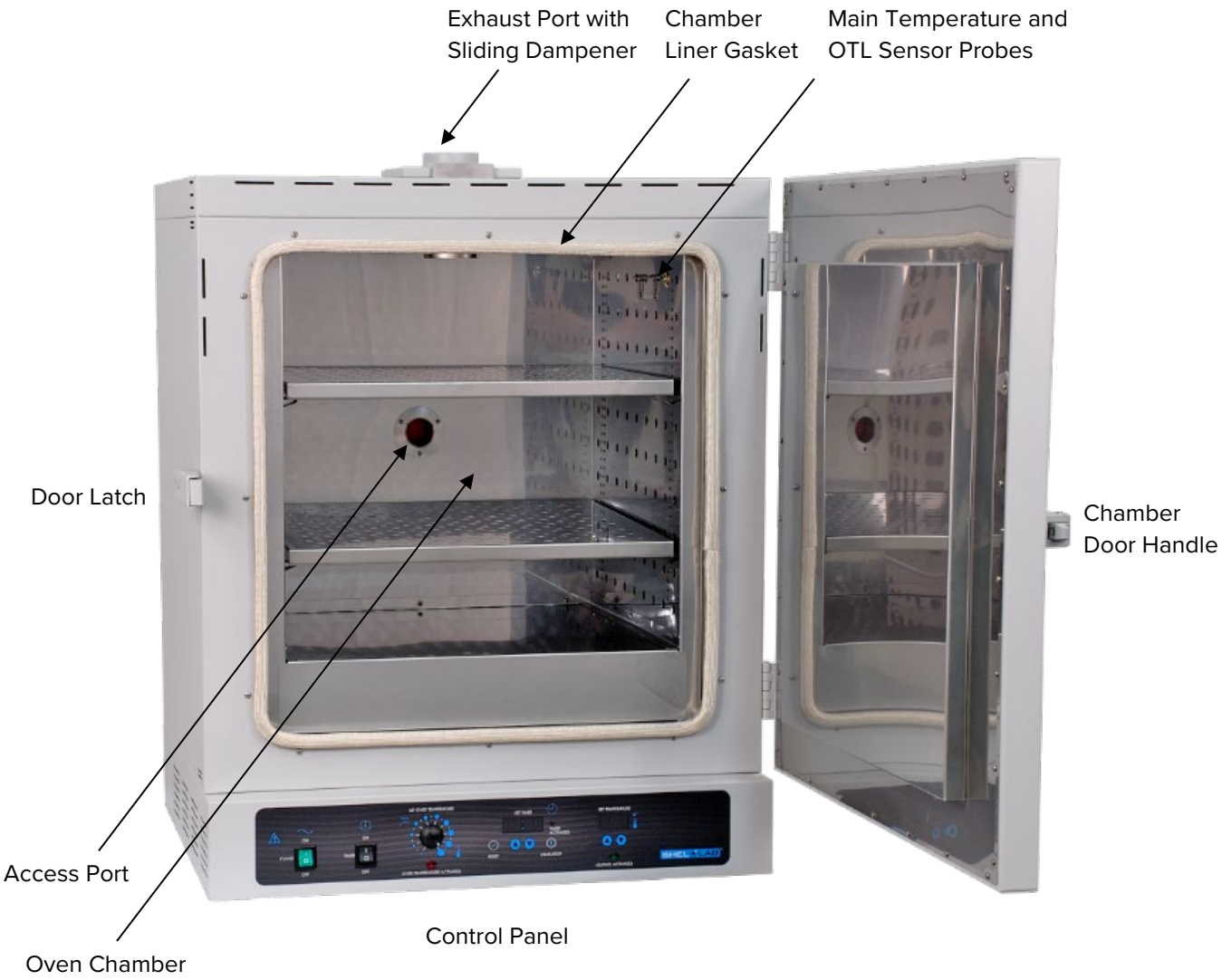
SMO5



***Sliding Shelves:** An SMO5 ordered with the SMO5-M option comes with 4 shelves total and 8 shelf slides. See page 13. A high-temperature access port stopper ships installed in the port located on the back of the oven.

ORIENTATION IMAGES

SMO5



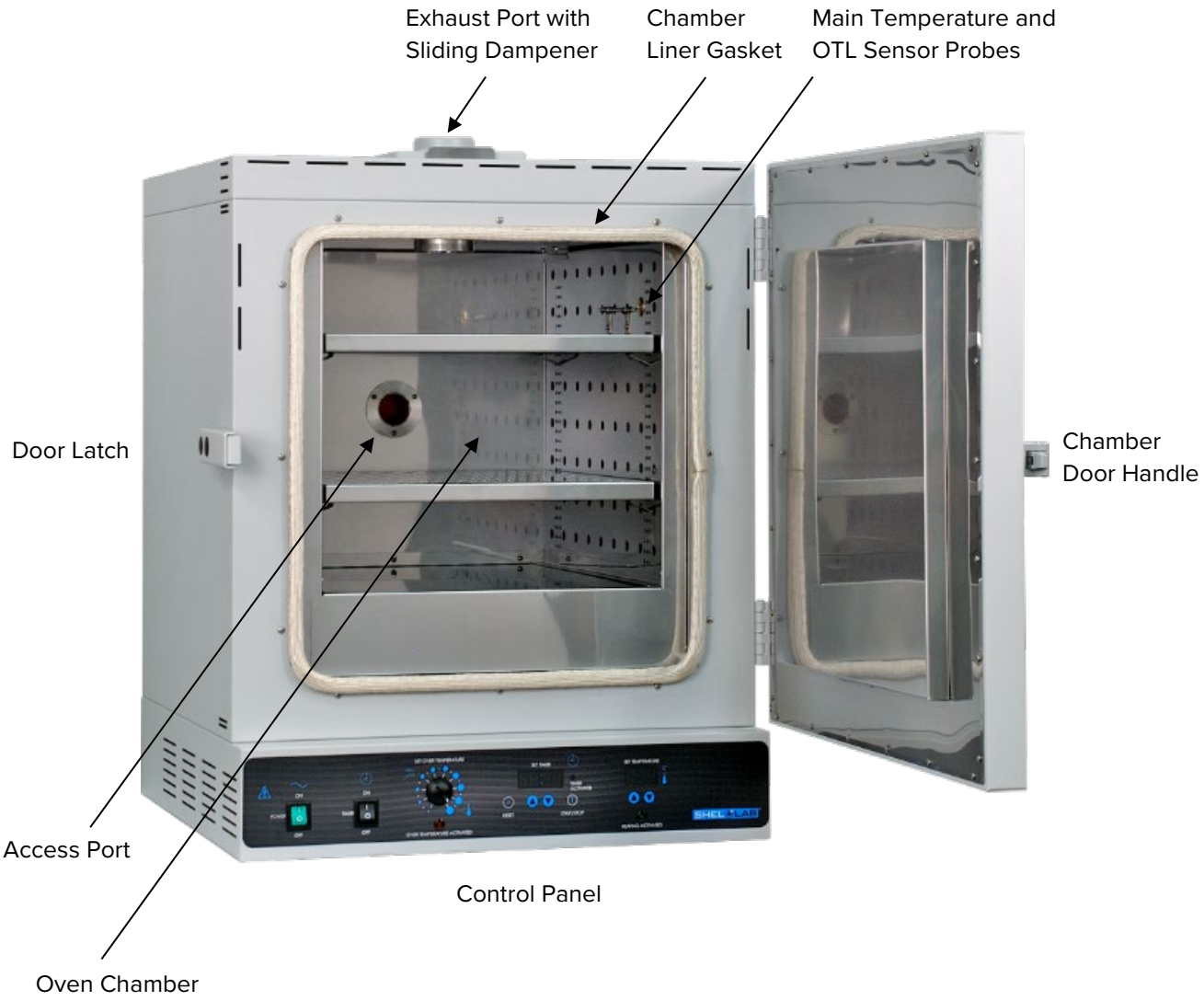
SMO5 with factory sliding shelves option

Order using Part ID: **SMO5-M**

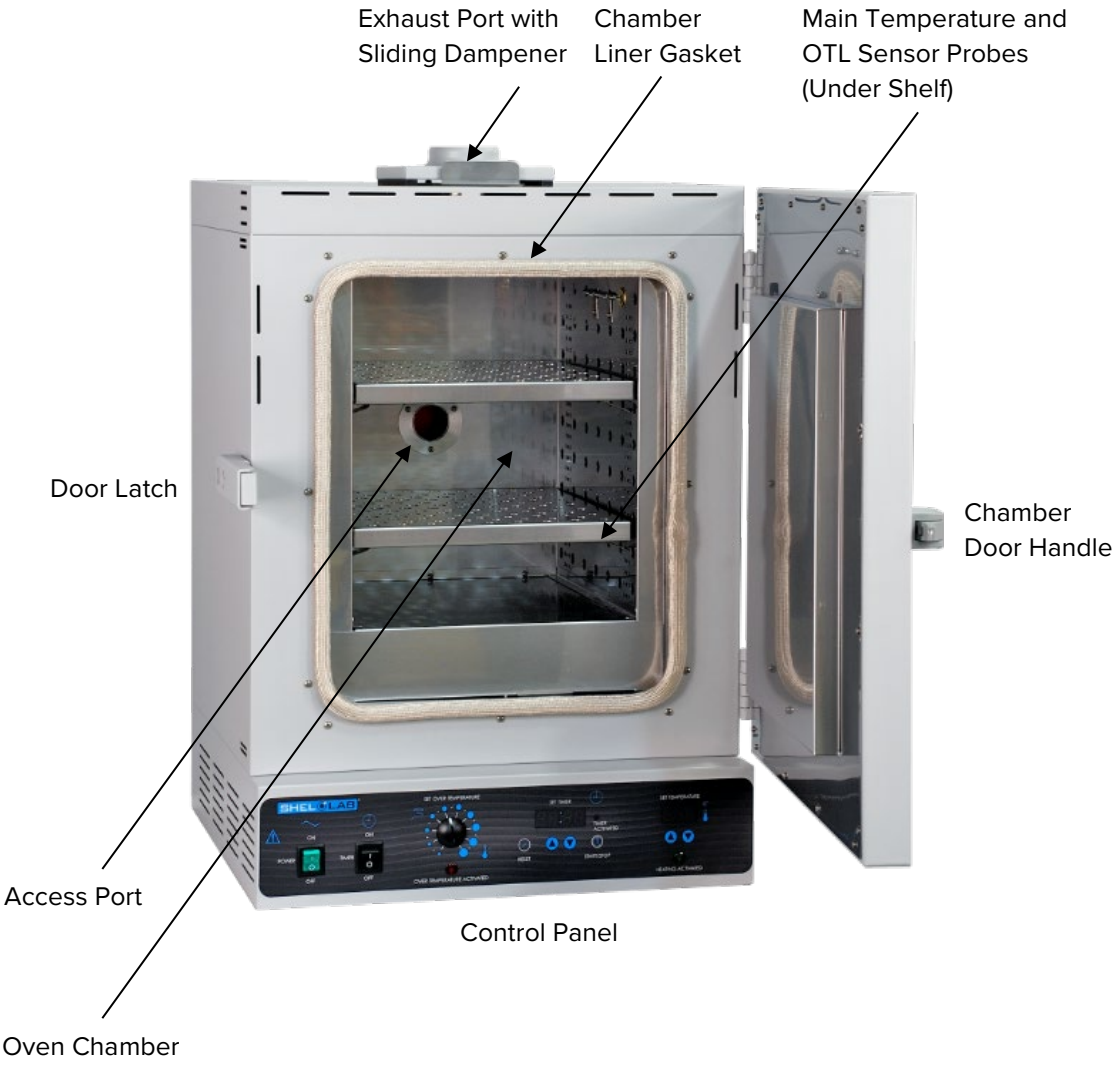
Comes with 4 shelves and 8 slide mounts.

Sliding shelf kits may also be purchased ovens that you already own. See Accessories on page 52.

SMO3


Exhaust Port with Sliding Dampener
Chamber Liner Gasket
Main Temperature and OTL Sensor Probes
Door Latch
Chamber Door Handle
Access Port
Control Panel
Oven Chamber

SMO1


Exhaust Port with Sliding Dampener
Chamber Liner Gasket
Main Temperature and OTL Sensor Probes (Under Shelf)
Door Latch
Chamber Door Handle
Access Port
Control Panel
Oven Chamber

Unit Back

Power Cord Inlet

(Holds Fuse)

RECORD DATA PLATE INFORMATION

The data plate contains the unit **model number, serial number,** and **part number**. Customer Support will need this information during any support call. Record it below for future reference.

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

Data Plate Information

MODEL NO:	
SERIAL NO:	
PART NO:	

INSTALLATION PROCEDURE CHECKLIST

For installing the unit in a new workspace location.

Pre-Installation

- ✓ Check that the required ambient conditions for the unit are met, page 20.
- ✓ Check that the spacing clearance requirements are met, page 20.
  - Unit dimensions may be found on page 47.
- ✓ Check that a suitable electrical outlet and power supply is present, page 21.

Install the oven in a suitable location

- ✓ Review the lifting and handling instructions, page 22.
- ✓ Install the unit leveling feet, page 22.
- ✓ Install the oven in its workspace location, page 23.

Set up the oven for use

- ✓ Clean and disinfect the unit and shelving (recommended), page 23.
- ✓ Install the shelving, page 24.
- ✓ Verify that the stopper is installed in the access port on the outside of the oven, page 26.

Required Ambient Conditions

These units are built 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). The ambient temperature should not change by 2°C (3.6°F) or more during operation.

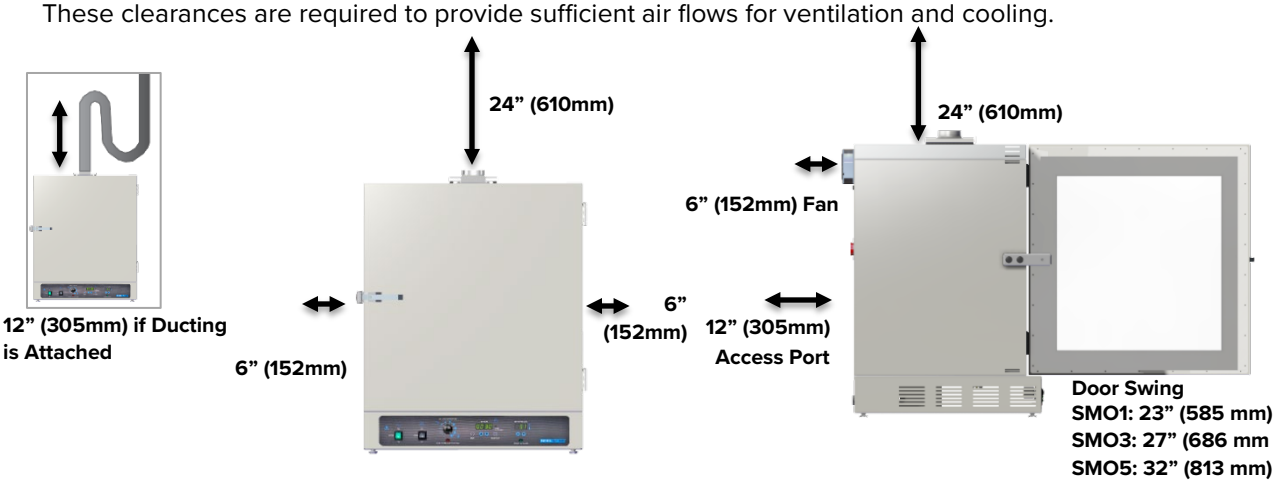
Operating outside these conditions may affect the unit temperature performance.

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

Required Clearances

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



6 inches (152 mm) of clearance is required from the sides and from the vent fan on the back of the oven. Always keep the fan unobstructed.

12 inches (305 mm) of clearance is required from the back of the oven.

24 inches (610 mm) of headspace clearance is required between the exhaust vent and any overhead cover or partition.

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

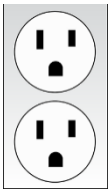
Do not place objects on top of the oven.

The chamber access port is located on the back of the oven. Leave sufficient room for easy access if oven operators will be using the port.

POWER SOURCE REQUIREMENTS

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

Power Source: The power source must match the voltage and amperage requirements listed on the unit data plate. These units are intended for **110 - 120 volt, 50/60 Hz** applications at the following amperages:



SMO1	SMO3	SMO5
12.0 Amps	14.0 Amps	14.0 Amps

- The wall power source must be protective earth-grounded and single phase.
- **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 product due to overloading or circuit failure.
- **The recommended wall circuit breakers for these units are 15 amps.**
- Wall power sources must conform to all national and local electrical codes.

Power Cord: The unit must be positioned so that all end-users can quickly unplug the oven in the event of an emergency.

- The unit comes provided with a **125 volt, 15 amp, 6ft (1.8m) NEMA 5-15P** power cord.
- Always use this cord or an identical replacement.

Fuse: The unit ships with a fuse installed in the power cord inlet.

- The fuse must be installed and intact for the unit to operate.
- Always find and fix the cause of a blown fuse before putting the unit back into operation.
- Fuse type:
    - 250V T16 Amp, 5x20mm

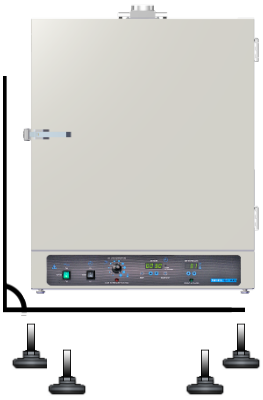
LIFTING AND HANDLING

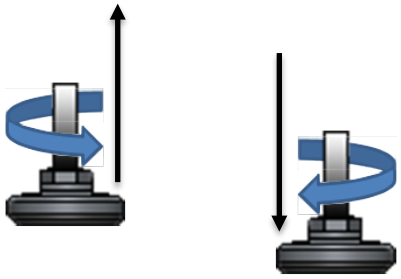
The oven is heavy. Use appropriate lifting devices that are sufficiently rated for these loads. Follow these guidelines when lifting the oven:

- 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.

LEVELING

Install the 4 leveling feet with the 4 corner holes on the bottom of the oven. The oven 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

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

DEIONIZED AND DISTILLED WATER

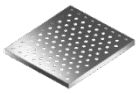
Do not use deionized water to clean the unit, even if DI water is readily available in your laboratory.

- Use of deionized water may corrode metal surfaces and **is not covered by the manufacturing defect 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 - CLEAN AND DISINFECT

The manufacturer recommends cleaning and disinfecting the shelving and oven chamber prior to installing 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.
- See the **Cleaning and Disinfecting** topic in the User Maintenance section (see page 41) for information on how to clean and disinfect without damaging the unit.
- **Do not clean with deionized water.**



SHELVING INSTALLATIONS

For all models.

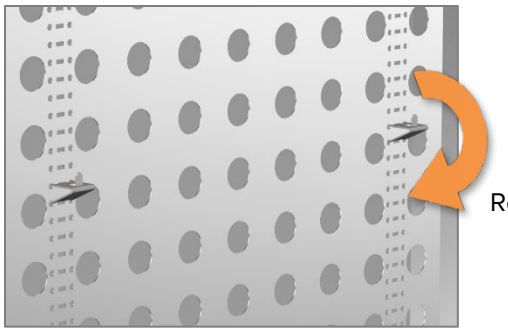
Airflow: The horizontal airflow in the chamber moves from the small duct holes in the chamber right wall, across the shelf space, and into the large holes in the left wall. To maximize airflow, avoid obstructing the duct holes on either side as much as possible when placing shelves.

Spacing: Space the shelves evenly in the oven chamber to ensure the best possible temperature uniformity.

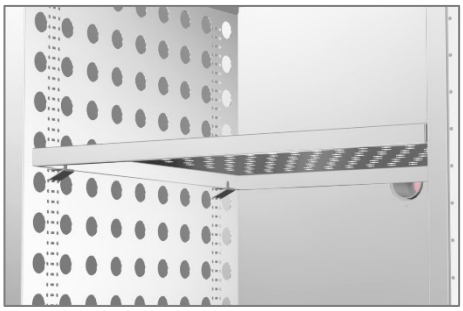
Shelf Clips and Shelves

See next page for sliding shelves

Install 4 Shelf Clips



Place the Shelf



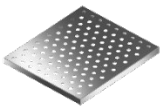
1. Install the shelf clips in the slots of the shelf standard mounting rails located on the sides of the chamber interior, 4 clips per shelf.

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

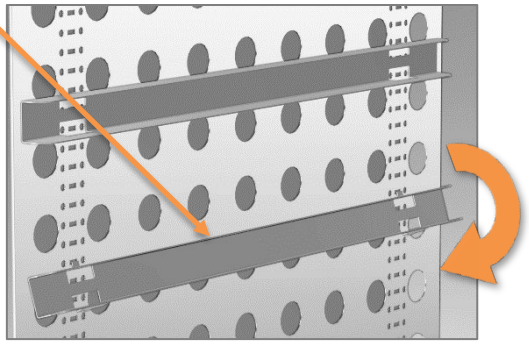
2. Set the shelves on the clips.

    a. Verify the shelves are level.

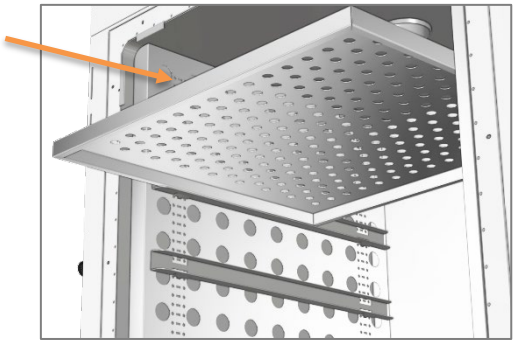
Sliding Shelf Option



Install 2 Shelf Slides



Slide in the Shelf



1. Install the shelf slides in the slots of the shelf standard mounting rails located on the sides of the chamber interior, 2 slides per shelf.

    a. Insert the top tab first, and then the bottom tab using a rocking motion.

2. Slide the shelves into the chamber.

    a. Verify the shelves are level.

Access Port Stopper

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

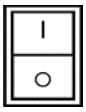
The stopper must always be installed on the outside of the oven. Installing the stopper inside the oven chamber risks damaging the stopper.

The intended use of the port is to introduce sensor probes into the oven chamber.

Port Stopper in Access Port

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.

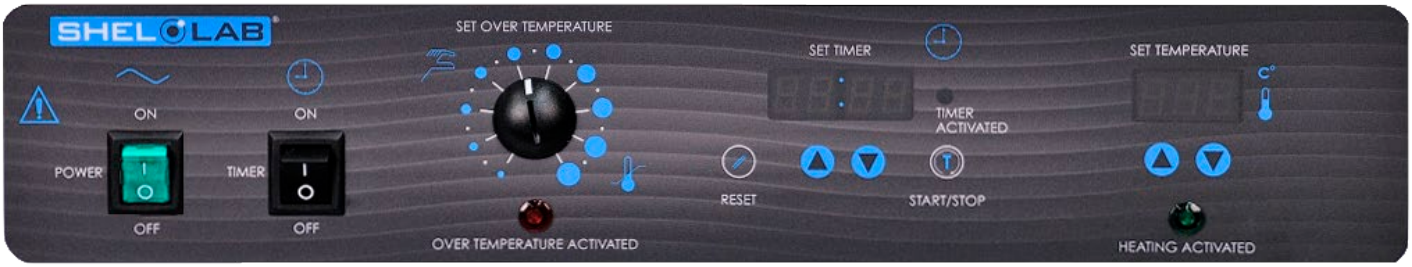
Symbol	Definition
	**Consult the user manual.** Consulter le manuel d'utilisation
	**Temperature Display** Indique l'affichage de la température
	**Over Temperature Limit system** Thermostat température limite contrôle haute
	**AC Power** Repère le courant alternatif
	**I/ON O/OFF** I indique que l'interrupteur est en position marche. O indique que le commutateur est en position d'arrêt.
	**Protective earth ground** Terre électrique
	**Indicates UP and DOWN respectively** Touches de déplacements respectifs vers le HAUT et le BA
	**Manually adjustable** Indique un réglage manuel
	**Recycle the unit. Do not dispose of in a landfill.** Recycler l'unité. Ne jetez pas dans une décharge.
	**Caution hot surface** Attention surface chaude

SYMBOLS

Symbol	Definition
	**Indicates the timer** Indique le minuterie
	**Start or Stop the Timer** Lancer ou arrêter le minuteur
	**Reset the Timer** Réinitialisation de la Minuterie

CONTROL PANEL OVERVIEW

SMO3 SMO5 Control Panel



SMO1 Control Panel

Power Switch

Power is supplied and the switch illuminates when the switch is in the (I) ON position.

Timer Switch

The black Timer Switch controls power to the timer system. When this switch is in the (I) ON position, the oven ceases heating, the SET TIMER display illuminates, and the user may launch a timer at the current temperature setpoint. The oven **will not heat** while the Timer system is on unless a timed countdown is running.

Over Temperature Limit System (OTL)

This graduated dial sets the mechanical heating cutoff point for the Over Temperature Limit system. The system prevents unchecked heating of the chamber in the event of an electronics failure or external heat spike.

The red Over Temperature Activated light illuminates when the OTL system is rerouting power away from the heating elements. For more details, please see the **Over Temperature Limit System** description in the Theory of Operations (page 33).

Timer Display and Controls

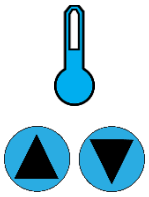
When activated. the SET TIMER display shows the currently programmed timer value. When a timer is launched, the timer value counts down to 0.

The “//” RESET button is used to access the Timer display adjustable duration mode, and to advance through the duration time parameters.

The **Up** and **Down** arrow buttons are used to adjust the timer duration.

The “T” START/STOP button initiates or interrupts a timer.

The Timer Activated indicator light illuminates when the oven timer is running.



Set Temperature Display and Controls

Shows the current chamber temperature. The **Up** and **Down** arrow buttons are used to access the Temperature Setpoint (SP) or Calibration Offset (C O) display modes and input the temperature setpoint or calibration adjustment value.

Heating Activated Light

The green HEATING ACTIVATED light illuminates when the oven powers the chamber heating elements.

OPERATION

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 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

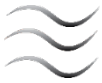
When powered, the oven heats to and maintains a user-selected target setpoint in the oven chamber. The oven senses the chamber air temperature using a solid-state probe mounted on the right chamber wall. When the oven detects that the chamber temperature has dropped below the target setpoint, it pulses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

SMO 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.

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.

Exhaust Vent

The oven is provided with an exhaust vent that may be opened or closed using a dampener slide located on the vent. **SMO forced air ovens must be run with the dampener closed in order to achieve the stated temperature performance specifications.**

The dampener is intended to be opened **after** the heated portion of an application is complete. Opening the dampener vent while the oven is running may speed the rate of material drying, depending on the nature of your application. However, it also introduces cool air into the chamber while allowing heated air to exit. This will likely impact the temperature performance of the oven.

Oven Timer

The timer function allows the end-user to program the oven to run a timed countdown at the current temperature setpoint. When the timer reaches zero, the oven ceases heating.

When the Timer system is on, **the oven will not heat** unless a timed countdown is running.

The Over Temperature Limit System

The over temperature limit system (OTL) is a user-set, mechanical heating cutoff connected to a hydrostatic sensor probe inside the oven chamber. The system operates independently of the main microprocessor temperature controller and routes power away from the oven heating elements if the chamber temperature exceeds the OTL temperature cutoff setting. It will continue doing so as long as the chamber temperature remains above the OTL setting. This helps safeguard the unit by preventing runaway heating in the event of electronics failures or a sudden external heat spike.

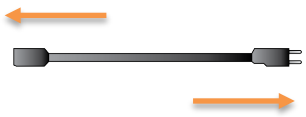
The OTL must be set by the user in order to function. The manufacturer recommends a setting of approximately 5°C above the highest temperature setpoint of your heating application. A red indicator illuminates when the OTL is rerouting power. Failure to set the Over Temperature Limit system voids the unit manufacturing defect warranty in the event of an overtemperature event.

Note: The oven may produce light smoking during its first use above 150°C as traces of a protective oil coating burn off the heating element.

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.

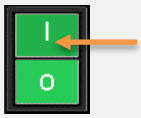
1. Plug in the power cord



Attach the power cord that came with the unit to the inlet receptacle on the back of the oven.

Plug the power cord into the workspace electrical outlet.

2. Turn on the oven



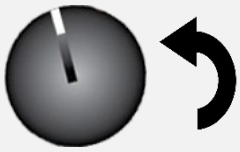
Place the oven Power Switch in the ON (I) position.

- The switch will illuminate.

3. Set the Temperature Setpoint

Carry out the **Set the Temperature Setpoint** procedure on page 35. Set the oven to your application temperature.

4. Set the Over Temperature Limit



Perform the **Set the Over Temperature Limit** procedure on page 36.

- The oven must be heated **and stable** at your application temperature prior to performing this procedure.

Optional: Program the Timer

- See the **Setting the Timer** procedure on page 37.
- Once a Timer is set, see the **Running the Oven Timer** procedure on page 38.

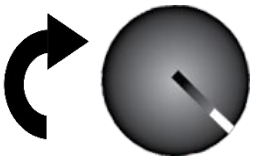
The oven is now ready for use.

SET THE TEMPERATURE SETPOINT

Perform the steps below to adjust the setpoint to your process or application temperature.

1. Set the Over Temperature Limit control to its maximum setting, if not already set to max.

- This prevents the heating cutoff system from interfering with this procedure.



2. Navigate to the Temperature Setpoint Adjustment mode

Briefly push and release either the **Up** or **Down** arrow buttons to activate the temperature setpoint adjustment mode.

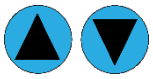
- The display will briefly flash the letters "SP", then show the flashing, adjustable temperature setpoint.

Setpoint Adjustment Mode

Initial Setpoint

Note: The display will automatically exit the adjustment mode after 5 seconds of inactivity, with the last shown setpoint value saved.

3. Set the Temperature Setpoint



Use the **Up** and **Down** arrow buttons to change the temperature setpoint.

New Setpoint

4. Wait for 5 seconds after entering the Setpoint

- The display will stop flashing, and the setpoint is now saved in the controller.
- The chamber will now automatically heat or passively cool to match your setpoint.
- The display will revert to showing the current chamber air temperature.

Heating to New Setpoint

End of Procedure

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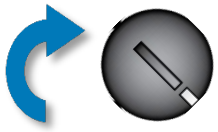
Note: Test the OTL system at least once per year to verify its functionality. **Failure to set the OTL voids the manufacturing defect warranty if over temperature damage occurs.**

SET THE OVER TEMPERATURE LIMIT

This procedure sets the mechanical heating cutoff to approximately 5°C above the current chamber temperature. **Perform this procedure when the unit has been running with no temperature fluctuations at your application temperature for at least 30 minutes**.

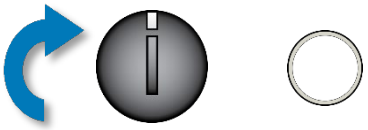
1. Set OTL control to its maximum setting, if not already set to max.



2. Turn the dial counterclockwise (to the left) until the Over Temperature Activated light illuminates.

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

3. Slowly turn the dial clockwise (to the right) until the Over Temperature light turns off.



- The Over Temperature Limit is now set approximately 5˚C above the current chamber air temperature.

4. 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.

If the Over Temperature Limit sporadically activates after setting the control, turn the dial very slightly to the right (clockwise). If the OTL continues activating, check for ambient sources of heat or cold that may be adversely impacting the unit temperature stability. If you find no sources of external or internal temperature fluctuations, contact Customer Support or your distributor for assistance.

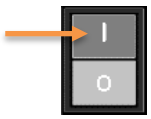
SETTING THE TIMER

Perform the following steps to program the oven timer.

Note: While the Timer system is on, the oven will **not** heat unless a timer is running.

1. Turn on the Timer

- The **Timer Display** will illuminate, showing the previously programmed timer duration.
- The oven will cease heating.



Note: The default Timer value is 1 minute.

2. Access the Set Timer mode

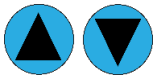
Press and hold the **RESET** button on the control panel.

- The display will show the flashing, adjustable hours setting.

1 Minute Value

Note: The display will automatically exit the adjustment mode after 5 seconds of inactivity, with the last shown timer value saved.

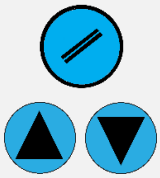
3. Program the number of hours



Use the **Up** and **Down** arrow buttons to program the desired number of hours, up to a maximum of 99 hours.

1 Hour, 1 Minute

4. Program the tens of minutes

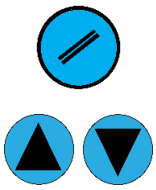


Push and release the **RESET** button to advance.

Use the **Up** and **Down** arrow buttons to program the desired tens of minutes.

1 Hour, 51 Minutes

5. Program the number of single minutes



Push and release the **RESET** button to advance.

Use the **Up** and **Down** arrow buttons to program the desired number of minutes.

1 Hour, 55 Minutes

6. Wait 5 seconds after entering the number of minutes

Wait 5 Seconds

- The display will exit the adjustment mode and the Timer value is saved.

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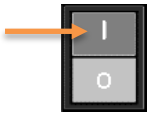
RUNNING THE OVEN TIMER

Allow the oven to come up to temperature prior to running the oven timer. See the **Setting the Timer procedure** on page 37 for how to program the timer.

Note: While the Timer system is on, the oven will **not** heat unless a timed countdown is running.

1. Turn on the Timer System



- The **Timer Display** will illuminate, showing the previously programmed timer duration.
- The oven will cease heating.

2. Start the timer

Push and release the **Start/Stop "T"** button on the control panel.

- The Timer Display will start counting down and the green Timer Activated light will illuminate.
- The oven will resume heating.

Timer Counting Down

Optional: Pausing a running timer

Push and release the **Start/Stop** button to pause the timer.

- The oven will cease heating until the timer is restarted, reset, or the Timer system is turned off.

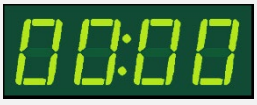
To continue the timer where it left off, push the **Start/Stop** button again.

End of Countdown

- The oven ceases heating when the timer value reaches 0.

To resume manual heating, place the **Timer Switch** in the OFF (O) position.

To run the timer again, press and hold the "//" **Reset** button and enter a new timer value, then push the **Start/Stop "T"** button to launch.



Timer Complete

VENTING THE EXHAUST PORT

Optional: The oven does not require venting during most applications.

- Obtain flexible, non-insulated ducting.
- Attach the ducting to the lip of the exhaust port on the top 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.

Flexible ducting attached to exhaust vent

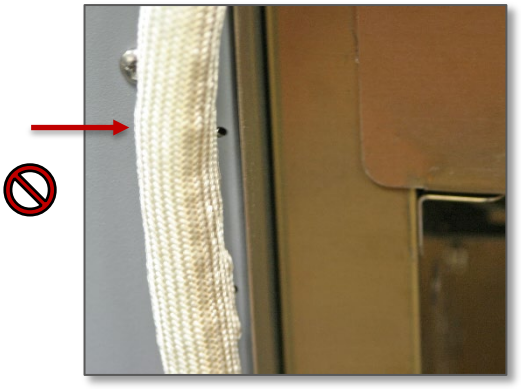
Exhaust Vent 2.75 inch (70 mm) diameter

HIGH EXTERIOR TEMPERATURES

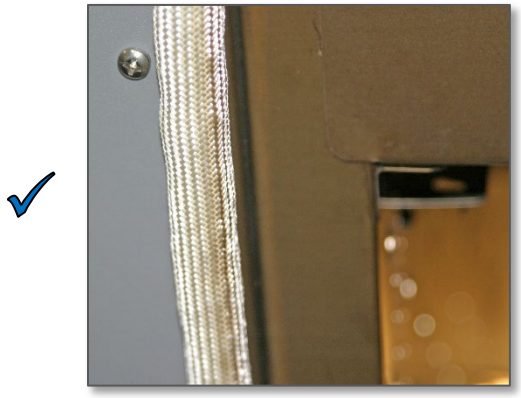
Note: Allow the oven to cool or use appropriate PPE and tools when adjusting the chamber gasket seating.

If the chamber gasket comes out of alignment, oven chamber air may be drawn into the insulating baffle spaces. This can result in heating of the oven exterior surfaces.

If the oven is exterior is unusually warm or hot, push the chamber gasket inward along its entire length to restore the integrity of the seal.



Chamber Gasket Misaligned



Chamber Gasket Aligned

DRYING RACKS AND OTHER ACCESSORIES

Make sure that any accessories used inside the oven chamber, such as drying racks, are suitable for your application and will not suffer damage when brought to temperature. Always set the OTL cutoff system to approximately 5°C above your application temperature setpoint in order to safeguard accessories against over temperature events. The manufacturing defect warranty does not cover damage caused by melted or otherwise overheated accessory items.

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

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 chamber, immediately initiate your site Hazardous Material Spill Containment protocol. Contact your local Site Safety Officer and follow instructions per the site policy and procedures.

- Periodic cleaning and disinfection are 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 the 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: 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 abrasive cleaners**, 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 unplug 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 ovens 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 Customer Support for assistance.

CALIBRATE THE TEMPERATURE DISPLAY

Note: Please see the **Reference Sensor Device entry** on page 9 for the minimum 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

1. Introduce the reference device thermocouple sensor probe through the access port on the back of the oven.

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.

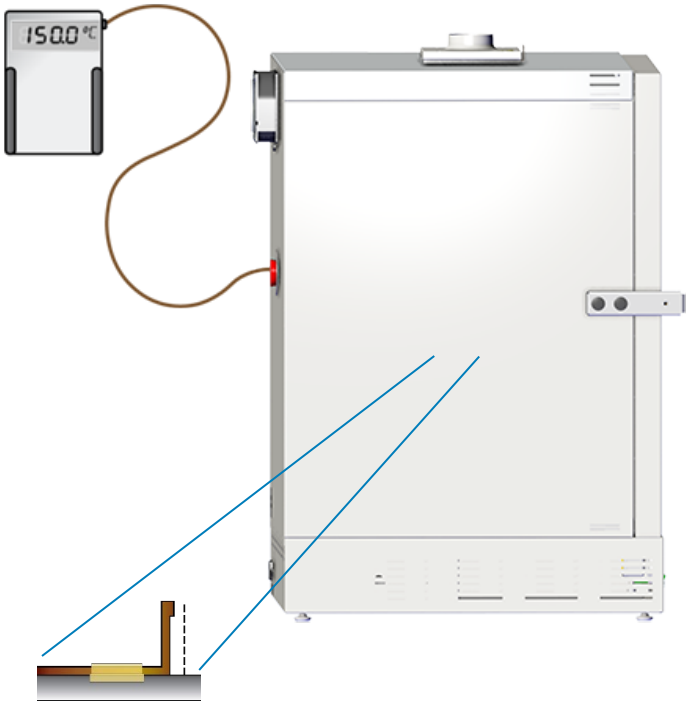
4. Carefully place the access port stopper in the port over the probe wires. Use non-stick tape to seal any gaps created between the stopper and the port by the probe wire.

5. The oven door must be closed and latched. Failure to do so will prevent an accurate calibration.

6. Verify the exhaust vent is closed. The vent **must be closed** for an accurate calibration.

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

Exhaust Vent Closed



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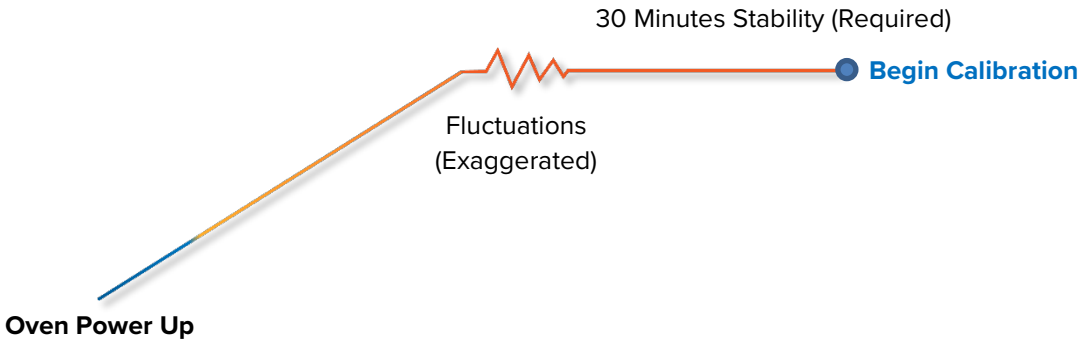
7. The unit temperature **must be stable** in order to perform an accurate calibration.

- The oven must run for at least 1 hour prior to conducting a calibration.
- The temperature is considered stabilized when the oven has operated with the door closed at your calibration temperature for at least 30 minutes with no fluctuations greater than the specified stability of the unit (see page 48).



Suggested Temperature Calibration

1

Once the oven temperature has stabilized, compare the reference device and oven 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 oven chamber air temperature. **The Temperature Calibration procedure is now complete**.

-OR-

- If the difference falls outside of your protocol range, advance to Step 2.

Reference Device

Set Temperature

2

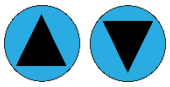
A display calibration adjustment must be entered to match the display to the reference device. See the next step.

Reference Device

Temperature Calibration Continued

3

Place the display in temperature calibration mode.



a. Press and hold both the **Up** and **Down** temperature arrow buttons simultaneously for approximately 5 seconds.

b. Release the buttons when the temperature display shows the letters “C O”. The display will begin flashing the **current temperature display value**.

Note: The display will automatically exit calibration mode after 5 seconds of inactivity, with the last shown temperature display value saved.

4

Use the **Up** or **Down** arrows to adjust the current display temperature value until it matches the reference device temperature reading.

Reference Device

5

After matching the display to the reference device, wait 5 seconds.

- The temperature display will cease flashing and store the corrected chamber display value.
- The oven will now begin heating or passively cooling in order to reach the setpoint with the corrected display value.

Heating to Setpoint

6

Allow the oven to operate for at least 30 minutes undisturbed to stabilize **after the oven has achieved the corrected temperature setpoint.**

- Failure to wait until the oven is fully stabilized will result in an inaccurate reading.

Setpoint Achieved

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Temperature Calibration Continued

7

Compare the reference device reading with the chamber temperature display.

- If the reference device and the chamber temperature display readings are the same or the difference falls within the range of your protocol, **the oven is now calibrated for temperature**.

-OR-

- See the next step if the readings fail to match or fall outside of your protocol range.

Reference Device

8

If the difference still falls outside the acceptable range of your protocol, repeat steps 3 – 7 up to two more times.

Reference Device

9

If the temperature readings of the oven temperature display and the reference device still fall outside your protocol after 3 calibration attempts, contact your distributor or customer support for assistance.

End of Procedure

UNIT SPECIFICATIONS

These ovens are 110 – 120 volt 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	Unit
SMO1	167 lb / 77 kg	126.5 lb / 57.4 kg
SMO3	216 lb / 98 kg	170.5 lb / 77.3 kg
SMO5	258 lb / 117 kg	208.0 lb / 94.3 kg

DIMENSIONS

In Inches

Model	Exterior W × D × H	Interior W × H × D
SMO1	22.7 x 23.5 x 31.5	12.1 x 13.7 x 14.5
SMO3	26.9 x 28.6 x 34.0	16.5 x 19.5 x 16.2
SMO5	31.4 x 28.1 x 38.8	21.0 x 19.4 x 20.7

In Millimeters

Model	Exterior W × D × H	Interior W × D × H
SMO1	577 x 596 x 800	307 x 349 x 368
SMO3	684 x 727 x 840	419 x 495 x 412
SMO5	798 x 714 x 986	533 x 494 x 527

CAPACITY

Model	Cubic Feet	Liters
SMO1	1.4	39.4
SMO3	3.0	85.0
SMO5	4.9	138.0

SHELF CAPACITY BY WEIGHT

Model	Per Shelf	Max Total Load	Max No. Shelves
SMO1	50.0 lb / 22.6 kg*	100.0 lb / 45.3 kg**	6 Shelves
SMO3	50.0 lb / 22.6 kg*	200.0 lb / 91.3 kg***	7 Shelves
SMO5	50.0 lb / 22.6 kg*	200.0 lb / 91.0 kg***	9 Shelves

*50.0 lb / 22.6 kg with weight evenly distributed across the shelf.

**100.0 lb / 45.3 kg total load for the SMO1 shelves. Exceeding this limit risks damaging the chamber liner.

***200.0 lb / 91.0 kg total load for the SMO3 and SMO5 shelves. Exceeding this limit risks damaging the chamber liner.

TEMPERATURE

Range and Stability

Model	Operating Range	Stability
SMO1	Ambient +20 to 306°C	± 0.3° @150°C
SMO3	Ambient +20 to 306°C	± 0.3° @150°C
SMO5	Ambient +20 to 306°C	± 0.2° @150°C

Uniformity

Model	Uniformity @80°C	Uniformity @150°C	Uniformity @306°C
SMO1	+ 0.5°C	+ 1.2°C	+ 5.4°C
SMO3	+ 0.4°C	+ 1.8°C	+ 3.2°C
SMO5	+ 0.6°C	+ 1.7°C	+ 3.0°C

Time to Temperature: From an ambient temperature of 20°C.

Model	Heat Up to 80°C	Heat Up to 150°C	Heat Up to 306°C
SMO1	5.5 Minutes	15.0 Minutes	96.0 Minutes
SMO3	6.0 Minutes	27.0 Minutes	81.0 Minutes
SMO5	8.0 Minutes	22.5 Minutes	139.0 Minutes

Recovery Time: From a 30-second door opening.

Model	Recovery to 80°C	Recovery to 150°C	Recovery to 306°C
SMO1	0.6 Minutes	1.4 Minutes	14.5 Minutes
SMO3	0.5 Minutes	1.0 Minutes	12.0 Minutes
SMO5	0.5 Minutes	3.0 Minutes	36.0 Minutes

Recovery Time: From a 60-second door opening.

Model	Recovery to 80°C	Recovery to 150°C	Recovery to 306°C
SMO1	1.3 Minutes	2.2 Minutes	20.0 Minutes
SMO3	2.0 Minutes	4.0 Minutes	25.0 Minutes
SMO5	3.5 Minutes	6.0 Minutes	59.0 Minutes

Air Flow Performance

Ventilation Rates

Model	Cubic Feet per Minute @80°C	Liters per Minute @80°C
SMO1	5.6	158.6
SMO3	11.3	320.0
SMO5	15.2	430.4

Air Changes per Hour

Model	@80°C
SMO1	330
SMO3	225
SMO5	180

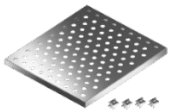
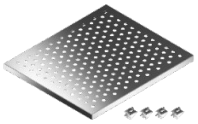
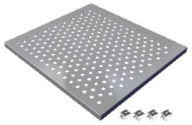
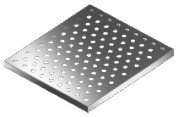
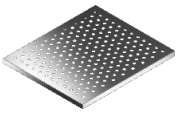
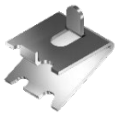
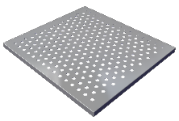
Air Velocity Across Shelf Space

Model	Linear Feet per Minute	Meters per Minute
SMO1	125	38.1
SMO3	140	42.7
SMO5	145	44.2

POWER

Model	AC Voltage	Amperage	Frequency
SMO1	110 - 120	12.0	50/60 Hz
SMO3	110 - 120	14.0	50/60 Hz
SMO5	110 - 120	14.0	50/60 Hz

PARTS

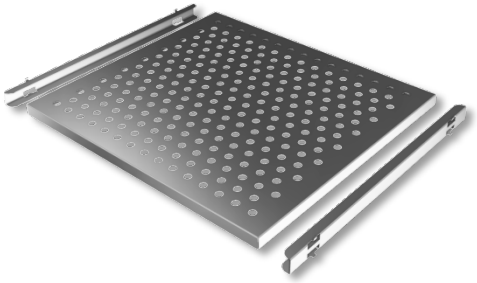
Part	Part Number	Part	Part Number
Adjustable Leveling Foot	 **2700512**	Shelf and 4 Shelf Clips, SMO1	 **9751227**
Fiberglass Door Gasket, sold by 1.5 feet SMO1 requires 5.4 ft (1.65 meters) SMO3 requires 7.5 ft (2.3 meters) SMO5 requires 8.1 ft (2.5 meters)	 **3450767**	Shelf and 4 Shelf Clips, SMO3	 **9751228**
Fuse, T10A 250V 5x20mm	 **3300516**	Shelf and 4 Shelf Clips, SMO5	 **9751229**
Power Cord 125 volt, 15 Amp, 6ft (1.8m) NEMA 5-15P	 **1800510**	Shelf (no Clips), SMO1	 **5130887**
Port Stopper, High Temperature	 **7750572**	Shelf (no Clips), SMO3	 **5130888**
Shelf Clip, Individual (1)	 **1250512**	Shelf (no Clips), SMO5	 **5130890**

ACCESSORIES

SMO1s Sliding Shelf Kit Part Number 9902245

- 2 additional shelves
- 4 shelf slides

Allows the oven to run with four shelves mounted on slides



SMO3s Sliding Shelf Kit Part Number 9902244

- 2 additional shelves
- 4 shelf slides

Allows the oven to run with four shelves mounted on slides

SMO5s Sliding Shelf Kit Part Number 9902243

- 4 additional shelves
- 16 shelf slides

Allows the oven to run with six shelves mounted on slides

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. 3 or (503) 640-3000 ext. 3.

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

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