FORCED AIR OVENS

SHEL LAB®

230 Voltage

Installation - Operation Manual

SMO14-2 SMO28-2 SMO28G-2

Pictured on the front cover, left to right: SMO14-2 and SMO28-2

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

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

230 Volts

Part Number (Manual): 4861581

Revision: October 27, 2022

Sheldon Part ID Numbers:

Model	SMO14-2	SMO28-2	SMO28-2
Part ID	SLF1422-H	SLF2823-H / SMO28G-2 SLFG2823-H	SMO28-2-M*

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

*The SMO28-2 may be ordered with sliding shelves using Part ID SMO28-2-M.

Note: The SMO28G-2 ships with two wire shelves typically used in curing applications for coatings. The SMO28G-2 is identical to the SMO28-2 in all other respects.

SHELDON MANUFACTURING.INC

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

Safety Certifications

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

IEC 61010-1:2010
IEC 61010-1:2010/AMD1:2016
IEC 61010-2-010:2019
CSA C22.2 No. 61010-1:2012/A1:2018-11
CSA C22.2 No. 61010-2-010:19
UL 61010-1:2012/R:2019-07
UL 61010-2-010:2019
EN 61010-1:2010/A1:2019,
EN IEC 61010-2-010:2020

TABLE OF CONTENTS

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.

- Always hardwire the unit power feed to a protective earth-grounded electrical source that conforms to national and local electrical codes. If the unit is not grounded, parts such as knobs and controls may conduct electricity and cause serious injury.
- Position the unit so the end-user can quickly and easily disconnect or uncouple the power feed in the event of an emergency.
- Avoid damaging the power feed. Do not bend it excessively, step on it, place heavy objects on it. A damaged power feed can easily become a shock or fire hazard. Never use a power feed after it has been damaged.
- Use only approved accessories. Do not modify system components. Any alterations or modifications to your oven may 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, serial number, part number,** and **Part ID** (see page 14).

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

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

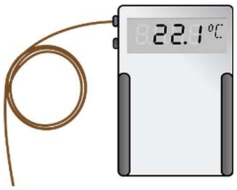
Must be purchased separately

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

Reference devices must meet the following standards:

- Accurate to at least 0.1°C

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



Temperature Reference

Temperature Probe

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

Why a Probe?

Reference readings taken from 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 chamber to re-stabilize before continuing.

No Alcohol or Mercury Thermometers

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

INTRODUCTION

INSPECT THE SHIPMENT

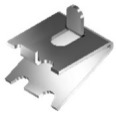
- When a unit leaves the factory, **safe delivery becomes the responsibility of the carrier**.
- **Damage sustained during transit is not covered by the manufacturing defect warranty.**
- Save the shipping carton until you are certain the unit and its accessories function properly.

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**.

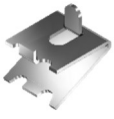
1. Carefully inspect the shipping carton for damage.
2. Report any damage to the carrier service that delivered the unit.
3. If the carton is not damaged, open the carton and remove the contents.
4. Inspect the unit for signs of damage. Use the orientation images in this chapter as references.
5. The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

Included Components:

Model	Shelves	Shelf Clips	Leveling Feet
SMO14-2	3	12	4
SMO28-2	6	24	4

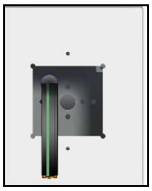




Model	Shelves	Shelf Clips	Leveling Feet
SMO28G-2	2	8	4

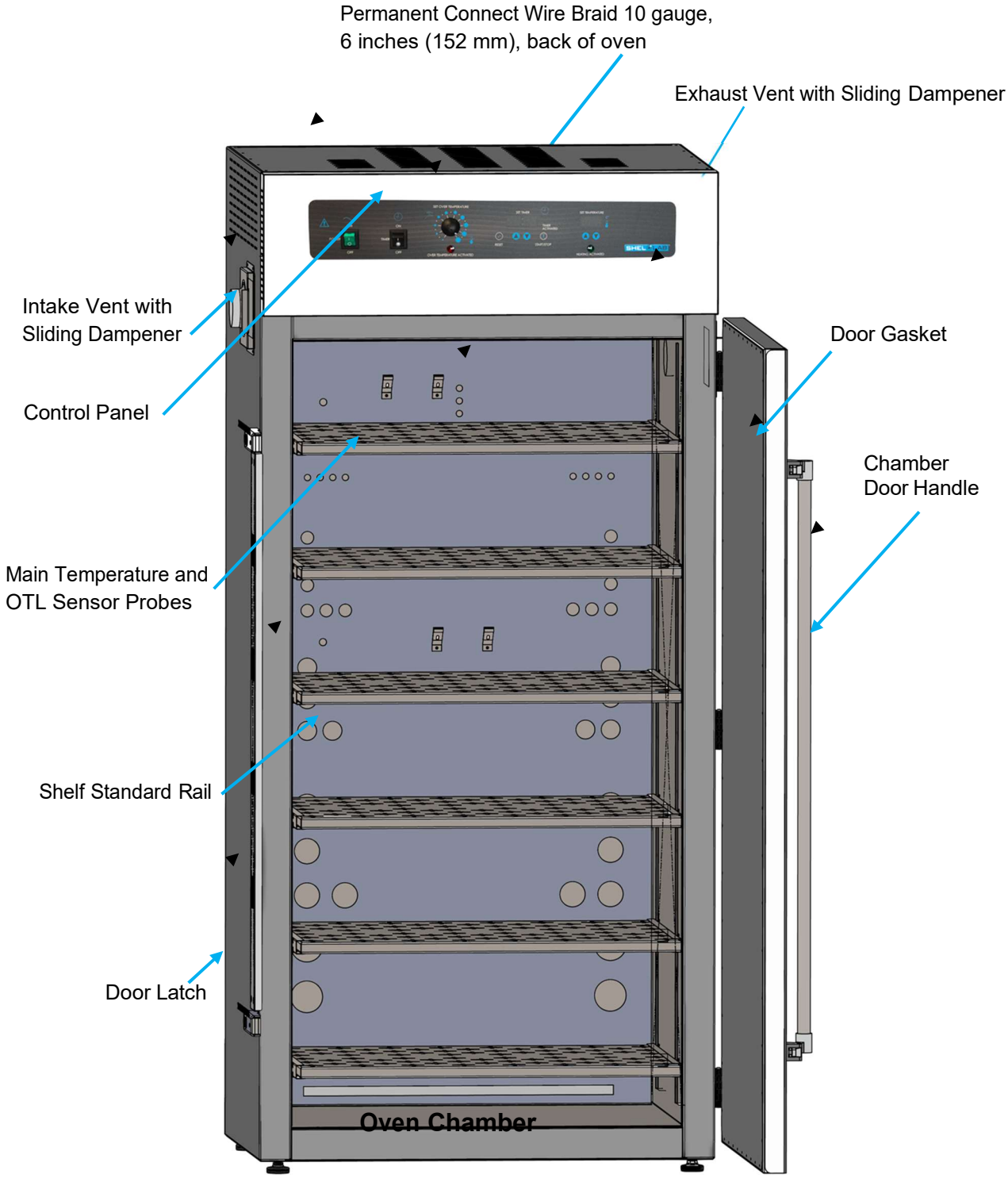




Note: SMO28-2s ordered with the **sliding shelf option** will come with a total of 14 shelves and 28 shelf slides. See page 11.

ORIENTATION

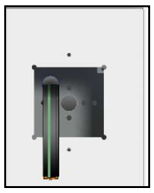


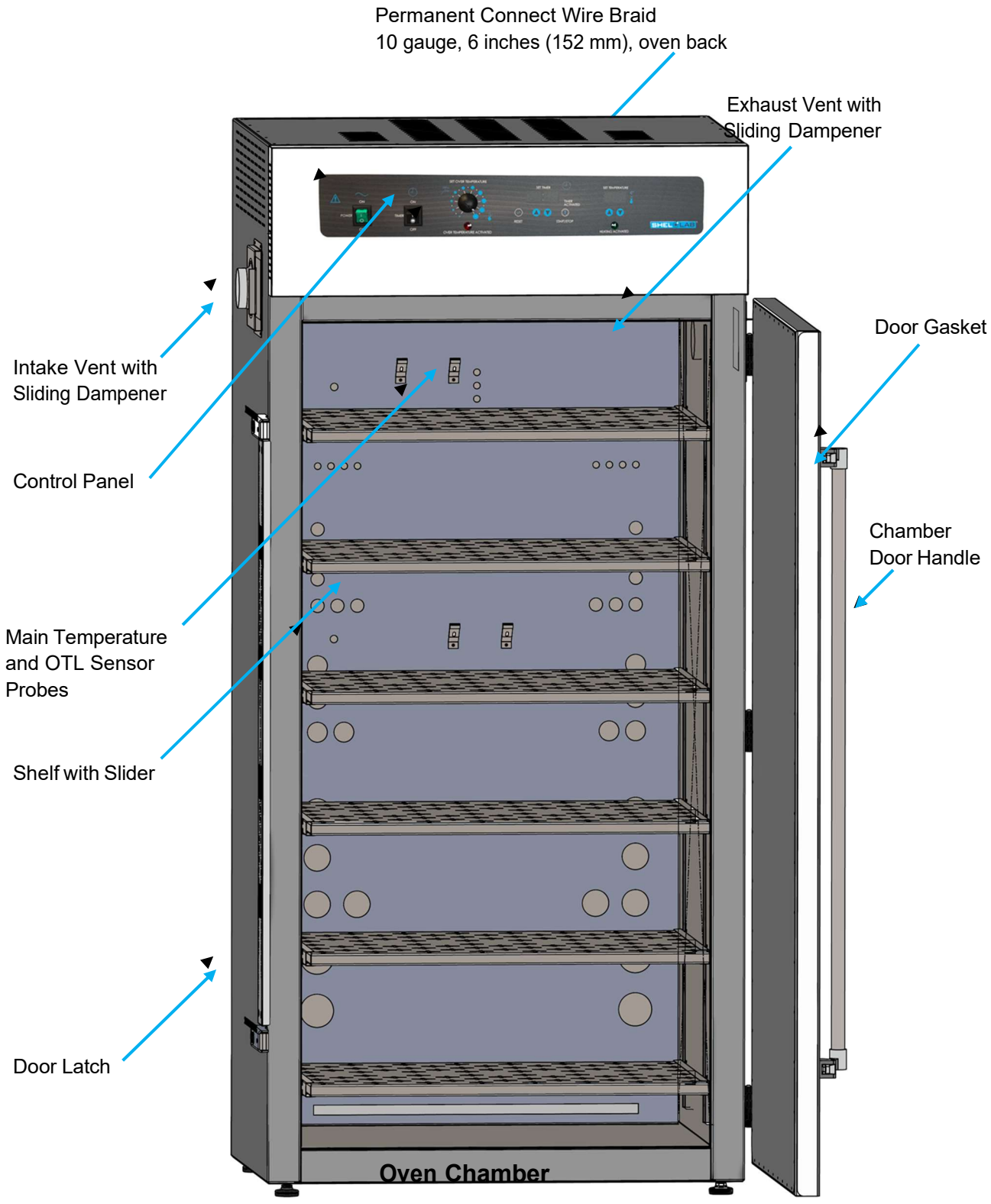
SMO28-2



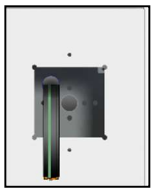
SMO28-2 with Sliding Shelves Option

Part ID: SMO28-2-M

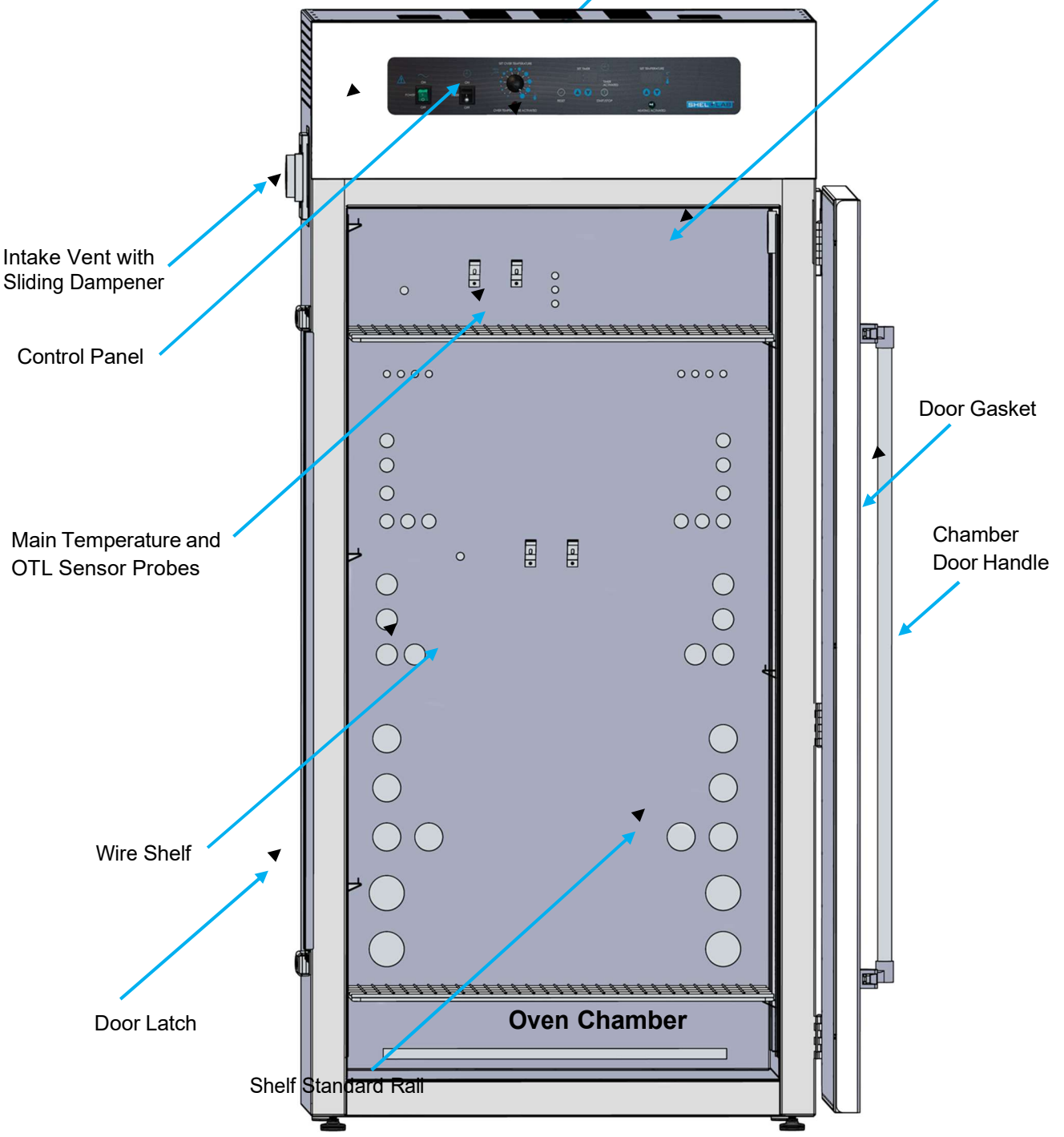




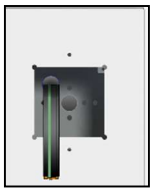
SMO28G-2

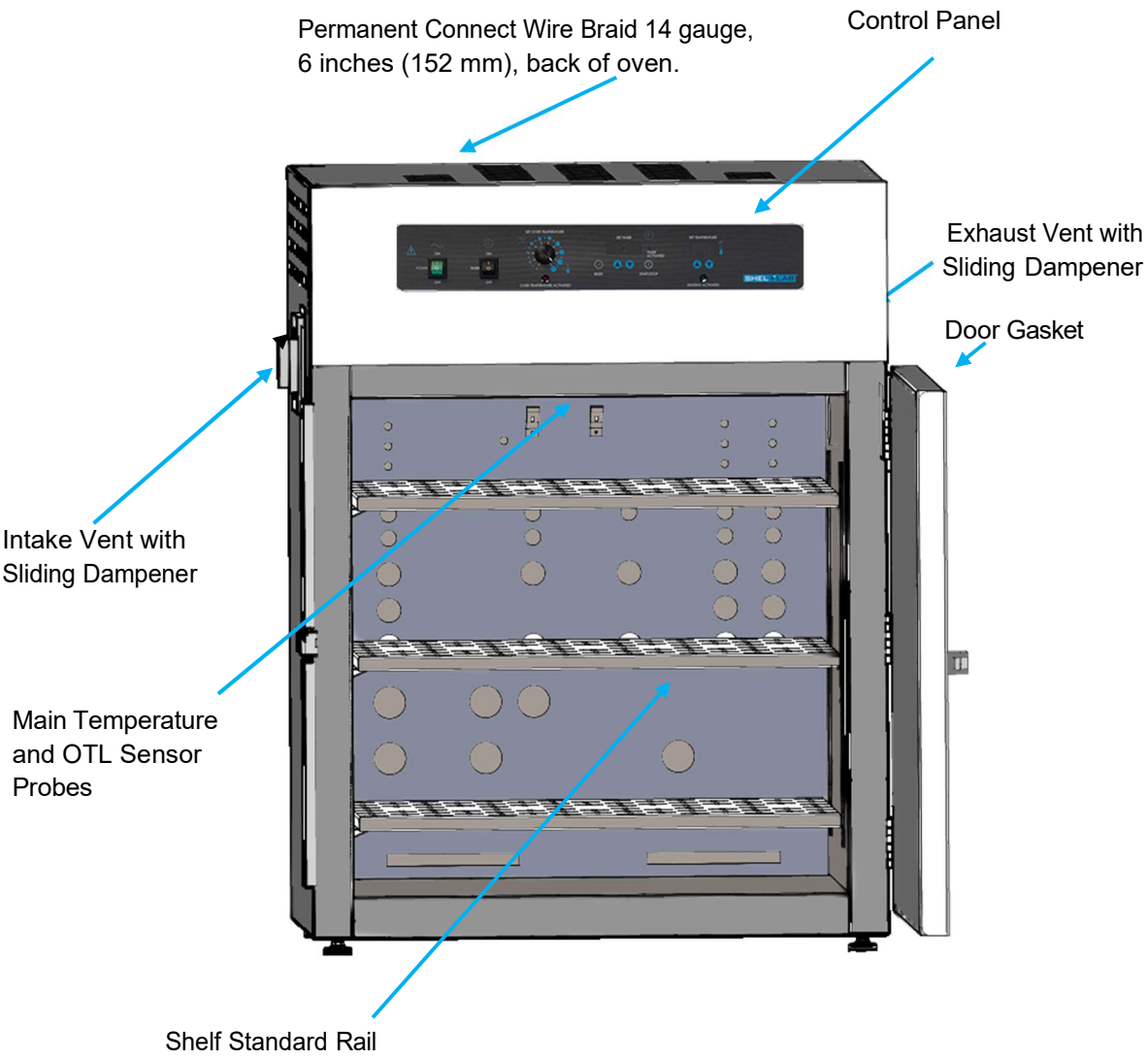


Permanent Connect Wire Braid 10 gauge,
6 inches (152 mm), back of oven.



SMO14-2





Oven Chamber

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, below the power braid inlet.

Data Plate Information

MODEL NO:	
SERIAL NO:	
PART NO:	

HARDWIRE REQUIREMENT

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

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 16.
- ✓ Check that the spacing clearance requirements are met, page 16.
  - Unit dimensions may be found on page 43.
- ✓ Check that a suitable permanent connect electrical power supply is present, page 17.

Install the oven in a suitable location

- ✓ Review the lifting and handling instructions, page 18.
- ✓ Install the unit leveling feet, page 19.
- ✓ Install the oven in its workspace location, page 20.

Set up the oven for use

- ✓ Clean and disinfect the unit and shelving (recommended), page 20.
- ✓ Install the shelving, page 21.

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.

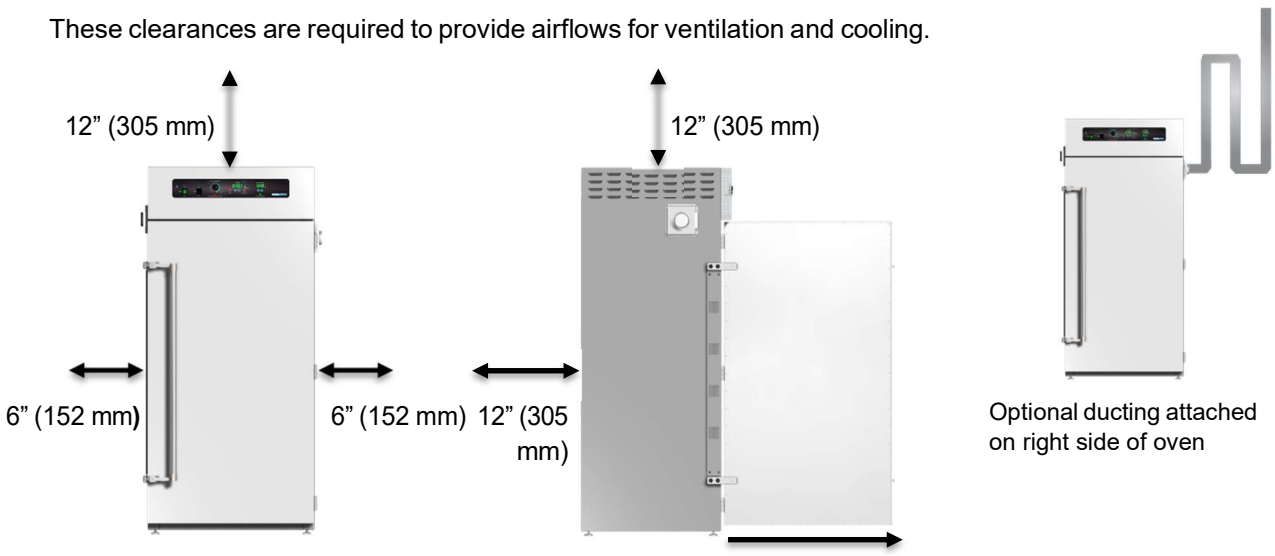
The maximum altitude is 2,000 feet or 610 meters. The pollution degree of the intended environment is 2. Operating outside these conditions may adversely affect the oven temperature performance.

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 airflows for ventilation and cooling.



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

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

12 inches (305 mm of headspace clearance is required between the top of the oven and any overhead cover or partition.

Do not place objects on top of the oven.

POWER SOURCE REQUIREMENTS

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

Power Supply: The power supply must meet the power requirements listed on the oven data plate. These ovens are intended for **230-volt, 50/60 Hz** applications at the following amperages:

Model	Amperage	Model	Amperage
SMO14-2	12	SMO28-2s	20

- **Supplied voltage must not vary more than 10% from the data plate rating**. Damage to the unit may result if the supplied voltage varies more than 10%.
- The power source must be **single (1) phase** and **protective earth grounded**.
- Use a separate circuit to prevent loss of the unit due to overloading or circuit failure.
- The power source must conform to all national and local electrical codes.

Switch or Circuit Breaker Required: A switch or circuit-breaker must be used in the building installation to protect against overcurrent conditions. The recommended circuit-breakers are:

- SMO14-2 **15 amps**
- SMO28-2 SMO28G-2 **30 amps**

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

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

POWER FEED WIRING

The oven comes provided with an integral 6-inch (152 mm) wire braid consisting of:

- SMO14-2 – Two 14-gauge high-temperature (300°C) hot wires and a 14-gauge earth ground.
- SMO28-2 SMO28G-2 – Two 10-gauge high-temperature (300°C) hot wires and a 10-gauge earth ground.

The wires for power source connection should be in accordance with the following:

- SMO14-2: Green/Yellow – Earth; Red – Hot; Black – Hot.
- SMO28-2 SMO28G-2: Green/Yellow – Earth; Black – Hot; Black – Hot.

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

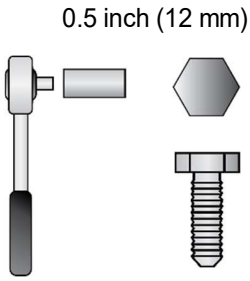
LIFTING AND HANDLING

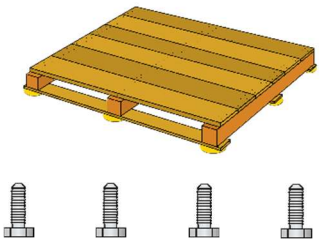
The unit is heavy. Use appropriate lifting devices that are sufficiently rated for these loads. Follow these guidelines when lifting the unit.

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

REMOVING FROM THE PALLET

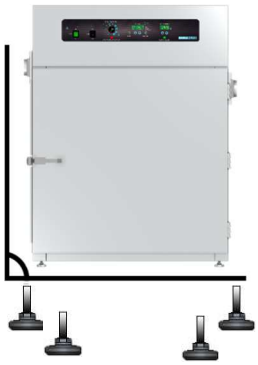
The unit comes secured to a shipping pallet with ½" hex bolts inserted through the 4 leveling feet holes on the bottom of the oven. Use a socket wrench to remove the bolts and release the unit from the pallet.

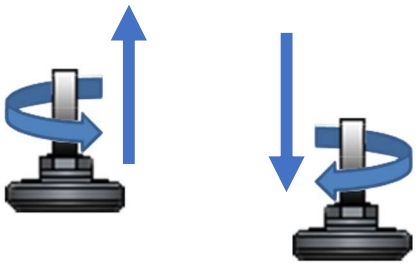




LEVELING

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





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

INSTALL THE OVEN

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

- Verify that the oven stands level and does not rock. Adjust the leveling feet as needed.
- **Power**: The oven may now be hardwired to its power source.

DEIONIZED AND DISTILLED WATER

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

- The 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 before 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 before cleaning and installing.
- See the **Cleaning and Disinfecting** topic in the User Maintenance section (see page 37) for information on how to clean and disinfect without damaging the unit.
- **Do not clean with deionized water.**

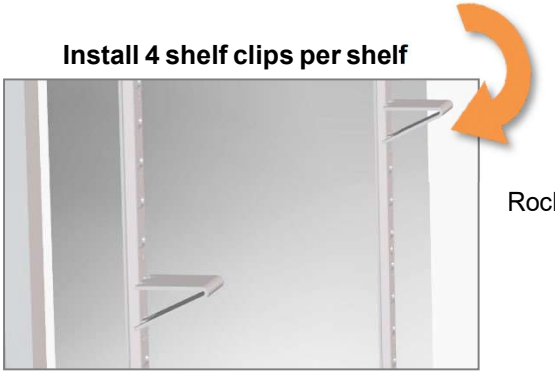
SHELVING INSTALLATIONS

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.

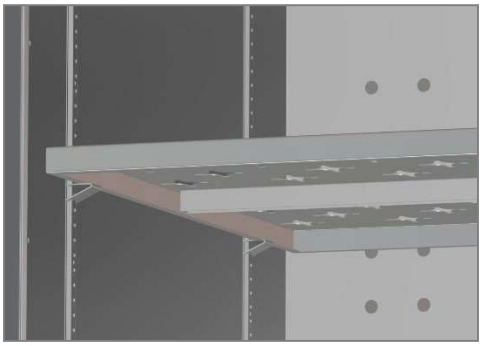
Static Shelves: See the next page for sliding shelf installation.

Install 4 shelf clips per shelf



Rocking motion

Place the shelves



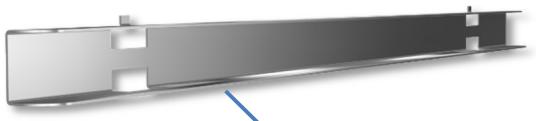
1. Install the shelf clips in the slots of the shelf standard mounting rails located on the sides of the chamber interior, 4 clips per shelf.

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

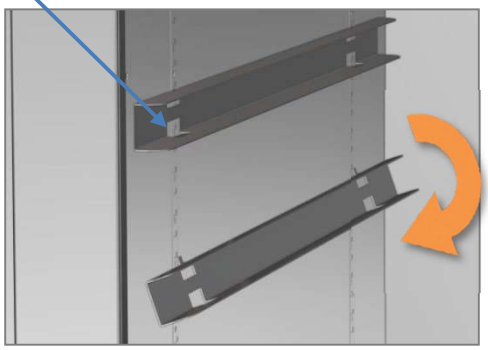
2. Set the shelves on the clips.

    a. Verify the shelves are level.

Sliding Shelf Installation

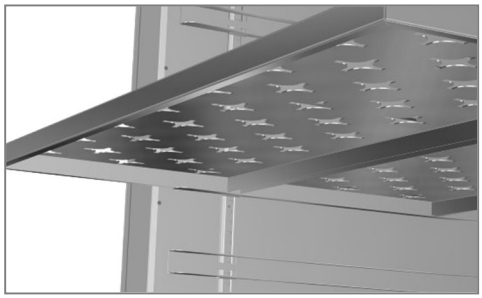


Install shelf slides



Rocking Motion

Slide in the shelves



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.

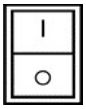
    a. Insert the top tab first, and then the bottom tab using a rocking motion.

2. Slide the shelves into the chamber.

    a. Verify the shelves are level.

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 d e déplacements respectifs vers le HAUT et le BA
	**Manually adjustable** Indique un réglage manuel
	**Potential shock hazard** Risque de choc électrique
	**Recycle the unit. Do not dispose of in a landfill.** Recycler l'unité. Ne jetez pas dans une décharge.

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
	**Caution hot surface** Attention surface chaude

CONTROL PANEL OVERVIEW

Control Panel

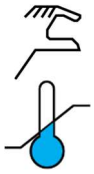
Power Switch

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)



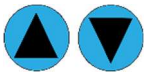
This graduated dial sets the heating cutoff point for the mechanical Over Temperature Limit system. The system prevents unchecked heating of the chamber in the event of an electronics failure or external heat spike.

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 29).

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.

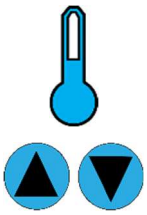
The "//" RESET button is used to access the Timer display adjustable duration mode, and to advance through the duration time parameters.



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.

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 Operating Precautions, deliberately or through error, is a hazardous behavior on the part of the operator.

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

OPERATING PRECAUTIONS

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

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

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 left side of the chamber, blows across the shelf space, and is then pulled into a duct that makes up the right chamber wall. From there, the air is drawn upward into a heating duct by the action of the blower fan. The oven is intended to be run as a closed air-cycle system.

Vents: Intake and Exhaust

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

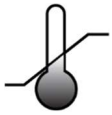
The dampeners are intended to be opened **after** the heated portion of an application is complete. Opening the dampener vents during the treatment or bake out may speed the rate of material drying, depending on the nature of the sample material, outgassed byproducts, and ambient conditions. However,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

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 (OTL)



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.

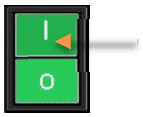
The OTL must be set by the user in order to function. The manufacturer recommends a setting of approximately 5°C above the highest temperature setpoint of your heating application. A red indicator illuminates when the OTL is rerouting power. Failure to set the Over Temperature Limit system voids the 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 the remnants 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. Turn on the oven

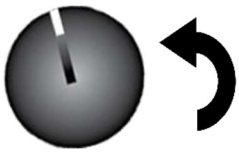


Place the oven Power Switch in the ON (I) position.
The switch will illuminate.

2. Set the Temperature Setpoint

Carry out the **Set the Temperature Setpoint** procedure on page 31. Set the oven to your application temperature.

3. Set the Over Temperature Limit



Perform the **Set the Over Temperature Limit** procedure on page 32.

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

Optional: Program the Timer

- See the **Setting the Timer** procedure on page 33.
- Once a Timer is set, see the **Running the Oven Timer** procedure on page 34.

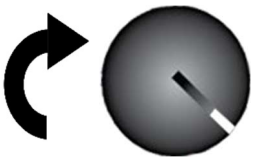
The oven is now ready for use.

SET THE TEMPERATURE SETPOINT

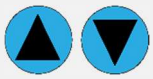
Perform the steps below to adjust the setpoint to your process or application temperature.

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.

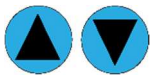
- The display will briefly flash the letters "SP", then show the flashing, adjustable temperature setpoint.

Setpoint Adjustment Mode

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

Initial Setpoint

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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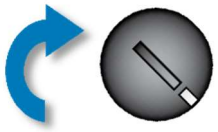
Note: Test the OTL system at least once per year to verify its functionality. **The manufacturing defect warranty does not cover over-temperature damage if the OTL is not set.**

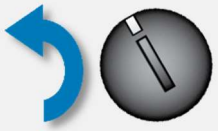
SET THE OVER TEMPERATURE LIMIT

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.

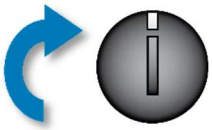


2. Turn the dial counterclockwise (to the left) until the Over Temperature Activated light illuminates.




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

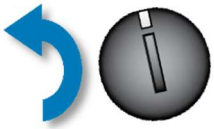
3. Slowly turn the dial clockwise (to the right) until the Over Temperature light turns off.




- 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.

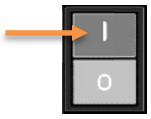
SETTING THE TIMER

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

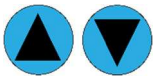
Press and hold the **RESET** button on the control panel.

- 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.

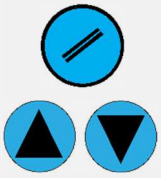
3. Program the number of hours



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

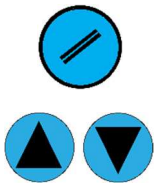


Push and release the **RESET** button to advance.

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

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

End of Procedure

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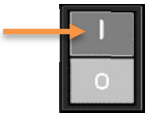
RUNNING THE OVEN TIMER

Allow the oven to come up to temperature before running the oven timer. See the **Setting the Timer procedure** on page 33 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.

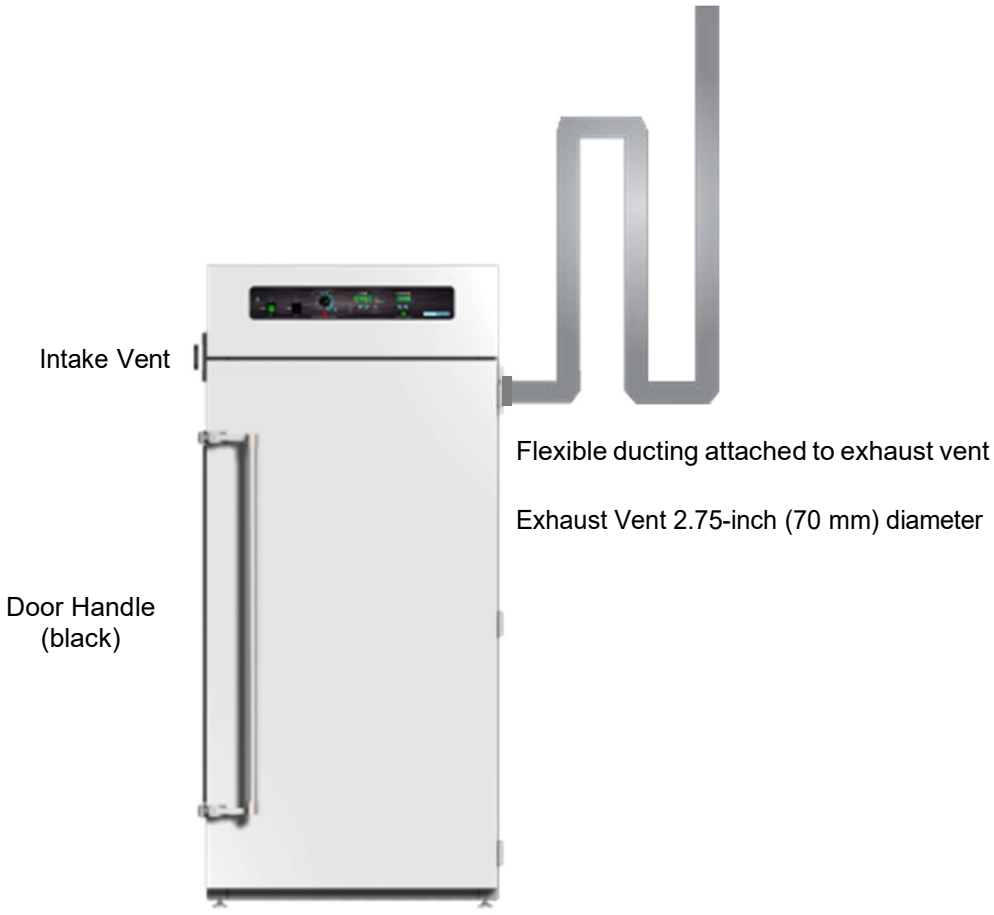
To run the timer again, press and hold the "//" **Reset** button and enter a new timer value, then push the **Start/Stop "T"** button to launch.

Timer Complete

VENTING OVEN EXHAUST

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

- Obtain flexible, non-insulated ducting.
- Attach the ducting to the lip of the exhaust port on the right side of the oven. See the image 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.



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 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 oven, 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 an abrasive cleaner**, these will damage metal surfaces.
    - **Do not use deionized water to rinse or clean with.**
    - Take special care when cleaning around the temperature sensor probes in the chamber to prevent damage. Do not clean the probes.
4. Rinse with distilled water and wipe dry with a soft cloth.

Disinfecting

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

Keep the following points in mind when disinfecting the oven:

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

DOOR COMPONENTS

Periodically, inspect the door latch, trim, and catch for alignment. Check the silicone rubber gaskets located on the door and on the doorframe of the oven body for signs of drying, brittleness or cracking. Failure to maintain the integrity of the door system shortens the lifespan of the oven and may adversely impact chamber temperature uniformity and stability.

Replacement of the door liner and chamber liner gaskets is a service-level procedure.

ELECTRICAL COMPONENTS

Electrical components do not require maintenance. If the unit electrical systems fail to operate as specified, please contact your distributor or Customer Support for assistance.

CALIBRATING THE TEMPERATURE DISPLAY

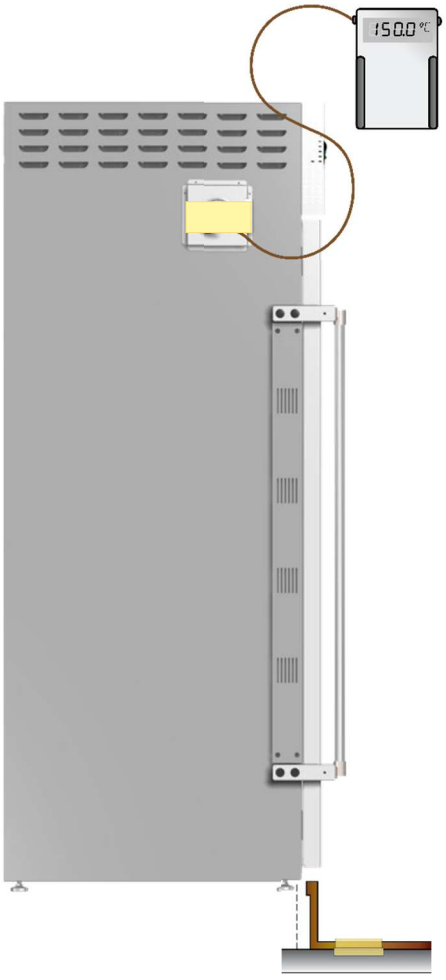
Note: Please see the **Reference Sensor Device entry** on page 7 for the minimum device requirements.

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

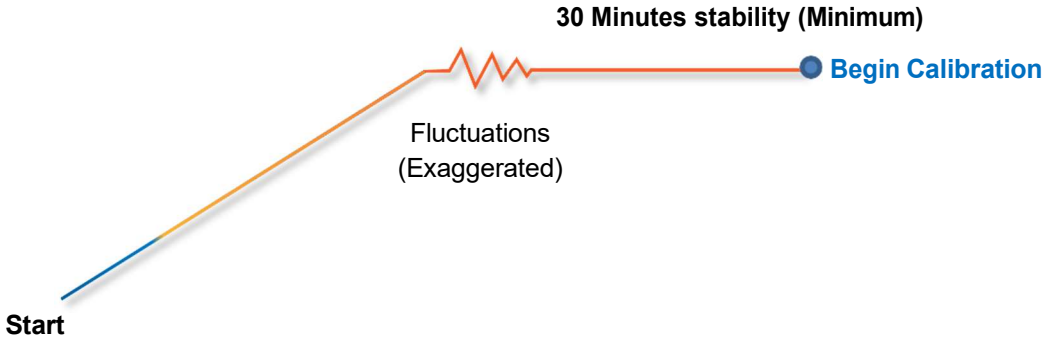
1. Introduce the reference device thermocouple sensor probe through the left side intake vent or the chamber door space.
   - There must be at least 12 inches (305 mm) of wire in the chamber to prevent heatsinking, which would result in a false low temperature reading.
2. Position the probe in the chamber.
   - Place the probe head as close as possible to the geometric center point of the chamber.
   - The probe head must be at least 2 inches (51 mm) from the surface of the shelving to prevent heatsinking.
3. Secure the probe head in position with the non-marking, heat-resistant tape.
4. Carefully close the sliding vent dampener. Use non-stick tape to seal any gaps created by the probe wire.
5. The oven chamber door must be closed and latched. Failure to do so will prevent an accurate calibration.
6. Verify the intake and exhaust vents are closed. **Both vents must be closed** for an accurate calibration.

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



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

- The oven must run for at least 1 hour before 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 45).



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.

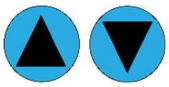
Reference Device

Continued next page

Temperature Calibration Continued

3

Place the display in temperature calibration mode.

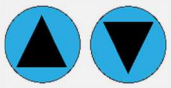


a. Press and hold both the **Up** and **Down** temperature arrow buttons simultaneously for approximately 5 seconds.

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

Continued next page

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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 230-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 with 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 Weight
SMO14-2	361 lb / 164 kg	280.0 lb / 127.3 kg
SMO28-2	513 lb / 233 kg	390.0 lb / 177.3 kg
SMO28G-2	513 lb / 233 kg	390.0 lb / 177.3 kg

DIMENSIONS

In Inches

Model	Exterior W × D × H	Interior W × D × H
SMO14-2	39.1 x 34.0 x 48.0 in	30.8 x 24.8 x 31.0 in
SMO28-2	39.1 x 35.0 x 78.3 in	30.8 x 25.0 x 61.0 in
SMO28G-2	39.1 x 35.0 x 78.3 in	30.8 x 25.0 x 61.0 in

In Millimeters

Model	Exterior W × D × H	Interior W × D × H
SMO14-2	994 x 864 x 1219 mm	782 x 630 x 788 mm
SMO28-2	994 x 889 x 1989 mm	782 x 635 x 1575 mm
SMO28G-2	994 x 889 x 1989 mm	782 x 635 x 1575 mm

CAPACITY

Model	Cubic Feet	Liters
SMO14-2	13.7	388
SMO28-2	27.6	781
SMO28G-2	27.6	781

SHELF CAPACITY BY WEIGHT

Model	Per Shelf	Total
SMO14-2	75.0 lb / 34.0 kg	225.0 lb / 102.0 kg
SMO28-2	75.0 lb / 34.0 kg	450.0 lb / 204.0 kg
SMO28G-2	30.0 lb* / 13.6 kg	60.0 lb** / 27.2 kg

*30.0 lb (13.6 kg) with the weight evenly distributed across the shelf.

**The maximum weight capacity of the SMO28G-2 can be increased to 450.0 lb (204.1 kg) with the purchase of more shelves. For free-hanging long objects, the oven can only accommodate 2 shelves.

AIR FLOW PERFORMANCE

Ventilation Rates

Model	Cubic Feet per Minute @80°C	Liters per Minute @80°C
SMO14-2	42	1189
SMO28-2	39.4	1116
SMO28G-2	39.4	1116

Air Changes per Hour

Model	@80°C
SMO14-2	175
SMO28-2	85
SMO28G-2	85

Air Velocity Across Shelf Space

Model	Linear Feet per Minute	Meters per Minute
SMO14-2	5	1.5
SMO28-2	5	1.5
SMO28G-2	5	1.5

SPECIFICATIONS

TEMPERATURE

Range and Stability

Model	Operating Range	Stability
SMO14-2	Ambient +15 to 260°C	± 0.4°C @150°C
SMO28-2	Ambient +15 to 260°C	± 0.4°C @150°C
SMO28G-2	Ambient +15 to 260°C	± 0.5°C @150°C

Uniformity

Model	@80°C	@150°C	@260°C
SMO14-2	± 1.5°C	± 3.0°C	± 7.0°C
SMO28-2	± 1.5°C	± 3.0°C	± 7.0°C
SMO28G-2	± 1.5°C	± 3.5°C	± 7.5°C

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

Model	Heat Up Time to 80°C	Heat up Time to 150°C	Heat up Time to 260°C
SMO14-2	10 minutes	25 minutes	85 minutes
SMO28-2	12 minutes	25 minutes	60 minutes
SMO28G-2	10 minutes	25 minutes	55 minutes

Recovery Time: From a 30-second door opening.

Model	Recovery to 80°C	Recovery to 150°C	Recovery to 260°C
SMO14-2	1.5 minutes	2.5 minutes	15 minutes
SMO28-2	1.5 minutes	3 minutes	7 minutes
SMO28G-2	1.5 minutes	3 minutes	7 minutes

Recovery Time: From a 60-second door opening.

Model	Recovery to 80°C	Recovery to 150°C	Recovery to 260°C
SMO14-2	2 minutes	4 minutes	22 minutes
SMO28-2	2 minutes	4 minutes	9.5 minutes
SMO28G-2	2 minutes	4 minutes	8 minutes

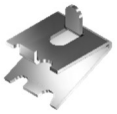
POWER

Model	AC Voltage	Amperage	Frequency
SMO14-2	230	12	50/60 Hz
SMO28-2	230	20	50/60 Hz
SMO28G-2	230	20	50/60 Hz

OVER-VOLTAGE

Model	AC Voltage	OVC II
SMO14-2	230	1500
SMO28-2	230	1500
SMO28G-2	230	1500

PARTS LIST

Description	Parts Number	Description	Parts Number
Adjustable Leveling Foot	 2700506	Shelf, Stainless Steel, SMO14-2, SMO28-2	 995-00006
Shelf Clip, All Units	 1250512	Shelf, Wire, SMO28G-2	 6800537NCF

Sliding Shelf Kit Part Number 9751368

Compatible with the SMO14-2 and SMO28-2s`.

- 1 additional shelf
- 2 shelf 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, Part,** and **Part ID** numbers of the unit ready. Customer Support needs this information to match your unit to its correct part.

SHELLAB®

SHELDON MANUFACTURING.INC

P.O. Box 627
Cornelius, OR 97113
USA

support@sheldonmfg.com
sheldonmanufacturing.com

800-322-4897
503-640-3000
FAX: 503-640-1366