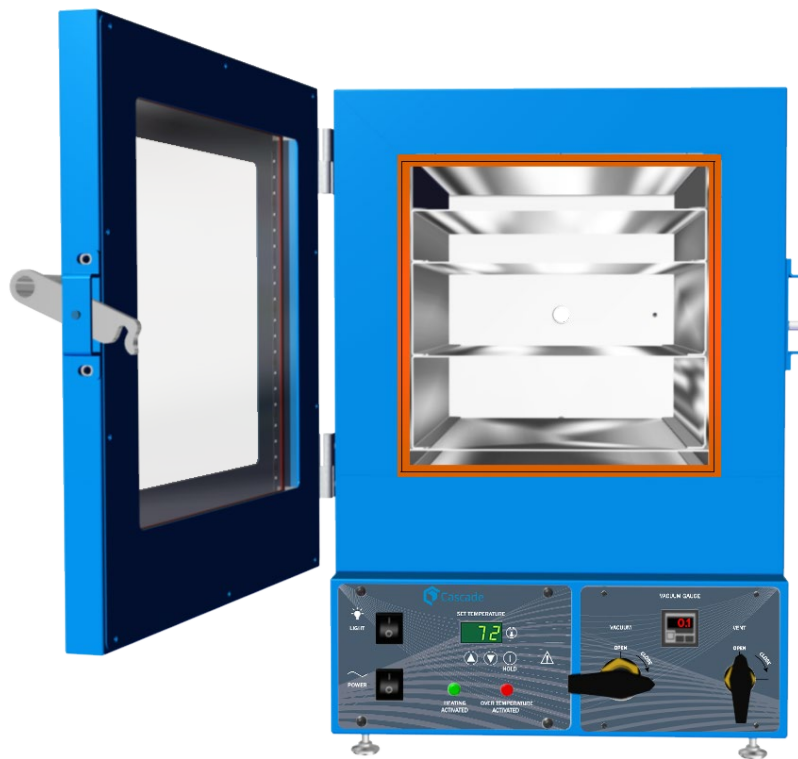


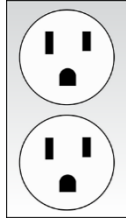
Benchtop Vacuum Ovens



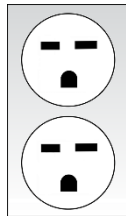
CVO-2 CVO-2-2

Installation - Operation Manual

The **CVO-2** requires a standard 110 – 120-volt power supply outlet to plug into (NEMA 5-15R).



The **CVO-2-2** requires a 220 – 240-volt power supply outlet to plug into (NEMA 6-15R).



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

Benchtop Vacuum Ovens

CVO-2: 110 – 120 Voltage

CVO-2-2: 220 – 240 Voltage

Part Number (Manual): 4861832

Revision: November 8, 2019

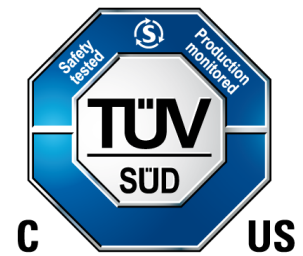
TABLE OF CONTENTS

CERTIFICATIONS	7
UNIT SPECIFICATIONS	9
<i>Temperature Performance</i>	<i>9</i>
<i>Power</i>	<i>10</i>
<i>Vacuum</i>	<i>10</i>
<i>Weight.....</i>	<i>10</i>
<i>Dimensions.....</i>	<i>11</i>
<i>Capacity</i>	<i>11</i>
<i>Shelf Capacity by Weight.....</i>	<i>11</i>
<i>Unit Dimension Drawings.....</i>	<i>12</i>
INTRODUCTION	13
<i>Read this Manual.....</i>	<i>13</i>
<i>Contacting Assistance</i>	<i>13</i>
<i>Engineering Improvements.....</i>	<i>13</i>
<i>Vacuum Supply Required</i>	<i>14</i>
<i>Gaskets</i>	<i>14</i>
RECEIVING YOUR OVEN	15
<i>Inspect the Shipment.....</i>	<i>15</i>
<i>Orientation.....</i>	<i>16</i>
<i>Recording the Data Plate Information.....</i>	<i>19</i>
INSTALLATION	21
<i>Installation Procedure Checklist</i>	<i>21</i>
<i>Required Ambient Conditions.....</i>	<i>22</i>
<i>Required Clearances.....</i>	<i>22</i>
<i>Power Source Requirements</i>	<i>23</i>
<i>General Power Safety</i>	<i>24</i>
<i>Lifting and Handling</i>	<i>25</i>
<i>Leveling.....</i>	<i>25</i>
<i>Install the Oven</i>	<i>26</i>
<i>Installation Cleaning.....</i>	<i>26</i>
<i>Shelving Installation.....</i>	<i>27</i>
<i>Connect to the Vacuum Supply</i>	<i>28</i>
<i>Connect to a Gas Backfill Supply</i>	<i>29</i>
GRAPHIC SYMBOLS	31
CONTROL OVERVIEW	33
OPERATION.....	35
<i>Safety Guidelines</i>	<i>35</i>
<i>Operating Precautions.....</i>	<i>36</i>
<i>Theory of Operation</i>	<i>37</i>
<i>Put the Oven into Operation</i>	<i>39</i>
<i>Put the Chamber Under Vacuum</i>	<i>41</i>
<i>Set the Temperature Setpoint</i>	<i>42</i>
<i>Pausing Heating</i>	<i>43</i>
<i>Over Temperature Activation</i>	<i>43</i>
<i>Vacuum Gauge Operations</i>	<i>44</i>
<i>Maximum Obtainable Vacuum.....</i>	<i>45</i>
<i>Pressure Units Conversion Chart.....</i>	<i>45</i>
<i>Oven Heating Use.....</i>	<i>46</i>
<i>Oven Cooldowns.....</i>	<i>46</i>
USER MAINTENANCE.....	47
<i>Cleaning and Disinfecting.....</i>	<i>47</i>

Maintaining Atmospheric Integrity 48
Gaskets 48
Electrical Components 49
Vacuum Pump Maintenance..... 49
REPLACEMENT PARTS LIST.....**51**

TABLE OF CONTENTS





This certificate satisfies NRTL safety requirements

TÜV SÜD CUE

Certificate Number: U8 064872 0095

These units are CUE listed by TÜV SÜD as vacuum ovens for appropriate professional, industrial, or educational use. TÜV SÜD America Inc. is an OSHA recognized NRTL and a Standards Council of Canada accredited certification body.

The units have been tested to the following requirements:

CAN/CSA-C22.2 No. 61010-1:2012/U2:2:2016-04

CAN/CSA C22.2 No. 61010-2-010:2015

UL 61010-1:2012/R:2016-04

UL 61010-2-010:2015

EN 61010-1:2010

EN 61010-2-010:2014



UNIT SPECIFICATIONS

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 (±3° (77°F ±5.4°)) and at nominal voltage. The temperatures specified are determined in accordance with factory standards 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.

TEMPERATURE PERFORMANCE

Operating Range

Fahrenheit	Celsius
Ambient +18° to 300°F	Ambient +10° to 150°C

Temperature Uniformity

@ 105°F	@ 200°F	@ 300°F
±2.5°F	±7.5°F	±16.0°F

@ 40°C	@ 90°C	@ 150°C
±1.4°C	±4.2°C	±8.9°C

Temperature Stability

@ 105°F	@ 200°F	@ 300°F
±0.3°F	±0.3°F	±0.3°F

@ 40°C	@ 90°C	@ 150°C
±0.2°C	±0.2°C	± 0.2°C

Heat Up Times

Ambient to stabilization with the chamber under vacuum. Heat up times may be influenced by ambient conditions.

To 105°F	To 200°F	To 300°F
60 minutes	126 minutes	180 minutes

To 40°C	To 90°C	To 150°C
60 minutes	126 minutes	180 minutes

SPECIFICATIONS

Cooldown Times

Approximate times with the chamber under vacuum. Cooldown rates are influenced by ambient conditions.

From 105°F	From 200°F	From 300°F
345 Minutes	345 Minutes	345 Minutes

From 40°C	From 90°C	From 150°C
345 Minutes	345 Minutes	345 Minutes

POWER

Model	AC Voltage	Amperage	Frequency
CVO-2	110 – 120	8.0	50/60 Hz
CVO-2-2	220 – 240	4.0	50/60 Hz

VACUUM

Operational Vacuum Range

inHg	mmHg	kPa	bar
-3.0 to -29.9	-76 to -760	-10 to -101	-0.1016 to -1.0125

Vacuum Display Range

inHg	mmHg	kPa	bar
0.0 to -29.9	37.5 to - 757	5 to -101	0.05 to -1.013

WEIGHT

Shipping Weight	Unit Weight
218 lb / 99 kg	179 lb / 81.2 kg

SPECIFICATIONS

DIMENSIONS

Inches

Exterior W × D × H	Interior W × D × H
20.5 x 28.8 x 24.9 in	12.0 x 20.0 x 12.0 in

Millimeters

Exterior W × D × H	Interior W × D × H
521 x 732 x 633	304 x 508 x 304

CAPACITY

Cubic Feet	Liters
1.67	47.2

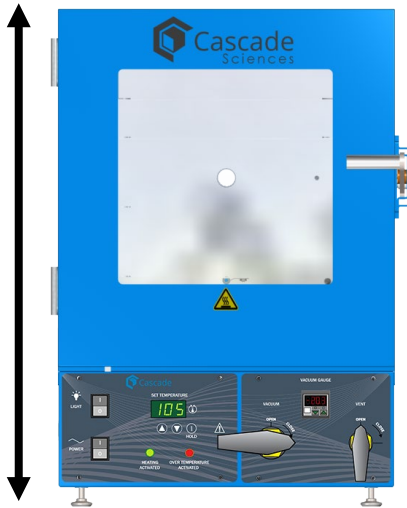
SHELF CAPACITY BY WEIGHT

Per Shelf	Total
35.0 lb / 15.8 kg	105.0 lb / 47.6 kg

SPECIFICATIONS

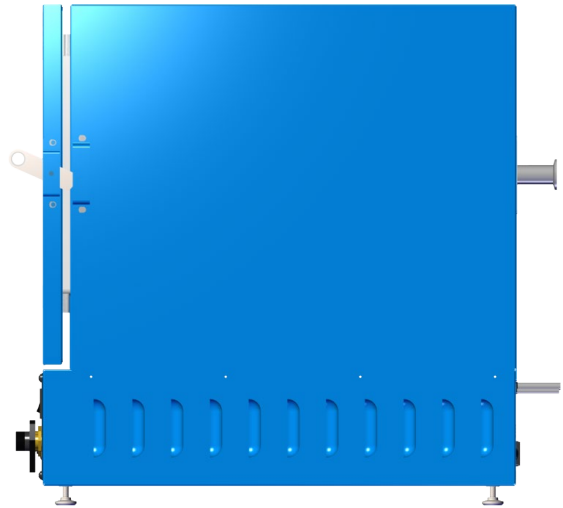
UNIT DIMENSION DRAWINGS

Total Height: 24.9 inches (633 mm)



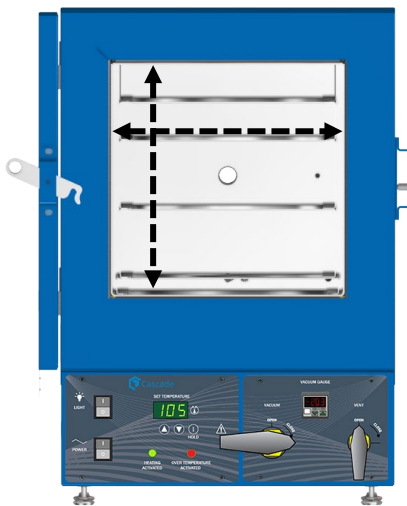
Width: 20.5 inches (521 mm)

Exterior Dimensions



Depth: 28.8 inches (734 mm)

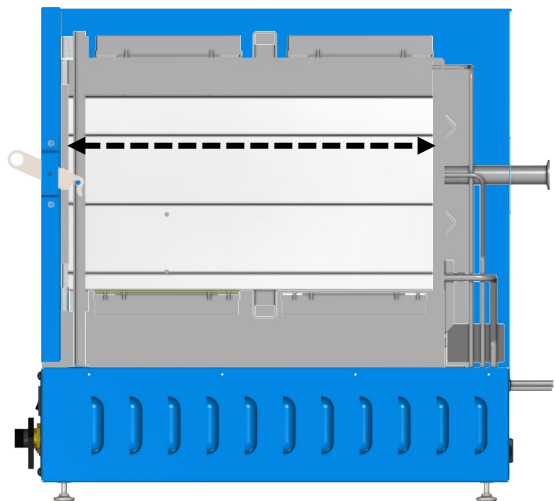
Width: 12.0 inches (304 mm)



Height: 12.0 inches (304 mm)

Chamber Interior

Depth: 20.0 inches (508 mm)



Cutaway Side View

READ THIS MANUAL

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

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

Intended Applications and Locations

CVO vacuum ovens are engineered for drying, curing, and baking applications under vacuum in professional, industrial, and educational environments. The ovens are not intended for use at hazardous or household locations.

CONTACTING ASSISTANCE

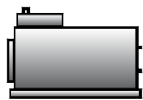
Please have the following information ready when calling or emailing Technical Support: the **model number** and the **serial number** (see page 19).

Phone: 503 847-9047

Cascade Sciences
6725 NE Evergreen Pkwy
Ste 106
Hillsboro, OR 97124

ENGINEERING IMPROVEMENTS

Cascade Sciences 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 oven dealer or customer service representative for assistance.



Vacuum Pump

VACUUM SUPPLY REQUIRED

CVO ovens require a vacuum supply source, which **must be purchased separately from the oven**. Please see the Cascade Sciences website for pumps and vacuum system accessories suitable for your application.

cascadesciences.com/vacuum-pumps



Building
Vacuum Supply

Minimum Vacuum Draw

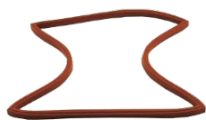
In order to seal completely, the oven chamber must be under a minimum vacuum draw of:

inHg	mmHg	kPa	bar
-3.0	-76	-10	-0.1016

GASKETS

Each oven comes with a replaceable cured silicone gasket installed on the chamber liner. This gasket seals against the chamber door to maintain the vacuum integrity of the chamber. The gasket must be replaced periodically and is rated to 230°C. It is vulnerable to acids and solvents. The gasket color may vary.

The chamber liner gasket is a non-warranty item subject to compression forces, heat, and outgassed byproducts. Heavy usage rates may necessitate frequent replacements. The manufacturer strongly recommends keeping at least one spare gasket on hand during operation.



RECEIVING YOUR OVEN

INSPECT THE SHIPMENT

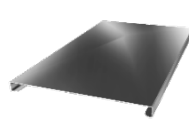
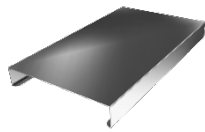
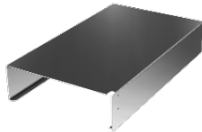
- When a unit leaves the factory, safe delivery becomes the responsibility of the carrier.
- **Damage sustained during transit is not covered by the manufacturing defect warranty.**
- Save the shipping carton until you are certain that the unit and its accessories function properly.

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

1. Carefully inspect the shipping carton for damage.
2. Report any damage to the carrier service that delivered the unit.
3. If the carton is not damaged, open the carton and remove the contents.
4. Inspect the unit for signs of damage. See the orientation depiction on the next page 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 loose accessory items before discarding.

Included Accessory Items

Tall Shelves	Medium Shelves	Short Shelf w/ Clip
2	2	1



Power Cord, CVO-2	Power Cord, CVO-2-2	Leveling Feet
1	1	4

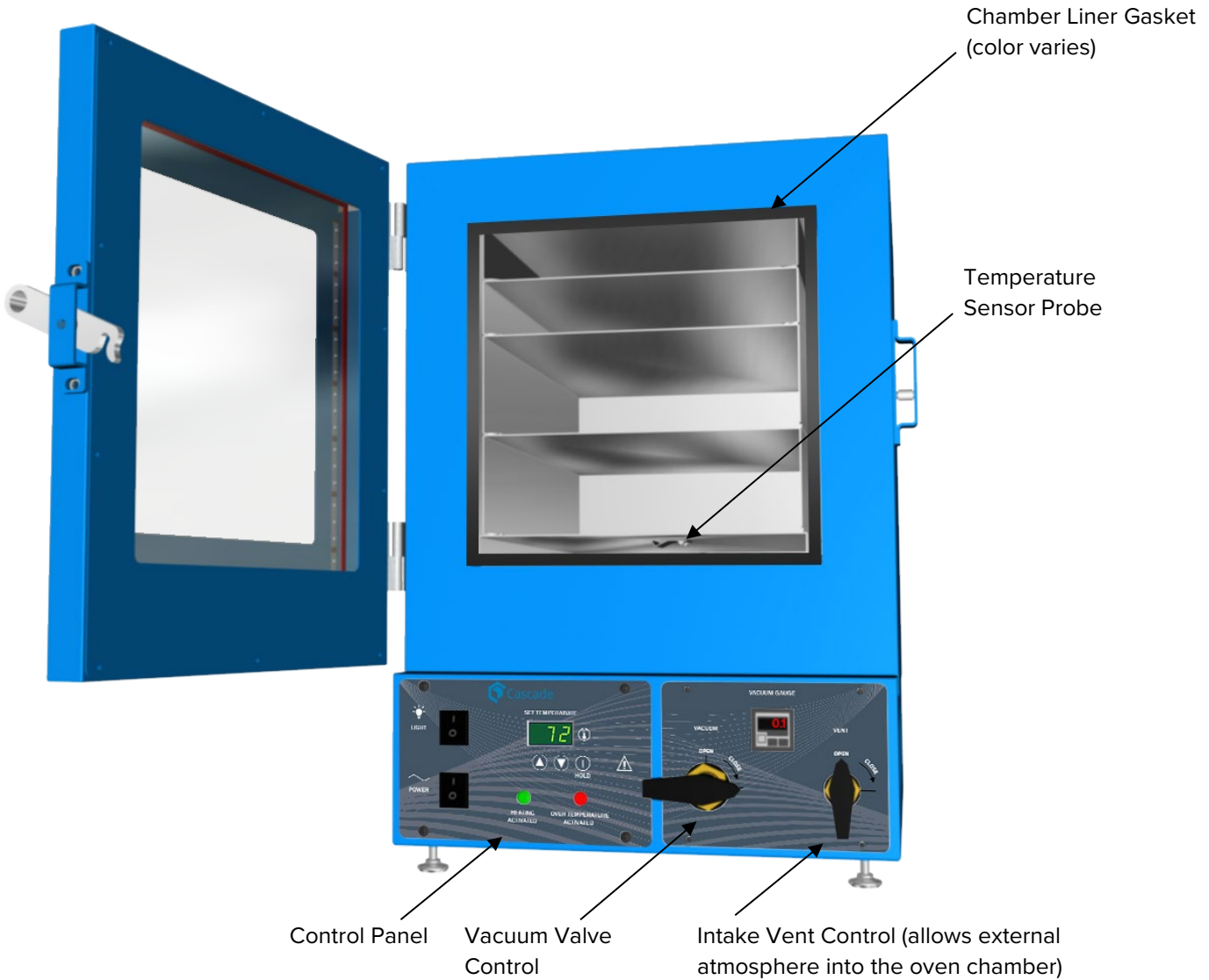


RECEIVING

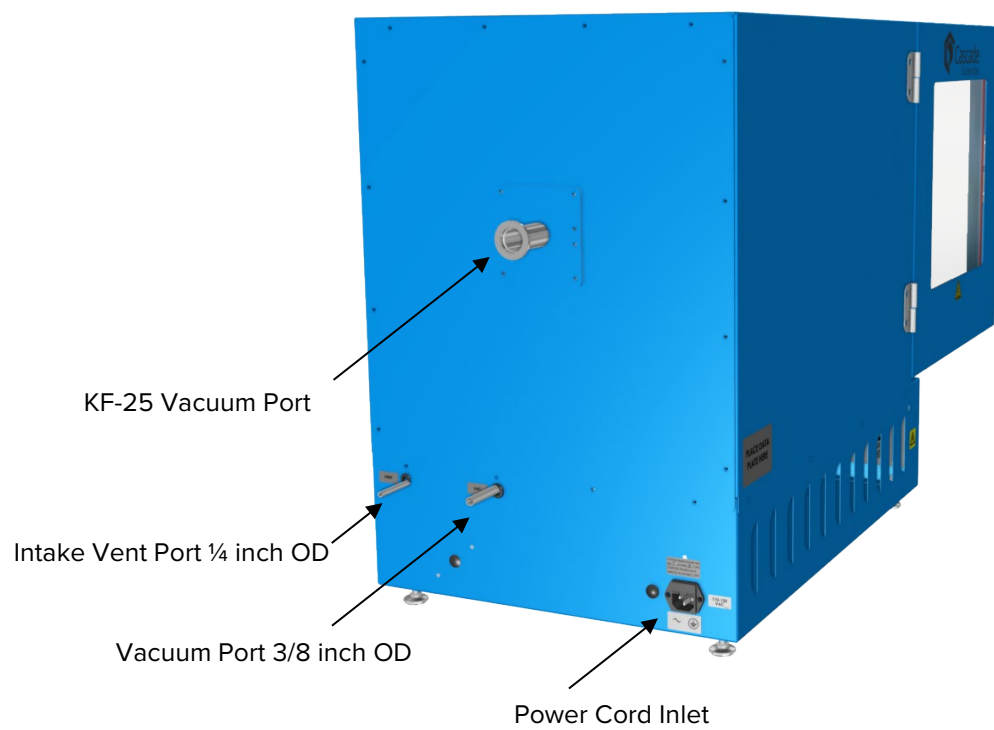
ORIENTATION

Front

CVO-2s



Back



RECEIVING

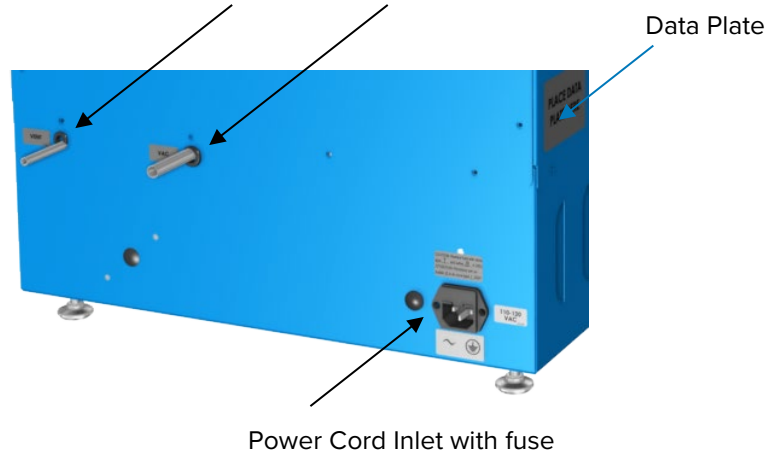
Power Panels

Located on the back of each unit.

CVO-2

Backfilling Intake Vent for the oven chamber, 1/4 in (6.35mm) OD

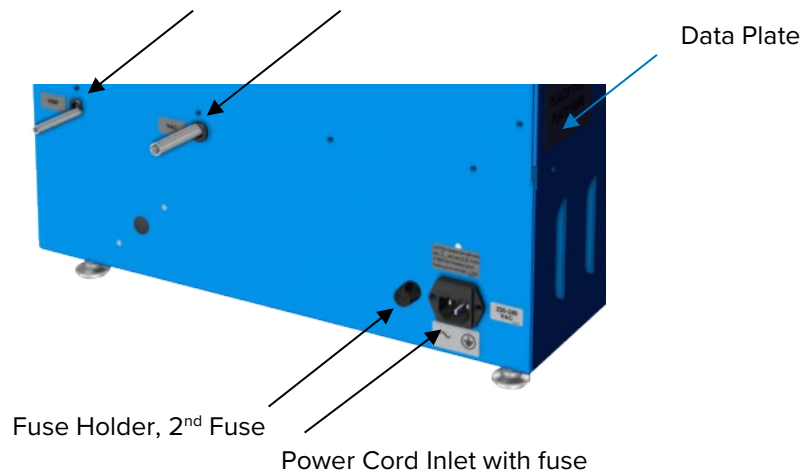
Vacuum Inlet 3/8in (9.52mm) OD – Connects to the vacuum pump or supply



CVO-2-2

Intake Vent – To the oven chamber 1/4 in (6.35mm) OD

Vacuum Inlet 3/8in (9.52mm) OD - Connect the vacuum pump or supply



RECORDING THE DATA PLATE INFORMATION

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

- The data plate is located on the lower left side of the oven, above the power cord inlet.

Data Plate Information

MODEL NO:	
SERIAL NO:	



INSTALLATION PROCEDURE CHECKLIST

For installing the oven in a new workspace location.

Pre-Installation

- ✓ Verify a vacuum supply source suitable for your application is available and can be connected to the oven, page 14.
 - See page 28 for the oven gas and vacuum port locations.
- ✓ Check that the required ambient conditions for the unit are met, page 22.
- ✓ Check that the spacing clearance requirements are met, page 22.
 - Unit dimensions may be found on page 11.
- ✓ Check that a suitable electrical outlet and power supply is present, page 23.

Install the oven in a suitable workspace location

- ✓ Review the lifting and handling instructions, page 25.
- ✓ Install the leveling feet, page 25.
- ✓ Install the oven in its workspace location, page 26.

Set up the oven for use

- ✓ Clean the oven shelving. Clean the chamber if needed, page 26.
- ✓ Install the shelving, page 27.
- ✓ Connect the vacuum supply to the oven, page 28.
- ✓ Optional: Connect the oven to an inert backfilling gas, page 29.

INSTALLATION

REQUIRED AMBIENT CONDITIONS

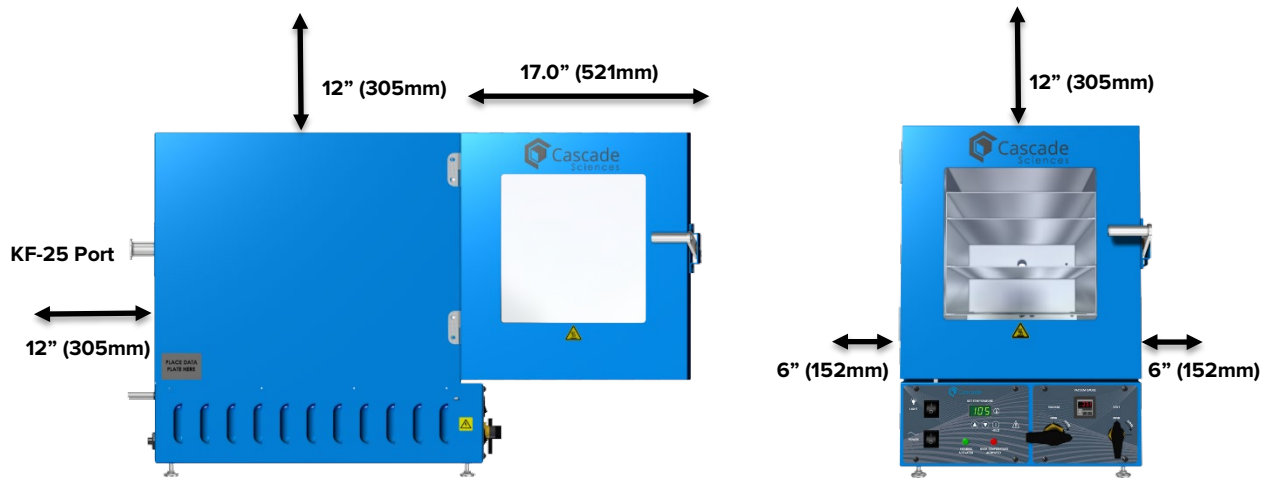
These units are built for use indoors at room temperatures between **15°C and 40°C (59°F and 104°F)**, at no greater than **80% Relative Humidity** (at 25°C / 77°F). Operating outside these conditions may adversely affect the unit temperature performance.

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

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

REQUIRED CLEARANCES

These clearances are required to provide airflows for ventilation and cooling.



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

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

12 inches (305 mm) of headspace clearance is required between the top of the unit and any overhead partitions.

Do not place objects on top of the oven.

A KF-25 vacuum port is located on the back of the oven for introducing vacuum-rated thermocouple feedthroughs into the chamber or connecting to an external vacuum supply source. Leave sufficient clearance for operators to safely access this port.

INSTALLATION

POWER SOURCE REQUIREMENTS

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

Power Source

The wall power outlet must meet the power requirements listed on the unit data plate.

Model	AC Voltage	Amperage	Frequency
CVO-2	110 – 120	8.0	50/60 Hz
CVO-2-2	220 – 240	4.0	50/60 Hz

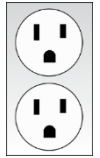
- **The unit may be damaged if the supplied voltage varies by more than 10% from the data plate rating.**
- Wall power sources must be **single-phase (1)** and **protective earth grounded**.
- Use a separate circuit to prevent loss of the unit due to overloading or circuit failure. The circuit must meet or exceed the amperage requirements listed on the unit data plate.
- The recommended wall circuit breakers for these units are:
 - CVO-2: **15 amps**
 - CVO-2-2: **20 amps**
- The wall power source must conform to all national and local electrical codes.

Power Cords

The unit must be positioned so that all operators can quickly unplug the power cord in the event of an emergency.

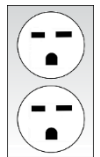
- The **CVO-2** is provided with a **125V, 15A, 9ft 5in (2.86m), NEMA 5-15P** power cord.
- The **CVO-2-2** is provided with a **250V, 15A, 8ft 2in (2.5m) NEMA 6-15P** power cord.
- Always use the same type of power cord shipped with the oven.

CVO-2



Standard NEMA 5-15R Outlet

CVO-2-2



NEMA 6-15R



Continued next page

INSTALLATION



Fuses

All fuses must be installed and not blown for the unit to operate. The cause of a blown fuse should always be determined and fixed prior to returning the oven to operation.

CVO ovens ship with the following 5x20mm fuses installed:

Model	Type	Quantity	Location
CVO-2	T8A 250V	1	Power cord inlet.

GENERAL POWER SAFETY

Your unit and its recommended accessories are designed and tested to meet strict safety requirements. It is designed to connect to a power source using the specific power cord type shipped with the unit.

For continued safe operation of your unit, always follow basic safety precautions including:

- Always plug the unit power cord into a protective earth grounded electrical outlet that conforms 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.

INSTALLATION

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 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 the oven stands level and does not rock. Adjust the leveling feet or casters as needed.

INSTALLATION CLEANING

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

- The unit was cleaned at the factory but may have been exposed to contaminants during shipping.
- Remove all wrappings and coverings from shelving prior to cleaning and installation.
- **Do not clean with deionized water.**
- See the [Cleaning and Disinfecting](#) topic in the User Maintenance section (page 47) for more information on how to clean and disinfect without damaging the unit.

INSTALLATION

SHELVING INSTALLATION

Heating in a vacuum environment takes place partly through conduction. Heat is transported from oven elements inside the chamber walls or floor to the shelves. Install the shelves as described below to ensure proper heat conduction and temperature measurement.

Never place samples or product on the oven chamber floor. The floor runs hotter than the shelf temperatures. All oven heating specifications are for shelving temperatures only.

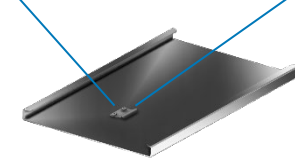
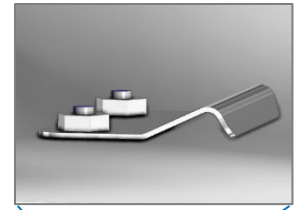
1. Carefully slide the short shelf into position on the chamber floor, sliding the clip on the bottom of the shelf onto the oven temperature probe.

- The oven probe extends from the back wall near the floor of the chamber.
- **The short shelf must be on the bottom** of the shelf-stack to ensure the oven controls temperature properly.

2. Place the 2 tall shelves on top of the short shelf.

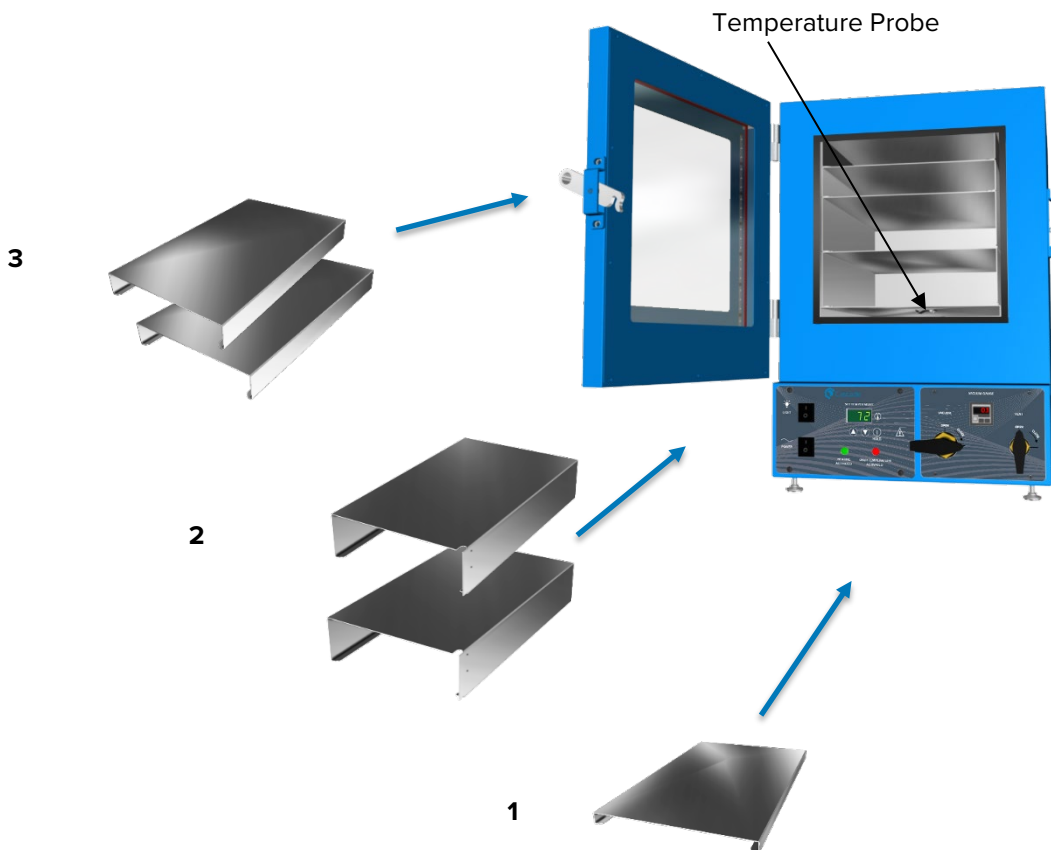
3. Place the 2 medium shelves on top of the tall shelves.

Temperature Probe Shelf Clip



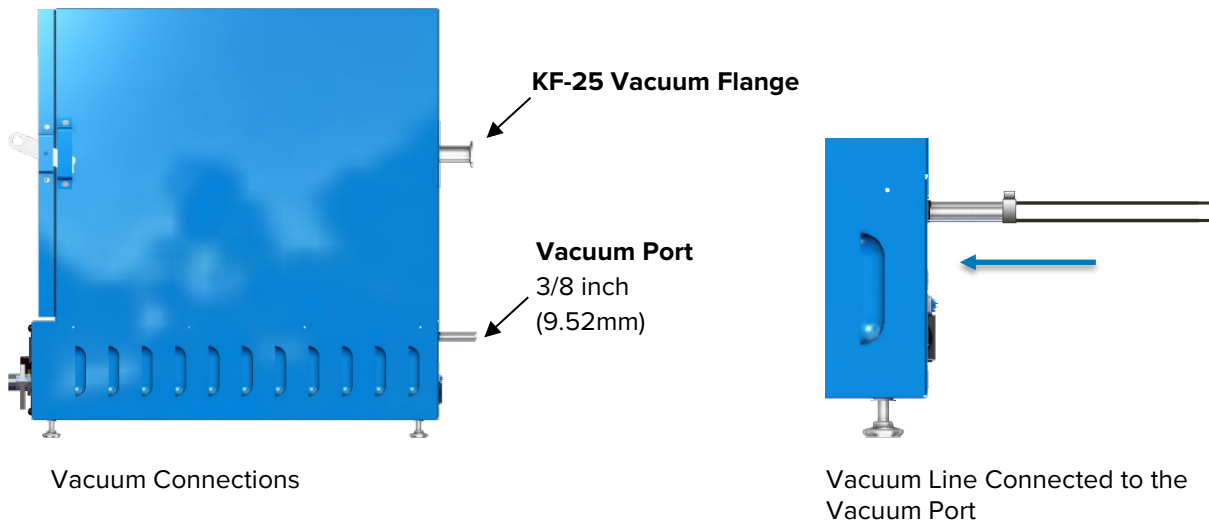
Bottom Shelf Upside Down

CVO-2 Shelving Configuration



INSTALLATION

CONNECT TO THE VACUUM SUPPLY



Use of clamps to secure tubing to the Vacuum Port and Chamber Vent is recommended.

- **The Vacuum Port – 3/8 inch (9.52mm) OD**
 - Connect a vacuum pump or building vacuum supply system to this port. Chamber atmosphere is evacuated through this port.
 - This port is opened and closed by the Vacuum Valve control on the front control panel.
- **The Chamber Vent Port (Backfilling) – 1/4 inch (6.35mm) OD**
 - This intake port allows external atmosphere to backfill the oven chamber when the Vent Valve control on the front control panel is turned to open.
 - **Optional:** A clean or inert gas supply source may be connected to this port. Please page 29.
- **KF-25 Fitting**
 - This large fitting is normally used to introduce sensor probes into the oven chamber using a vacuum feed through.
 - **Optional:** A vacuum supply can be connected to the KF-25 fitting for increased efficiency in vacuuming down the chamber. However, the Vacuum Valve control on the front control panel will not affect the level of vacuum and must be set to closed to prevent atmosphere from entering the chamber through the 3/8" Vacuum Port.

INSTALLATION

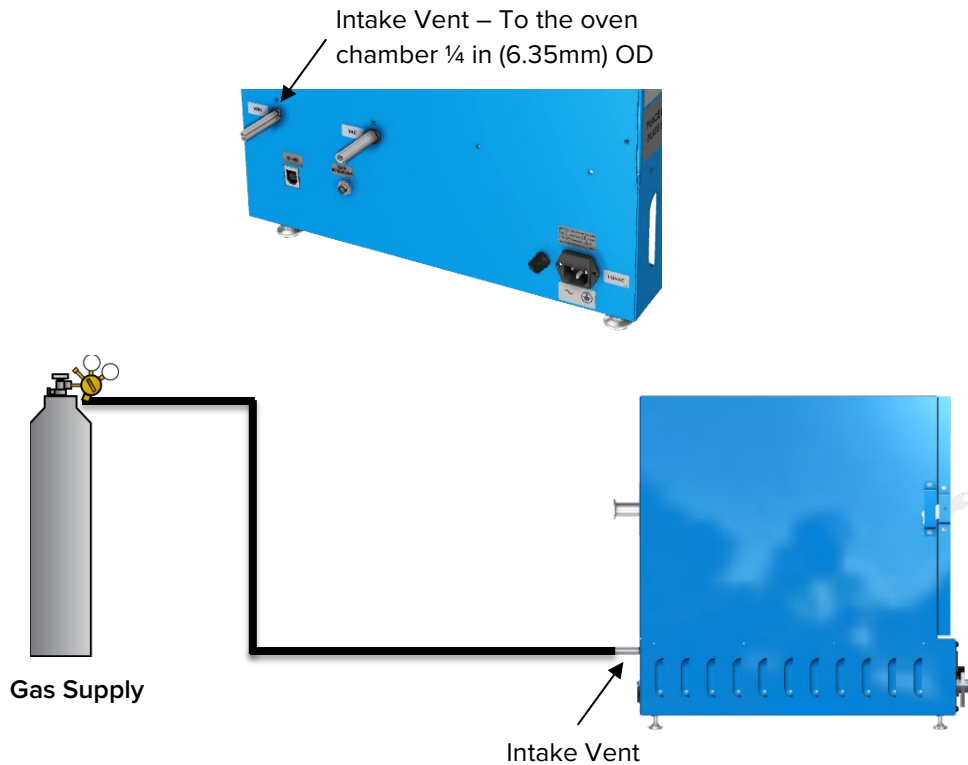
CONNECT TO A GAS BACKFILL SUPPLY

Optional: A clean or inert gas supply — such as nitrogen (N₂) or argon — may be connected to the vent intake port located on the back of the oven. This supply will backfill the evacuated oven chamber when the vent intake valve is opened on the front control panel.

The maximum allowed gas backfill pressure is 15 psi.

Exceeding 15 psi of gas backfill pressure may damage the oven.



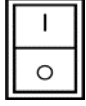





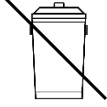


CVO-2





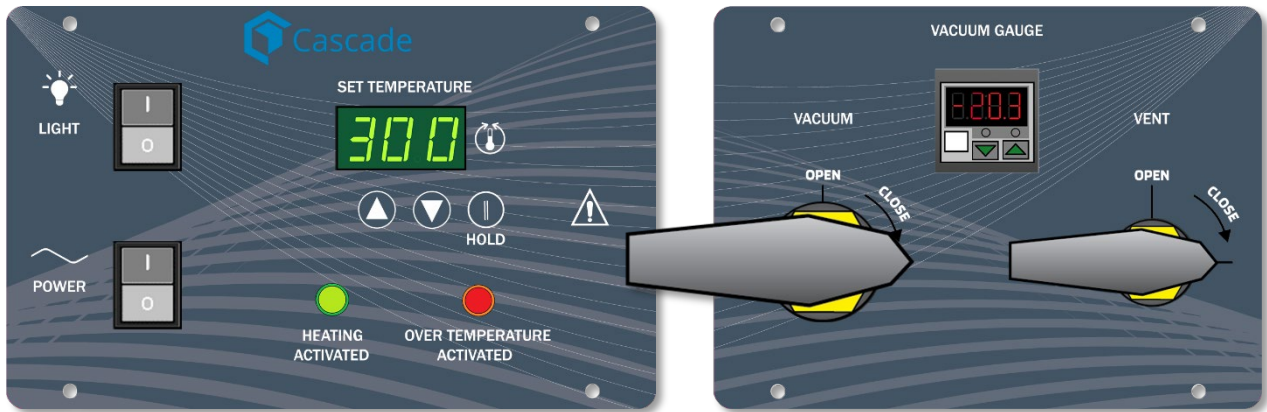
GRAPHIC SYMBOLS

The oven 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
	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.
	Adjustable Temperature Indique une température réglable
	Lighting Indique l'éclairage
	Heating pause Indique une pause de chauffage
	Indicates UP and DOWN respectively Touches de déplacements respectifs vers le HAUT et le BA
	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.
	Protective earth ground Terre électrique
	Caution hot surface Attention surface chaude

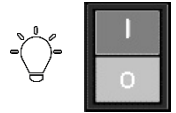


CONTROL OVERVIEW



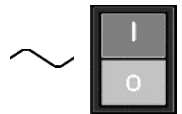
Light Switch

Controls the oven chamber light.



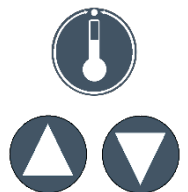
Power Switch

Controls all power to the oven and its systems.



Set Temperature Display and Controls

Shows the current chamber temperature in degrees Fahrenheit. The **Up** and **Down** arrow buttons are used to access the Temperature Set Point (SP) or Calibration Offset (C O) display modes and input the temperature set point or calibration adjustment value.



Hold Button

Temporarily disables heating in the oven chamber. Pushing the button once turns off power to the heating elements. Pushing the button a second time restores heating.

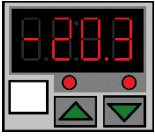


Over Temperature Activated

This red light illuminates if the Over Temperature Limit heating cutoff system routes power away from the heating elements. The heating cutoff is triggered when the shelving temperature exceeds 250°F. For more details, please see the [Over Temperature Limit System](#) description on page 38.



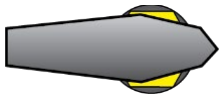
Vacuum Gauge



This gauge is set at the factory to show the chamber vacuum level relative to sea level atmospheric pressure in inches of mercury (inHg). The display range is 0 to -29.9inHg. Zero is the room atmosphere pressure at sea level and -29.9inHg a near-perfect vacuum. See page 44 for how to display other units of measurement or zero the gauge to your local altitude.

Vacuum Valve Control

This valve adjusts the level of vacuum draw applied to the oven chamber through the vacuum port on the back of the oven.



Closed

- When **open**, this valve allows the connected vacuum supply to evacuate the oven chamber.
- In the **closed** position, the valve cuts off the vacuum draw.

Vent Valve Control – Backfill Inlet

This valve controls the chamber inlet Vent port on the back of the oven.



Open

- In the **open** position, the oven chamber is open to external atmosphere through the vent intake port on the back of the oven.
- Optional: An inert or clean backfilling gas supply connected to the Vent Port will flow gas from the pressurized supply to the oven chamber when the Vent Valve is open.
- When the valve control is in the **closed** position, the chamber is cut off from external atmosphere and any gas supply.
 - **The vent must be closed prior to vacuuming down the chamber.** Failure to do so may result in damage to your vacuum pump.

Safe operation of the oven is dependent on the actions and behavior of the oven operators.

Operating personnel must read and understand the Safety Guidelines and 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.



SAFETY GUIDELINES

Failure to follow the guidelines and instructions in this manual may create a protection impairment by disabling or interfering with unit safety features. This can result in damage to the unit and injury, death, or negative effects on the health of the oven operators.

- Follow all national laws, regulations, and local ordinances in your area regarding the use of this unit type and the applications you are using it for. If you have any questions about national and local requirements, please contact the appropriate agencies.
- Because of the range of potential applications this unit can be used for, the operator or their supervisors must draw up a site-specific standard operating procedure (SOP) covering each application and associated safety guidelines. This SOP must be written and available to all operators in a language they understand.
- Use only approved accessories. Do not modify system components. Any alterations or modifications to your unit not explicitly authorized by the manufacturer can be dangerous and will void your warranty.

Continued next page

OPERATION



Warning Hot Surfaces: These areas are marked with Hot Surface labels. Proper protective equipment should be employed to minimize the risk of burns.

Avertissement Surface Chaude: Ces zones sont marquées avec des étiquettes de surface chaude. Un équipement de protection approprié devrait être utilisé pour minimiser le risque de brûlures.

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. Vacuum pump 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 the chamber is under vacuum.
- Do not place alcohol or mercury thermometers in the oven. With improper use, they can rupture.
- Do not move the oven until it has finished cooling.

THEORY OF OPERATION

Vacuum

Vacuum is supplied by an external vacuum supply (a pump or building system) connected to one of the oven vacuum ports. Vacuum levels obtained in the oven chamber are dependent on pump type and performance, valve settings, and the nature of the application or process, including the volume of materials outgassed.



The chamber atmospheric pressure is displayed on the Vacuum Gauge on the control panel.

The chamber should be sealed and evacuated at the start of a vacuum baking application. The oven is not built to operate with the chamber exposed to atmosphere. Running the oven with the door or the vent open risks destroying the vacuum pump, damaging the integrity of the oven chamber, and may oxidize chamber surfaces.

Vacuum pumps and door gaskets should be selected on the basis of application type or process. Pumps vary in suitability and safety depending on the outgassed byproduct types and moisture level produced in the oven chamber. Gasket types have varying resistances and vulnerabilities to different outgassed chemicals.

Heating in a Vacuum

In conventional ovens, powered elements transfer heat into the chamber air. The heated air then circulates by natural convection or blower fan action, and surrounds the product on the shelves, gradually bringing it to temperature. In a vacuum oven, heat transport takes place by both direct infrared radiation from heated surfaces and from metal-to-metal conduction. The oven heating elements are located inside the chamber walls or floor, which transfer some heat to the walls and then to the shelves. Each shelf then transports heat to the products or samples resting on it.



Gas Backfill

A gas or clean air supply can be connected to the vent port (backfill inlet) or KF-25 port located on the back of the oven. Nitrogen or another inert gas are typically used to avoid particulate or humidity contamination or the oxidation of product and shelving that has not cooled down. The maximum allowed backfill pressure is 15 psi of delivery at the port.



Heating Control

The oven controller monitors the chamber shelving temperature using a thermocouple temperature probe extending into the chamber from the back wall. In a vacuum environment, the probe senses the temperature of the shelf placed immediately above it. Placement of a shelf in close proximity to, but not in contact with the probe, is crucial for accurate measurement of the shelving temperature in the vacuum chamber.

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.

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

The oven relies on natural heat radiation for cooling. It can achieve a low-end operating temperature of the ambient room temperature plus the oven waste heat.

Warm-Up

Only preheat the oven if this is compatible with your application and safe practices. To achieve the best temperature stability and uniformity, allow the oven to heat up under vacuum prior to loading product. This heat soaks the oven body and insulation masses. Allowing the oven to heat up with atmosphere in the chamber can result in a significant temperature drop when heated atmosphere is evacuated from the chamber.

Heating Cutoff System

The oven is equipped with a thermal cutoff system that automatically cuts off electricity to the oven heating elements when the shelving temperature exceeds 392°F (200°C). This safeguards the oven in the event of a failure of the main temperature control circuitry or main temperature sensor probe. The cutoff system will reset when the chamber temperature drops below its cutoff setting.

OPERATION

Note: There may be **light smoking** from protective oil coatings on the elements when running the oven near its maximum temperature for the first time.

PUT THE OVEN INTO OPERATION

Verify all required procedures in the Installation chapter have been completed before beginning.

1 Plug in the Power Cord



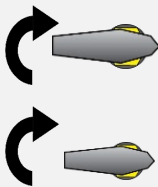
Attach the power cord that came with the unit to the power inlet receptacle on the back of the oven.

2



Plug the power cord into the workspace electrical supply.

3 Verify the vacuum and vent valves are both closed



Always verify the oven chamber is sealed prior to starting the oven.

- This helps safeguard your vacuum pump from prolonged and possibly damaging exposure to streaming atmosphere.

4 Turn on the oven



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

- The oven temperature display will illuminate.
- Any vacuum pump connected to the accessory power outlet will turn on.

5 Plug in the vacuum pump



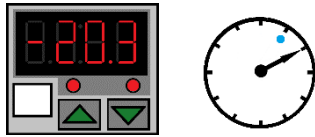
Plug the vacuum pump power cord into a wall power source.

Continued next page

OPERATION



6 Verify vacuum system integrity



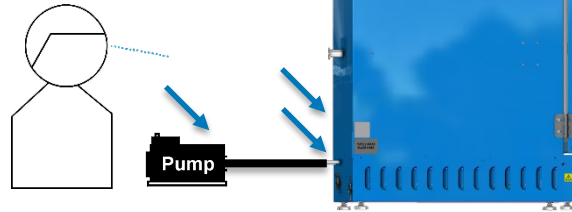
10 Minute Minimum

Place the Chamber Under Vacuum for a **minimum of 10 minutes** to verify the integrity of the vacuum supply system.

See

page

41.



7 Set the operating temperature



Set the Oven Temperature to your baking application temperature in degrees Fahrenheit. See page 42.

Note: The oven chamber should always be under vacuum when heating the chamber to the setpoint.

The oven is now ready for use

OPERATION

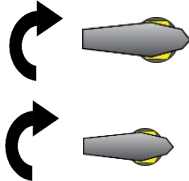
PUT THE CHAMBER UNDER VACUUM

Put the oven chamber under vacuum and hold for at least 10 minutes when first putting the oven into operation in a new location to verify the integrity of the vacuum supply system. The oven chamber must be drawn down to at least -3inHg (-76mmHg or -10kPa) in order to seal.



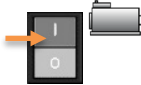
Evacuate the Oven Chamber

1. Verify the Vacuum and Vent Valve controls are in the closed position

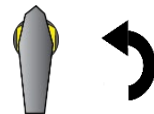


- This protects your vacuum pump from exposure to streaming atmosphere.

2. Turn on your vacuum pump



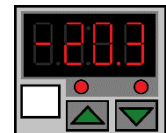
3. Open the oven Vacuum Valve



VACUUM

Turn the control all the way counterclockwise

- The Vacuum Gauge on the front panel should show the chamber pressure decreasing.
- The achievable vacuum level is dependent on altitude above sea level as well as the vacuum supply efficiency and the volume of outgassed byproducts. See page 45.



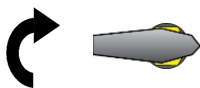
Holding at Vacuum



Continue evacuating the chamber throughout the baking application to vent outgassed byproducts.

Backfilling the Oven Chamber

4. Close the Vacuum Valve

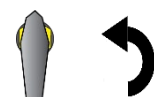


VACUUM

Turn the Vacuum Valve control back to the closed position (clockwise) to protect the vacuum pump from extended exposure to streaming atmosphere.

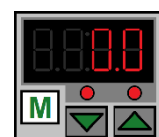
- The pump may remain on.

5. Slowly open the Vent Valve



VENT

- The chamber will return to room pressure.



End of Procedure

OPERATION

Note: The oven temperature probe must be seated in the bottom shelf probe clip to ensure an accurate temperature display reading. See page 27.



SET THE TEMPERATURE SETPOINT

Perform the steps below to adjust the set point to your process or application temperature in degrees Fahrenheit.

Note: if the Temperature display is showing the **HLd** (Hold), press and hold the Hold button for approximately 2 seconds to unlock the display. The setpoint cannot be adjusted while a Hold is active.



1. Navigate to the Temperature Set Point Adjustment mode



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

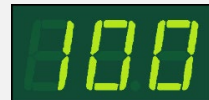
- The display will briefly flash the letters “SP”, then show the flashing, adjustable temperature setpoint.

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

Set Temperature



Setpoint Adjustment Mode



Current Setpoint

2. Set the Temperature Setpoint.



Adjust the setpoint to your process temperature using the **Up** and **Down** arrow buttons.

Set Temperature



New Setpoint °F

3. Wait for 5 seconds after entering the Set Point



Wait 5 Seconds

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

Set Temperature



Heating to Setpoint

End of Procedure

PAUSING HEATING

To pause the oven heating, press and hold the Hold button for approximately 2 seconds.

- The Temperature display screen will change to show HLd.
- The oven will cease heating.



HOLD



Temperature Hold: The oven will not heat

Resuming Heating

Press and hold the Hold button for approximately 2 seconds.

- The Temperature display will resume showing the current oven chamber temperature.
- The oven will resume heating if the chamber temperature is lower than the temperature setpoint.

OVER TEMPERATURE ACTIVATION

Possible causes of Over Temperature Limit Activation:

- A heat source in the oven chamber is pushing the oven temperature above the limit setting.
- Significant outgassing in the chamber may be interfering with the measured temperature.
- Attempting to heat a significant mass of product or samples may trigger a temperature overshoot and subsequent Limit cutoff.
- The oven temperature controller circuitry or sensor probe have failed.



If you suspect an ignition event in the oven chamber or a hardware failure **wait for the oven to cool to room temperature before opening chamber door**. Contact [Technical Support](#) for assistance.

OPERATION

VACUUM GAUGE OPERATIONS

Change the Unit of Measurement



1. Place the vacuum gauge in its adjustment mode.

a. Press and hold the “M” button for approximately 3 seconds.

- The display will begin to blink and show a unit of measurement.



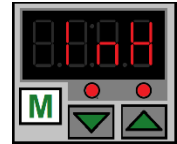
2. Use the arrow buttons to scroll between units.



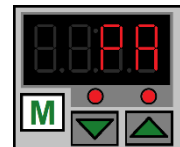
3. Exit the adjustment mode.

a. Press and hold the “M” button for approximately 3 seconds.

- The display will cease blinking and show the current chamber pressure.



Inches of Mercury



Kilopascals

Units of Measurement – Display Characters

kPa	Kgf/cm ²	bar	psi	mmHg	inHg	mmH ₂ O
0.000	0.000	0.000	0.000	0.000	0.000	0.000

Zeroing the Gauge

As set at the factory, the vacuum gauge shows a reading of 0 inches of mercury (inHg) when the chamber is at ambient (room) pressure. The display was set near sea level.

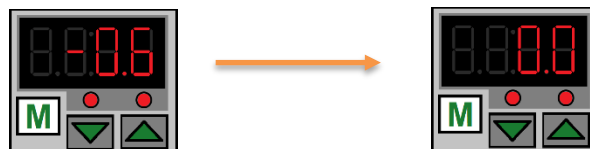
If the gauge does not show 0inHg when the chamber is at room atmospheric pressure, perform the following steps to zero the gauge.



Both

1. **With the chamber door open**, press and hold both the **Up** and **Down** arrow buttons.

2. Release the buttons when the display shows 0.0.



See page 10 for the zero equivalent for units of measurement other than inHg.

OPERATION

MAXIMUM OBTAINABLE VACUUM

The maximum vacuum obtainable, **as measured by the oven gauge**, is in part a function of altitude. While a vacuum pump will evacuate the same percentage of atmosphere from the oven chamber at higher altitudes, less **overall pressure** is expelled because of the reduced density.

Put differently, at sea level there are 29.9 inches of mercury pressure that can be drawn out of the oven chamber by a vacuum pump. At 5000ft (1524m), there are only 24.9 inches of atmospheric pressure to be evacuated from the oven chamber.

Altitude (Feet)	Altitude (Meters)	Atmospheric Pressure	Max Vac Obtainable
Sea Level	Sea Level	14.70 psi	-29.9 inHg
1000ft	305m	14.16 psi	-28.9 inHg
2000ft	610m	13.66 psi	-27.8 inHg
3000ft	914m	13.16 psi	-26.8 inHg
4000ft	1219m	12.68 psi	-25.8 inHg
5000ft	1524m	12.22 psi	-24.9 inHg
6000ft	1829m	11.77 psi	-24.0 inHg
7000ft	2134m	11.33 psi	-23.1 inHg
8000ft	2438m	10.91 psi	-22.2 inHg
9000ft	2743m	10.50 psi	-21.4 inHg
10,000ft	3048m	10.10 psi	-20.6 inHg

*In gauge pressure

PRESSURE UNITS CONVERSION CHART

	InHg	kPa	Kgf/cm ²	bar	psi	mmHG	mmH ₂ O
1 inHg	1	3.3863	0.0345	0.3386	0.4911	25.400	345.32
1 kPa	0.2953	1	0.0102	0.01	0.1450	7.5006	101.97
1 Kgf/cm ²	28.9590	98.0665	1	0.9806	14.2233	735.55	10000.27
1 bar	29.5300	100	1.0197	1	14.5037	750.06	10197.44
1 psi	2.0360	6.8947	0.0703	0.0689	1	51.7150	703.09
1 mmHG	0.0394	1.3332	0.0014	0.0013	0.0193	1	13.5954
1 mmH ₂ O	0.0028	0.0098	0.0001	0.0001	0.0014	0.0029	1

OVEN HEATING USE

Vacuum ovens heat slowly compared to conventional ovens. This is due in part to the physics of heat flow in an environment without an atmosphere to help transport thermal energy. The slow heat-up is also used to help prevent temperature overshoots in the vacuum environment.

Best practices for vacuum oven heating include:

- **Never place product or samples on the floor of the oven chamber!** The chamber floor runs significantly hotter than the shelving.
- Leave the oven on and under vacuum after it has reached your setpoint temperature. The oven can be left on overnight, unattended.
- Leaving the oven on at temperature eliminates repeating the long heat up and provides better temperature stability than repeated cooldowns and heat-ups.
- An oven chamber under vacuum is efficient at retaining heat and can require less energy to maintain temperature than heating up again.
- Leave the shelves in the heated chamber. This allows for optimal heat absorption in preparation for vacuum heating applications.
- Unused shelves outside the oven chamber can be stored on top of the oven to keep warm.

OVEN COOLDOWNS

The oven chamber is well insulated and requires a significant length of time to cool down while remaining sealed.

- 6 hours may be required to cool down from 300°F to 212°F.
- 16 hours may be needed for the oven to return to room temperature cooling from 300°F.
- Backfilling the oven does not significantly increase the rate of cooling.

Introducing free atmosphere into the oven chamber at temperatures above 200°F risks oxidizing chamber surfaces.

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

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



CLEANING AND DISINFECTING

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

- Periodic cleaning is required.
- Do not use spray-on cleaners or disinfectants. These can leak through openings and coat electrical components.
- Do not use cleaners or disinfectants that contain solvents capable of harming paint coatings or stainless steel surfaces. **Do not use chlorine-based bleaches or abrasives; these will damage the chamber liner.**
- Consult with the manufacturer or their agent if you have any doubts about the compatibility of decontamination or cleaning agents with the parts of the equipment or with material contained in it.

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 any removable chamber accessory items, such as shelving, if present.
3. Use 99% isopropyl alcohol to clean chamber surfaces and shelving. Apply using lint-free wipes.
4. Take special care when cleaning around temperature sensor probes. Do not clean the probes.
5. Clean all removable accessories and components.
6. Verify the cleaning alcohol has evaporated completely from all chamber surfaces and accessories prior to reconnecting the unit to its power source.

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:

- 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 interior accessories (any 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.

MAINTAINING ATMOSPHERIC 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 unit.

GASKETS

The ovens come with cured silicone gaskets that help seal the chamber door when under vacuum. The gaskets are rated to 446°F (230°C) and are vulnerable to acids and solvents. See the Replacement Parts chapter at the end of this manual to order replacement gaskets.

The chamber liner gasket is exposed to heating, the chamber atmosphere, and significant compressive force, and requires periodic replacement. Check the liner gasket for cracking, dryness, brittleness, or other signs indicating a loss of elasticity. Heavy use will necessitate frequent checks and replacements of the door gasket.

Replacement Procedure: The gasket can be pulled off and the replacement easily installed by pushing it into place. The edges of the chamber liner at the door may be sharp. Exercise caution while working with the seal.

ELECTRICAL COMPONENTS

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

VACUUM PUMP MAINTENANCE

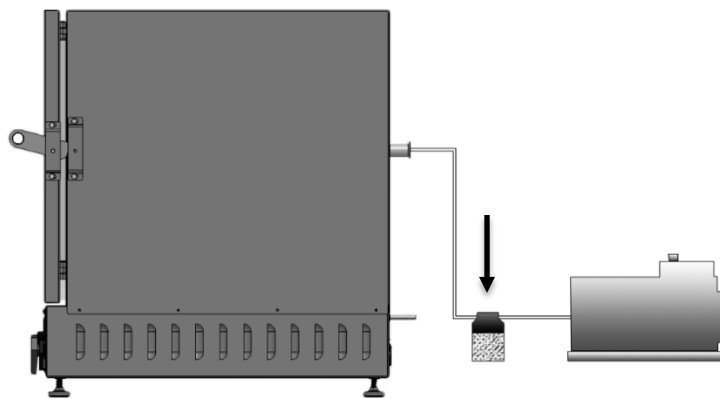
Vacuum pumps are high wear equipment and require replacement of seals and diaphragms **at least** once per year. Poor vacuum performance or bubbling or strained noises from the pump may indicate that the pump is in need of maintenance.

Pump Manual

Refer to the operation manual supplied with your vacuum pump for recommended maintenance routines such as oil levels, replacement of sorbent charge, and exhaust filter change-outs. **Contact your vacuum pump supplier if you do not have an operation manual.**

Trap






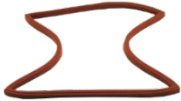

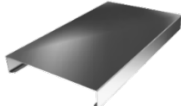
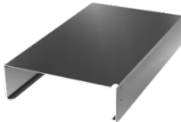
A filter trap plumbed to the vacuum line between the pump and the oven helps protect the pump from outgassed byproducts and extends the operational lifespan of the pump.

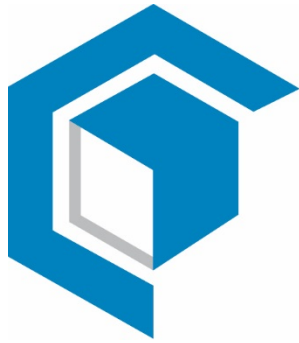


Example of a trap plumbed between an oven and vacuum pump



REPLACEMENT PARTS LIST

Description	Parts Number
Adjustable Leveling Feet	 2700512
Fuse, CVO-2 5X20mm T8A 250V Requires 1 fuse. Please see the power panel illustration on page 18 for the CVO-2 fuse location.	 3300546
Fuse, CVO-2-2 5X20mm, 6.3A 250V 2 fuses are required to operate the oven. Please see the power panel illustration page 18 for the CVO-2-2 fuse locations.	 3300515
Power Cord, CVO-2 125 Volt, 15Amp, 9ft 5 in (2.86m) NEMA 5-15P	 1800510
Power cord, CVO-2-2 250 Volt, 15Amp, 8.2 feet (2.5m), NEMA 6-15P	 1800539
Cured Silicone Gasket	 9490542
Shelf Short, Bottom, with temperature probe clip.	 9751226
Shelf Medium	 5680582
Shelf Tall	 5680567



Cascade
Sciences