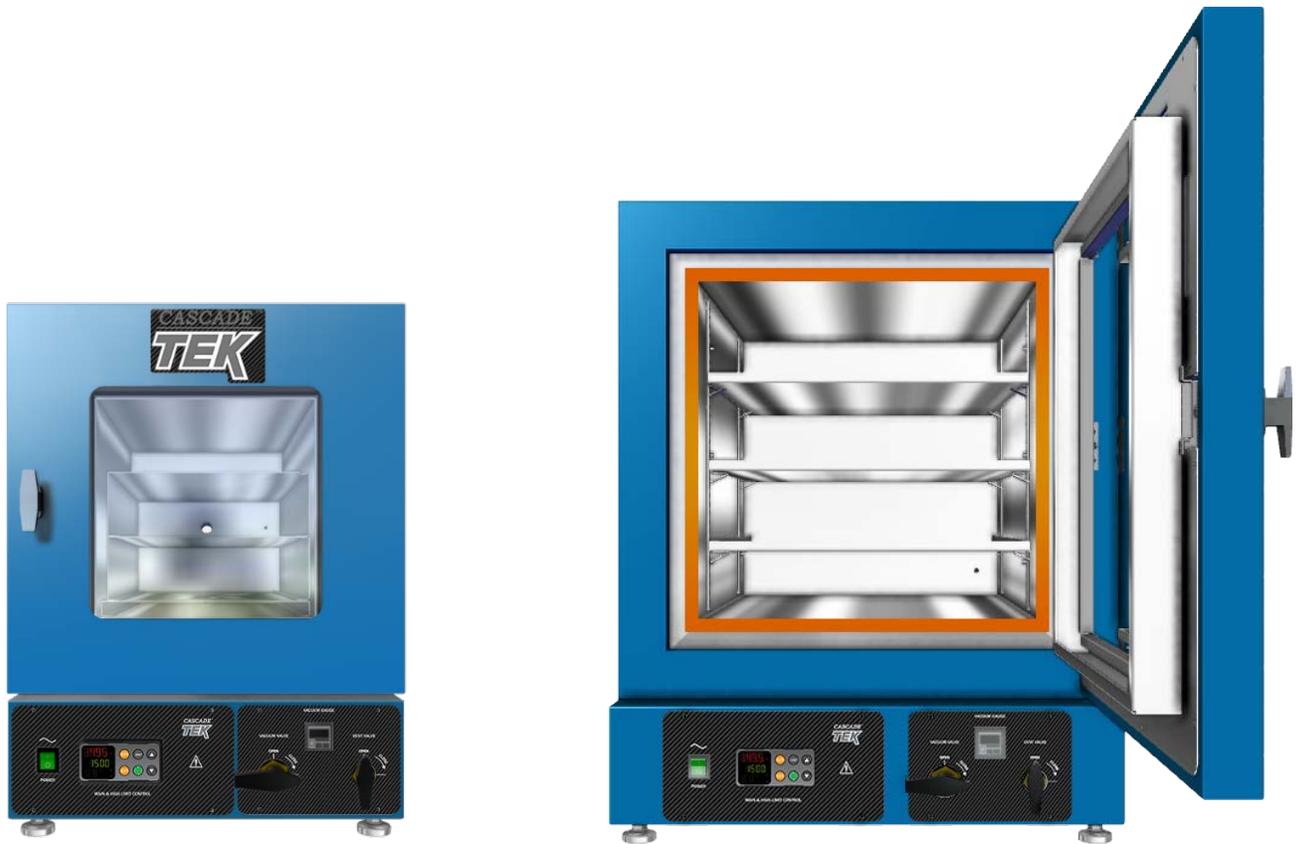


CASCADE™

TEK



Vacuum Ovens TVO-2 TVO-5
Installation and Operation Manual

Pictured on front cover, left to right: TVO-2, TVO-5



Manufacturing Warranty

For warranty information outside the USA please visit:

www.cascadetek.com/resource/limited-international-warranty-policy-cascade-tek-solution-llc

For warranty information inside the USA please visit:

www.cascadetek.com/resource/limited-usa-warranty-policy---cascade-tek-solutions-llc

Vacuum Ovens 110 – 120 Voltage

Part Number (Manual): 4861795

Revision: April 16, 2018

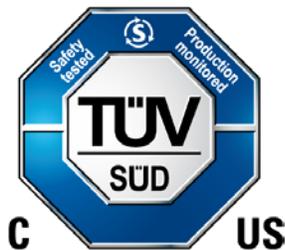
Sheldon Part ID Numbers:

TVO-2	TVO-5
CTV222	CTV522



Cascade TEK is a brand of Sheldon Manufacturing, INC.

Safety Certifications



These units are CUE listed by TÜV SÜD as vacuum 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:

- CAN/CSA C22.2 No. 61010-1:2012
- CAN/CSA C22.2 No. 61010-2-010/R:2009
- UL 61010-1:2012
- UL 61010A-2-010:2002
- EN 61010-1:2010
- EN 61010-2-010:2003

TABLE OF CONTENTS

INTRODUCTION	7
<i>Read this Manual.....</i>	7
<i>Safety Considerations and Requirements</i>	7
<i>Contacting Assistance</i>	8
<i>Engineering Improvements.....</i>	8
<i>Vacuum Supply Required</i>	9
<i>Gaskets</i>	10
RECEIVING YOUR OVEN	11
<i>Inspect the Shipment.....</i>	11
<i>Orientation Photos.....</i>	12
<i>Record the Data Plate Information.....</i>	15
INSTALLATION	17
<i>Installation Procedure Checklist</i>	17
<i>Required Ambient Conditions.....</i>	18
<i>Required Clearances.....</i>	18
<i>Power Source Requirements</i>	19
<i>Lifting and Handling</i>	19
<i>Leveling.....</i>	20
<i>Install the Oven</i>	20
<i>Installation Cleaning.....</i>	20
<i>Shelving Installation.....</i>	21
<i>Connect to the Vacuum Supply</i>	23
GRAPHIC SYMBOLS	25
CONTROL OVERVIEW	27
OPERATION.....	29
<i>Operating Precautions.....</i>	29
<i>Theory of Operation</i>	30
<i>Put the Oven into Operation.....</i>	32
<i>Set the High Temperature Limit.....</i>	34
<i>Evacuating and Backfilling the Oven Chamber</i>	35
<i>Setting the Constant Temperature Setpoint</i>	36
<i>Heating Profiles</i>	36
<i>High Temperature Limit Activated</i>	37
<i>Change Unit of Measurement</i>	38
<i>Vacuum Gauge Operations</i>	39
<i>Maximum Obtainable Vacuum.....</i>	40
<i>Pressure Units Conversion Chart.....</i>	40
<i>Data Ports.....</i>	41
OPERATOR MAINTENANCE.....	43
<i>Cleaning.....</i>	43
<i>Maintaining Atmospheric Integrity</i>	44
<i>Electrical Components.....</i>	44
<i>Storage.....</i>	44
<i>Diagnostic Questionnaire — Heating Issues.....</i>	45
<i>Diagnostic Questionnaire — Vacuum leak issues.....</i>	50
UNIT SPECIFICATIONS	57
<i>Weight.....</i>	57
<i>Dimensions.....</i>	57
<i>Capacity</i>	57
<i>Shelf Capacity by Weight.....</i>	57
<i>Vacuum</i>	58
<i>Temperature</i>	58

Power..... 58
REPLACEMENT PARTS LIST..... **59**
Replacement Gaskets..... 60



INTRODUCTION

Thank you for purchasing a Cascade TEK 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 operation manual may create a protection impairment by disabling or interfering with the unit safety features. This can result in injury or death.

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

SAFETY CONSIDERATIONS AND REQUIREMENTS

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

SOPs

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

Intended Applications and Locations

TVO vacuum ovens are engineered for constant temperature 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.

Power

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

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

CONTACTING ASSISTANCE

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

EMAIL: support@cascadetek.com

PHONE: 888-835-9250

FAX: (503) 640-1366

Cascade TEK Solutions LLC
300 N 26th Avenue
P.O. Box 625 Bldg B
Cornelius, OR 97113

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 Cascade TEK dealer or customer service representative for assistance.

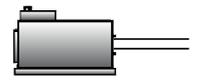
INTRODUCTION

VACUUM SUPPLY REQUIRED

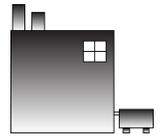
The oven does not come with a vacuum pump. **A pump must be separately purchased for the oven.**

Use of an oil trap plumbed on the vacuum line between the oven and the pump is strongly recommended. The trap protects the pump from any oils outgassed during your baking procedure. This extends the life of the pump. All maintenance and instructional information should be obtained from the pump manufacturer if not shipped with the pump. Use of clamps to secure vacuum tubing is also recommended.

Consult a vacuum pump specialist to determine the pump type best suited to your baking application. The correct selection of a vacuum pump is critical for evacuating the chamber to the level required for your vacuum baking applications in a timely manner. The nature of the sample or product being heated should drive the selection of the pump, including the types of chemicals outgassed during the baking process. Common pump types include Chemical Duty PTFE Dry, Standard Duty Dry, Compact Direct-Drive, and specialty pumps for Corrosive gases. Selection of an application-specific pump can improve the overall oven performance and minimize pump maintenance costs.



Vacuum Pump



**Building
Vacuum Supply**

For the chamber to seal, the vacuum pump must be able to evacuate at least 1 cubic foot per minute (cfm) for each cubic foot of oven chamber volume (CuFt).

Model	Chamber Capacity	Min. Pump Capacity CFM	Min. Pump Capacity LPM
TVO-2	1.67 CuFt	2 cfm	57 Liters per Minute
TVO-5	4.50 CuFt	5 cfm	142 Liters per Minute

Cascade TEK recommends evacuating the oven to 500 torr as part of the first step in a baking recipe to verify the oven is sealed. This helps safeguard the oven and pump.

INTRODUCTION

GASKETS

Gaskets are non-warranty, high-wear consumable items subject to compression forces, heat, and outgassed byproducts. Heavy usage rates may necessitate frequent replacements. The manufacturer strongly recommends keeping a spare gasket on hand during operation.

Each oven comes with a replaceable 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 manufacturer also offers for sale *Viton*®, fluorosilicone, and Buna-N gaskets. See page 60 for information on gasket type suitability for baking applications.

These ovens do not require vacuum grease.



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 and a profile programming guide.
6. Verify the correct number of accessories has been included.
7. Carefully check all packaging for accessories before discarding.

Included Accessories:

TVO-2	Tall Shelves	Short Bottom Shelf	Power Cord	Leveling Feet
	2	1	1	4



TVO-5	Shelves	Shelf Clips	Power Cord	Leveling Feet
	3	12	1	4

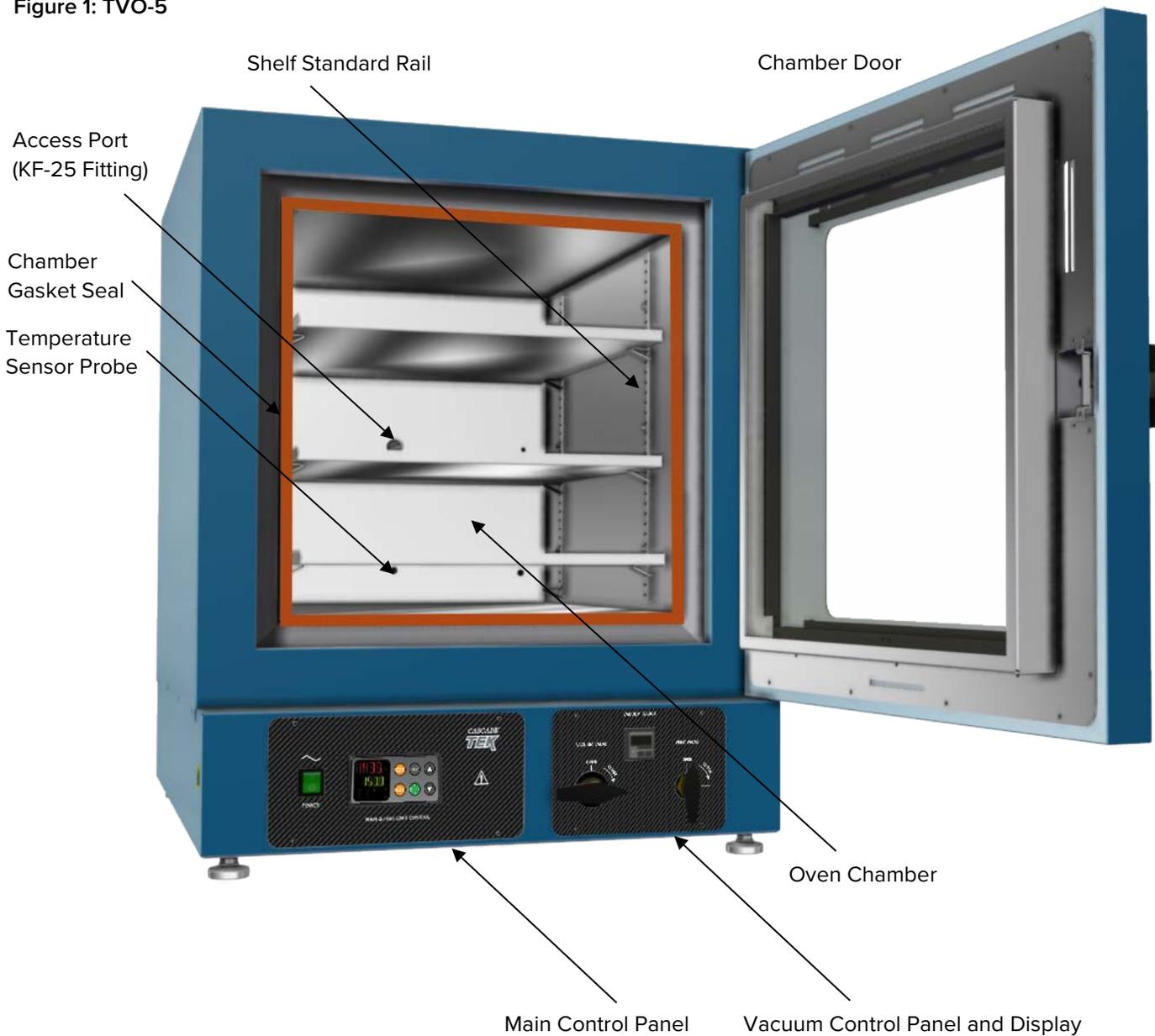


RECEIVING YOUR OVEN

ORIENTATION PHOTOS

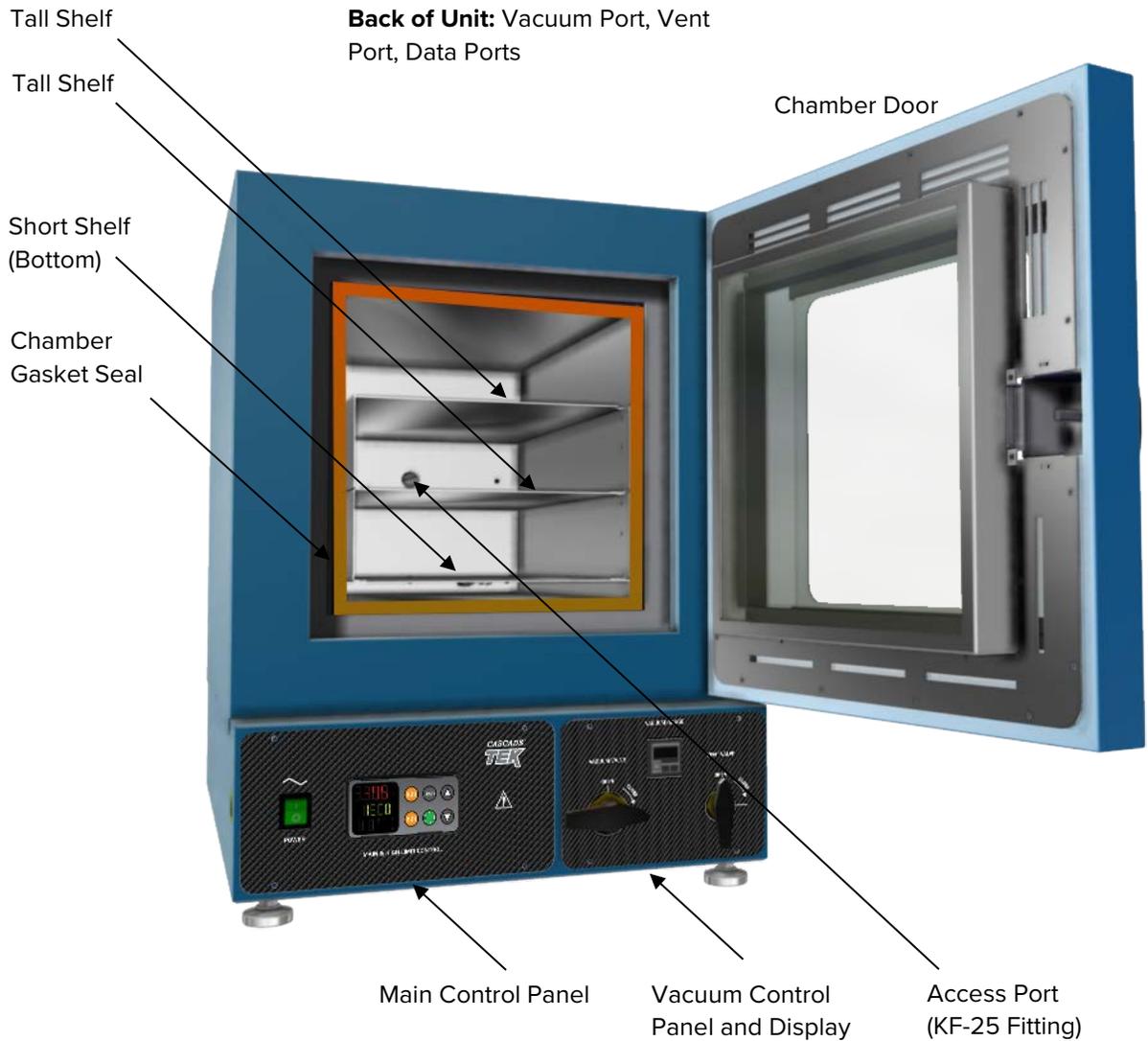
Back of Unit: Vacuum Port, Vent Port, Data Ports (See page 14)

Figure 1: TVO-5



RECEIVING YOUR OVEN

Figure 2: TVO-2



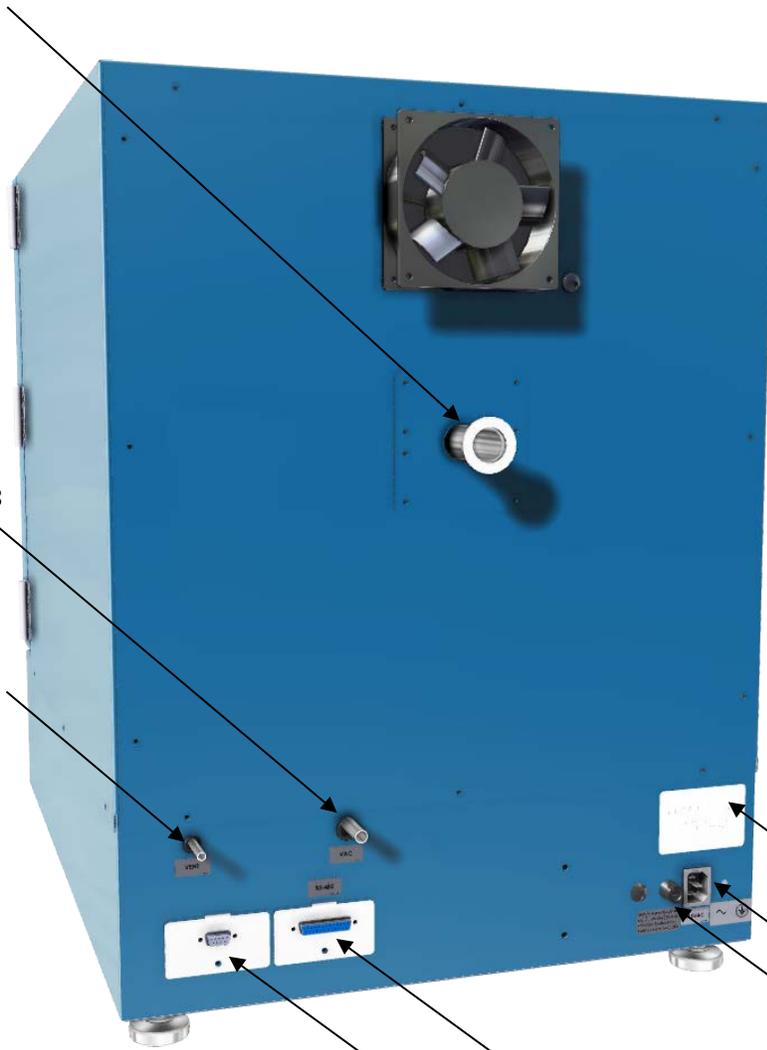
RECEIVING YOUR OVEN

Back of Ovens

KF-25 Vacuum Port (Includes Blank and Clamp, not pictured here)

Vacuum Port, 3/8 inch (9.52 mm)

Chamber Vent Inlet Port 1/4 inch (6.35 mm)



9-Pin Voltage Output Port

RS485 Data Port - 25 Pin

Data Plate

Power Cord Inlet

Fuse Holder

RECEIVING YOUR OVEN

RECORD THE DATA PLATE INFORMATION

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

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

MODEL NO:	
SERIAL NO:	
PART NO:	
PART ID:	



INSTALLATION PROCEDURE CHECKLIST

For installing the oven in a new workspace location.

Pre-Installation

- ✓ Verify that a vacuum supply source suitable for your application is available and can be connected to the oven, page 9.
 - See page 23 for the oven gas and vacuum port locations.
- ✓ Check that the required ambient conditions for the unit are met, page 18.
- ✓ Check that the spacing clearance requirements are met, page 18.
 - Unit dimensions may be found on page 57.
- ✓ Check that a suitable electrical outlet and power supply is present, page 19.

Install the oven in a suitable workspace location

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

Set up the oven for use

- ✓ Clean the oven shelving. Clean the chamber if needed, page 20.
- ✓ Install the shelving in the oven chamber, page 21.
- ✓ Connect the oven to its vacuum supply source along with any optional backfill gas supply, page 23.

INSTALLATION

REQUIRED AMBIENT CONDITIONS

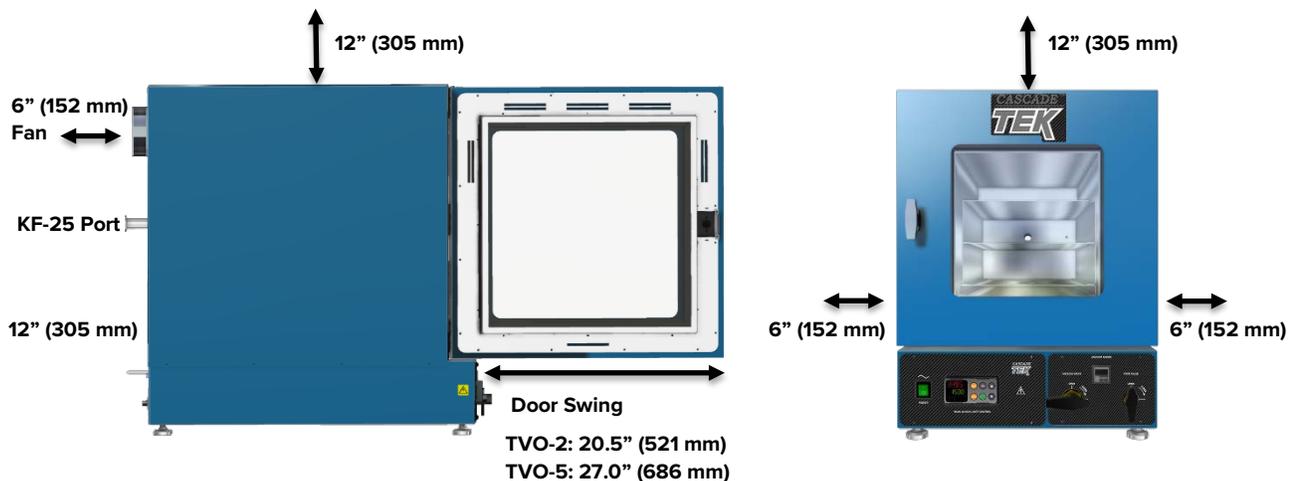
This oven is built for use indoors at room temperatures between **15°C and 40°C (59°F and 104°F)**, at no greater than **80% Relative Humidity** (at 25°C / 77°F). Operating outside these conditions may adversely affect the oven temperature performance.

When selecting a location to install the unit, consider all environmental conditions that can adversely 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 air flows for ventilation and cooling.



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

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.

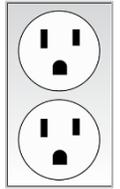
INSTALLATION

POWER SOURCE REQUIREMENTS

When selecting a location for the unit, verify 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
TVO-2	110 – 120	10.0	50/60 Hz
TVO-5	110 – 120	13.0	50/60 Hz



Standard 15-amp NEMA 5-15 power outlet.

- Wall power sources must be protective earth grounded and **single phase**.
- Wall power sources must conform to all national and local electrical codes.
- **Supplied voltage must not vary more than 10% from the data plate rating.** Damage to the unit may result if the supplied voltage varies more than 10%.
- **The recommended wall circuit breakers for these units are 15 amps.**
- Use a separate circuit to prevent loss of product due to overloading or circuit failure. The circuit must match or exceed the amperage requirement listed on the unit data plate.

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



- The unit comes provided with a 125 volt, 15 amp, 9ft 5 in (2.86m) NEMA 5-15P power cord.

Fuses: These units each ship with a 16 amp 250V 5x20mm fuse installed in a fuse holder immediately adjacent to the power cord inlet.

- The fuse must be installed and intact for the unit to operate.
- Always find and fix the cause of a blown fuse prior to putting the unit back into operation.

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:

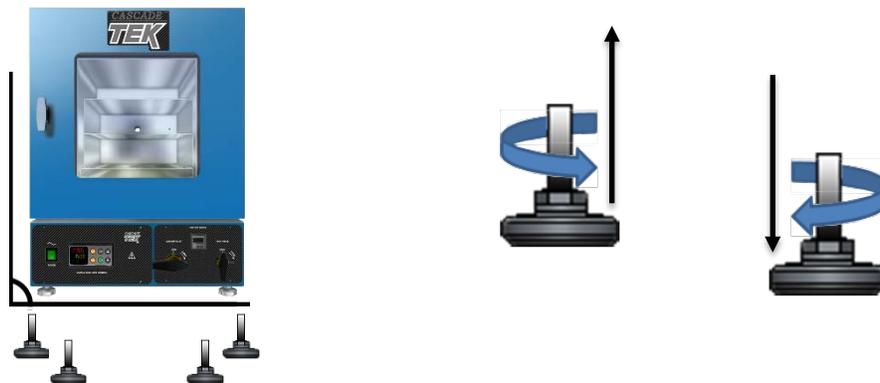
- Lift the oven only from its bottom surface.
- Doors, handles, and knobs are not adequate for lifting or stabilization.
- Restrain the oven completely while lifting or transporting so it cannot tip.
- Remove all removable parts, such as shelves and trays, and lock doors in the closed position during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

INSTALLATION

LEVELING

The unit must be level and stable for safe operation.

Install the 4 leveling feet in the 4 corner holes in the bottom of the oven.



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

INSTALL THE OVEN

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

- Do not connect the oven to its power source at this time.

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. Remove all wrappings and coverings from shelving prior to cleaning and installation. **Do not clean with deionized water.**

See the [Cleaning](#) topic in the Operator Maintenance section (see page 43) for more information on how to clean the oven chamber and shelving.

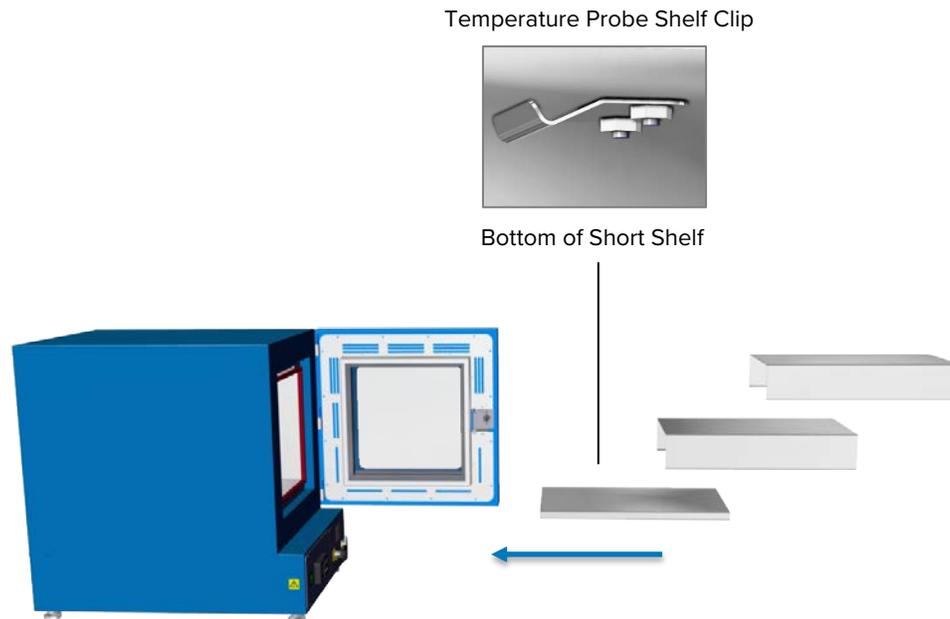
INSTALLATION

SHELVING INSTALLATION

Heating in a vacuum environment takes place primarily 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.

TVO-2



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 meets its temperature uniformity specifications.
2. Place the 2 tall shelves on top of the short shelf.

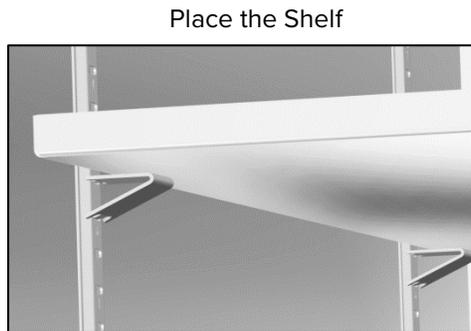
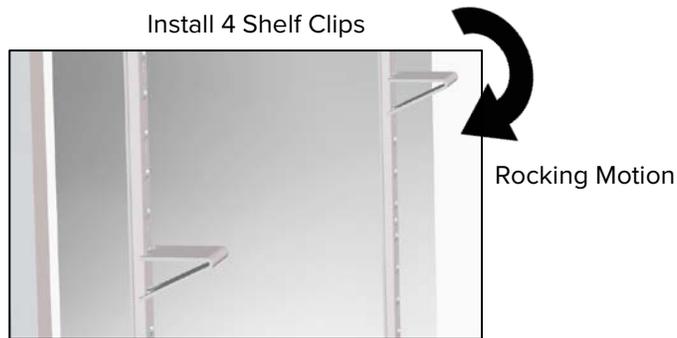
Continued on next page

INSTALLATION

Shelving Installation Continued

TVO-5 Shelving

To ensure accurate temperature measurement, **one shelf bottom must be in close proximity to the oven temperature probe.** This probe extends out from the chamber back wall. Do not place the shelf in direct contact with the probe.

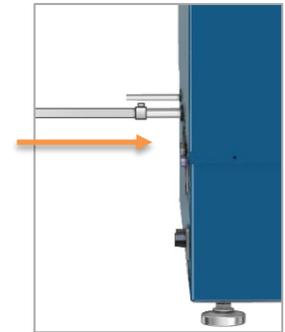
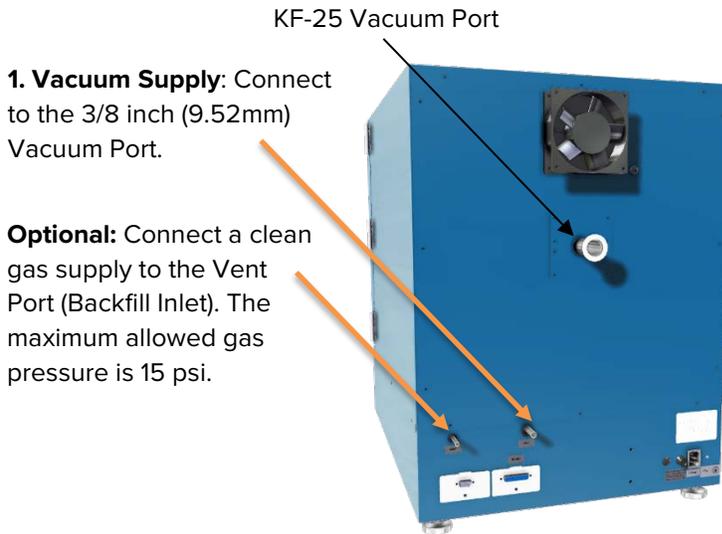


1. Install the shelf clips in the slots of the shelf standard mounting rails located on the sides of the chamber interior, 4 clips per shelf.
 - a. Squeeze each clip, insert the top tab first, and then the bottom tab using a rocking motion.
2. Set the shelves on the clips.
 - a. Verify the shelves are level.

INSTALLATION

CONNECT TO THE VACUUM SUPPLY

Use clamps to secure tubing to the Vacuum and Vent Ports.



Vacuum Line Connected to the 3/8-inch Vacuum Port

Vacuum and Gas Backfill Connections

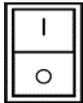
Oven Chamber Ports – Left to Right

- **Vent Port (Backfill Inlet) – 1/4 Inch (6.35 mm) OD**
 - External atmosphere backfills the oven chamber through this port when the Vent Valve control on the front control panel is opened.
 - A clean or inert gas supply source may be connected to this port. **The maximum allowed delivery pressure at the port is 15 psi.**
- **Vacuum Port – 3/8 Inch (9.52 mm) OD**
 - Chamber atmosphere is evacuated through this port. Connect the vacuum source to the oven here.
 - This port is opened and closed by the Vacuum Valve control on the front control panel.
- **KF-25 Vacuum Port**
 - Comes with a clamp and blank.
 - Used for introducing thermocouple probes through a vacuum rated feedthrough.
 - A vacuum supply can be connected to the KF-25 port 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-inch Vacuum Port.



GRAPHIC SYMBOLS

The oven is provided with multiple graphic symbols on its interior and exterior surfaces. The symbols identify hazards and the functions of the adjustable components, as well as important notes in the operation manual.

Symbol	Definition
	Consult the operation manual Consulter le manuel d'utilisation
	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.
	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



Control Panels

Power Switch

The switch illuminates when in the ON (I) position.



Temperature Controller - Display on Homepage

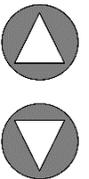


Top Line (Red): Present chamber shelving temperature

Middle Line (Green): The constant temperature setpoint

Bottom Line: Flashing "2" indicates active heating

While on the homepage, the **Up** and **Down** arrow buttons adjust the constant temperature setpoint. Pressing and holding both buttons navigates from the homepage to menu pages. On the menu pages, the buttons adjust calibration offsets and heating profile variables.



When starting on the homepage, the green **Advance** button navigates forward through parameter option pages including **Event 1** (vacuum on or off) and units of measurement (Celsius or Fahrenheit). The button also advances forward in menus and parameter lists when programming heating profiles.



The gray **Reset** button returns the display to the previous page or menu. Pushing the Reset button repeatedly returns the display to the homepage.



The EZ1 button launches heating Profile 1. Pushing EZ1 again while running aborts Profile 1.

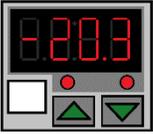


The EZ2 button launches heating Profile 2 (Step 11). Pushing EZ2 again while running aborts Profile 2.



CONTROL OVERVIEW

Vacuum Gauge



As set at the factory, this gauge shows 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 39 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 before applying vacuum to the chamber.** Failure to do so may result in damage to your vacuum pump.

OPERATION

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

Operating personnel must read and understand the Operating Precautions in this section prior to operating the oven. The operators must follow these instructions to prevent injuries and to safeguard their health, environment, and the materials being treated in the oven, as well as to prevent damage to the oven. Failure to adhere to the 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. 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 items can become airborne and come into contact with hot surfaces.
- Individual ovens are not rated to be explosion proof. Follow all building certification requirements and laws for Class I, II, or III locations as defined by the US National Electric Code.
- The bottom surface of the chamber should not be used as a work surface. It runs hotter than the shelf temperatures. Never place samples or product on the oven chamber floor.
- Do not place sealed or filled containers in the oven. These may burst open when 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.

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.



OPERATION

THEORY OF OPERATION

Vacuum



Vacuum is supplied by an external vacuum supply (a pump or building system) connected to the vacuum port on the back of the oven. 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 main 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 are both resistant to and vulnerable to different chemicals.

Gas Backfill



A gas supply can be connected to the vent port (backfill inlet) located on the back of the oven. Nitrogen or another inert gas are typically used to avoid particulate contamination or the oxidation of product that has not cooled down. The maximum allowed backfill pressure is 15 psi of delivery at the port inlet. The port valve is opened and closed using the Vent control on the front panel.

Heating Options



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

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 primarily by conduction. The oven heating elements are located inside the chamber walls or floor, which in turn transfer heat to the shelves. Each shelf then transports heat to the products or samples resting on it.

Direct radiant heating through infrared emission in a vacuum environment provides poor temperature uniformity compared to conductive heating.

OPERATION

Heating Control

The oven temperature controller stores an operator-selected constant temperature setpoint. When powered, the oven heats the chamber shelves to the setpoint. The controller board is wired to a solid-state temperature probe located in the chamber on the rear wall. When the controller detects that the shelf temperature has dropped below the temperature setpoint, it pulses power to the heating elements.

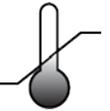
The controller employs proportional-integral-derivative analytical feedback-loop functions when measuring and controlling the shelving temperature. PID-controlled heating pulse intensities and lengths are proportional to the difference between the measured shelf temperature and the current setpoint. The frequency of pulses is derived from the rate of change in that difference. The integral function slows the rate of pulses when the temperature nears the setpoint to avoid overshooting.

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

High Limit Control System

The temperature controller contains a heating cutoff system with independent circuitry connected to a redundant solid-state temperature sensor probe inside the oven chamber. This high limit system depowers the oven heating elements whenever the chamber shelving temperature exceeds the current limit setting. This safeguards the oven in the event of a failure of the main temperature control circuitry or main temperature sensor probe.

The high limit is set by the operator to a minimum of 10°C above the highest temperature of the application process the oven is currently being used for. Failure to set the high limit control system voids the oven manufacturing defect warranty in the event of an overtemperature event.



OPERATION

PUT THE OVEN INTO OPERATION

Verify all of the required procedures in the Installation section have been carried out. Then perform the following steps and procedures to prepare the oven for use in a new location.

1 Attach the Power Cord



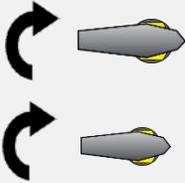
Attach the power cord that came with the unit to the power inlet receptacle on the back of the oven.

2



Plug the power cord into the workspace electrical supply.

3 Verify the Door and Valves are Closed



Verify the oven **chamber door** is **closed and latched**, and that the **vent intake valve** and **vacuum valve** are in **the closed position** (turned all the way clockwise).

This safeguards your vacuum pump from exposure to streaming atmosphere.

4 Turn on the Oven



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

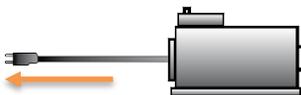
- The controller display will illuminate and default to its homepage.
- The vacuum display will illuminate.

5 Set the High Limit Temperature



Set the Temperature High Limit to at least 10°C above the highest intended temperature of your application, page 34.

6 Plug in the Vacuum Pump



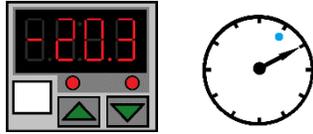
Plug the vacuum pump power cord into a wall power source.

Continued next page

OPERATION

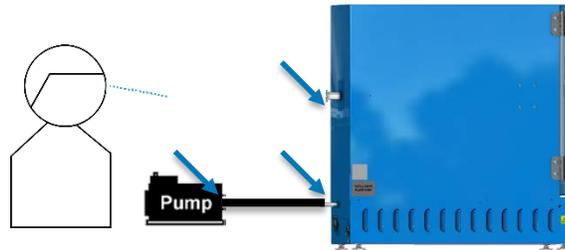
Continued from the previous page

7 Verify Vacuum Integrity

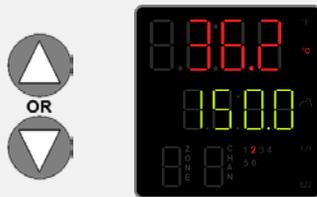


10 Minutes Minimum

Place the Chamber Under Vacuum for a **minimum of 10 minutes** to verify the integrity of the vacuum supply system. See page 35.



8 Set the Operating Temperature



- **Set the constant temperature setpoint.** See page 36.

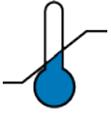
Or

- **Program multistep heating recipe profiles.** See page 36.



The oven is now ready for use

SET THE HIGH TEMPERATURE LIMIT



Note: Test the high limit system once per year for functionality.

The high temperature limit is set by the operator at least 10°C above the highest temperature the oven will run at during your baking application.

1. Advance to the Limit High Setpoint, starting on the homepage



Push Advance
Multiple Times



- Push the Advance button repeatedly until “Lh.S1” (Limit High Setpoint) shows in the green mid-level display line.

2. Adjust the high limit to at least 10°C above the highest temperature of your application



Adjust



- The oven will automatically save and apply the new High Limit setting after you have stopped adjusting.

Note: If you are just checking the current high temperature limit setting, push the Reset button to exit the Limit High Setpoint menu and return to the homepage without saving any changes.

3. Return to the homepage



Push Reset



- Returned to homepage

End of Procedure

OPERATION

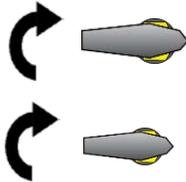
EVACUATING AND BACKFILLING THE OVEN CHAMBER

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.



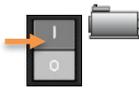
Evacuate the Oven Chamber

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

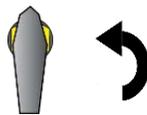


- This protects your vacuum pump from exposure to streaming atmosphere.

2. Turn on your vacuum pump



3. Open the oven Vacuum Valve



VACUUM

Turn the control all the way counter clockwise

- 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 40.



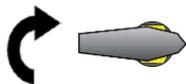
Holding at Vacuum



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.

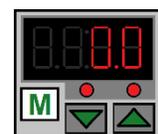
- The pump may remain on.

5. Slowly open the Vent Valve



VENT

The chamber pressure gauge will count upward to zero.



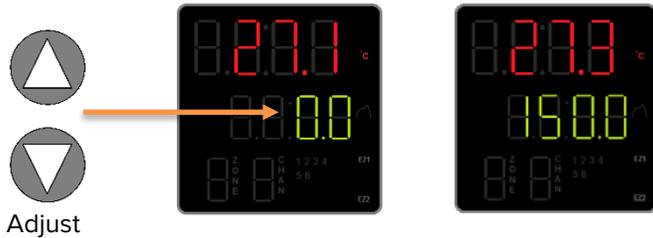
End of procedure

OPERATION

SETTING THE CONSTANT TEMPERATURE SETPOINT



1. Adjust the constant temperature setpoint on the homepage



- Stay 10°C below the high limit setpoint.

Note: Holding down an arrow button will cause the temperature to advance in increments of ten (10).

2. Release the arrow buttons after adjusting the setpoint



Oven Heating

- There may be a brief pause as the oven controller calculates the optimum power usage to achieve the setpoint starting from the current oven chamber temperature.
- A small illuminated 2 near the bottom of the display indicates the temperature controller is calling for heat.

HEATING PROFILES



Please see the profiles guide included with this oven for how to program automated heating recipes. The guide provides illustrated explanations for all major profile functions and programming steps.

EZ1

Pushing EZ1 launches heating Profile 1. Pushing EZ1 again while running aborts Profile 1.

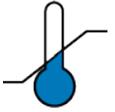
EZ2

Pushing EZ2 launches heating Profile 2 (Step 11). Pushing EZ2 again while running aborts Profile 2.

OPERATION

HIGH TEMPERATURE LIMIT ACTIVATED

The High Limit system cuts off heating in the oven whenever the chamber temperature meets or exceeds the Limit setting. Heating remains disabled until the oven operator clears the Limit cutoff.



Indicators

When heating is cut off, the oven display flashes two alternating alert screens. Additionally, an illuminated “4” on the bottom display level specifies that the oven should be routing electricity away from the heating elements.

Activation of the Limit cutoff is accompanied by a click sound.

Possible Causes of High Limit Activation

- The oven temperature is set above or near the High Limit cutoff setting. The High Limit should be set **at least 10°C above** the highest intended temperature of your heating application.
- 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.

Clearing the High Limit Heating Cutoff

- Clearing the cutoff restores power to the oven heating elements.
- The oven chamber temperature must be below the High Limit cutoff setting before clearing the cutoff.
- Always verify it is safe to resume heating before clearing the High Limit cutoff.

1. Push the Reset button.



- The alert screens will flash 2 additional times before the oven controller clears the cutoff, ending it.

Alternating Alert Screens



Attention Screen



Heating Off

°C → °F

CHANGE UNIT OF MEASUREMENT

The controller can display temperatures in either Celsius or Fahrenheit.



1. From the homepage, advance to the “C_F1” unit of measurement option.
 - a. Push the green Advance button 7 times.
2. Change the unit of measurement.
 - a. Use the Arrow button to change the parameter on the top display line. “C” is Celsius and “F” is Fahrenheit.
3. After changing the Unit parameter, return to the homepage.
 - a. Push the Reset button.



OPERATION

VACUUM GAUGE OPERATIONS

Change the Unit of Measurement



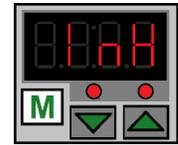
1. Place the vacuum gauge in its adjustment mode.
 - a. Press and hold the “M” button for approximately 3 seconds
 - The display will begin to blink and show a unit of measurement



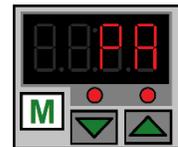
2. Use the arrow keys to scroll between units.



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 at near sea level.

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



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 58 for the zero equivalent for units of measurement other than inHg.

OPERATION

MAXIMUM OBTAINABLE VACUUM

The maximum obtainable vacuum is determined by the altitude of the oven workspace or laboratory environment. The atmosphere is less dense at higher altitudes than at sea level. While a vacuum pump will evacuate the same percentage of atmosphere from the oven chamber, less overall pressure is expelled because of the reduced density.

Altitude (Feet)	Altitude (Meters)	Atmospheric Pressure	Maximum Vacuum Level Attainable
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

DATA PORTS

25-Pin Port



The RS485 data port, located on the back of the oven, connects to the oven temperature controller. The port is primarily intended for updating the controller software but can be used for data logging and graphical profile programming. Accessing the controller with a computer requires a 25-pin RS485-to-USB converter cable and driver software.

Applications and Utility Software

- **National Instrument LabView** and **Watlow SpecView** — Temperature monitoring and data logging in graphical user interface environments.
- **Watlow's EZ Zone™ Configurator** — Programming heating profiles in a drop-down menu environment. Configurator can also be used to copy and save the controller configuration file, which includes the currently programmed heating profiles.
 - Configurator is available for free on the Watlow website.

9-Pin Port



This port connects with accessories ordered from the oven manufacturer, including data loggers.



OPERATOR MAINTENANCE

Warning: Disconnect the unit from its power supply prior to maintenance or cleaning of this unit.

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



CLEANING

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

- 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.



Oven Chamber Cleaning Guidelines

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

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.

The gasket should be replaced if it is dry, cracked, or otherwise showing a loss of elasticity.

ELECTRICAL COMPONENTS

Electrical components do not require maintenance. If the oven fails to operate as specified, please contact your distributor or [Technical Support](#) for assistance.

STORAGE

To prepare the unit for storage, remove all shelves, dry the chamber completely, and disconnect the power supply. Be certain that the door is positively locked in the closed position.

OPERATOR MAINTENANCE

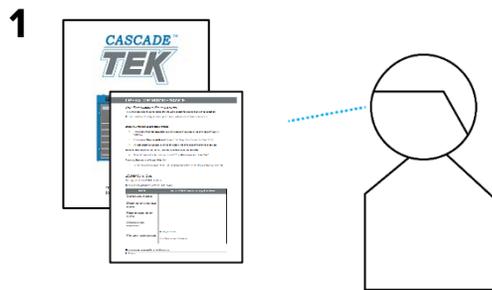
DIAGNOSTIC QUESTIONNAIRE — HEATING ISSUES

If the unit is experiencing heating issues, use this questionnaire to gather information on the unit prior to contacting Technical Support. Gathering and sharing this information aids Tech Support in making timely and accurate remote diagnosis. Additionally, data logger files as well as pictures and videos of the unit in its failure mode are valuable diagnostic resources that can be shared with Tech Support.

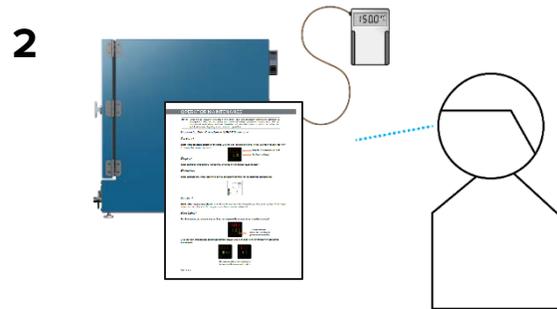
Required: A copy of the unit Installation and Operation manual is required to carry out this procedure.

Overview

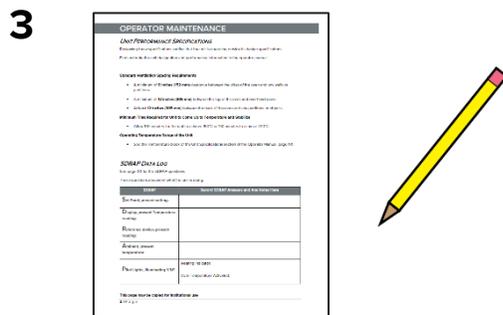
You will be performing the following tasks to gather onsite data:



Reading the Unit Performance Specifications on page 46 and consulting the operation manual for answers.



Observing the unit in operation using the SDRAP diagnostic questions on page 48.



Recording your observations in the SDRAP Answers Log on page 49.



Unit Model Information

Find the unit data plate (see page 14) and the record the information on it below. This information is critical for accurate diagnoses as displays, gauges, valves, and port types vary based on unit model and customization options.

MODEL NO:	
SERIAL NO:	
PART NO:	
PART ID:	

OPERATOR MAINTENANCE

Note: Does the car actually have gas in the tank? Have you physically verified the computer is plugged in? Yes, we are going ask some very basic questions. Please bear with us. Methodical verifications and the elimination of potential causes of failure are often the quickest means of getting a unit back into operation.

Unit Performance Specifications

Verify the following items to ensure a fault in the unit is preventing it from achieving its specified performance levels.

Standard Ventilation Spacing Requirements

Verify there is sufficient spacing around the oven for ventilation or cooling. Insufficient spacing can adversely impact temperature performance.

- A minimum of **6 inches (152 mm)** clearance is required between the sides of the oven and any walls or partitions.
- A minimum of **12 inches (305 mm)** is required between the top of the oven and overhead cover.
- A minimum of **12 inches (305 mm)** is required between the back of the oven and any partitions or objects.

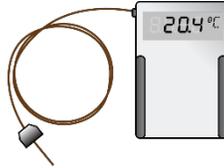
Operating Temperature Range of the Unit

Verify that your constant temperature setpoint or the setpoints of your heating profile all fall within the operating range of the oven.

- See the Temperature Range specifications for the oven on page 58.

OPERATOR MAINTENANCE

Optional: Obtain a temperature reference device. A calibrated digital thermometer with a vacuum-rated thermocouple feedthrough. The device must be accurate to at least 0.1°C.



Diagnostic Setup

1. The unit must be connected to a power source that meets the requirements in the Installation chapter (page 19) and turned on.



2. Optional: secure the reference temperature device sensor probe at the center of the bottom shelf, with the probe head in direct contact with the shelf surface.



3. The oven chamber must be sealed and be under vacuum. See the [Place the Chamber Under Vacuum](#) entry on page 35.



4. The unit must have adequate time to come up to temperature and stabilize. **Failure to wait will result in an inaccurate diagnosis.**



- Allow 120 minutes for the unit to achieve 150°C or 175 minutes to achieve 220°C. The unit cannot come up to temperature and stabilize faster than these rates.
- Start the Diagnostic Data Procedure **when the allotted time has passed**, even if the unit fails to achieve the setpoint temperature.

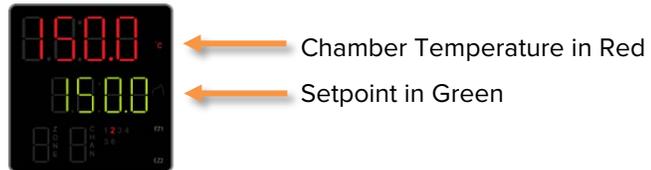
OPERATOR MAINTENANCE

SDRAP Diagnostic Questions

Record the answers in the log on page 49.

Setpoint?

What is the current temperature setpoint?

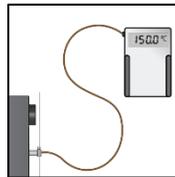


Display?

What chamber temperature is presently showing on the temperature display?

Reference?

Optional: What temperature is the reference device presently showing for the chamber temperature?



Ambient?

What is the room temperature? For best results, measure the temperature in the same section of the room where the unit is located. Do not place your thermometer on the unit.

Pilot Lights?

1) Is the heating active indicator on the control panel flashing or otherwise illuminating, Y/N?



2) Is the High Limit cutoff active or has it activated recently, Y/N?



Alternating alert screens flash when the high limit heating cutoff is active.

OPERATOR MAINTENANCE

SDRAP Answer Log

Record answers to the SDRAP questions in this log. These document the unit behavior.

SDRAP	Record SDRAP Answers and Any Notes Here
S etpoint, present setting:	
D isplay, present Temperature reading:	
R eference device, present reading:	
A mbient, present temperature:	
P ilot Lights, illuminating Y/N?	Heating Indicator:
	High Limit Activated:

Other valuable diagnostic resources to share:

- Datalogger data
- Pictures and video of the unit in failure mode
- How long has the temperature issue been occurring?

Share!

Share the SDRAP and Unit Specifications data with Technical Support. This data is crucial for offsite personnel making accurate remote diagnoses and is used to help ensure technical support can resolve the issue.

Facilities Technicians

SDRAP and Unit Specifications data are also useful to any institutional repair technicians at your facility who may be responsible for servicing of out-of-warranty units.

This page may be copied for institutional use

End Diagnostic Data Procedure

OPERATOR MAINTENANCE

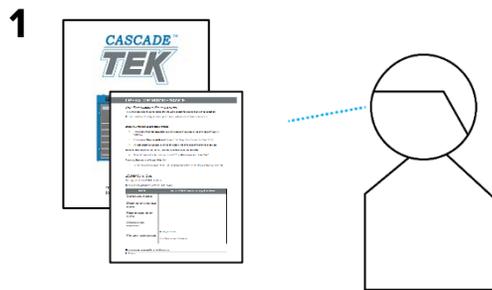
DIAGNOSTIC QUESTIONNAIRE — VACUUM LEAK ISSUES

If the unit is experiencing heating issues, use this questionnaire to gather information on the unit prior to contacting Technical Support. Gathering and sharing this information aids Tech Support in making timely and accurate remote diagnosis. Additionally, data logger files as well as pictures and videos of the unit in its failure mode are valuable diagnostic resources that can be shared with Tech Support.

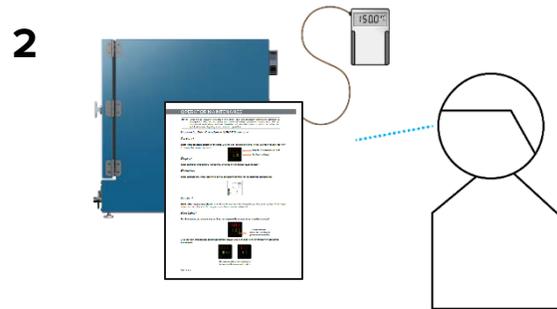
Required: A copy of the unit Installation and Operation manual is required to carry out this procedure.

Overview

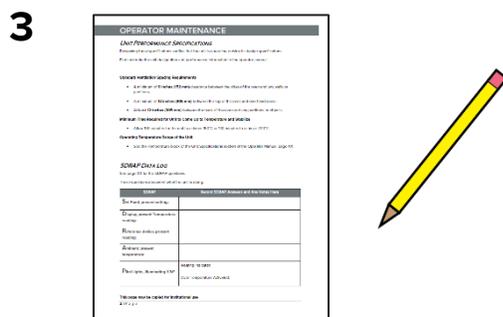
You will be performing the following tasks to gather onsite data:



Reading the Unit and Vacuum Performance Specifications on page 51 and consulting the operation manual for answers.



Observing the unit in operation using the SDRAP diagnostic questions on page 53.



Recording your observations in the SDRAP Data Log on page 55.



Unit Model Information

Find the unit data plate (see page 14) and the record the information on it below. This information is critical for accurate diagnoses as displays, gauges, valves, and port types vary based on unit model and customization options.

MODEL NO:	
SERIAL NO:	
PART NO:	
PART ID:	

OPERATOR MAINTENANCE

Note: Does the car actually have gas in the tank? Have you physically verified the computer is plugged in? Yes, we are going to ask some very basic questions. Please bear with us. Methodical verifications and the elimination of potential causes of failure are often the quickest means of getting a unit back into operation.

Unit Performance Specifications

Verify the following items to ensure a fault in the unit is preventing it from achieving its specified performance levels.

- Is the chamber being evacuated for the full duration of your baking application?
 - Any outgassing from samples or products will raise the chamber pressure if the vacuum valve is closed or the vacuum pump is turned off.
- The chamber must be evacuated to a minimum of -3 inHg (684 torr) to maintain a seal.
 - The door will not seal completely at pressures higher than this.
 - The vacuum pump must be rated to a minimum flow capacity of 1 cubic foot per minute (cfm) per cubic foot of the chamber volume. Example: a 2 cubic-foot chamber should be connected to a pump that can evacuate at least 2 cubic-feet per minute.
- Is the vacuum pump type suitable for your application or process?
 - The vacuum pump must be resistant to byproducts outgassed during the baking process with a sufficient evacuation rate to achieve your vacuum target.
- Is the gasket type suitable for the application?
 - Each gasket type is resistant and vulnerable to different outgassed byproducts. A gasket that is vulnerable to byproducts from your applications may fail after only a short period of use.
 - See page 60 of the operation manual to verify that the installed gasket is suitable for your application.

Vacuum Specifications

Vacuum ovens cannot obtain perfect seals. The following specifications are the best performance that can be expected of the oven in maintaining a vacuum environment.

- The baseline **leak rate** of the oven is **less than 1 mTorr per 30 minutes** at ambient temperature when the oven chamber is empty.
- The **lowest rated chamber pressure** is less than **20 mTorr at 150°C**.

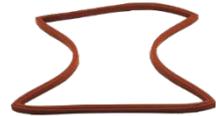
OPERATOR MAINTENANCE

Diagnostic Setup

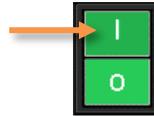
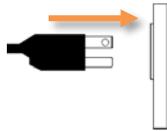
1. **Check the primary chamber gasket for damage.** This is the gasket mounted either on the chamber liner or the door that seals the oven chamber when the door is closed.

Look for:

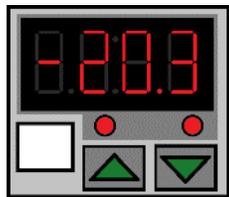
- Cuts or nicks on the gasket caused by removing shelves or samples from the chamber.
- Cracking, brittleness, or loss of elasticity.
- Discoloration of the gasket.
- Nicks or other damage on the surface the gasket seals against.



2. The unit must be connected to a power source that meets the requirements in the Installation chapter (page 19) and turned on.



3. **Do not heat the oven.** The oven must remain at ambient temperature for this procedure.
4. The oven chamber must be empty, sealed, and under full achievable vacuum levels. See the Evacuating the Oven Chamber entry on page 35.



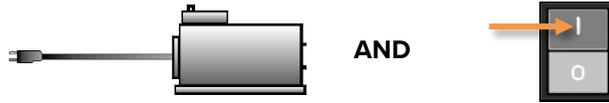
Vacuum Gauge

OPERATOR MAINTENANCE

Diagnostic Questions

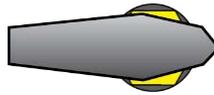
Pump On and Running?

Yes or no?



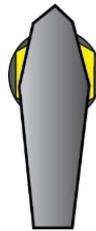
Vent Valve Closed?

The vent (backfill inlet port) must be closed before applying vacuum to the chamber. Failure to do so may result in damage to your vacuum pump.



Vacuum Valve Open?

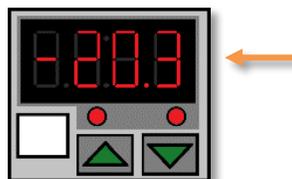
The vacuum valve must be open to allow a connected vacuum supply to evacuate the oven chamber.



Vacuum Valve

Display Reading?

Record the chamber pressure level showing on the Vacuum Gauge display.



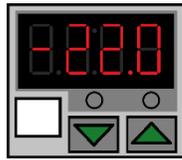
Reminder: Make sure to record the correct unit of measurement for the chamber pressure. See the Vacuum Gauge Operations topic on page 39 to verify the current unit of measurement.

OPERATOR MAINTENANCE

Leak Verification, Y/N?

Verify that the oven is leaking and not experiencing outgassing from residual contamination.

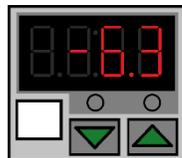
1. If the oven is hot, allow it to cool to room temperature.
2. Evacuate the chamber to the lowest achievable pressure.
3. Write down the pressure displayed on the Vacuum Gauge as a positive number.



4. Isolate the chamber by closing the vacuum valve.



5. Monitor the vacuum gauge for 1 hour. If the pressure on the gauge increases, this may indicate a significant leak.



6. Monitor the gauge for another hour.
 - If the pressure level stabilizes, the initial rise in pressure may be caused by residual material in the chamber outgassing, increasing the pressure.
 - If the pressure level continues to increase, record the pressure displayed on the Vacuum Gauge at the end of the second hour. Include these findings in the Diagnostic Data Log.

OPERATOR MAINTENANCE

Vacuum Leak Diagnostic Data Log

Record the diagnostic question answers in this log. These questions document the unit behavior.

Diagnostic Questions	Record Answers and Any Notes Here
P ump On and Running, Y/N?	
V ent Valve Closed, Y/N?	
V acuum Valve Open, Y/N?	
D isplay Reading, Vacuum Gauge:	
V erified the Oven is Leaking, Y/N?	

Other valuable diagnostic resources:

- Datalogger files
- Pictures and video of the unit in failure mode
- How long has the vacuum issue been occurring?

Share!

Share the Vacuum Diagnostic Data Log and Unit Specifications data with Technical Support. This data is crucial for offsite personnel making accurate remote diagnoses and is used to help ensure technical support can resolve the issue.

Facilities Technicians

The Vacuum Diagnostic Data Log and Unit Specifications data are also useful to any institutional repair technicians at your facility who may be responsible for servicing out-of-warranty units.

This page may be copied for institutional use



UNIT SPECIFICATIONS

This oven is a 110 – 120 volt unit. Please refer to the oven data plate for individual electrical specifications.

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

WEIGHT

Model	Unit Weight
TVO-2	179.0 lb / 81.2 kg
TVO-5	360.0 lb / 163.3 kg

DIMENSIONS

Inches

Model	Exterior W × D × H	Interior W × D × H
TVO-2	20.5 x 29.5 x 26.3	12.0 x 20.0 x 12.0
TVO-5	26.5 x 34.5 x 32.3	18.0 x 24.0 x 18.0

Millimeters

Model	Exterior W × D × H	Interior W × D × H
TVO-2	521 x 750 x 667	304 x 508 x 304
TVO-5	673 x 876 x 819	457 x 610 x 457

CAPACITY

Model	Cubic Feet	Liters
TVO-2	1.67	47.2
TVO-5	4.50	127.4

SHELF CAPACITY BY WEIGHT

Model	Per Shelf	Maximum Total Load	Max. No. Shelves
TVO-2	35.0 lb / 15.8 kg*	105.0 lb / 47.6 kg**	3 Shelves
TVO-5	35.0 lb / 15.8 kg*	105.0 lb / 47.6 kg**	6 Shelves

*35.0 lb / 15.8 kg with weight evenly distributed across the shelf.

**105.0 lb / 47.6 kg total load in the chamber. Exceeding this limit risks damaging the chamber liner.

UNIT SPECIFICATIONS

VACUUM

All Ovens

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

Lowest Rated Chamber Pressure
24 mTorr at 150°C

Leak Rate
Less than 1 mTorr per 30 minutes @ ambient temperature

TEMPERATURE

Range, Stability, and Uniformity

Model	Range	Stability	Uniformity
TVO-2	Ambient +20° to 220°C	± 0.2°C @ 150°C	±6% of Setpoint
TVO-5	Ambient +20° to 220°C	± 0.25°C @ 150°C	±6% of Setpoint

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

Model	Heat Up to 80°C	Heat Up to 150°C	Heat Up to 220°C
TVO-2	70 Minutes	120 Minutes	175 Minutes
TVO-5	70 Minutes	120 Minutes	175 Minutes

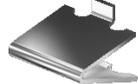
The maximum temperature is dependent on the type of door gasket installed. The oven comes with a silicone gasket installed that is rated to 230°C. See page 60 for the temperature ranges of other gasket types.

POWER

Model	AC Voltage	Amperage	Frequency
TVO-2	110 – 120	10.0	50/60 Hz
TVO-5	110 – 120	13.0	50/60 Hz

REPLACEMENT PARTS LIST

See the next page for gaskets

Description	Parts Number	Description	Parts Number
Adjustable Leveling Feet	 2700506	Shelf Short, TVO-2	 9751226
Fuse, T16A 250V 5x20mm	 3300513	Shelf Clip, Individual (1), TVO-5	 1250510
Power Cord 125 volt, 15Amp, 9ft 5 in (2.86m) NEMA 5-15P	 1800510	Shelf, TVO-5	 5680563
Shelf Tall, TVO-2	 5680567		

REPLACEMENT PARTS LIST

REPLACEMENT GASKETS

Available Gasket Types	Part Number
<p>Silicone, black or red, (comes with oven), rated to 230°C</p> <p>Applications: General and high temperature</p> <p>Resistant to: Moderate or oxidizing chemicals, ozone, and concentrated sodium hydroxide</p> <p>Attacked by: Many solvents, oils, concentrated acids, and diluted sodium hydroxide</p>	<p>TVO-2: 3450707</p> <p>TVO-5: 3450719</p>
<p>Buna-N rated to 105°C</p> <p>Applications: Solvent</p> <p>Resistant to: Many hydrocarbons, fats, oils, greases, and hydraulic fluids.</p> <p>Attacked by: Ozone (except PVC blends), ketones, esters, aldehydes, chlorinated, and nitro hydrocarbons.</p>	<p>TVO-2: 3450708</p> <p>TVO-5: 3450724</p>
<p>Fluorosilicone rated to 175°C</p> <p>Applications: Acidic</p> <p>Resistant to: Moderate or oxidizing chemicals, ozone, aromatic chlorinated solvents, and bases.</p> <p>Attacked by: Brake fluids, hydrazine, and ketones.</p>	<p>TVO-2: 3450611</p> <p>TVO-5: 3450612</p>
<p>Viton® rated to 205°C</p> <p>Applications: Acidic</p> <p>Resistant to: All aliphatic, aromatic and halogenated hydrocarbons, acids, and animal and vegetable oils.</p> <p>Attacked by: Ketones, low molecular weight esters, and compounds containing nitro.</p>	<p>TVO-2: 3450670</p> <p>TVO-5: 3450671</p>
<p>Gasket Dimensions</p> <p>TVO-2 – 12 x 12 Inches (305 x 304 mm)</p> <p>TVO-5 – 18 x 18 Inches (457 x 457 mm)</p>	

Ordering Parts and Consumables

Parts may be ordered from Cascade TEK by calling 1-888-371-4096. Please have the **model number** and **serial number** of the unit ready, as Tech Support will need this information to match your oven with its correct part.





Cascade TEK Solutions LLC
P.O. Box 625 Bldg B
Cornelius, Oregon 97113
USA
support@cascadetek.com
cascadetek.com
1-888-835-9250