

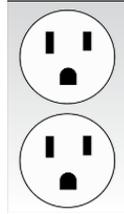
CASCADE™

TEK



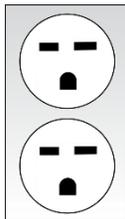
Vacuum Ovens TVO-2-VC TVO-2-2-VC TVO-5-VC TVO-5-2-VC
Installation and Operation Manual

The **TVO-2-VC** and **TVO-5-VC** ovens require a 110 – 120-volt power outlet.

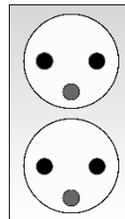


Standard NEMA 5-15R wall socket

The **TVO-2-2-VC** and **TVO-5-2-VC** ovens require a 220 – 240 volt power outlet.



Standard
NEMA 6-15R
wall socket



Standard
CEE7/7
wall socket

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.

Vacuum Ovens

TVO-2-VC, TVO-5-VC: 110 – 120 Voltage

TVO-2-2-VC, TVO-5-2-VC: 220 – 240 Voltage

Part Number (Manual): 4861802

Revision: March 14, 2025

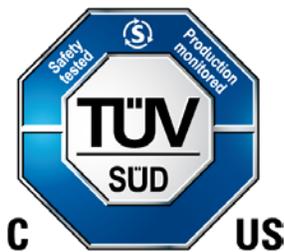
Cascade TEK Part ID Numbers:

Model	TVO-2-VC	TVO-2-2-VC	TVO-5-VC	TVO-5-2-VC
Part ID	CTVV222	CTVV222-EA	CTVV522	CTVV522-EA

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

Cascade TEK Solutions, LLC is an ISO 9001 certified manufacturer.

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. 61010-2-010:2015

UL 61010-1:2012

UL 61010-2-010:2015

EN 61010-1:2010

EN 61010-2-010:2014

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INTRODUCTION

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

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

Keep this manual available for use by all operators.

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.

INTRODUCTION

- 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 Customer Support are 6 am – 4:30 pm Pacific Coast Time (west coast of the United States, UTC -8), Monday – Friday. Please have the following information ready when calling or emailing Customer Support: the **model number**, **serial number**, **part number**, and **part ID** (see page 20).

support@cascadetek.com
1-888-835-9250
1-971-371-4096

Manufacturing and Customer Support

Cascade TEK Solutions, LLC
300 N. 26th Ave.
Cornelius, OR 97113
USA

MANUFACTURING WARRANTY

For information on your warranty and online warranty registration please visit:

<https://www.cascadetek.com/warranty/>

INTRODUCTION

CONTACTING ASSISTANCE

Phone hours for Customer Support are 6 am – 4:30 pm Pacific Coast Time (west coast of the United States, UTC -8), Monday – Friday. Please have the following information ready when calling or emailing Customer Support: the **model number**, **serial number**, **part number**, and **part ID** (see page 20).

support@cascadetek.com
1-888-835-9250
1-971-371-4096
FAX: 1-(503) 640-1366

Manufacturing and Customer Support

Cascade TEK Solutions, LLC
PO Box 625
300 N 26th Ave
Cornelius, OR 97113
USA

MANUFACTURING WARRANTY

For information on your warranty and online warranty registration please visit:

<https://www.cascadetek.com/warranty/>

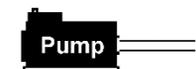
ENGINEERING IMPROVEMENTS

Cascade TEK 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.

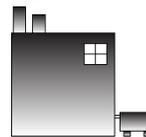
VACUUM SUPPLY REQUIREMENTS

Pump or Building System Required

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



Vacuum Pump



Building Vacuum Supply

INTRODUCTION

Required Flow Rate

For the chamber to seal, the vacuum pump or system 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-VCs	1.67 CuFt	2 cfm	57 Liters per Minute
TVO-5-VCs	4.50 CuFt	5 cfm	142 Liters per Minute

The use of clamps to secure vacuum tubing is recommended.

Minimum Evacuation Level

The oven must be evacuated to **500 torr or lower** for the oven chamber door to seal. The manufacturer recommends pumping down below 500 torr as part of the first step in a baking recipe to ensure a good seal. This helps safeguard the oven and pump.

Pump Type Selection

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, and Compact Direct-Drive. The selection of an application-specific pump can improve the overall oven performance and minimize pump maintenance costs. **All maintenance and instructional information should be obtained from the pump manufacturer** if not shipped with the pump.

Oil Trap Recommended

The 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.

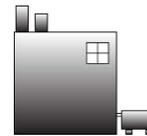
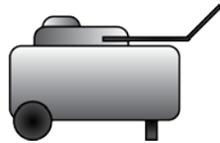
INTRODUCTION

COMPRESSED AIR SUPPLY REQUIRED

The oven chamber cannot be pumped down or auto backfilled without a compressed air supply. Compressed air provides the mechanical pressure required to operate the automated vacuum and backfill valves on the back of the oven.

Use ¼ inch OD (outside dimension) tubing to connect the supply to the ¼ inch push fitting on the back right side of the oven, labeled Air 70 psi.

The oven requires **70 psi** of air pressure delivered at the port to function. **Never exceed 80 psi.**



**Building
Pneumatic
Supply**

INTRODUCTION

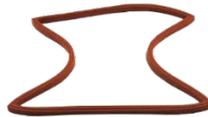
OVEN CHAMBER GASKETS

Wear and Replacement

Chamber liner 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.

Included Chamber Gasket

Each oven comes with a replaceable silicone gasket installed on the chamber liner which seals the oven chamber when the door is closed and the chamber is under vacuum. 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 74 for information on gasket type suitability for baking applications.



Do Not Use Vacuum Grease

- These ovens do not require vacuum grease to seal.
- The use of grease may contaminate the chamber and samples and can foul vacuum pumps.
- **Silicone vacuum grease will damage silicone gaskets.** Do not use silicone grease with silicone gaskets.

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.** 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.**

Save the shipping carton until you are certain that the unit and its accessories function properly.

1. Carefully inspect the shipping carton for damage.
2. Report any damage to the carrier service that delivered the unit.
3. If the carton is not damaged, open the carton and remove the contents.
4. Inspect the unit for signs of damage. See the orientation depictions on the next pages as a reference.
5. The unit should come with an Installation and Operation Manual and a Temperature Program Manual.
6. Verify the correct number of accessories has been included.
7. Carefully check all packaging for accessories before discarding.

Included Accessories:

TVO-2-VCs	Tall Shelves	Short Bottom Shelf	Leveling Feet
	2	1	4
			
TVO-5-VCs	Shelves	Shelf Clips	Leveling Feet
	3	12	4
			

Power Cords

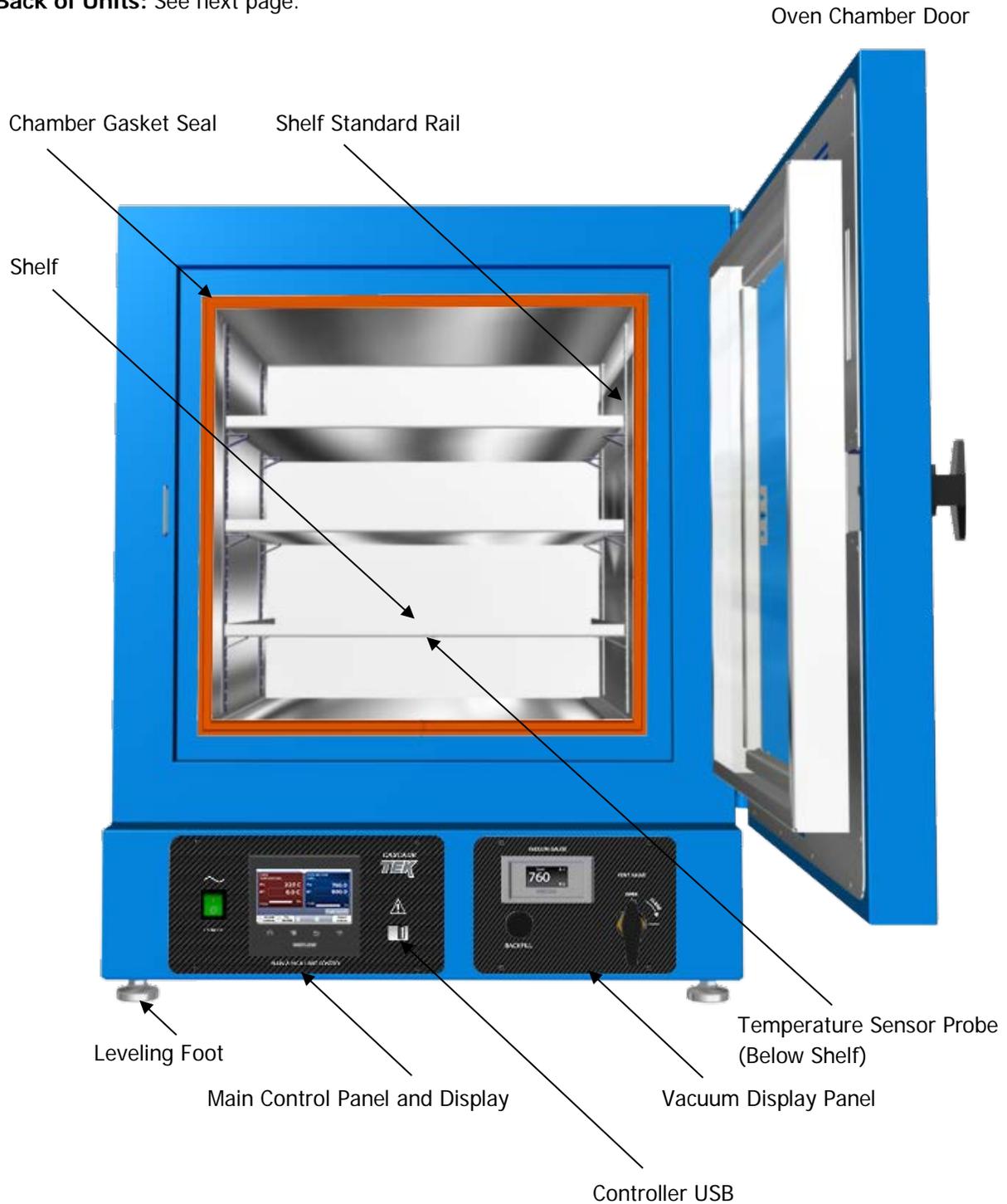
Model	NEMA 5-15P 125 Volt	NEMA 6-15P 240 Volt (US)	CEE 7/7 250 Volt (Euro)
TVO-2-VC	1	0	0
TVO-5-VC	1	0	0
TVO-2-2-VC	0	1	1
TVO-5-2-VC	0	1	1

RECEIVING

ORIENTATION IMAGES

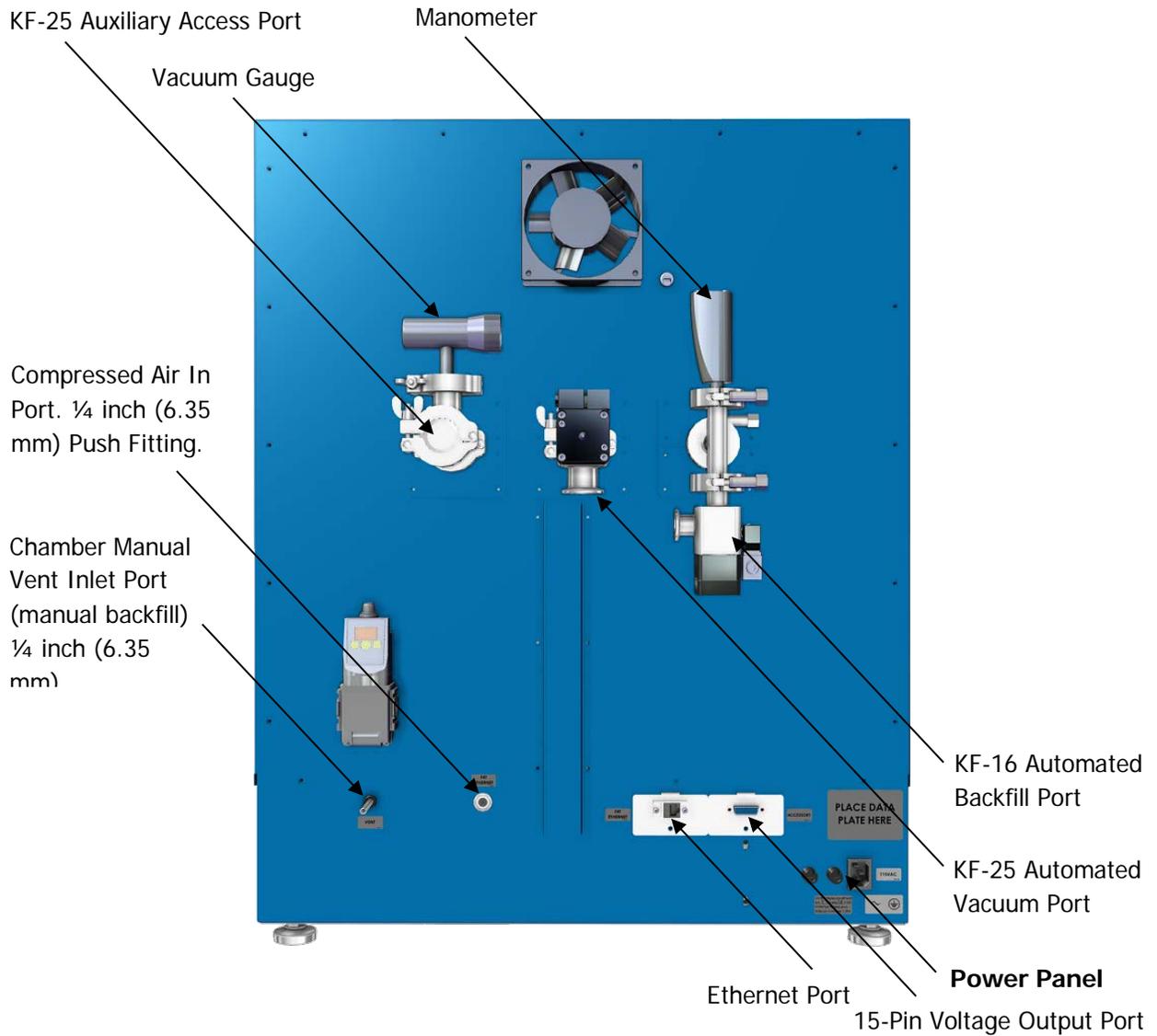
TVO-5-VC and TVO-5-2-VC

Back of Units: See next page.



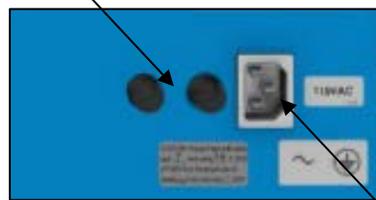
RECEIVING

Back of TVO-5-VC and TVO-5-2-VC



Fuse Holder(s)

- TVO-5-VC: One holder
- TVO-5-2-VC: Two holders



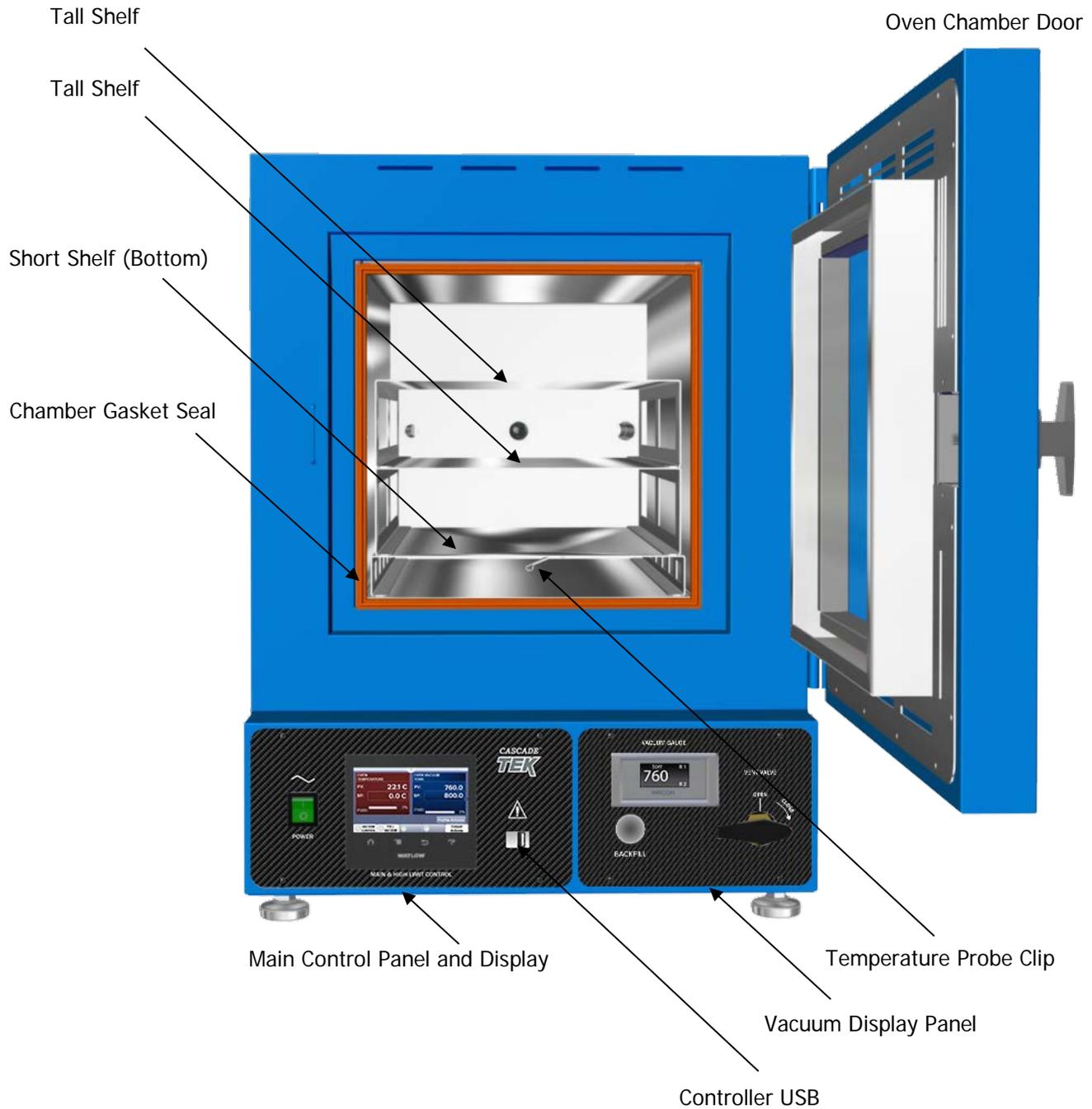
Power Panel Closeup

Power Cord Inlet

RECEIVING

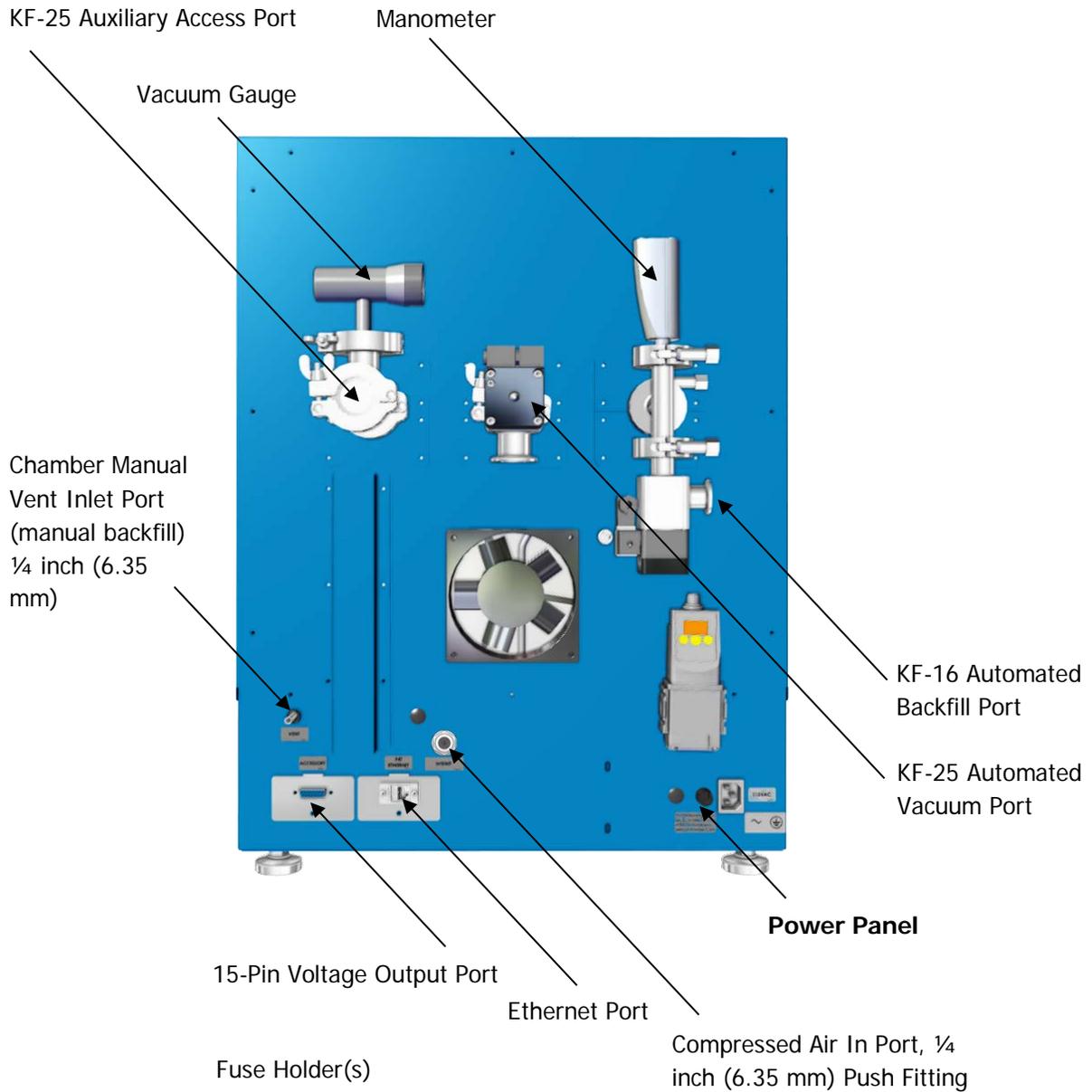
TVO-2-VC and TVO-2-2-VC

Back of Units: See next page.

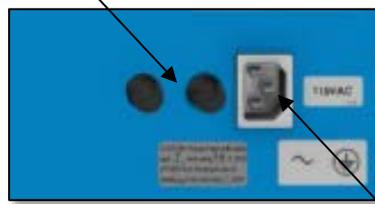


RECEIVING

Back of TVO-2-VC and TVO-2-2-VC



- TVO-2-VC: One holder
- TVO-2-2-VC: Two holders



Power Panel Closeup

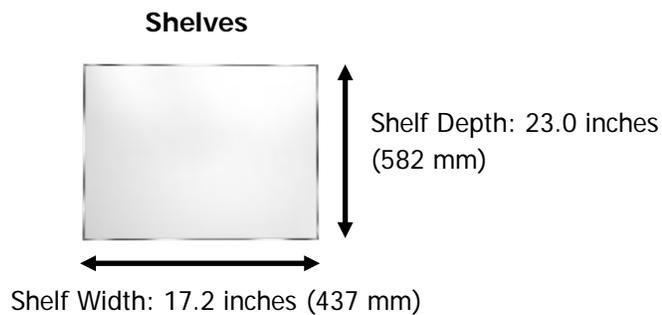
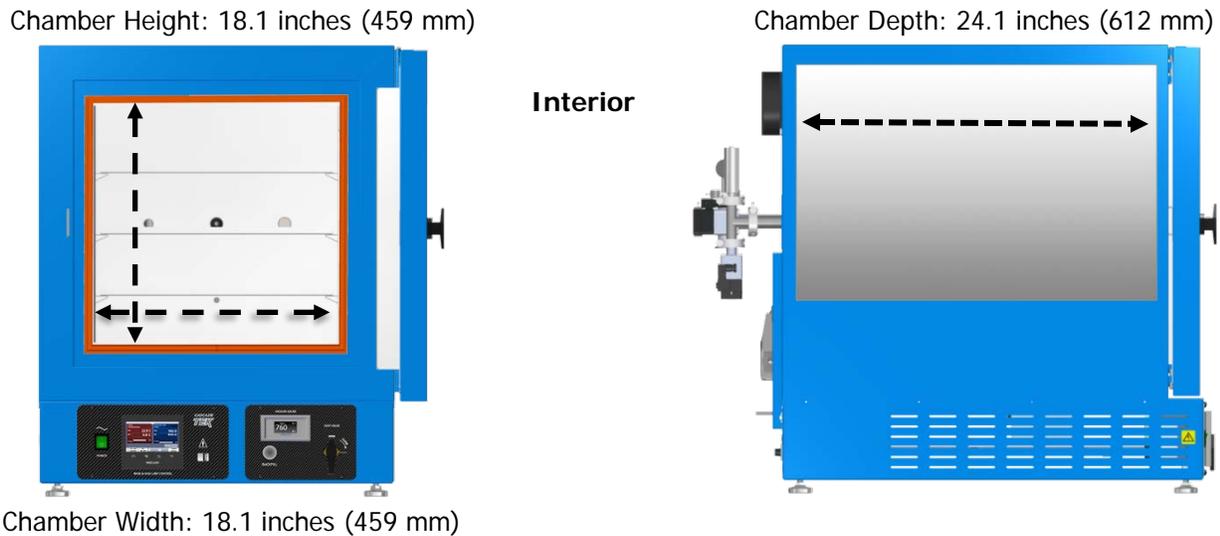
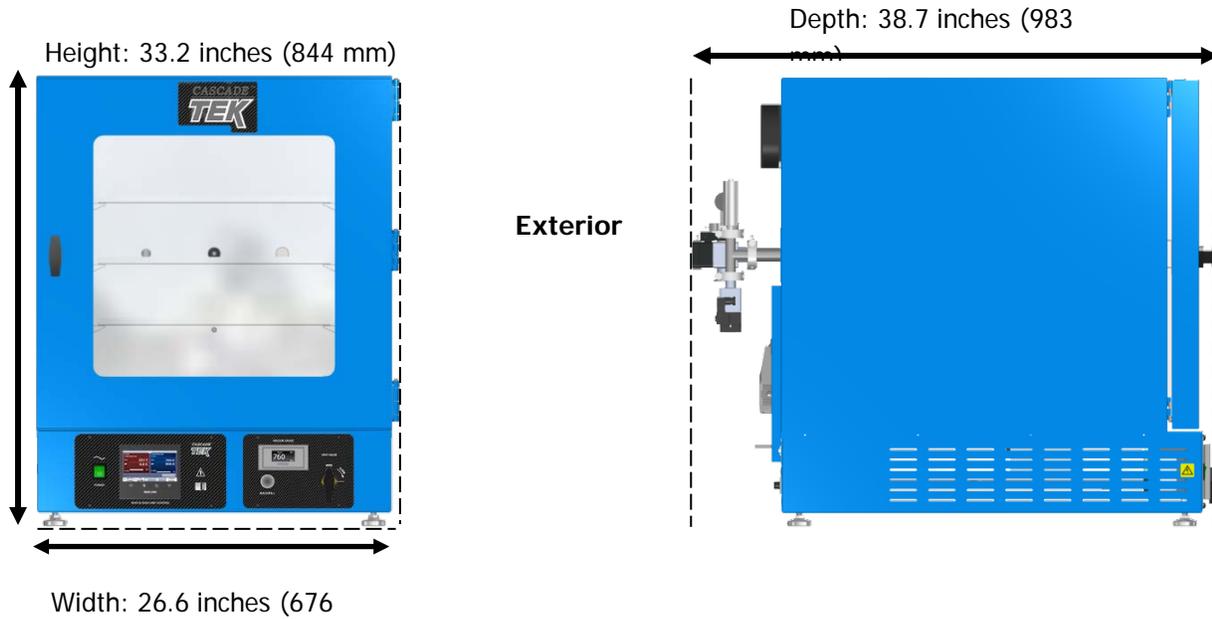
Power Cord Inlet

RECEIVING

DIMENSION VISUALS

TVO-5-VCs

See page 22 for the required ventilation clearances.



RECEIVING

TVO-2-VCs

See page 22 for the required ventilation clearances.

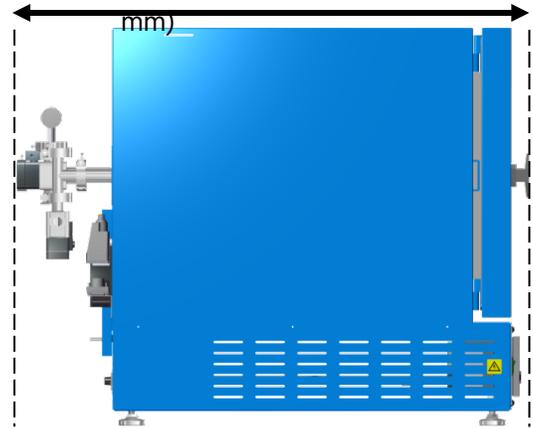
Height: 27.1 inches (689 mm)



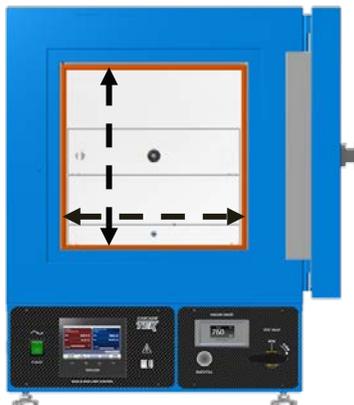
Width: 20.2 inches (513 mm)

Exterior

Depth: 34.9 inches (887 mm)



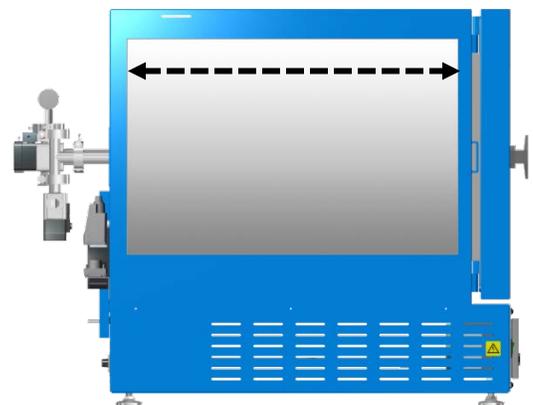
Chamber Height: 12.0 inches (304 mm)



Chamber Width: 12.0 inches (304 mm)

Interior

Chamber Depth: 20.0 inches (508 mm)



Tall Shelves



Shelf Depth: 19.0 inches (483 mm)

Shelf Width: 11.3 inches (287 mm)

RECORD THE DATA PLATE INFORMATION

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

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

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

INSTALLATION PROCEDURES 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 10.
 - See page 31 for the oven gas and vacuum port locations.
- ✓ Verify a suitable compressed air supply is on hand and can be connected to the oven. See page 31.
- ✓ 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 71.
- ✓ 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 27.
- ✓ Install the unit leveling feet, page 27.
- ✓ Install the oven in its workspace location, page 28.

Set up the oven for use

- ✓ Clean the oven shelving. Clean the chamber if needed, page 28.
- ✓ Install the shelving in the oven chamber, page 29.
- ✓ Connect the oven to its vacuum and air pressure supply sources along with any optional backfill gas supply, page 31.

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

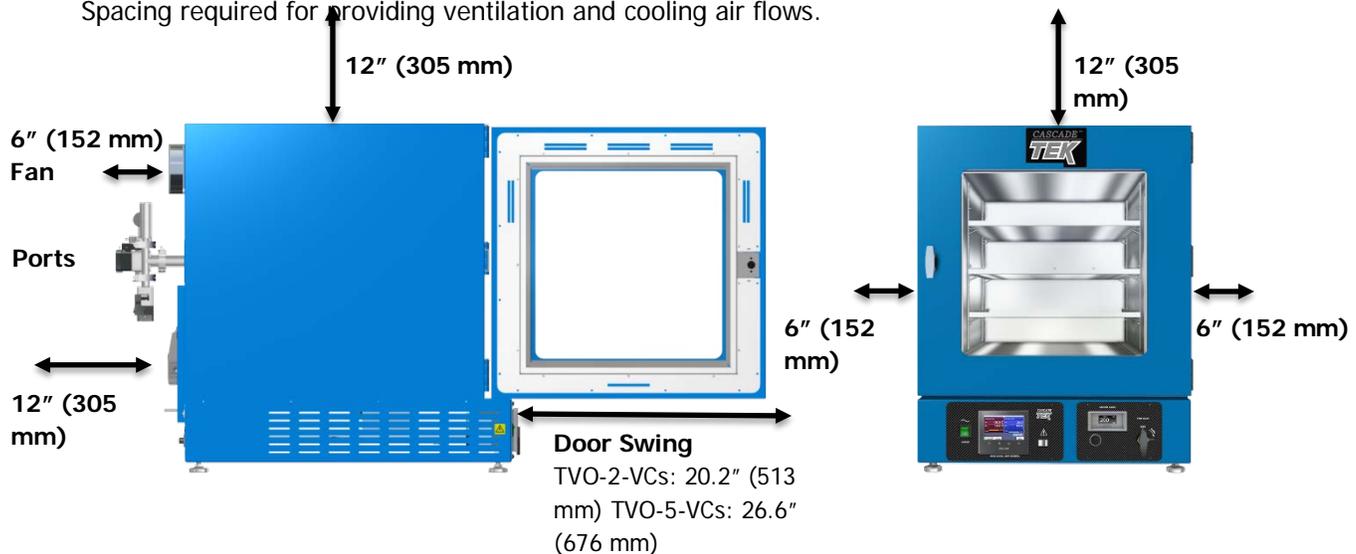
The maximum altitude is 2,000 feet or 610 meters. The pollution degree of the intended environment is 2. Operating outside these conditions may adversely affect the oven temperature performance.

When selecting a location to install the unit, consider all environmental conditions that can 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

Spacing required for providing ventilation and cooling air flows.



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

12 inches (305 mm) of clearance is required between the back of the oven and any partition.

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.

Vacuum, backfill, and access ports are located on the back of the oven. Leave sufficient clearance for operators to safely access these ports.

INSTALLATION

Note: See page 25 for the TVO-2-2-VC and TVO-5-2-VC ovens.

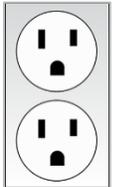
POWER SOURCE REQUIREMENTS 110 – 120 VOLTS

TVO-2-VC TVO-5-VC

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-VC	110 – 120	10.0	50/60 Hz
TVO-5-VC	110 – 120	13.0	50/60 Hz



- 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.



INSTALLATION

Fuse

Each unit comes with a 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.
- Fuse type, TVO-2-VC and TVO-5-VC:
 - T16A, 250V 5x20mm



Power

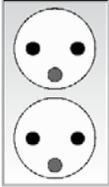
Your unit and its recommended accessories are designed and tested to meet strict safety requirements.

- 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.

INSTALLATION

POWER SOURCE REQUIREMENTS 220 – 240 VOLTS

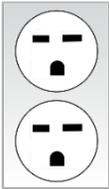
TVO-2-2-VC TVO-5-2-VC



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-2-2-VC	220 – 240	5.5	50/60 Hz
TVO-5-2-VC	220 – 240	7.0	50/60 Hz



- 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 20 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 **250 volt, 10 amp, 8ft 2in (2.5m), CEE 7/7** power cord.
- The unit comes provided with a **240 volt, 15 amp, 8ft 2in (2.5m) NEMA 6-15P** power cord.

INSTALLATION

Fuses



Each unit comes with two fuses installed in fuse holders immediately adjacent to the power cord inlet.

- Both fuses 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.
- Fuse types:
 - T6.3A 250V 5x20mm (TVO-2-2-VC)
 - T10A 250V 5x20mm (TVO-5-2-VC)

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. This power cord must have a minimum wire thickness of 14WG or more.
- 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.

INSTALLATION

LIFTING AND HANDLING

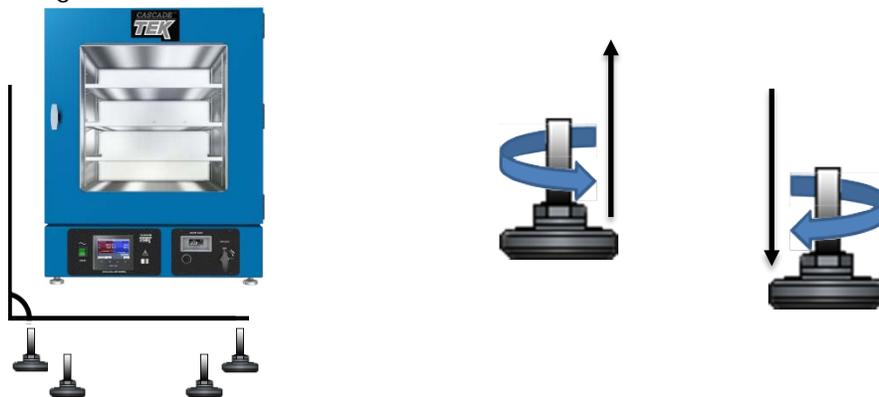
The oven is heavy. Use appropriate lifting devices that are sufficiently rated for these loads. Follow these guidelines when lifting the oven:

- 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 removable parts, such as shelves and trays, and lock doors in the closed position during transfers to prevent shifting and damage.

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.
- See the **Cleaning** topic in the Operator Maintenance section (see page 55) for more information on how to clean the oven chamber and shelving.
- **Do not clean with deionized water.**

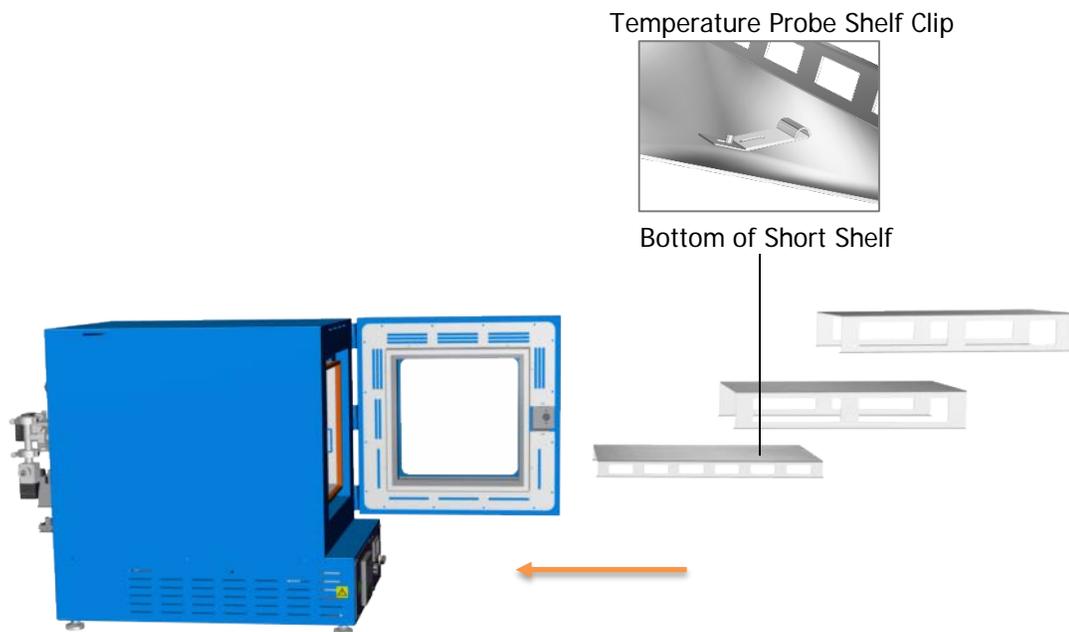
INSTALLATION

SHELVING INSTALLATION

Heating in a vacuum environment takes place primarily through conduction. Heat flows from oven elements inside the chamber walls and 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-VCs



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 shelf clip should be on the side of the shelf closest to the oven door. This ensures the best measurement position for the 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 accurately measures and controls the shelving temperature.
2. Place the 2 tall shelves on top of the short shelf.

Continued next page

INSTALLATION

Shelving Installation Continued

TVO-5-VCs 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.

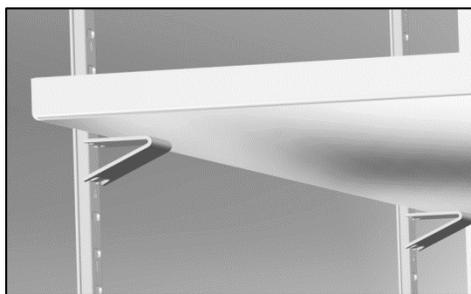


Install 4 Shelf Clips



Rocking Motion

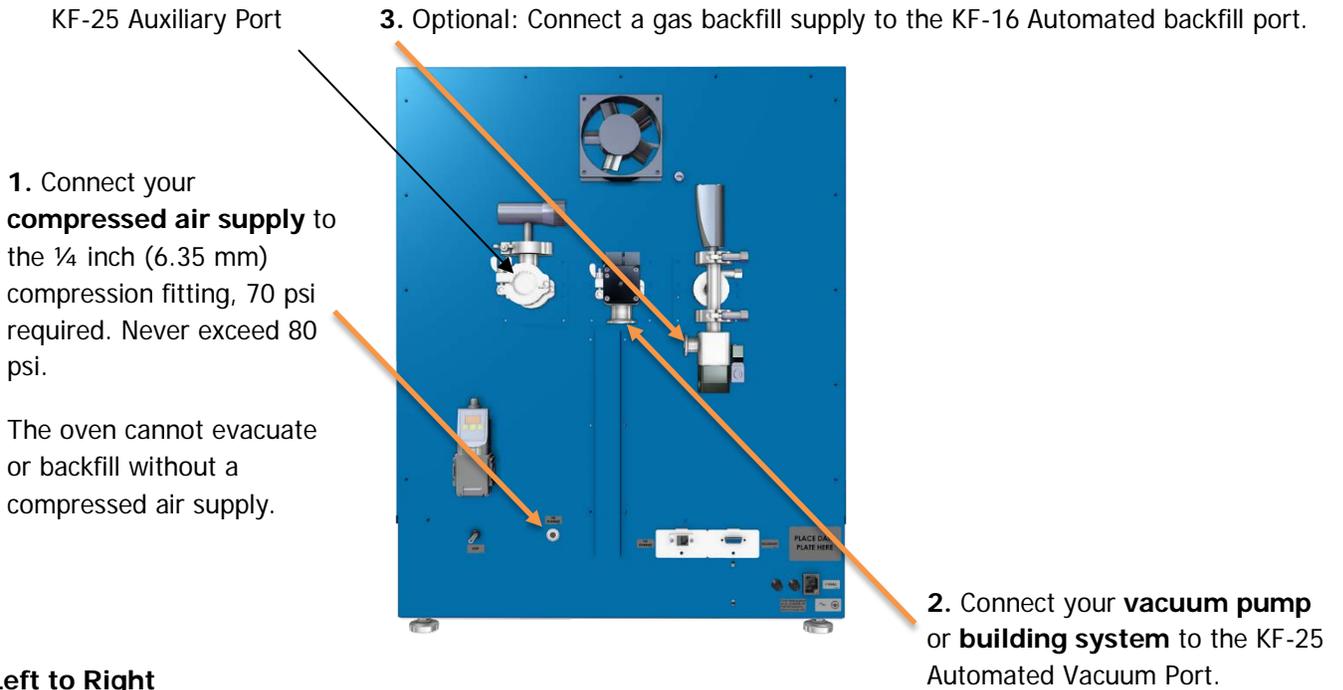
Place the Shelf



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

INSTALLATION

CONNECT TO THE VACUUM AND GAS SUPPLIES



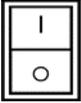
Left to Right

- **Compressed Air ¼ Inch Push Fitting**
 - A compressed air supply must be attached to this fitting for the vacuum and backfilling control systems to function.
- **KF-25 Auxiliary Port**
 - Used for introducing vacuum-rated thermocouple feedthrough probes.
 - The port comes with a KF-25 blank and clamp.
- **KF-25 Automated Vacuum Port**
 - The valve attached to this port is controlled using the touch screen on the control panel.
 - The port does **not** come with a blank or fitting.
- **KF-16 Automated Backfill Port**
 - The valve attached to this port is controlled using the touch screen on the control panel.
 - The port comes with a KF-16 blank and clamp.
 - The maximum allowed gas backfill pressure for the oven is **15 psi**.



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 operator manual.

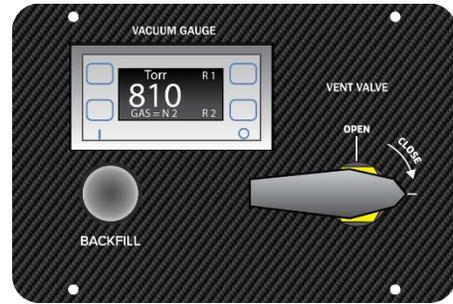
Symbol	Definition
	Consult the operator manual Consulter le manuel d'utilisation
	AC Power Repère le courant alternatif
	I/ON O/OFF I indique que l'interrupteur est en position marche O indique que le commutateur est en position d'arrêt
	Potential shock hazard Risque de choc électrique
	Recycle the unit. Do not dispose of in a landfill Recycler l'unité. Ne jetez pas dans une décharge
	Protective earth ground Terre électrique



CONTROL OVERVIEW



Main Control Panel



Vacuum Panel

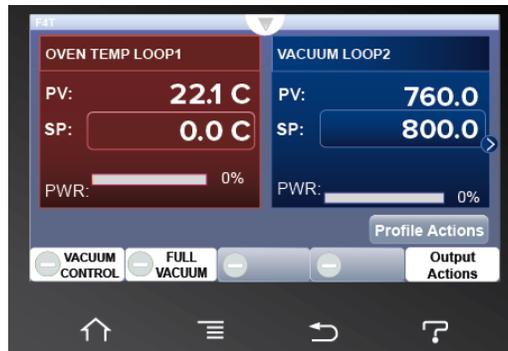
Main Control Panel

Power Switch

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



Oven Temperature and Vacuum Controller



Home

Returns the display to the homepage.



Menu

Accesses the **password** for unlocking the heating profile programming menu.



Return

Returns the display to the previous page or menu.



Help

This button has no assigned functions.

CONTROLS

Oven Temperature Tab



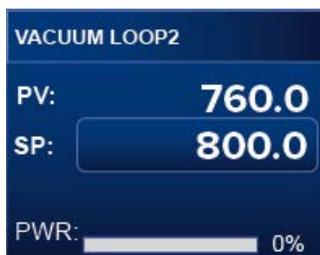
PV: The present oven chamber temperature. When the chamber is pumped down, this **Process Value** measures the temperature of the shelving in the vacuum environment. When atmosphere is present in the chamber, the PV is a measurement of that gas temperature.

SP: Setpoint. The current target temperature of the oven. Tapping the **SP button** brings up the setpoint menu for the constant temperature setpoint.

PWR: The power bar indicates the percentage of maximum power the oven controller is calling for. The bar will be at 100% during most of a temperature ramp up, then drop down as the PV nears the target setpoint.

Vacuum Control System Tab

Vacuum gauges measure the pressure of different gas types. This display connects to a gauge that measures the pressure of **standard atmosphere**. It controls the Vacuum Control pump down process.



~760 torr – Room atmosphere pressure for standard composition atmosphere at or near sea level

PV: This vacuum loop Process Value shows the chamber pressure **down to 1 torr**.

SP: The Vacuum Control function attempts to achieve this setpoint when on. Tapping the **SP button** brings up the chamber pressure setpoint menu.

PWR: The power bar indicates the percentage of air pressure called for to open the oven vacuum valve. This pressure level is not applied to the valve unless the Vacuum Control function is turned on. **The Full Vacuum function** ignores this variable level to keep the valve open continuously.



Not Evacuating



Chamber Evacuating

CONTROLS

Vacuum Control

Tapping this button turns on the Vacuum Control function. Vacuum Control actively adjusts the oven chamber vacuum valve to achieve and then maintain a pressure level between room atmosphere pressure and 1 torr. This level can be set by the operator using the homepage vacuum tab setpoint or programmed as part of an automated heating profile.



Vacuum Control On

Full Vacuum

Tapping this button turns on the Full Vacuum function. Full Vacuum opens the oven chamber vacuum valve all the way, supplying the maximum draw of the pump. The function can evacuate the chamber to below 1 torr **and overrides the Vacuum Control function** if both functions are on at the same time. The maximum achievable Full Vacuum level depends in part on the pump connected to the oven and the rate of outgassing from products or samples in the chamber.



Full Vacuum On

Profile Actions

This button brings up heating profile menu options. These include:

- Running a profile (launching).
- Creating a new profile.
- Editing an existing profile.
- Exporting profiles.



Note: You must log in to create or edit profiles. These actions are hidden when not logged on.

Output Actions

Brings up the output menu, showing each output channel and the data type assigned to it.



Right Arrow

Tapping the arrow brings up the Oven Limit page.



CONTROLS

Oven Limit Page



The Oven Limit system routes power away from the heating elements during over temperature events, preventing further overheating. See page 41.

Vacuum Panel

Vacuum Gauge



~810 torr – Room atmosphere pressure for pure N₂ atmosphere at or near sea level

This display connects to a gauge that measures the pressure of pure nitrogen (N₂) and shows the chamber pressure level in torr and millitorr (mTorr). It controls the automated backfill function. Backfilling is commonly done using N₂ or other inert gases.



Backfill Button

Pressing and holding the button backfills the oven chamber to room pressure.

Both vacuum functions must be turned off before the oven will backfill. See page 47.

Manual Vent (Backfill) Control

Used to backfill the oven chamber in the event of a power outage. During normal operations, this valve should stay in the closed position.

- **This valve must be closed before applying vacuum to 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 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 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.

Burn hazard: Use proper personal protective equipment to minimize the risk of burns when the oven door is open and the chamber door interior, chamber surfaces, and shelving are hot.



THEORY OF OPERATION

Vacuum



Vacuum is supplied by an external vacuum pump connected to the pneumatic vacuum valve port on the back of the oven. The valve is controlled by the oven Full Vacuum and Vacuum Control functions. Full vacuum opens the valve all the way and holds it there, pumping down the chamber using the best flow rate of the supply pump. Vacuum Control actively adjusts the valve position to obtain and then maintain a target vacuum setpoint from just below room pressure down to 1 torr. Vacuum levels obtained in the oven chamber are dependent on pump type and performance, the oven temperature, the selected vacuum function, and the nature of the application or process, including the volume of outgassed materials.

Gas pressure varies by gas type. The Vacuum tab on the Main controller display measures the pressure of a standard atmosphere mix. It controls the Vacuum Control pump down function, which is typically used to pump air out of the chamber to reach a target setpoint pressure. The Vacuum Gauge display measures the pressure of pure nitrogen (N₂) and controls the automated backfilling function of the oven.

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 chamber liner 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 levels produced in the oven chamber. Gasket types are both resistant to and vulnerable to different chemicals.



Automated Gas Backfill

The oven controller opens its vacuum valve when the Full Vacuum or Vacuum Control functions are on. As soon as both these functions are off, the oven closes the vacuum valve, then opens the pneumatic backfill valve. This backfills the chamber to approximately 600 torr. To restore the chamber to full room pressure (approximately 810 torr N₂ / 760 torr atmosphere), the operator manually presses and holds the Backfill button on the Vacuum Control panel.

A gas or clean air supply can be connected to the KF-16 Backfill port fitting on the back of the oven. Nitrogen or another inert gas is typically used to avoid particulate contamination or the oxidation of product that has not cooled down. The maximum allowed pressure for backfilling gases is 15 psi of delivery at the port. Higher pressures may damage the oven.



Heating Options

The oven operates in one of two heating modes: A single constant temperature setpoint or executing an operator-programmed, multistep heating profile.

OPERATION

Heating in a Vacuum

In conventional ovens, powered elements transfer heat into the chamber air. The hot air then circulates by natural convection or blower fan action, surrounds the product on the shelves, gradually bringing it to temperature. In a vacuum oven, heat transfer occurs in part through direct infrared radiation. A significant portion, however, takes place through conduction. The oven heating elements located inside the chamber walls and floor transfer heat to the shelves via metal-on-metal contact. Each shelf then transports heat to the products or samples resting on it.



The displayed oven temperature may drop when pumping down the oven. This reflects the chamber probe transitioning from measuring air temperature to shelf temperature, followed by a redistribution of thermal energy in the vacuum environment. This may present as an apparent drop in followed by a rise. The displayed drop may take place even if the oven is actively heating.

Heating Control

The controller monitors the oven 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.

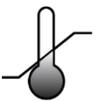
The unit uses Proportional – Integral – Derivative (PID) control to avoid significantly overshooting the setpoint. The rate of heating will slow as the chamber temperature approaches the target temperature. If the chamber temperature is above the setpoint, the unit uses minimum heating to control the 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.

Oven Limit System

The oven controller contains a heating cutoff system with independent circuitry connected to a redundant temperature sensor probe inside the oven chamber. The oven 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 the main temperature sensor probe.



The oven 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 oven limit control system voids the oven manufacturing defect warranty in the event of an overtemperature event.

OPERATION



PUT THE OVEN INTO OPERATION

Perform the procedures below after the unit has been installed in a new workplace location. These verify the integrity of the vacuum system and prepare the oven for normal use.

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.

Plug the power cord into the workspace electrical supply.

2. Verify the door and manual vent valve are closed



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

This safeguards your vacuum pump from exposure to streaming atmosphere.

3. Turn on the oven



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

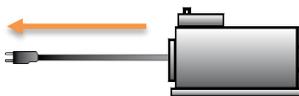
- The controller display will illuminate and default to its homepage.
- The vacuum display will illuminate.

4. Set the Oven Limit Temperature



Use the [Set the Oven Limit Temperature](#) procedure on page 44 to set the Limit heating cutoff at least 10°C above the highest intended temperature of your application.

5. Plug in the vacuum pump



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

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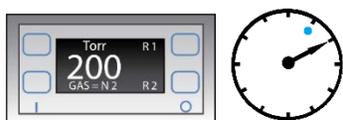
OPERATION

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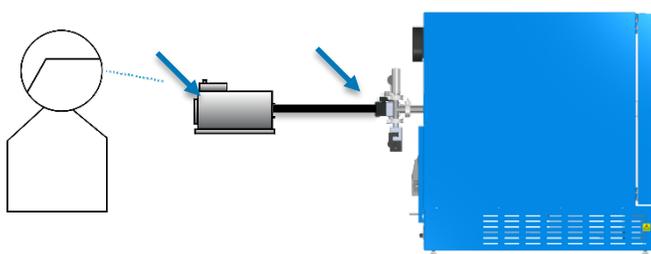
6. Verify the vacuum system integrity



Use the **Pump Down the Oven Chamber** procedure on page 45 to pump down and hold the oven chamber under vacuum for **10 minutes** to verify the integrity of the vacuum supply system.



10 Minutes Minimum



7. Setting the operating temperature



Read these procedures and descriptions.

- **Set the constant temperature setpoint.** See the procedure on page 49.

Or

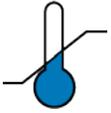
- **Program multistep heating recipe profiles.** See the description on page 49.



The oven is now ready for use

OPERATION

SET THE OVEN LIMIT TEMPERATURE

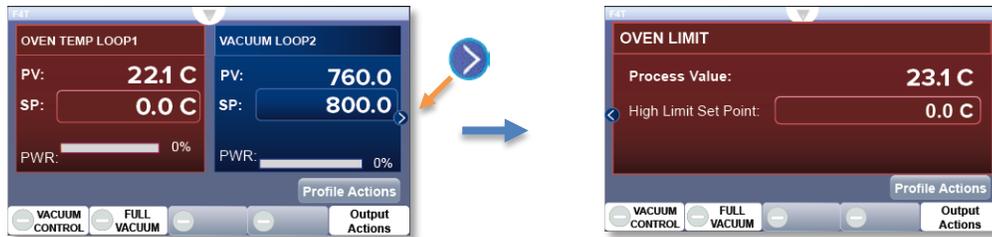


Note: Test the oven limit system once per year for functionality.

Set the oven temperature limit at least 10°C above the highest temperature the oven will run at during your recipe program or constant-temperature application. See page 41 for the system explanation.

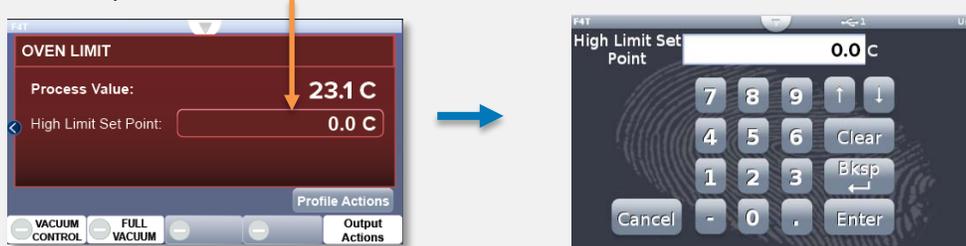
1. Open the Oven Limit Page

Tap the homepage arrow button.



2. Bring up the Setpoint Programming Page

Tap the High Limit Setpoint button.



3. Enter an Oven Limit Setting

Enter an Oven Limit **at least 10°C above** the highest temperature of your baking process. Then tap ENTER to save the new limit.



Tapping ENTER or Cancel brings the display back to the Oven Limit page.

4. Return to the Homepage

Tap the Oven Limit page arrow.



End of Procedure

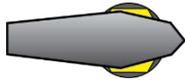
OPERATION

PUMP DOWN THE OVEN CHAMBER

Note: Perform a Full Vacuum evacuation of the chamber for at least 10 minutes when first putting the oven into operation in a new location to verify the vacuum supply system integrity. Use Method 2.



Always verify the manual backfill vent valve is in the closed position.



Close

Reminder: The measured chamber temperature will drop when pumping atmosphere out of the oven. It will then go back up as thermal energy in the chamber redistributes in the newly established vacuum environment.

Vacuum Options

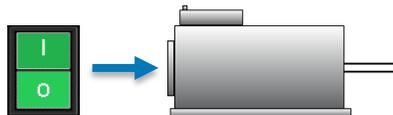
There are three options for evacuating the chamber atmosphere. These can be used to manually place the oven chamber under vacuum or set as part of each automated step in a heating profile.

Method 1 – Manually Turn On Vacuum Control

1. Enter a vacuum setpoint between 1 torr and 760 torr on the homepage Vacuum Tab.



2. Turn on the vacuum pump or other supply source connected to the oven Vacuum Valve.
3. Tap the Vacuum Control button, partly opening the oven Vacuum Valve.



- The oven will evacuate down to and then maintain the Vacuum Tab setpoint.



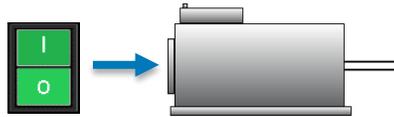
OPERATION



Method 2 – Manually Turn On Full Vacuum

Opens the vacuum valve to its maximum position.

1. Turn on the vacuum pump or supply source connected to the oven Vacuum Valve.



2. Tap the Full Vacuum button on the homepage, fully opening the Vacuum Valve.
 - The chamber will evacuate to the lowest pressure allowed by the pump and samples.



Reminder: The homepage vacuum tab cannot display a Process Value of less than 1 torr.

Note: Full Vacuum overrides Vacuum Control if both are turned on at the same time. If the chamber is evacuated below the Vacuum Control setpoint, it will remain at the lower vacuum level if only Full Vacuum is turned off, as the oven will not backfill until both vacuum functions are disabled.



Vacuum Valve 100% open

Method 3 – Automate the Vacuum Functions

The Vacuum Control or Full Vacuum functions may be set to automatically turn on as part of a heating profile. See page 49.



Reminder: One of the vacuum functions must be turned on during each step in which the chamber will be preparing to launch the vacuum level.
profile.

End of Procedures

BACKFILLING THE CHAMBER

Atmosphere is restored to the chamber in two stages.



Stage 1: Automatic Partial Backfill

Two triggers cause the oven to turn off the vacuum pump and partly backfill to a range of 600 – 700 torr as measured on the Vacuum Gauge.

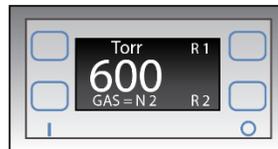
Manual Trigger

When **both** vacuum functions are manually turned off.



Profile Automatic Trigger

When an active profile reaches a step in which both vacuum function event parameters are turned off.



Profile Exception: If a vacuum function is turned on during the End step of a profile, the oven will hold the chamber under vacuum indefinitely with the vacuum valve open and the backfill valve closed.

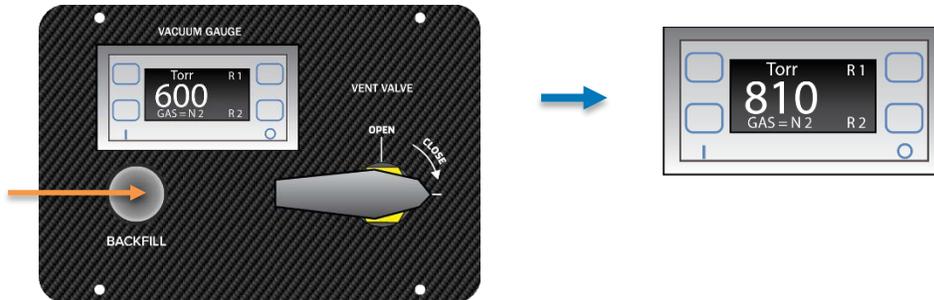
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OPERATION



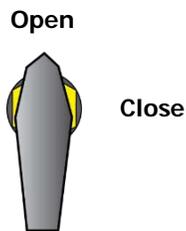
Stage 2: Manual Backfill to Room Pressure

Press and hold the Backfill button on the Vacuum Panel. The chamber will begin to backfill. Release the button when the chamber has reached room pressure.



MANUALLY BACKFILLING

In the event of a power outage or emergency, the manual Vent Valve control on the Vacuum Panel can be used to restore atmosphere to the chamber.



Always return the control to the Close position after backfilling.

Note: This control does not open the automated backfilling Vent Valve on the back of the oven. It opens the smaller, ¼ inch diameter port, drawing in room atmosphere. **Do not** connect a backfilling gas supply to the Manual Vent inlet port.

OPERATION

SETTING A CONSTANT TEMPERATURE SETPOINT

Note: Heating to your baking application temperature with atmosphere in the chamber will result in a drop in temperature when the chamber is evacuated. It may also oxidize chamber surfaces.



To end heating, enter a setpoint of 0.

End of Procedure

HEATING PROFILES

Please see the *Programming Guide – F4T Heating Profiles* document for instructions on how to program automated heating recipe profiles. The guide comes included with the oven and provides illustrated explanations for all major functions and programming steps.



Profile Status Icons

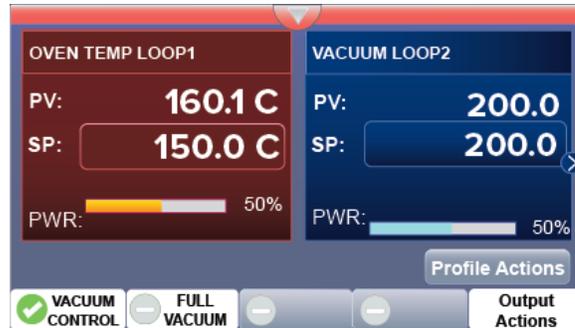




OVEN LIMIT ACTIVE

Limit activations serve as a persistent, protective interruption of heating in the oven chamber. **Always identify and correct** the cause of an oven limit activation before restoring heating.

Homepage in Alarm mode



The chamber temperature exceeds both the Oven Limit setting and the Temperature Setpoint

Note: The oven chamber **is not heating** in the example above. The power bar (PWR) at 50% does indicate the oven controller is calling for power to the heating elements. However, the activated Oven Limit system is routing that power away from the elements, as indicated by the red alarm mode bar.

Oven Limit Activation Causes

- Launching a heating profile with a temperature setpoint near to or exceeding the current Oven Limit setting.
- The chamber temperature is within 9°C of the Oven Limit setting.
- An external temperature source or a heat source in the oven chamber pushes the oven temperature to or above the Limit setting.
- The temperature controller circuitry or sensor probe has failed, allowing uncontrolled heating in the chamber to meet or exceed the Limit setting.

If you suspect a hardware failure or an ignition even in the chamber, **turn off the oven and wait for the oven to cool to room temperature before backfilling the chamber.**

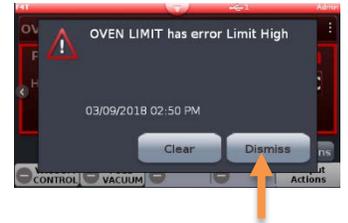
Continued next page

OPERATION

Reminder: Always identify and correct the cause of an oven limit activation before restoring heating.

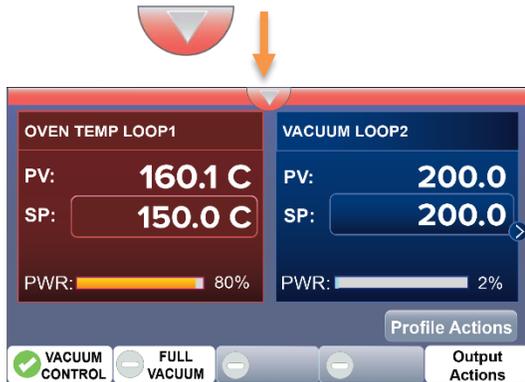
Clearing an Active Limit Cutoff

The oven shelving temperature must return to below the Oven Limit setting before a Limit cutoff can be cleared (canceled).



Alarm Message: This alert window appears the first time a button is tapped during a Limit cutoff. Tap Dismiss to close the message.

1. Tap the Down triangle on the top ribbon to bring up the Error page.

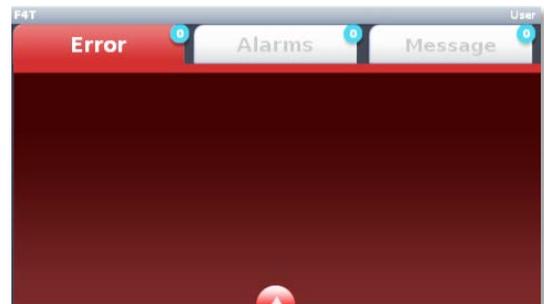
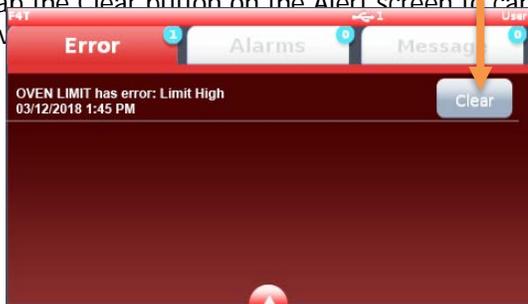


Oven appears to be operating at the **intended** temperature.

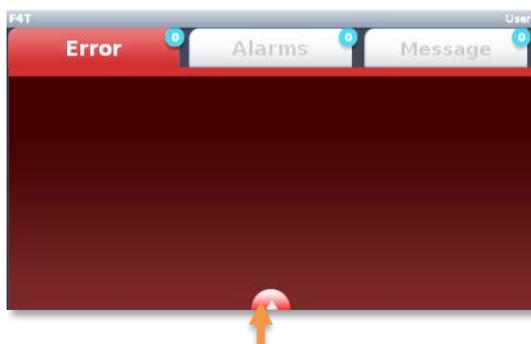


Error page

2. Tap the Clear button on the Alert screen to cancel the OV



Heating cut off ended



3. of the



DATA PORTS

Front of Unit

USB Port



Located on the front control panel, this gives access to the main oven controller and can be used for the following:

- Uploading heating profiles to the controller.
- Programming heating profiles on a desktop or laptop environment.
- Backing up the oven configuration.

15-Pin Port



This port, located on the back of the oven, connects with accessories ordered from the oven manufacturer, including data loggers.

PASSWORD

The Oven Temperature and Vacuum controller comes from the factory locked with the following default password:

ctek

The controller must be unlocked by logging in with the password in order to do the following:

- Program new heating profiles
- Edit existing profiles
- Access settings
- Access the Operations Menu
- Access Output Options

To unlock the controller, sign in on the menu page using the Log In option.

1. Tap the Menu button on the **Oven Temperature and Vacuum Controller** (Main and Oven Limit)
2. Tap the Log-in button
3. Enter the current password



OVEN COOLDOWNS

The oven chamber is well insulated and requires a significant amount of time to cool down while sealed and evacuated. Please see the Unit Specifications chapter for cooldown times.

- Introducing free atmosphere into the oven when the chamber temperature is above 100°C risks oxidizing chamber surfaces.
- Backfilling the oven with N₂ does not significantly increase the rate of cooling.



OPERATOR MAINTENANCE

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

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. 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.

Oven Exterior Cleaning Guidelines

1. Disconnect the unit from its power supply.
2. The manufacturer recommends cleaning the unit with a mild soap and water solution.
 - **Do not use abrasive cleaners**, these will damage metal surfaces.
 - Cleaning agents must be compatible with steel and powder coat paint surfaces.
 - Do not use deionized water to rinse or clean with.
3. Rinse with distilled water and wipe dry with a soft cloth.

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 [Customer Support](#) for assistance.

VACUUM PUMP MAINTENANCE

Refer to the operation manual supplied with your vacuum pump for recommended maintenance routine, 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.**

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.

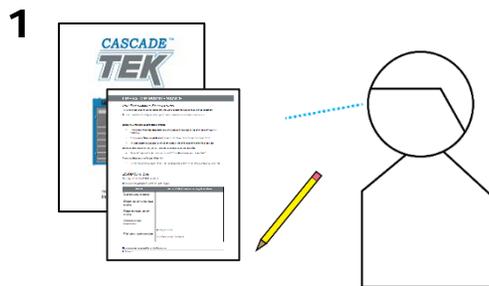
MAINTENANCE

HEATING ISSUES — DIAGNOSTIC QUESTIONNAIRE

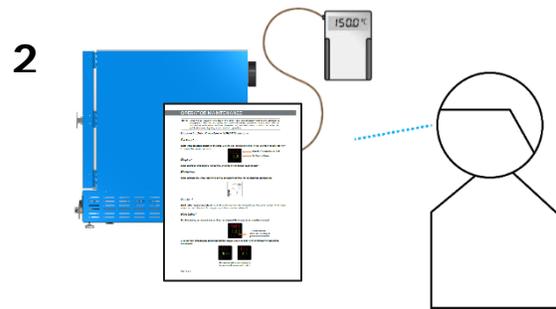
If the unit is experiencing heating issues, use this questionnaire to gather information on the unit prior to contacting Customer Support. Gathering and sharing this information aids Customer Support in making timely and accurate remote diagnoses. Additionally, datalogger files, as well as pictures and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

Overview

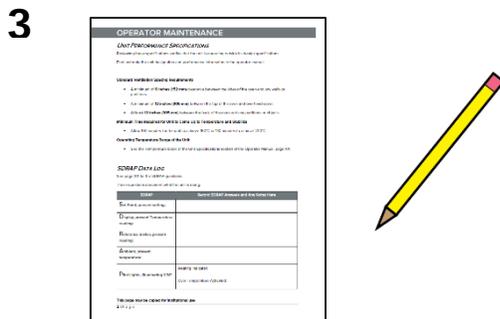
You will be performing the following tasks to gather data onsite:



Verify the Unit Conditions using the procedure on page 59.



Read the Preparing topic on page 60, then observe the unit in operation using the Heating Diagnostic questions on page 61.



Record your observations in the Heating Diagnostic Data Log on page 62.



Unit Model Information

Find the unit data plate (see page 15) and record the information on it below. This information is critical for accurate diagnoses as displays, gauges, valves, and port types vary based on the unit model and customization options.

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

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 failure causes are often the quickest means of getting a unit back into operation.

Verify the Unit Conditions

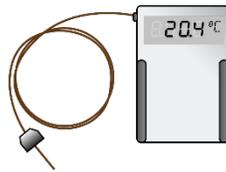
Verify the following items to verify the unit is actually malfunctioning.

Condition Checks	Condition Data Location	Record Results Here
Ambient Conditions: Verify the room temperature falls within the required range.	See the Required Ambient Conditions topic on page 22 . Operating the unit outside the specified room temperature range will adversely impact its temperature performance	The room temperature falls within the required range: Yes or No?
Spacing Clearances: Verify there is enough ventilation spacing around the unit.	See the Required Clearances topic on page 22 . Insufficient ventilation spacing may adversely impact temperature performance.	The oven has the minimum required clearance spacing around it: Yes or No?
Operating Range: Verify the oven is designed to achieve the temperature you are attempting to run it at.	See the unit Temperature Specs on page 72 . The oven will not operate outside this specific temperature Range.	Are you attempting to operate the oven within the specified range: Yes or No?
Heat-up Time: Verify the oven has enough time to come up to temperature.	See the unit Temperature Specs on page 72 . The oven will not heat up faster than the given Time to Temperature specifications.	The oven is being allowed sufficient time to come up to temperature: Yes or No?
Stability and Uniformity: Verify the unit is rated to provide the stability and uniformity you are attempting to achieve.	See the unit Temperature Specs on page 72 . The oven will not reliably achieve a better performance than the stated Uniformity and Stability specifications. *	You are attempting to achieve uniformity and / or stability matching the stated specifications: Yes or No?

* The oven may require time to achieve the specified temperature stability and uniformity after heating up to or cooling down to an operating setpoint. This is affected by the ambient conditions around the oven, the mass of the product or samples in the oven chamber, as well as the volume of outgassing taking place. The longer the oven has been operating, the more heat soaked it is. This generally shortens the time for the temperature to stabilize.

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.

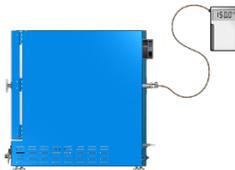


Preparing for the Heating Diagnostic Observations

1. The unit must be connected to a power source that meets the requirements in the Installation chapter (page 23) 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 **empty, sealed** and be **under vacuum**. See the [Evacuating the Oven Chamber](#) topic on page 45.



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



- See the oven Time to Temperature specifications on page 72.
- Start the Heating Diagnostic Procedure **when the allotted time has passed**, even if the unit fails to achieve the setpoint temperature.

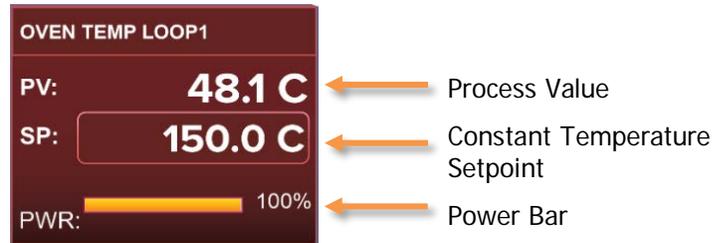
MAINTENANCE

Heating Diagnostic Questions

Record the answers in the log on page 62.

Setpoint?

What is the current temperature setpoint?



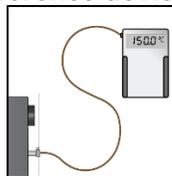
Display?

1) What Process Value is showing on the controller Oven Temp tab?

2) Is the Oven Temp power bar indicating that the oven is drawing power to heat the chamber, Y/N?

Reference?

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



Ambient?

What is the current 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.

Oven Limit Activating?

Is the Oven Limit cutoff active or has it activated recently, Y/N?



Oven Limit Cutoff Activated



Error Page: Limit High Error

MAINTENANCE

Heating Diagnostic Data Log

Record the answers to the Heating Diagnostic questions in this table.

These questions document the unit behavior.

Diagnostic Questions	Record Answers and Any Notes Here
S etpoint, present reading:	
D isplay, Oven Temp tab:	Temperature Process Value reading:
	Power Bar, present heating power percentage:
R eference Device, present reading (optional):	
A mbient, present temperature:	
O ven Limit activated, Y/N?:	

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

Facilities Technicians

The Heating Diagnostic Data Log 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.

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End Diagnostic Data Procedure

MAINTENANCE

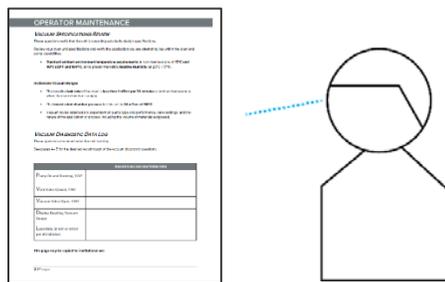
Vacuum Leak Issues – DIAGNOSTIC QUESTIONNAIRE

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

Overview

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

1



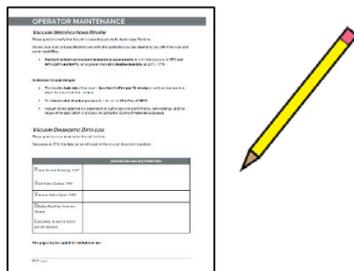
Verify the Unit Vacuum Conditions using the procedure on page 65.

2



Read the Vacuum Diagnostic Setup topic on page 66, then observe the unit in operation using the Vacuum Diagnostic questions on page 67.

3



Record your observations in the Vacuum Leak Diagnostic Data Log on Page 70.

4

Share the gathered information with Customer

Unit Information

Find the unit data plate (see page 15) and record the information on it below. This information is critical for accurate diagnoses as displays, gauges, valves, and port types vary based on the unit model and customization options.

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

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 Vacuum Conditions

Verify the items below to ensure a fault in the oven rather than the pump or external vacuum plumbing or contamination is preventing the unit from achieving its specified performance levels. During normal operations, the oven can be vacuumed down to 500 torr to 10 mTorr depending on the performance of the pump, the oven chamber temperature, and the volume of outgassed byproducts. For most applications, the vacuum pump must remain on and connected to the oven chamber to remove outgassed byproducts.

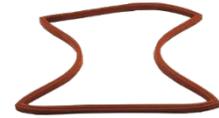
- Is the chamber being **quickly** pumped down to 500 torr or lower? **Yes** or **No?**
 - The door will not seal completely at pressures higher than 500 torr.
 - A slow evacuation may not be sufficient to seal the door.
 - The vacuum pump must be rated to a minimum flow capacity of 1 cubic foot per minute (cfm) per cubic foot of 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? **Yes** or **No?**
 - The vacuum pump must be resistant to byproducts outgassed during the baking process. Otherwise, the integrity of the pump can be quickly compromised.
- Is the gasket type suitable for the application? **Yes** or **No?**
 - Each gasket type is resistant to 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 74 of the user manual to verify that the installed gasket is suitable for your application.
- Is the oven chamber clean prior to being pumped down? **Yes** or **No?**
 - Outgassing from contaminants can cause a rise in chamber pressure. At very low-pressure levels, the oven may register outgassing from fingerprints.
- Is the chamber being evacuated for the full duration of your baking application? **Yes** or **No?**
 - If the vacuum valve is closed during the baking application — isolating the chamber from the vacuum pump — outgassing from samples or products will raise the chamber pressure.

Vacuum Diagnostic Setup

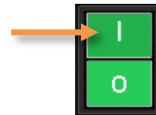
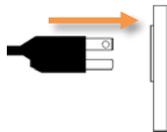
1. Check the primary chamber gasket for damage. This is the gasket mounted on the chamber liner that seals the oven chamber when the door is closed.

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.



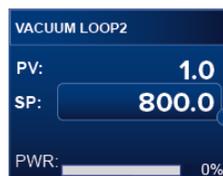
2. The unit must be connected to a power source that meets the requirements in the Installation chapter (page 23) and turned on.



3. Do not heat the oven. The oven must remain at ambient temperature for this procedure.

4. The oven chamber must be **empty, sealed, clean,** and **under full vacuum draw.** See the [Evacuating the Oven Chamber](#) topic on page 45.

- Reminder: Outgassing products, samples, or contaminants such as fingerprints or spilled solvents will generate pressure and prevent the accurate diagnosis of a leak.



Main Controller Vacuum Tab



Vacuum Gauge

MAINTENANCE

Vacuum Diagnostic Questions

Record the answers in the log on page 70.

Pump On and Running?

Yes or no?



Full Vacuum Turned On?

Is Full Vacuum turned on from the oven controller homepage?

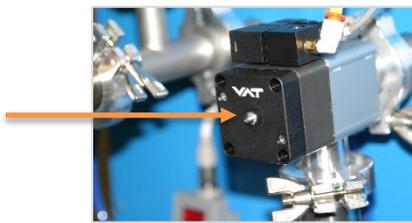
Use Full Vacuum for this diagnostic procedure to ensure the oven is under the full achievable vacuum draw.



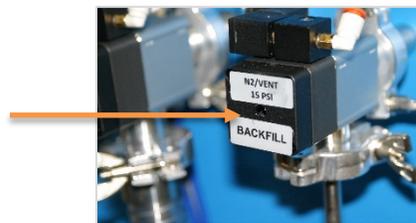
Vacuum Valve Open?

Is the Vacuum Valve indicator switch in the open position, Y/N?

A metal switch protrudes from the back of the vacuum valve when the valve is open. When closed, the switch is fully retracted into the valve.



Vacuum Valve Indicator Open



Backfill Valve Closed

MAINTENANCE

Air Pressure?

Record the Air Pressure Regulator reading. **70 psi of air pressure** is required to supply the mechanical force used to open and close the vacuum and backfill valves. Insufficient pressure will prevent the oven from fully evacuating.



Air Pressure Regulator

Display Values?

1. **Record the Process Value** showing on the homepage Vacuum Tab.

Note: The homepage Vacuum Tab has a display range of 760 – 1 torr.



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



Vacuum Gauge

Reminder: Make sure to record the correct unit of measurement for the chamber pressure, torr or millitorr (mTorr).

MAINTENANCE

Leak Rate?

Calculate and record the leak rate of the evacuated and isolated oven chamber:

1. Verify the oven chamber and shelving are at room temperature (20 – 25°C).
2. Verify the oven chamber is clean and dry to prevent outgassing from contaminants or water.
3. Close the chamber door, then turn on the Full Vacuum function.
4. Allow the oven to vacuum down to the lowest vacuum level your pump can achieve.
5. Write down the pressure displayed on the Vacuum Gauge as a positive number.
 - This is Record 1.



6. Isolate the chamber by disconnecting the compressed air supply to prevent backfilling.
7. Turn off Full Vacuum after the chamber is isolated. Vacuum Control must also be off.



8. Allow the oven to sit sealed and undisturbed for 30 minutes.
9. Write down the pressure displayed on the Vacuum Gauge.

- This is Record 2.



10. Subtract Record 1 from Record 2.
 - Record 2 (torr) – Record 1 (torr) = the leak rate in torr per 30 minutes.

Leak Criteria

The oven chamber may be leaking if the chamber pressure rises by **more than 30 mTorr during the 30-minute test** described above. **Note:** A significant increase during the first minute of testing is not uncommon. This is acceptable as long as the cumulative increase does not exceed the 30 mTorr in 30 minutes maximum.

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?	
F ull Vacuum Turned On, Y/N?	
V acuum Valve Open, Y/N?	
A ir Pressure, Present Reading:	
D isplay Readings:	Vacuum Tab reading:
	Vacuum Gauge reading:
L eak Rate, in torr or mTorr per 30 minutes:	

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 Customer Support. This data is crucial for offsite personnel making accurate remote diagnoses and is used to help ensure Customer 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.

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

WEIGHT

Model	Shipping Weight	Unit Weight
TVO-2-VCs	224 lb / 102 kg	183.0 lb / 83.0 kg
TVO-5-VCs	460 lb / 209 kg	365.0 lb / 166.0 kg

DIMENSIONS

Inches

Model	Exterior W × D × H	Interior W × D × H
TVO-2-VCs	20.2 x 34.9 x 27.1 in	12.0 x 20.0 x 12.0 in
TVO-5-VCs	26.6 x 38.7 x 33.2 in	18.1 x 24.1 x 18.1 in

Millimeters

Model	Exterior W × D × H	Interior W × D × H
TVO-2-VCs	513 x 887 x 689 mm	304 x 508 x 304 mm
TVO-5-VCs	676 x 983 x 844 mm	459 x 612 x 459 mm

CAPACITY

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

SHELF CAPACITY BY WEIGHT

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

SPECIFICATIONS

VACUUM

All Ovens

Operational Vacuum Range

torr	mbar
720 to 10 mTorr @ Ambient*	910.5 to <0.0319 @ Ambient*

*Pump dependent.

Vacuum Display Range

torr	mbar
1100 to 0.1 mTorr	1466 to 0.001

Leak Rate
30 mTorr per 30 minutes @ Ambient

TEMPERATURE

Range, Stability, and Uniformity

Model	Range	Stability	Uniformity
TVO-2-VCs	Ambient +10° to 220°C	± 0.2°C @ 150°C	±6% of Setpoint
TVO-5-VCs	Ambient +10° 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-VCs	70 Minutes	120 Minutes	175 Minutes
TVO-5-VCs	70 Minutes	120 Minutes	175 Minutes

The maximum temperature is dependent on the type of chamber liner gasket installed. The oven comes with a silicone gasket installed that is rated to 230°C. See page 74 for the temperature ranges of other gasket types.

POWER

Model	AC Voltage	Amperage	Frequency
TVO-2-VC	110 – 120	10.0	50/60 Hz
TVO-5-VC	110 – 120	13.0	50/60 Hz
TVO-2-2-VC	220 – 240	5.5	50/60 Hz
TVO-5-2-VC	220 – 240	7.0	50/60 Hz

PARTS LIST

Note: Note: See the next page for gaskets

Description	Parts Number	Description	Parts Number
Adjustable Leveling Feet	 2700506	Power Cord, TVO-2-2-VC and TVO-5-2-VC 250 volt, 10 Amp, 8ft 2in (2.5m), CEE 7/7	 1800500
Fuse, TVO-2-VC and TVO-5-VC T16A 250V 5x20mm	 3300513	Short Shelf, TVO-2-VCs	 9751342
Fuse, TVO-2-2-VC T6.3A 250V 5x20mm (Requires 2)	 3300515	Tall Shelf, TVO-2-VCs	 5680588
Fuse, TVO-5-2-VC T10A 250V 5x20mm (Requires 2)	 3300516	Shelf Clip, Individual (1), TVO-5-VCs	 1250510
Power Cord, TVO-2-VC and TVO-5-VC 125 volt, 15 Amp, 9ft 5in (2.86m) NEMA 5-15P	 1800510	Shelf, TVO-5-VCs	 5680563
Power Cord, TVO-2-2-VC and TVO-5-2-VC 240 volt, 15 Amp, 8ft 2in (2.5m) NEMA 6-15P	 1800539		

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-VCs: 9490542</p> <p>TVO-5-VCs: 9490544</p>
<p>Buna-N rated to 125°C</p> <p>Applications: Solvent</p> <p>Resistant to: Many hydrocarbons, fats, oils, greases, and hydraulic fluids.</p> <p>Attacked by: Ozone, ketones, esters, aldehydes, chlorinated and nitro hydrocarbons.</p>	<p>TVO-2-VCs: 3450708</p> <p>TVO-5-VCs: 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-VCs: 3450611</p> <p>TVO-5-VCs: 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-VCs: 3450670</p> <p>TVO-5-VCs: 3450671</p>
<p>Gasket Dimensions</p> <p>TVO-2-VCs – 12 x 12 Inches (305 x 304 mm)</p> <p>TVO-5-VCs – 18 x 18 Inches (457 x 457 mm)</p>	

Ordering Parts and Consumables

Parts may be ordered from Cascade TEK by calling 1-888-835-9250. Please have the **model**, **part**, and **serial** numbers and **Part ID** of the unit ready, as Customer Support will need this information to match your unit to its correct part.





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