CASCADE™

TEK

FORCED AIR OVENS TFO-28 TFO-10

Installation and Operation Manual

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

Depicted on front cover: TFO-28 (left) and TFO-10 (right)

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.

TFO-10 TFO-28 Forced Air Ovens 220 – 240 Voltage

Part Number (Manual): 4861884

Revision: March 14, 2025

Cascade TEK Part ID Numbers:

Model	TFO-10	TFO-28
Part ID	CTF1023-H	CTF2823-H

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

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

Safety Certifications

Certification is based on the TUV SUD “Testing, Certification, Validation and Verification Regulations (TCVVR)”. TUV SUD America Inc. is an OSHA-recognized NRTL for the USA and a Standards Council of Canada ISO/EIC 17065 accredited Certification body for Canada. These Forced Air Ovens are not intended for residential use, or for processing flammable solvents.

These units have been tested to the following standards:

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

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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.

Intended Applications and Locations

TFO forced-air ovens are engineered for constant temperature forced-air drying, curing, and baking applications in professional, industrial, and educational environments. The ovens are not intended for use at hazardous or household locations.

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.

Power

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

- Always hardwire the unit power feed to a protective earth-grounded electrical source that conforms to national and local electrical codes. If the unit is not grounded, parts such as knobs and controls may conduct electricity and cause serious injury.
- Position the unit so the operator can quickly and easily disconnect or uncouple the power feed in the event of an emergency.
- Do not bend the power feed excessively, step on it, or place heavy objects on it.

- A damaged power feed can be a shock or fire hazard. Never use a power feed 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 11).

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/

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.

INSPECT THE SHIPMENT

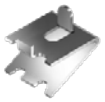
- When a unit leaves the factory, safe delivery becomes the responsibility of the carrier.
- **Damage sustained during transit is not covered by the manufacturing defect warranty.**
- Save the shipping carton until you are certain that the unit and its accessories function properly.

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 Programming Guide.
6. Verify that the correct number of accessory items has been included.
7. Carefully check all packaging for accessories before discarding.

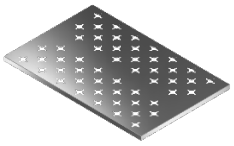
Included accessory items

Model	Shelves	Shelf Clips	Leveling Feet
TFO-10	3	12 Clips	4
TFO-28	6	24 Clips	4

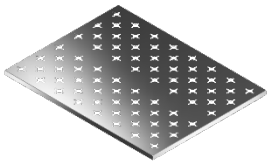


Shelves

TFO-10



TFO-28-2



ORIENTATION

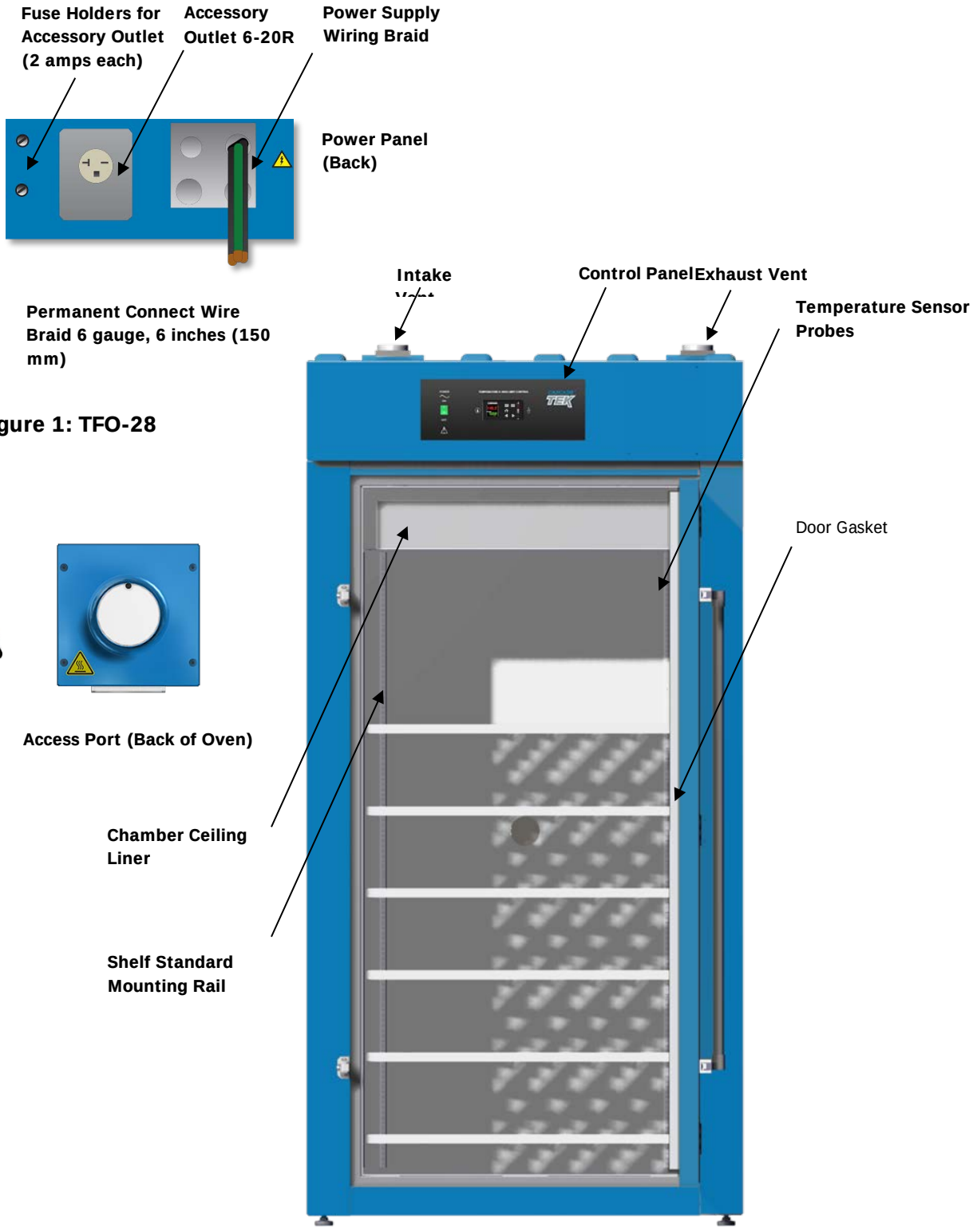
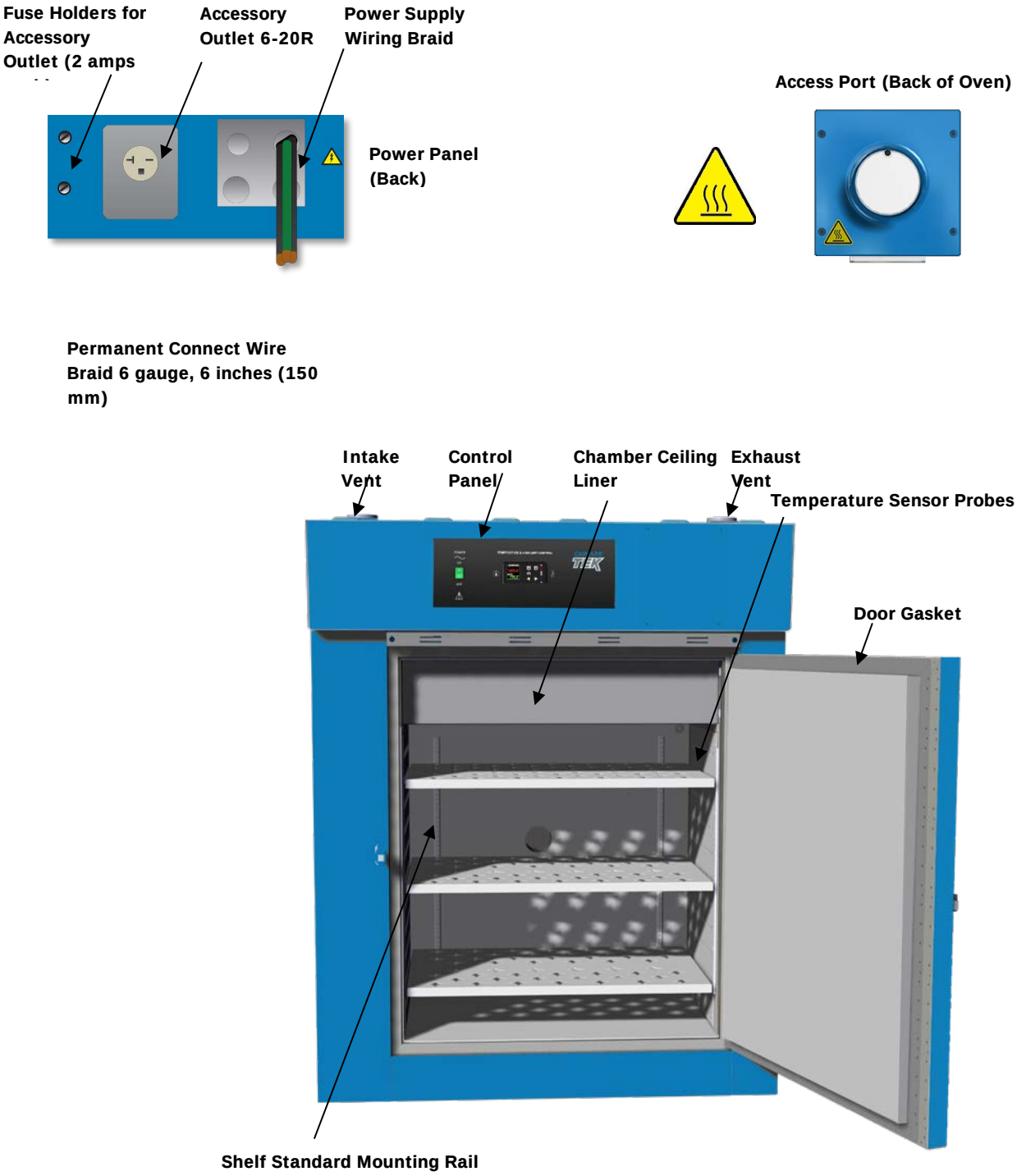


Figure 1: TFO-28

Figure 2: TFO-10



RECORD THE DATA PLATE INFORMATION

The data plate contains the unit **model number**, **serial numbe**r, **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 under the power inlet.

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

HARDWIRE REQUIREMENT

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

INSTALLATION PROCEDURE CHECKLIST

For installing the unit in a workspace location.

Pre-Installation

- ✓ Check that the required ambient conditions for the oven are met, page 15.
- ✓ Check that the ventilation spacing clearance requirements are met, page 15.
    - Unit dimensions may be found on page 48.
- ✓ Check that a suitable permanent connect electrical power supply is present, page 16.

Install the oven in a suitable workspace location

- ✓ Review the lifting and handling instructions, page 17.
- ✓ Install the oven in its workspace location, page 17.
    - The oven may be connected to its power supply after this procedure.

Set up the oven for use

- ✓ Clean the oven chamber and shelving if needed, page 18.
- ✓ Install the shelving in the oven chamber, page 19.

REQUIRED AMBIENT CONDITIONS

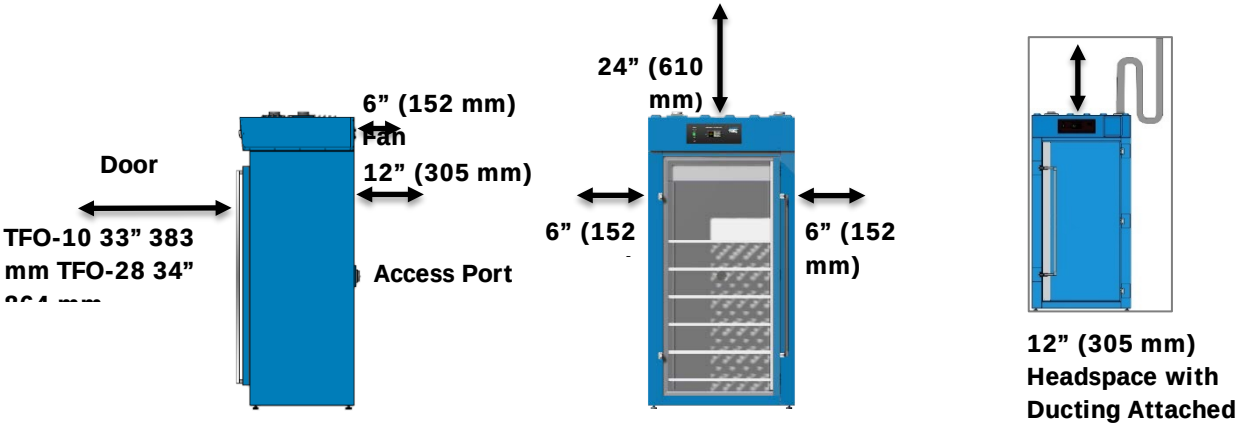
This oven is built for use indoors at room temperatures between **15°C and 40°C (59°F and 104°F)**, at no greater than **80% Relative Humidity** (at 25°C / 77°F). Operating outside these conditions may adversely affect the oven temperature performance.

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 sufficient air flows for ventilation and cooling.



- **12 inches (305 mm)** of vertical headspace clearance will suffice if the oven exhaust is vented from the workspace through a duct or other channeling.
    - Otherwise, **24 inches (610 mm)** of headspace clearance is required between the exhaust vent and any overhead cover or partition.
- **Do not place objects on top of the oven**. Exception: A power exhaust blower offered by Cascade TEK may be mounted on the exhaust vent.
- Allow at least **6 inches (152 mm)** from the fan vent on the back of the oven to the nearest wall or partition. Keep the fan unobstructed at all times.
- The chamber access port is located on the back of the oven. Leave sufficient room for easy access if oven operators will be using the port.

POWER SOURCE REQUIREMENTS

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

Power supply: The power supply must meet the power requirements listed on the oven data plate (located on the back of the unit, beneath the power feed inlet).

- These ovens are intended for 220 – 240 volt, 50/60 Hz applications at the following amperages:

Model	Amperage	Model	Amperage
TFO-10	26	TFO-28	50

- The power source must be **single (1) phase** and **protective earth grounded**.
- The power source 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 oven may result if the supplied voltage varies more than 10%.
- Use a separate circuit to prevent loss of the unit due to overloading or circuit failure. The circuit must meet or exceed the amperage requirements listed on the oven data plate.

Switch or circuit-breaker: A switch or circuit-breaker must be used in the building installation to protect against overcurrent conditions.

- The required circuit-breakers are TFO-10 **30 amps,** TFO-28 **60 amps**.

Power feed disconnect: The oven must be positioned so that all operators have access to the power feed disconnect in case of emergencies.

- The Disconnect must be in close proximity to the equipment and within easy reach of the operator.
- The Disconnect must be marked as the disconnecting device for the equipment.

Accessory Outlet fuses: The oven is also provided with a pair (2) of 2-amp fuses installed adjacent to the external power receptacle used to power accessory blower fans.

- The fuses protect against overcurrent conditions related to the operation of any attached exhaust blower.
- If one fuse blows, the receptacle will depower. The cause of a blown fuse should be determined prior to replacing it.

These fuses do not provide protection against overcurrent events associated with major components of the oven. Overcurrent protection for the oven must be set up in the location power supply external to the unit. See the circuit breaker requirements.

POWER FEED WIRING

The oven comes provided with an integral 6-inch (150 mm) wire braid consisting of:

- TFO-10 – two 6-gauge hot wires and a 6-gauge earth ground.
- TFO-28 – two 6-gauge hot wires and a 6-gauge earth ground.

The wires for power source connection should be in accordance with the following for all units: Green/Yellow – Earth; Black – Hot; Black – Hot.

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

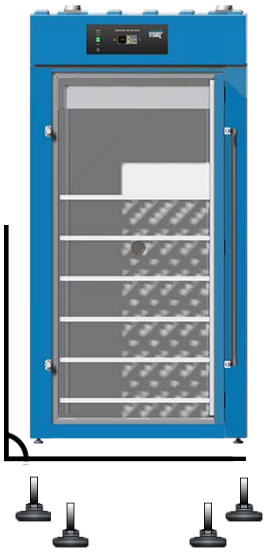
LIFTING AND HANDLING

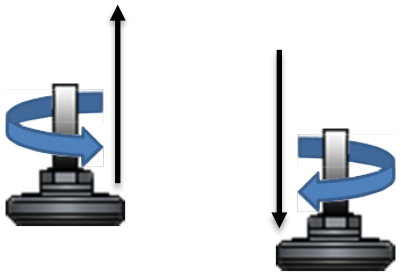
The oven is heavy. Use appropriate lifting devices that are sufficiently rated for these loads. Follow these guidelines when lifting the oven:

- 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 it so it cannot tip.
- Remove all moving parts, such as shelves and trays, and lock the door in the closed position during transfers to prevent shifting and damage.

LEVELING

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





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

INSTALL THE OVEN

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

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

INSTALLATION CLEANING

The unit was cleaned at the factory, but not sterilized. It may have been exposed to contaminants en route 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 40) for more information on how to clean the oven chamber prior to putting the unit into operation.

INSTALL THE SHELVING

The horizontal airflow within the chamber moves from the small duct holes on the right-hand side of the chamber to the large holes on the left side. Place the shelves as not to obstruct the duct holes on either side. This maximizes airflow across the shelf space.

Space the shelves evenly in the oven chamber to ensure the best possible air circulation and temperature uniformity.

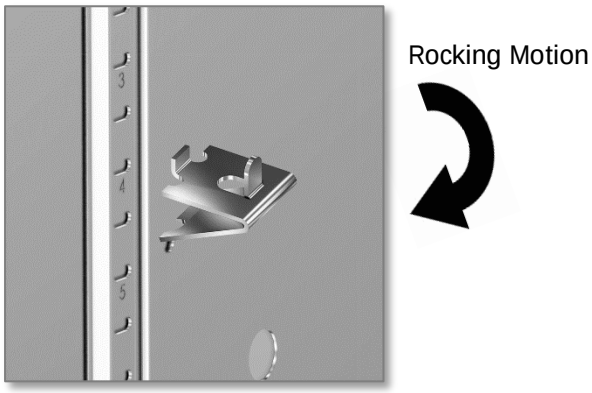


Figure 4: Installing Shelf Clip

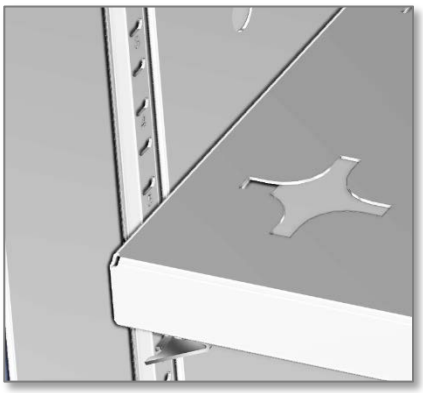


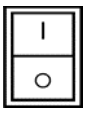
Figure 3: Shelf Set on Clips

1. Install 4 shelf clips in 4 slots on the shelf standard rails on the left and right walls and the rear wall of the chamber interior.
    a. Squeeze each clip.
    b. Insert the top tab first, then the bottom tab using a rocking motion.
    c. The slots must all be at an equal height from the oven chamber floor.

2. Place the shelf on the clips.

GRAPHIC SYMBOLS

The oven is provided with multiple graphic symbols on its external and internal surfaces. The symbols identify hazards and the functions of the adjustable components as well as important notes found in the operator manual.

Symbol	Definition
	Consult the operator manual Consulter le manuel d'utilisation
	Indicates adjustable temperature Indique température réglable
	AC Power Repère le courant alternatif
	I/ON O/OFF I indique que l'interrupteur est en position marche. O indique que le commutateur est en position d'arrêt.
	Protective earth ground Terre électrique
	Indicates UP and DOWN respectively Touches d e déplacements respectifs vers le HAUT et le BA
	Potential shock hazard Risque de choc électrique
	Caution hot surface Attention surface chaude
	Recycle the unit. Do not dispose of in a landfill. Recycler l'unité. Ne jetez pas dans une décharge.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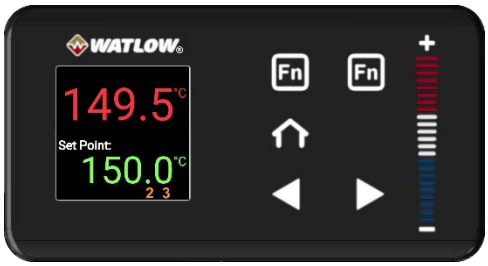
CONTROL PANEL OVERVIEW

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.
- Bottom Line: “3” indicates the blower is on.

The Home button allows immediate navigation back to the home screen, where it displays the current temperature and the set temperature.

While on the homepage, use the **(+)** and **(-)** buttons or swipe up or down on the **+ / - bar** to alter the constant temperature setpoint. On Operations pages, these controls are used to select Operation options, modify the high limit setpoint, adjust calibration offsets, and configure program variables.

From the homepage, pressing the **forward arrow** button progresses through various parameter option pages, such as Event 1 and Units of Measurement (Celsius or Fahrenheit). This button is also used for advancing through menus and parameter lists while programming a temperature recipe.

The **back arrow** button takes the display back to the previous page or menu. Continuously pressing this button will eventually navigate the display back to the homepage.

Pressing the **left Fn** button activates Profile Program 1. Pressing it again during its execution will stop Program 1. Similarly, the **right Fn** button initiates Profile Program 2 (Step 11) and pressing the button a second time while it is running will halt Program 2

OPERATION

The 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, the environment, and the materials being treated in the oven, as well as to prevent damage to the oven. Failure to adhere to the Safety Guidelines and Operating Cautions, deliberately or through error, is a hazardous behavior on the part of the operator.

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

OPERATING PRECAUTIONS

- Do not use this oven in unsafe improper applications that produce flammable or combustible gases, vapors, liquids, or fuel-air mixtures in quantities that can become potentially explosive.
- Outgassed byproducts may be hazardous to or noxious for operating personnel. Exhaust should be vented to a location outside the workspace in a safe manner in accordance with

all applicable laws, ordinances, and regulations. Do not operate the oven in an unsafe area with noxious fumes.

- Do not use this oven for applications heating hazardous fibers or dust. These 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 heated.
- Do not place alcohol or mercury thermometers in the oven. These devices may rupture under heat or other improper uses.
- Do not move the oven until it has finished cooling.

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

Avertissement: Les clapets d'aération peuvent être chauds au toucher. Ces zones sont marqués avec des étiquettes de Surface chaude. Les EPI approprié devraient être employée pour réduire au minimum le risque de brûler.

THEORY OF OPERATIONS

Heating

The oven temperature controller stores an operator-selected constant temperature set point. When powered, the oven heats the chamber atmosphere to the set point. 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 chamber temperature has dropped below the temperature setpoint, it pulses power to the heating elements.

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

TFO 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.

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.

Air Circulation

The oven continually circulates air internally while powered in order to maintain temperature uniformity and stability in the oven chamber and to speed drying rates. Air is forced through vent holes on the right side of the chamber, blows across the shelf space, and is then pulled into a duct that makes up the left chamber wall. From there, the air is drawn down into a heating duct by the action of the blower fan. The oven is intended to be run as a closed air-cycle system.

Vents – Intake and Exhaust

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

Accessory Power Exhaust Outlet

TFO Forced-Air ovens come with an external accessory power outlet to supply electricity to a power exhaust blower attached to the oven exhaust vent. The outlet and any attached blower are either activated by the temperature controller as part of an operator programmed heating recipe profile or can be activated from the homepage options when the oven running a constant temperature set point. The primary application of the power exhaust fan is to positively vent exhaust out of the workspace around the oven. The standard receptacle is a 240 volt, North American 6-20R.

The operation of the fan affects the oven chamber temperature, significantly lowering the temperature ceiling by boosting the rate that cooler outside air is brought in.

High Limit Control System

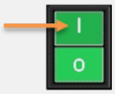
The temperature controller contains a heating cutoff system with independent circuitry connected to a redundant solid-state temperature sensor probe inside the oven chamber. This high limit system depowers the oven heating elements whenever the chamber air temperature exceeds the current limit setting. 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.

PUT THE OVEN INTO OPERATION

Verify all 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. Power the Oven



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

The controller display will illuminate, show the current firmware revision number, and then default to the homepage.

2. Set the High Limit Temperature

Set the Temperature High Limit to at least 10°C above the highest intended temperature of your application, page 28.

3. Set the Operating Temperature.

Or

Set the Constant Temperature Set Point, see page 29.

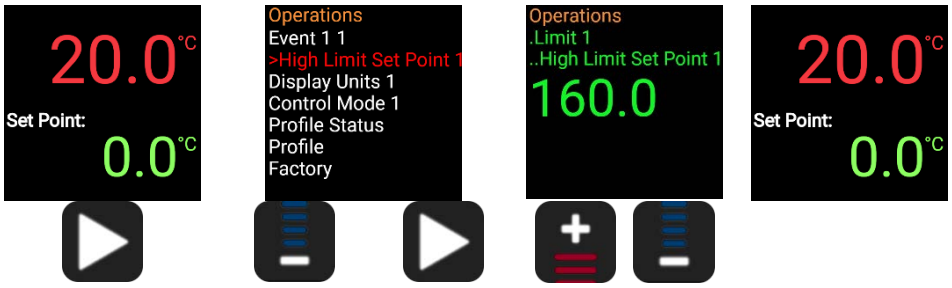
Program multistep heating recipe profiles, see page 29.

End of Procedure

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 recipe profile or constant-temperature application.



Goto Operations

Select High Limit Set Point

Advance

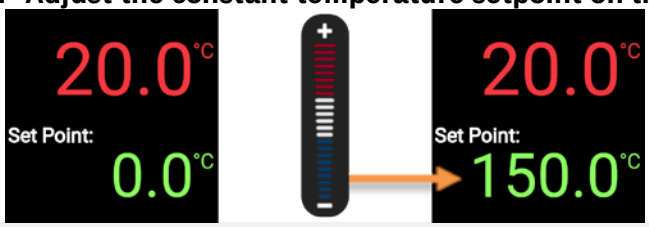
Adjust value

Return Home

End of Procedure

SETTING THE CONSTANT TEMPERATURE SETPOINT

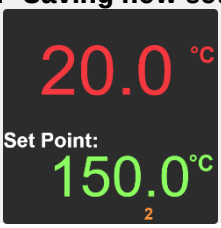
1. Adjust the constant temperature setpoint on the homepage



Stay 10°C below the high limit setpoint.

Press and hold the (+/-) buttons, or swipe up or down on the bar, to adjust the temperature setpoint.

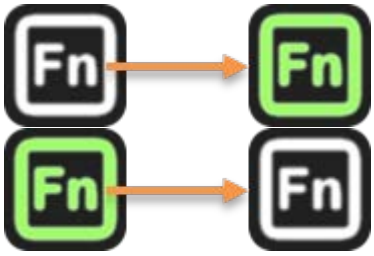
2. Saving new setpoint.



If there is no change in the setpoint for 3 seconds, the setpoint value will flash green and save the new setting.

HEATING PROFILES

Please see the *Programming Guide – Watlow PM9+ Controller 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 heating profile functions and programming steps.



Pressing the **left FN** button activates heating Program 1, turning the button green to indicate it is in use. Pressing the button again during operation will terminate Program 1.

Pressing the **right FN** button activates heating Program 2 (Step 11), turning the button green to indicate it is in use. Pressing the button again during operation will terminate Program 2.

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.

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 has failed.

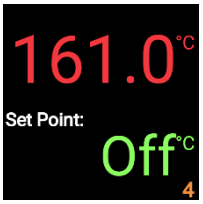
If you suspect an ignition event in the oven chamber or a hardware failure **wait for the oven to cool to room temperature before opening the chamber door.** Contact **Customer Support** for assistance.

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.

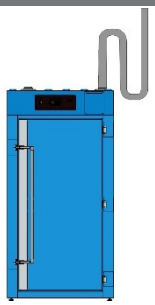
Alternating Alert Screens

Attention Screen



Heating Off

If the oven temperature falls to at least 2°C below the High Limit Setting, pressing the Home button will enable heat and turn off the alert.



POSITIVE EXHAUST VENTING

Exhaust ducting can be connected to the oven exhaust port to channel or positively vent exhaust away from the oven workspace. Include a U-shaped bend in the ducting to prevent moisture condensate from sliding back down into the oven.

POWER EXHAUST BLOWER

Cascade TEK offers an accessory forced-air power exhaust intended to mount directly on the exhaust vent and is powered by the oven. The exhaust blower is activated either as part of a heating recipe profile step or can be activated manually from the homepage Options menu while running a constant temperature set point.

The exhaust is intended for use after a heat application. The operation of the power exhaust will significantly impact the oven chamber temperature.

> **Warning**: Exposure to sustained oven chamber temperatures above 80°C will damage the exhaust blower. Leave the oven exhaust vent dampener closed to protect the blower when attached, and only open when it is time to actively vent the oven chamber.

Mounting the Power Exhaust

1. Remove the 8 screws on the exhaust vent cover on the top of the oven.
    a. Leave the vent assembly in place.
2. Mount the power exhaust blower on the exhaust vent cover assembly.
3. The open side of the blower mounting body should fit over the sliding damper.
    a. Align the blower and the assembly screw holes.

4. Reinstall the 8 screws to secure the blower and vent assembly.
5. Plug in the power exhaust into the 220 – 240 volt receptacle on the back of the oven.
6. Turning on the Power Exhaust – Constant Temperature Setpoint

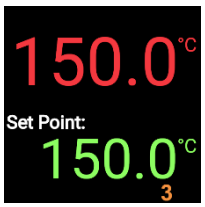
Goto Operations

Select Event 1 1

Advance

Adjust value.

Return Home



DATA PORT

The 25-pin RS485 data port, located on the back of the oven, connects to the oven temperature controller. It 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

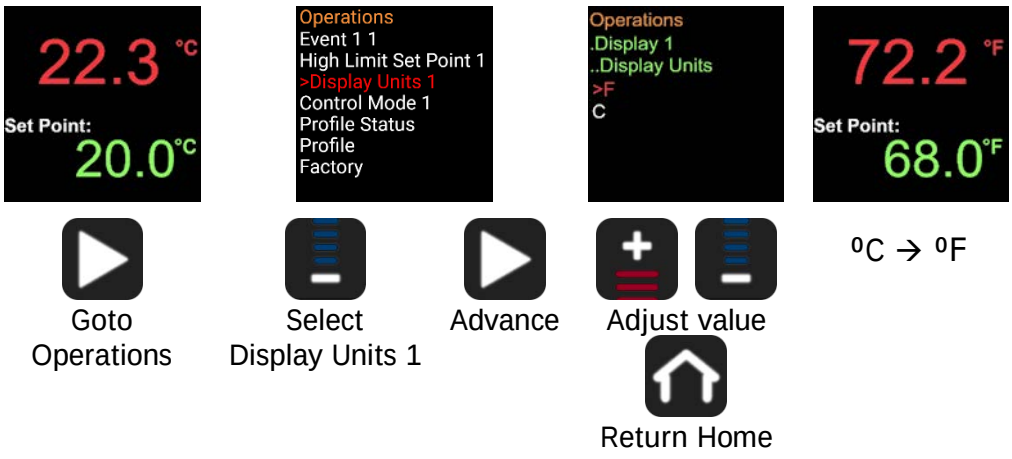
- **National Instrument LabView** and **Watlow Specview** — Temperature monitoring and data logging in graphical user interface environments.
- **Watlow's Composer** — Programming heating profiles in a drop-down menu environment. Configurator can also be used to copy and save the controller configuration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

Jack Port

The jack port accepts standard audio jacks (phono jacks) and outputs an analog signal (0 – 10 volts) corresponding to the current temperature of the oven chamber (0 – 360°C).

CHANGE UNIT OF MEASUREMENT

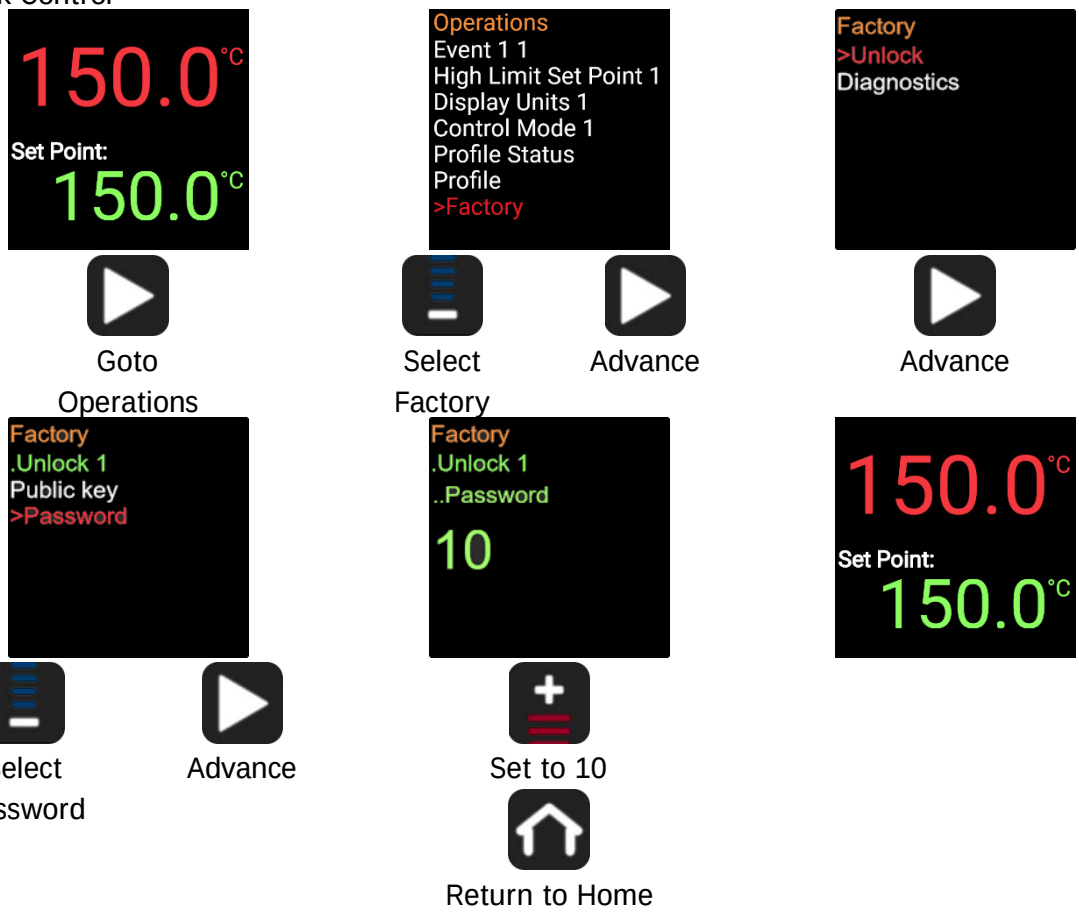
The controller display can show temperatures in either Celsius or Fahrenheit.



UNLOCK CONTROL

Caution: Unlocking the control grants access to configurations that, if adjusted improperly, could render the control non-functional or cause issues with the control and overall functions of the chamber. Exercise utmost caution to avoid making incorrect modifications. In the event that incorrect modifications are made, our customer service team will you help to the best of their ability. However, in the event that they are unable to rectify the issue, it might be necessary to remove the control and send it back to the factory for reprogramming. Please be aware that this could involve expenses that the customer will need to cover.

Unlock Control



Relocking the Controller

Once you have completed the secured process from the Operations menu, it is important to re-secure the controller. This can be done by simply switching the unit off and then turning it back on.

AUTO TUNING

The auto-tuning function runs the oven for a period of hours to optimize the controller PID parameters **when running the oven with a large volume or mass of product in the oven chambe**r. PID optimization is intended to be used if the oven temperature is lagging, overshooting, or failing to achieve the setpoint under the above conditions.

Auto tuning will not allow the oven to exceed its maximum specified heating rates. The oven will use the optimized PID settings until the controller is either tuned to different conditions or restored to its factory configuration.

Setting Up the Auto-Tune Conditions

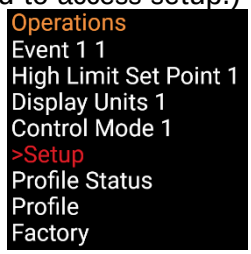
Prior to auto-tuning, set up the oven to match the conditions of your heating application.

- The oven should be turned off and resting at room temperature prior to starting the auto-tuning.
- Set the oven intake and exhaust vent to match your process configuration (closed, both open, one slightly open, etc.).
- Product or samples must be present in the chamber in the volume, mass, and distribution (spacing) of your recipe or heat application process.
    - Depending on the heat levels involved, temperature spikes may occur in the chamber. The manufacturer strongly recommends using wasting or sacrificial product for auto-tuning.

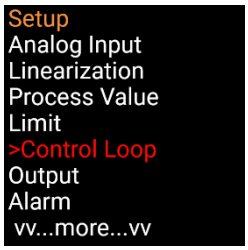
Carry Out the Auto Tuning

- Turn on the oven.
- Unlock Control (page 33)
- On the homepage, set the constant temperature set point to the temperature you wish to optimize for.
- Start Autotune (Control must be unlocked to access setup.)

Goto Operations

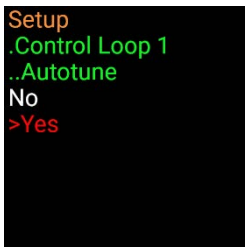


Select Setup — Advance



Select Control Loop 1 — Advance

Select Autotune — Advance



Select Yes — Return Home

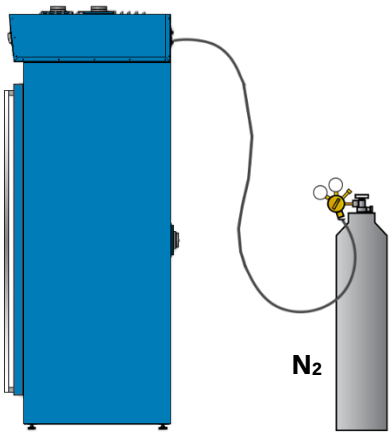
While Autotune is active, the Home screen will switch back and forth between the Tuning message and the Home Display.

The oven will increase to the set point and then decrease from it five times. The overall duration of the auto-tuning process varies based on the oven temperature and the mass of the product being heated.

To terminate Autotune before it finishes on its own, repeat the steps above and set Autotune to NO.

Note: The GN_2 purge is not intended to enhance air exchange rates or ventilation.

GN_2 PURGE OPTION



TFO ovens may be ordered with a gas nitrogen purge option. This is a special quote build and must be requested at the time of purchase, prior to construction of the oven.

Purpose

A GN_2 purge establishes an inert atmosphere in the oven chamber, preventing condensation, corrosion, or product oxidation. This is accomplished by forcing out oxygen (O_2), humidity, and airborne impurities both prior to heating and throughout the baking application. **The volume of nitrogen (N_2) required for a successful purge is 5 to 10 times that of the oven chamber volume.**

Process Summary

A flow of N_2 must be maintained during the heating application or treatment. This generates overpressure, which prevents infiltration by free atmosphere (room air). The nitrogen atmosphere and overpressure should be maintained until the heat load is below the oxidation temperature of your sample or product material for the final time in the process.

Nitrogen Gas Supply Requirements

- Your supply source and regulator should provide at least 80 psi of pressure.
- Minimum 100 Standard Cubic Feet per Hour (SCFH) of GN_2 flow.
- Recommended flow rate: 400 Standard Cubic Feet per Hour (SCFH).
- Gas Line Adaptor: The oven GN_2 port is a ¼ inch (~6mm) threaded pipe.

Asphyxiation Hazard!

The oven will leak significant GN_2 into the workspace area surrounding it during a purge. This creates an asphyxiation hazard for oven operators. **The area must be sufficiently ventilated**.

Le four libèrera la fuite de GN2 dans la zone de travail qui l'entoure pendant la purge. Cela crée un risque d'asphyxie pour les opérateurs de four. La zone doit être suffisamment ventilée.

- The onset of asphyxiation can be difficult to detect until personnel lose consciousness or suffer cognitive impairment.
- Ensure all areas in which expelled gas nitrogen is present are well ventilated with a **minimum** of 6 air changes per minute.
- Sufficient fresh air must be brought in with each air exchange to maintain a safe oxygen concentration in the workspace.

OPERATION

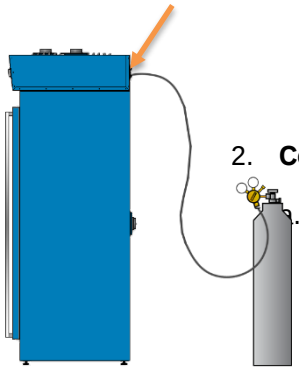
Set Up

1. **Close the oven vents.** Failure to close the vents compromises the integrity of the purge.

   a. Close both the intake and exhaust vents on the top of the oven.

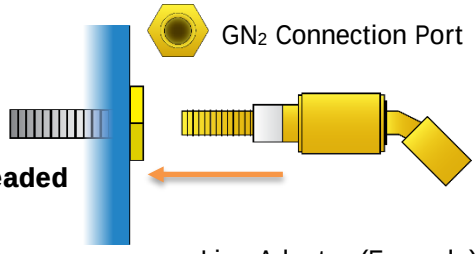
   b. Close the access port on the back of the oven.

All 3 vents fully closed.

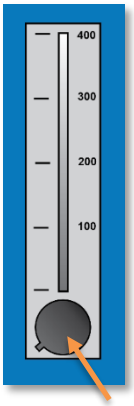


2. **Connect your nitrogen gas supply to the "GN2" connection port**.

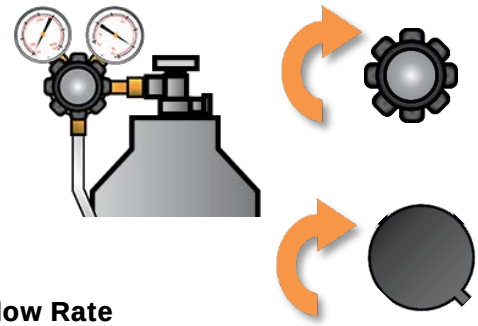
   a. The port is located on the back top on the of the oven at the left side.



Line Adaptor (Example)



3. **Set the supply regulator flow pressure to 80 psi**.



4. **Set the Flow Rate**

   a. 400 SCHF flow rate recommended.

Flow Rate Control

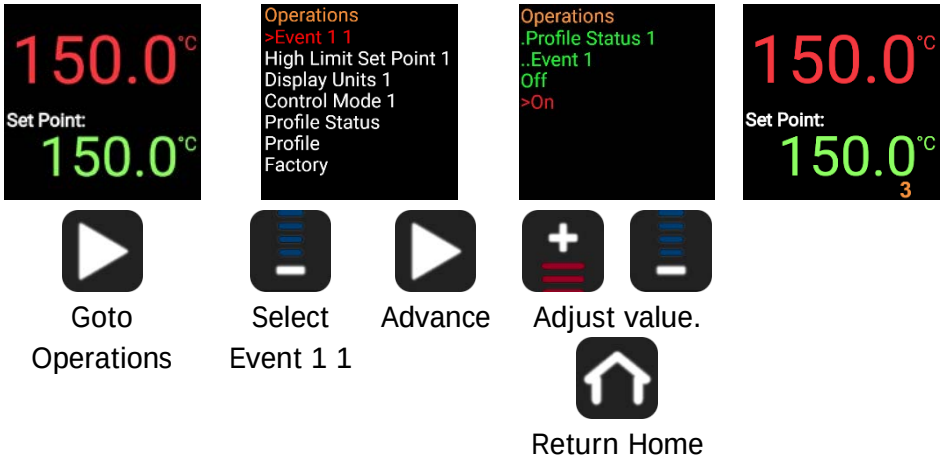
Note: When ending the purge, make sure to set the Flow Rate Control to zero **and** close the regulator on your supply source.

Initiating the Purge

There are two methods for starting the purge. Manually initiating by turning the Event 1 parameter to on, or by setting the Event 1 parameter to on when programming a heating profile so the port opens automatically when the profile is running.

Manual Mode

To manually initiate a flow of nitrogen into the oven chamber:



Note: In ovens with the GN_2 purge SQ option, the Event 1 parameter is repurposed to control the operation of a gas injection solenoid attached to the GN_2 port. It no longer controls the accessory power outlet.

Heating Profile Automatic Mode

Automatically initiates a flow of nitrogen into the oven chamber during a heating profile:

1. Turn on the oven.
2. Program your recipe or process in the controller as a heating profile.
    a. Starting with Step 1 of the profile, set the Event 1 Parameter to On.
    b. Allow sufficient time for the chamber to be purged before bringing the chamber up to the first of your heat treatment temperatures. A soak step with the oven set to room temperature can be used to accomplish this.
    c. Set Event 1 to on for each step until the oven cools down for the final time to a temperature that will not cause oxidation.
3. Launch the profile.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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.

- The oven chamber should be cleaned prior to first use.
- Periodic cleaning is required.
- Do not use spray-on cleaners or disinfectants. These can leak through openings and coat electrical components.
- Do not use cleaners or disinfectants that contain solvents capable of harming paint coatings, glass, 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 the material contained in it.

Warning: Exercise caution if cleaning the unit with alcohol or flammable cleaners. Always allow the unit to cool down to room temperature prior to cleaning and make sure all cleaning agents have evaporated or otherwise been completely removed prior to putting the unit back into service.

Avertissement: Soyez prudent lorsque vous nettoyez l'appareil avec de l'alcool ou des produits de nettoyage inflammables. Laissez toujours refroidir l'appareil à la température ambiante avant le nettoyage et assurez-vous que tous les produits de nettoyage se sont évaporés ou ont été complètement enlevés avant de remettre l'appareil en service.

Cleaning

1. Remove all removable chamber accessory items (shelves, racks, and any additional items), if present.
2. Clean the chamber interior with a mild soap and water solution, including all corners.
3. Take special care when cleaning around the temperature sensor probes. Do not clean the probes.
4. Clean all removable accessories and components.
5. Rinse the chamber surfaces and shelving with distilled water and wipe dry with a soft cloth. **Do not use deionized water.**

- Deionized water is an aggressive solvent that will attack most metals. Never use deionized water to clean your oven, even if it is readily available in your laboratory or production workspace.

DOOR GASKETS AND CHAMBER INTEGRITY

Periodically, inspect the door latch, trim, catch, and gasket for signs of deterioration. Failure to maintain the integrity of the door system shortens the life span of the oven.

These ovens use snap-in fiberglass door gaskets. The only tool required for swapping out these gaskets is a cutting implement for tailoring the length of the new gasket. Use proper PPE for handling exposed fiberglass when making the cuts.

ELECTRICAL COMPONENTS

Electrical components do not require maintenance. If the oven fails to operate as specified, please contact your Cascade TEK distributor or Customer Support for assistance.

DIAGNOSTIC QUESTIONNAIRE — HEATING ISSUES

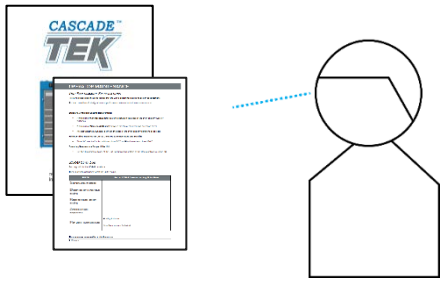
If the unit is experiencing heating issues, use this questionnaire to gather information on the unit prior to contacting Customer Support. Gathering and sharing this information aids Customer Support in making a timely and accurate remote diagnosis. Additionally, data logger files, as well as pictures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

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

Overview

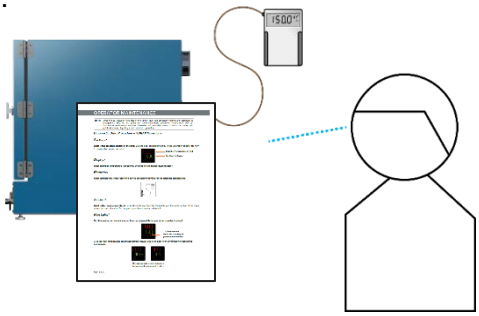
You will be performing the following tasks to gather onsite data:

1



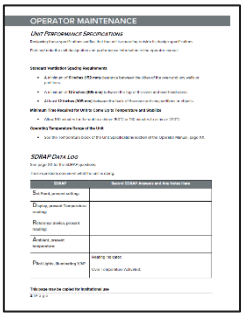
Reading the Unit Performance Specifications on page 42 and consulting the operation manual for answers.

2



Observing the unit in operation using the SDRAP diagnostic questions on page 45.

3



Recording your observations in the SDRAP Data Log on page 46.

4

Sharing the gathered information with Customer

Unit Model Information

Find the unit data plate (see page 11) 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 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.

Standard Ventilation Spacing Requirements

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

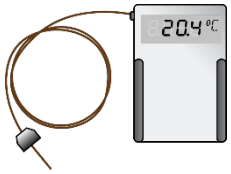
- A minimum of **6 inches (152 mm)** clearance is required between the sides of the oven and any walls or partitions.
- A minimum of **12 inches (305 mm)** between the top of the oven and overhead cover.
- At least **12 inches (305 mm)** between the back of the oven and any partitions or objects.

Operating Temperature Range of the Unit

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

- Find the Temperature Range specifications for the oven in the Unit Specifications chapter of the Operator Manual, page 50.

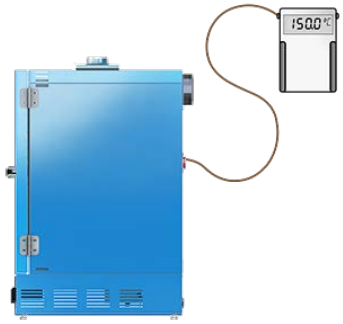
Optional: Obtain a temperature reference device. A calibrated digital thermometer with a thermocouple feedthrough. The device must be accurate to at least 0.1°C.



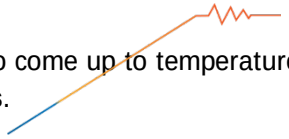
Before Starting

1. The unit must be connected to a power source that meets the requirements in the Installation chapter (page 16) and turned on.

2. Optional: secure the reference temperature device sensor probe at the center of the bottom shelf. Place the probe as close to the geometric center of the chamber as possible.



3. 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.

Diagnostic Data Procedure – SDRAP Questions

Record the answers in the log on page 46.

Setpoint?

What is the current temperature setpoint?

Chamber Temperature in Red

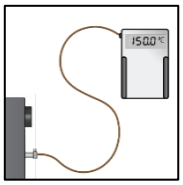
Set Point in Green

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?

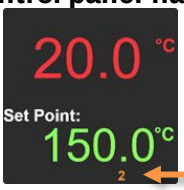


Ambient?

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" indicates the controller is calling for power to the element

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.

SDRAP Data Log

Record the SDRAP question answers in this log. These questions document the unit's behavior.

SDRAP	Record SDRAP Answers and Any Notes Here
Set Point, present setting:	
Display, present Temperature reading:	
Reference device, present reading:	
Ambient, present temperature:	
Pilot Lights, illuminating Y/N?	Heating Indicator:
	Over Temperature 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 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

SDRAP 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

End Diagnostic Data Procedure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UNIT SPECIFICATIONS

These ovens are 220 – 240 voltage single-phase units. Please refer to the oven data plate for individual electrical specifications.

Technical data specified applies to units with standard equipment at an ambient temperature of 25°C and a 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	Unit Weight
TFO-10	450 lb / 204 kg	357.0 lb / 163.0 kg
TFO-28	694 lb / 315 kg	569.4 lb / 258.3 kg

DIMENSIONS

By Inches

Model	Exterior W × D × H	Interior W × D × H
TFO-10	44.1 x 29.9 x 56.8	29.8 x 20.6 x 30.0
TFO-28	42.5 x 34.1 x 85.9	31.7 x 26.0 x 60.9

By Millimeters

Model	Exterior W × D × H	Interior W × D × H
TFO-10	1121 x 760 x 1442	757 x 524 x 762
TFO-28	1080 x 866 x 2182	805 x 660 x 1546

Unit SPECIFICATIONS

CAPACITY

Model	Cubic Feet	Liters
TFO-10	10.6	301
TFO-28	28.0	792

Shelf Capacity by Weight

Model	Per Shelf	Total
TFO-10	75 lb / 34 kg	225 lb / 102 kg
TFO-28	75 lb / 34 kg	450 lb / 204 kg

AIR FLOW PERFORMANCE

Ventilation Rates

Model	Cubic Feet per Minute @80°C	Liters per Minute @80°C
TFO-10	51	144
TFO-28	44	476

Air Changes per Hour

Model	@80°C
TFO-10	304
TFO-28	95

Air Flow Across the Shelf Space

Model	Linear Feet per Minute	Meters per Minute
TFO-10	144	43.9
TFO-28	476	145

TEMPERATURE PERFORMANCE

Range

Model	Range
TFO-10	Ambient +15°C to 306°C
TFO-28	Ambient +15°C to 306°C

Uniformity

Model	@80°C	@150°C	@306°C
TFO-10	1.5°C	2.5°C	5.5°C
TFO-28	1.5°C	2.5°C	5.5°C

Stability

Model	@80°C	@150°C	@306°C
TFO-10	± 0.2°C	± 0.3°C	± 0.4°C
TFO-28	± 0.2°C	± 0.3°C	± 0.4°C

Heat Up Times from Ambient (25°C)

Model	To 80°C	To 150°C	To 306°C
TFO-10	6 Minutes	14 Minutes	31 minutes
TFO-28	6 Minutes	15 Minutes	31 minutes

Temperature Performance Continued

Recovery Times from a 30 Second Door Opening

Model	@ 80°C	@ 150°C	@ 306°C
TFO-10	3 Minutes	3 Minutes	6 Minutes
TFO-28	3 Minutes	3 Minutes	5 Minutes

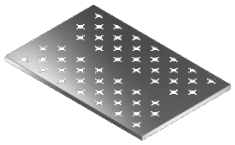
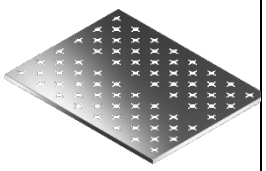
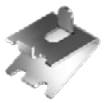
Recovery Times from a 60 Second Door Opening

Model	@ 80°C	@ 150°C	@ 306°C
TFO-10	5 Minutes	6 Minutes	10 Minutes
TFO-28	5 Minutes	5.5 Minutes	10 Minutes

POWER

Model	AC Voltage	Amperage	Frequency	Phase
TFO-10	220 – 240	26	50/60 Hz	1
TFO-28	220 – 240	50	50/60 Hz	1

REPLACEMENT PART LIST

Description	Parts Number	Description	Parts Number
Adjustable Leveling Feet	 **2700506**	Shelf Assembly, 19 x 29”, TFO-10	 **995-00007**
Door Gasket, fiberglass with clips, 1ft section TFO-10 requires 11.5 feet TFO-28 requires 17 feet	 **3450767**	Shelf Assembly, 23 x 31”, TFO-28	 **995-00005**
Power Exhaust Blower Unit 220 Volt, all models.	 **9990741**	Shelf Clip, 1	 **1250512**

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 oven with its correct part.

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

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