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)

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

Part number (Manual): 4861689

Revision: April 25, 2017

Cascade TEK is a brand of Sheldon Manufacturing, INC.

Safety Certifications

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

The units have been tested to the following requirements:

CAN/CSA-22.2 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 user manual may create a protection impairment by disabling or interfering with the unit safety features. This can result in injury or death.

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

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. Use only approved accessories.

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

INTRODUCTION

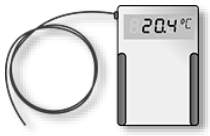
CONTACTING ASSISTANCE

Phone hours for Technical Support are 6 am – 4:30 pm Pacific Coast Time (west coast of the United States, UTC -8). Please have the following information ready when calling or emailing Technical Support: the **model number** and the **serial number** (see page 10).

EMAIL: support@cascadetek.com
PHONE: 888-835-9250
FAX: (503) 640-1366

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

TEMPERATURE REFERENCE SENSOR DEVICE



The oven does not come with a temperature reference device. A reference device must be purchased separately for performing in-house accuracy validations or calibration adjustments of the oven temperature display.

The device must be accurate to at least 0.1°C and should be regularly calibrated by a third party. For best results, use a digital device with one or more thermocouple probes. Remote readings eliminate chamber door openings and avoid subsequent waits for the chamber temperature to re-stabilize. Select probes suitable for the application temperature you will validate or correct the display accuracy at.

Alcohol thermometers are insufficient for conducting accurate validations and calibrations. Do not use a mercury thermometer. **Never place a mercury thermometer in the oven chamber.**

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.

RECEIVING YOUR OVEN

INSPECT THE SHIPMENT

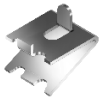
- When a unit leaves the factory, safe delivery becomes the responsibility of the carrier.
- Damage sustained during transit is not covered by the manufacturing defect warranty.
- Save the shipping carton until you are certain that the unit and its accessories function properly

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

1. Carefully inspect the shipping carton for damage.
2. Report any damage to the carrier service that delivered the unit.
3. If the carton is not damaged, open the carton and remove the contents.
4. The unit should come with an Installation and Operation Manual and a Programing Guide.
5. Verify that the correct number of accessory items have been included.
6. Save the shipping carton until you are certain the unit and its accessories function properly.
7. Carefully check all packaging for loose accessories before discarding.

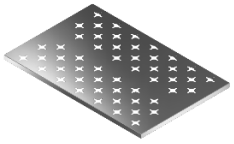
Included accessory items

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

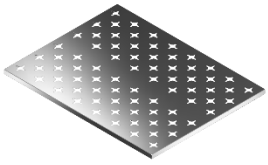


Shelves

TFO-10



TFO-28-2



ORIENTATION

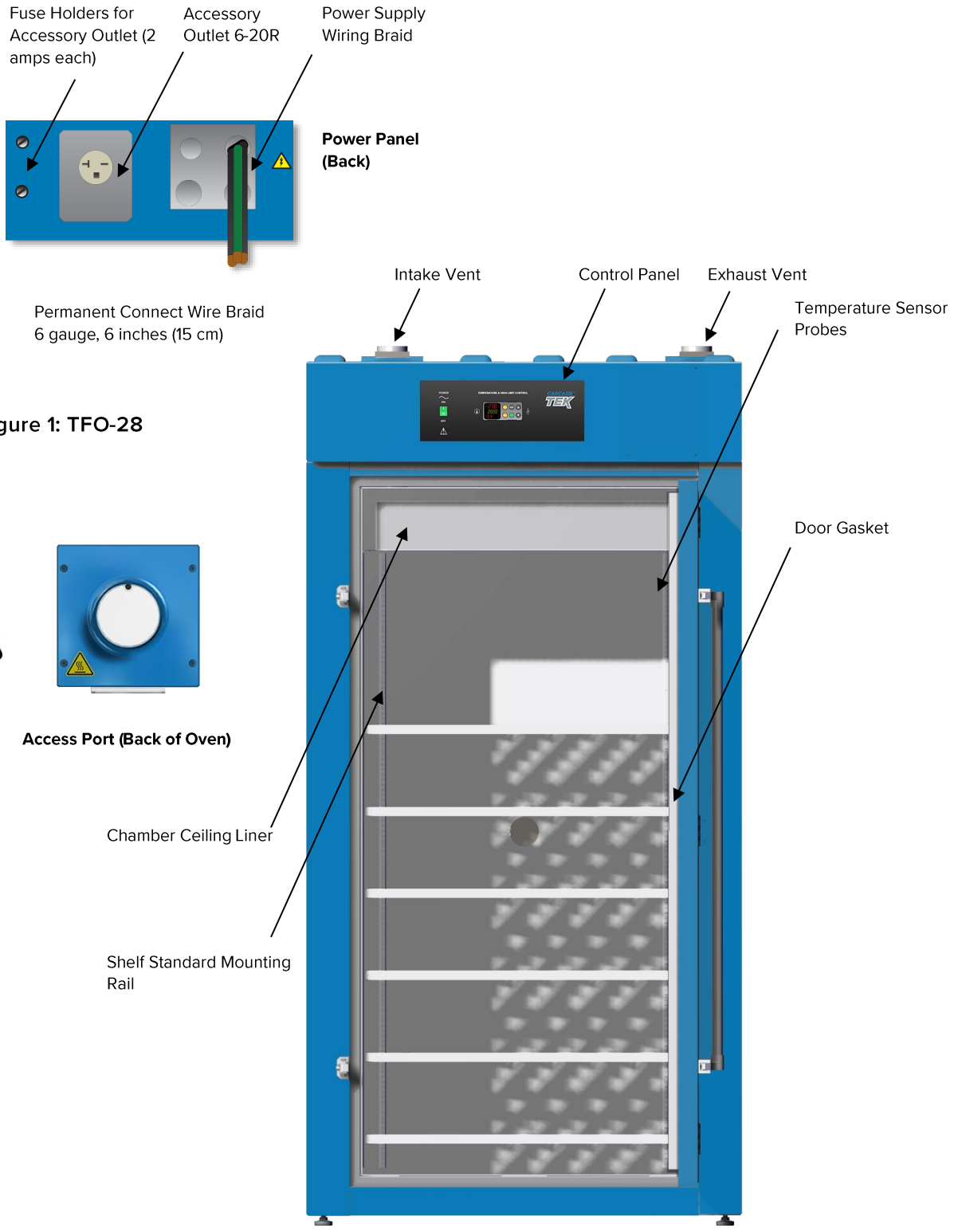
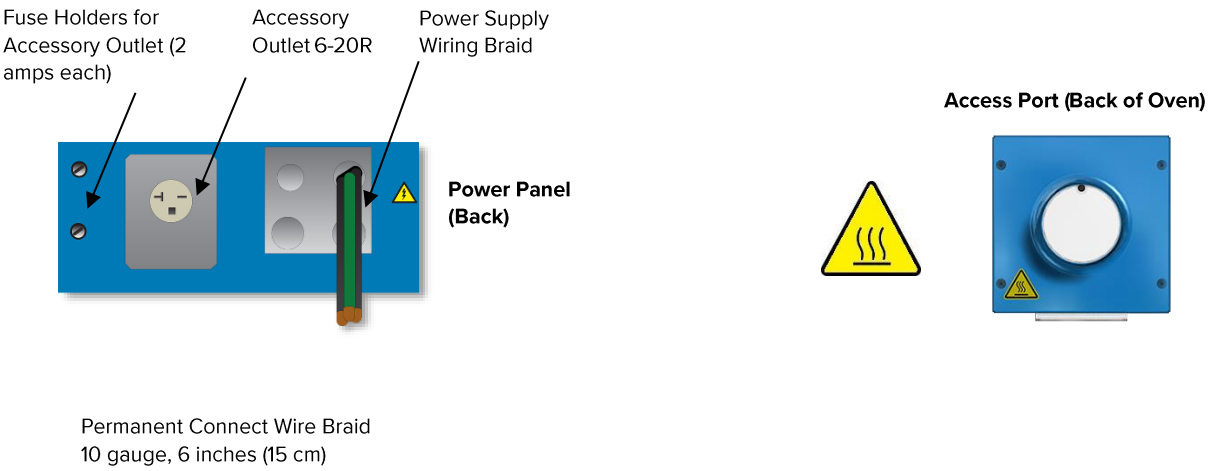
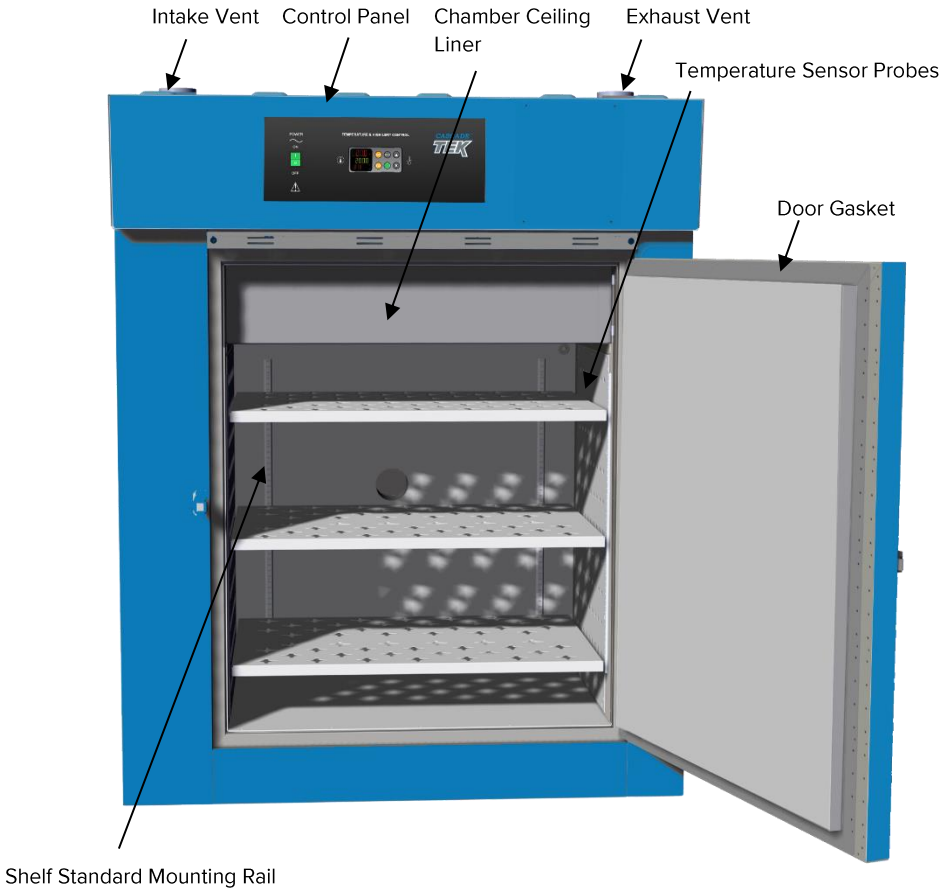


Figure 1: TFO-28

Figure 2: TFO-10





RECORDING DATA PLATE INFORMATION

Locate the data plate on the back of the oven next to the power inlet. The data plate contains the oven model number and serial number. Enter this information below for future reference.

Data Plate Information

Model Number	
Serial Number	

INSTALLATION

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 end-users.

INSTALLATION PROCEDURE CHECKLIST

Carry out the procedures and steps listed below to install the oven in a new workspace location and prepare it for use. All procedures are found in the Installation section of this manual.

Pre-Installation

- ✓ Check that the required ambient condition for the oven are met, page 14
- ✓ Check that the ventilation spacing clearance requirements are met, page 14
  - Unit dimensions may be found on page 38
- ✓ Check for performance-disrupting heat and cold sources in the environment, page 15
- ✓ Check that a suitable permanent connect electrical power supply is present, page 15

Install the Oven in a suitable workspace location

- ✓ Review the lifting and handling instructions, page 16
- ✓ Install the oven in its workspace location, page 16
  - 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 17
- ✓ Install the shelving in the oven chamber, page 18

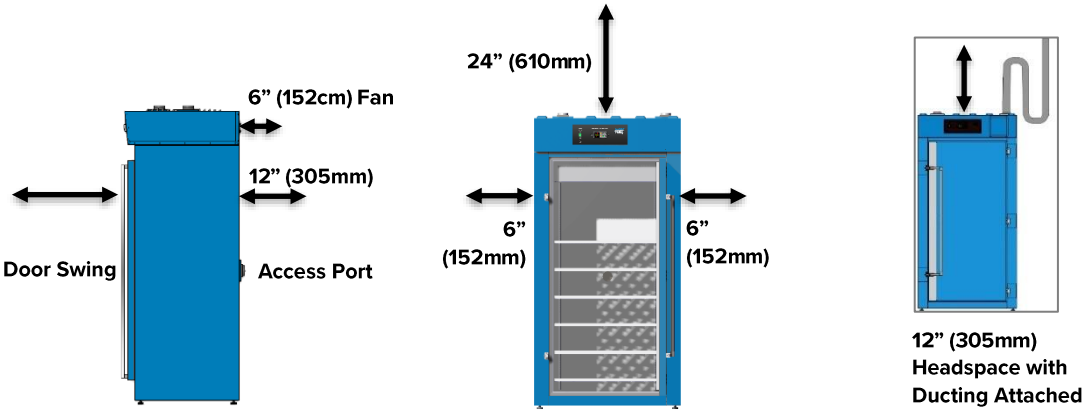
INSTALLATION

Required Ambient Conditions

These ovens are intended 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 the unit outside of these conditions may adversely affect its temperature range and stability. For conditions outside of those listed above, please contact your distributor to explore other oven options suited to your laboratory or production environment.

Required Clearances



These clearances are required for the oven to operate safely and meet its stated temperature specifications

- **12 inches (305mm)** of vertical headspace clearance will suffice if the oven exhaust is vented from the workspace through a duct or other channeling.
    - Otherwise, **24 inches (610mm)** 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 (152cm** 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.

ENVIRONMENTAL DISRUPTION SOURCES

When selecting a location to install the unit, consider all environmental conditions that can affect its temperature performance. For example:

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

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 a 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.

Continued next page

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 (15 cm) wire braid consisting of:

- TFO-10 – two 10-gauge hot wires and a 10-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

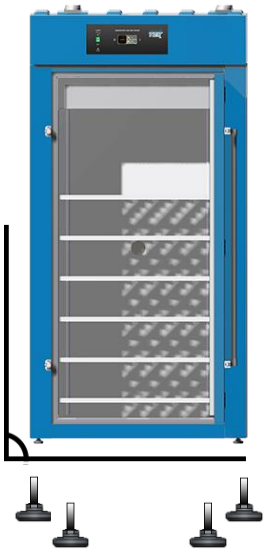
The oven is heavy. Use appropriate lifting devices that are sufficiently rated for these loads. Follow these guidelines when lifting the oven:

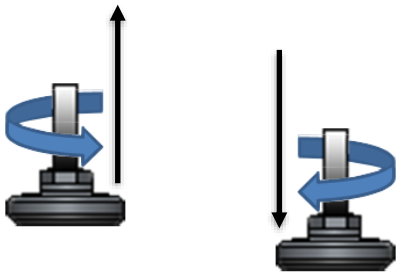
- Lift the oven only from its bottom surface.
- Doors, handles, and knobs are not adequate for lifting or stabilization.
- Restrain the oven completely while lifting or transporting so it cannot tip.
- Remove all moving parts, such as shelves and trays, and lock the door in the closed position during 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 four 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 and Disinfecting** topic in the User Maintenance section (see page 35) 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.

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 equal height from the oven chamber floor.
2. Place the shelf on the clips.

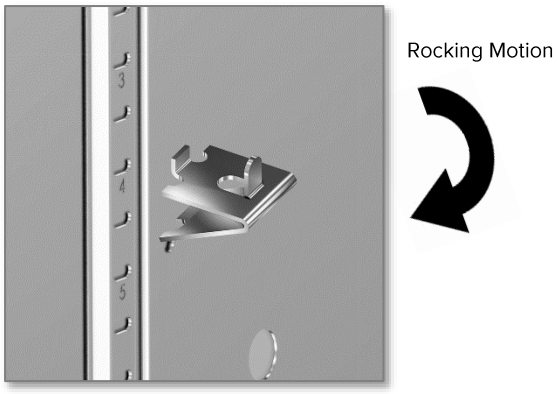


Figure 3: Installing Shelf Clip

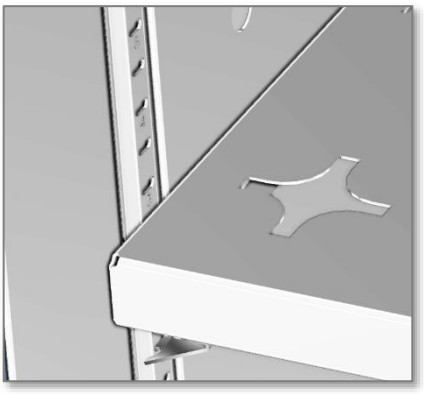
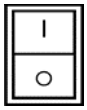


Figure 4: Shelf Set on Clips

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 user manual.

Symbol	Definition
	Consult the user 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. Reycle l'unité. Ne jetez pas dans une décharge.

GRAPHIC SYMBOLS

CONTROL PANEL OVERVIEW

Figure 5: Control Panel and Controller

Power Switch

The self-illuminating main power switch controls all power to the oven and its systems. The switch must be in the (I) on position for the unit to function.

Temperature Controller - Display on Homepage

Top Line (Red): Present chamber air temperature

Middle Line (Green): Active temperature set point (constant or profile)

Bottom Line: Flashing "2" indicates active heating

While on the Homepage, the **Up** and **Down arrow** buttons adjust the constant temperature set point. Pressing and holding both buttons jumps from the homepage to the Operations menu, if the controller has been unlocked to perform a calibration.

The green **Advance** button scrolls forward through menus and parameters lists when programming heating recipe profiles or performing a temperature calibration. On the homepage, it scrolls through operating parameters such as the unit of temperature display (°C or °F) or profile start.

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

The EZ1 button launches heating Profile 1. Pressing EZ1 again while running aborts Profile 1 (see the **Programmed Operations section** on page 28).

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

CONTROL PANEL OVERVIEW

OPERATION

Safe operation of the oven is dependent on the actions and behavior of the oven operators. **Operating personnel must read and understand the Operating Precautions in this section prior to operating the oven.** The operators must follow these instructions to prevent injuries and to safeguard their health, environment, and the materials being treated in the oven, as well as to prevent damage to the oven. Failure to adhere to the 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 gasses, 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 risk to burn.

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

THEORY OF OPERATIONS

Heating

When powered, the TFO oven heats the oven chamber atmosphere to the current constant temperature set point. The constant temperature set point, shown on the controller homepage, can be adjusted by the end-user using the temperature arrow controls on the oven control panel. The oven can also be programed with multi-step automated heating recipe profiles. When launched, a profile overrides the constant temperature set point. In its default setting, the oven resumes heating to the constant temperature set point after a profile completes or is aborted.

The oven temperature controller stores the constant temperature set point and 40 programmable heating profile recipe steps. The steps come allocated to 4 ten-step profiles, but successive profiles may be combined to run sequentially as one profile. Step types include timed-interval ramping (heating or cooling), soaking (constant temperature), and ending states. Please see the **Programed Operations** section on page 28 and the *Watlow EZ-Zone Profile Programing Guide* for more details.

Along with storing set points and profile steps, the temperature controller monitors the oven chamber air temperature using a solid-state probe located in the airstream on the right wall of the chamber. When the processor detects that the chamber temperature has dropped below the currently active temperature set point, it pulses power to a heating element in a recirculation air duct space located above the oven chamber.

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 set point to avoid overshooting.

TFO ovens rely on natural heat radiation for cooling.

When the oven is powered, the chamber air temperature cannot operate below the ambient room temperature **plus** the internal waste heat of the oven. Waste heat is generated primarily by the operation of the blower fan motor and the resulting air compression in the duct spaces. In practice, the lowest operational chamber temperature is ambient +15°C.

The heating rates given in unit specification section of this manual are for a 25°C environment. The ambient temperature of the workspace around the oven affects its heating and cooling performance.

Air Circulation

The TFO 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 upward into a heating duct by the action of the blower fan. The oven is intended to be run as a closed air-cycle system.

Vents – Intake and Exhaust

The oven is provided with an intake 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 a user-programed heating recipe profile or can be activated from the homepage options when the oven is 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

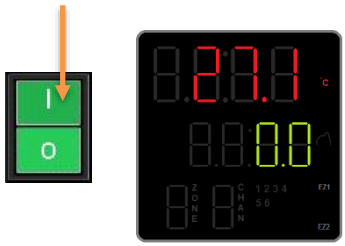
The temperature controller contains a heating cutoff system with independent circuitry connected to a redundant solid state temperature sensor probe inside the oven chamber. This high limit system depowers the oven heating elements whenever the chamber air temperature exceeds to the current limit setting.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

The high limit is set by the end-user to a minimum of 5˚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

Carry out the following steps and procedures to put the oven into operation after installing it in a new workspace environment.

1



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

Carry out the following procedures found in the Operation section:

- **Set the Temperature High Limit** for your application, page 27.
- **Optional:** After setting the High Limit, you may set the constant temperature set point to a warm-up temperature or to your constant temperature baking set point. Read **Set the Constant Temperature Set Point**, page 28
- Read the Programing Profile Guide that came with the unit if will you will be programming multi-step automated heating recipes to run the oven with.

End of Put the Oven into Operation

SET THE HIGH TEMPERATURE LIMIT

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

The high temperature limit is set by the end-user, typically at 5°C above the highest temperature the oven will run at during your recipe profile or constant-temperature application.

1. Advance to the Limit High Set Point, starting from the Homepage

Push Advance Multiple Times

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

2. Adjust the high limit to at least 5°C above the highest temperature of your application

Adjust

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

3. Save the new Limit High Setting

Push

- The top display (red) will show “SAFE”, indicating that the temperature limit has been saved

4. Return to the Homepage

Push Reset

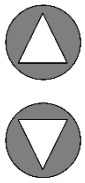
- Returned to Homepage

End of Procedure

CASCADE™ TEK

SETTING THE CONSTANT TEMPERATURE SET POINT

1. Adjust the constant temperature set point on the home page



Adjust

- Do not exceed the high limit temperature set point.

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

2. Release the Arrow buttons after adjusting the Set Point

Oven Heating

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

HEATING PROFILES

Please see the *Programing Guide – Watlow EZ-Zone 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.

HIGH TEMPERATURE LIMIT ACTIVE

If the oven chamber temperature exceeds the present high temperature limit setting, the limit system will depower the heating element. This is accompanied by a loud "click." The controller display will flash two alternating alert screen, fail and the homepage with the set point set to off. An illuminated "4" on the bottom-most display block indicates that the high limit circuitry has depowered the heating element.

Alternating HL Alert Screens

The high temperature limit activates if one of three events happens.

- The high limit is set below or too near the currently active heating profile set point or the constant temperature set point.
- An outside temperature source or a heat source in the oven chamber is pushing the oven temperature above the limit setting.
- The main controller circuitry or sensor probe have failed and must be replaced in order to maintain safe oven operations.

During the latter two causes, the red oven chamber temperature will be higher than the green set point. If you suspect an ignition event in the oven chamber or hardware failure, **turn off the oven and wait for the oven to cool to room temperature before opening chamber door.** Contact **Technical Support** for assistance.

Restoring Heating

If the High Limit is set below or within 4°C of the current set point, perform the following steps to take the unit out of the protective heating cutoff:

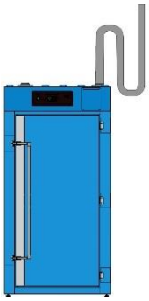
1. Push the green Advance button until Ignore "i9nr" shows in the top display and Limit High "Lih1" in the green display.

2. Push the Advance button again.
   - Limit High Set Point "LhS1" will now show in the green display, and the High Limit temperature setting in the red top display. The display will resume alternating until you begin adjusting the limit setting.

3. Adjust the limit setting to +5°C above the application set point using the Up Arrow button.
   a. If the Limit was already set +5°C above the set point, raise the Limit to 6 or 7 degrees. Ambient temperature stability issues may be briefly pushing the chamber temperature over the +5°C limit.

4. Push the Reset button to save the new setting and return to the homepage.
5. Monitor the oven to see if the high limit trips with the new, higher setting.
   a. Contact Technical Support if the high limit continues to cutoff heating to the oven chamber.

CASCADE TEK



Positive Exhaust Venting

Exhaust ducting can be connected to the oven exhaust port in order 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 exhasut 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.

Turning on the Power Exhaust – Constant Temperature Set Point


x8

1. Advance to the homepage Event parameter.
    a. Starting on the homepage, press the Advance button 8 times Until the green mid-line reads “Ent 1”.

2. Turn on the blower.
    a. Use the Up or Down arrow button to change the red top-line display from off to on.
    - The blower power outlet will turn on after approximately 2 seconds, indicated by the Red “3” light

3. Press the Reset button to return to the homepage.
4. To turn off the blower, advance to the Event parameter again and change the setting from on to off.

DATA PORT

The 21-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 21-pin RS485-to-USB converter cable and driver software.

Applications and Utility Software

- **National Instrument LabView** and **Watlow Specview** — Temperature monitoring and data logging in graphical user interface environments.
- **Watlow's EZ Zone™ Configurator** — Programing 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 programed 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.

1. From the homepage, advance to the "C_F1" unit of measurement option.
    a. Press the green Advance button 7 times.

2. Change the unit of measurement.
    a. Use the Arrow button to change the parameter on the top display line. "C" is Celsius and "F" Fahrenheit.

3. After changing the Unit parameter, return to the homepage.
    a. Press the Reset button.

CASCADE™ TEK

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 set point 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 the auto tuning.

Carry Out the Auto Tuning

1. Turn on the Oven
2. On the homepage, set the constant temperature set point to the temperature you wish to optimize for.
3. Advance to the “Aut1” Auto Tune parameter from the homepage using the Advance button.
4. Use the arrow button to switch “no” to “YES”.
    a. After approximately 4 seconds the display will start to flash the Auto tuning “Attn” alert message.
5. Use the Reset button to return to the homepage.
6. The oven will ramp up to and then down from the set point 5 times.
    - The total auto tuning time is dependent on the oven temperature and product mass being heated.

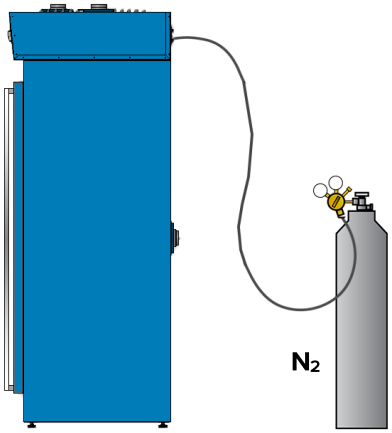
Auto Tuning

Tuning Launched

Tuning Alert

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.

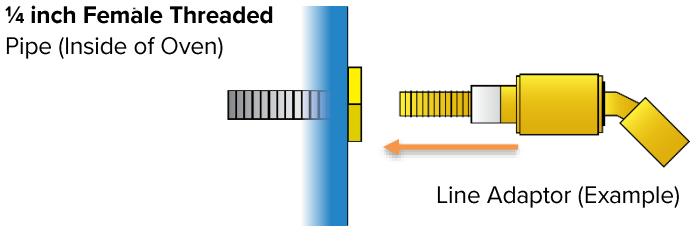
Purpose

GN_2 purges generate an inert atmosphere in the oven chamber, preventing condensation, corrosion, or product oxidation during a heat application. This is accomplished through purging out oxygen (O_2), humidity, and airborne impurities prior to the start of heating. As a rule of thumb, the volume of nitrogen (N_2) required for a successful purge is 5 to 10 times that of the oven chamber volume. Failure to complete the purge cycle before applying heat may result in oxidation.

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.

Gas Connection Port

Located on the back of the oven at the top.



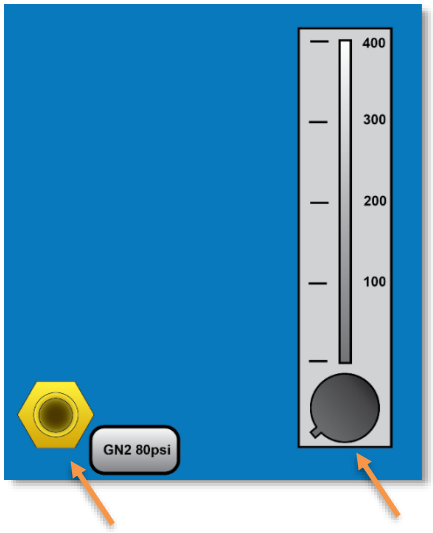
Gas Flow Requirements

- Minimum 100 Standard Cubic Feet per Hour (SCFH).
- The supply should be rated to at least 80psi.

During the purge cycle the following flow rates are recommended:

- The TFO-10 and TFO-28 require **400 SCFH**

Example control panel. Actual configuration may vary.



GN_2 Connection Port Flow Rate Control

Set Up

1. Close both the intake and exhaust vents on the oven.
   a. Failure to close the vents compromises the integrity of the purge.
2. Connect the nitrogen gas supply to the GN2 connection port.
3. Set the supply regulator flow pressure.
4. Set the oven gas flow rate using the flow rate control.
5. Open the supply source valve to start a flow of nitrogen to the oven GN2 port.

Manual Mode

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


x8

1. Starting on the homepage, press the Advance until Event 1 parameter (ENT1) shows on the display.

2. Use the Arrow keys to turn the Event 1 from Off to On.
   a. This opens the GN_2 port.

3. Return to the homepage using the Reset button.
4. Turning the Event 1 parameter to off will close the oven GN_2 port.

GN_2 Port Open

Automatic Mode

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

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.

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.

Warning: Prior to maintenance or service on this unit, disconnect the power feed from the power supply.

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

CLEANING AND DISINFECTING

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

- The unit 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.
- Consult with the manufacturer or their agent if you have any doubts about the compatibility of decontamination or cleaning agents with the parts of the equipment or with the material contained in it.
- Do not use cleaners or disinfectants that contain solvents capable of harming paint coatings or stainless steel surfaces. **Do not use chlorine-based bleaches or abrasives; these will damage the chamber liner.**

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

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

Cleaning

1. Disconnect the unit from its power supply.
2. Remove all removable interior components such as shelving and accessories.
3. Clean the unit with a mild soap and water solution, including all corners.
    - **Do not use an abrasive cleaner**, these will damage metal surfaces.
    - **Do not use deionized water to rinse or clean with!**
    - Take special care when cleaning around the temperature sensor probes in the chamber to prevent damage. Do not clean the probes.
4. Rinse with distilled water and wipe dry with a soft cloth.

Disinfecting

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

Keep the following points in mind when disinfecting the oven:

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

Door 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

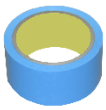
Electrical components do not require maintenance. If the oven fails to operate as specified, please contact your Cascade TEK distributor or Technical Support for assistance.

CALIBRATING THE TEMPERATURE DISPLAY

Note: Performing an accurate calibration of the temperature display requires a temperature reference device. Please see the **Reference Sensor Devices entry** on page 8 for the minimum device requirements.

Temperature calibrations match the temperature display to the actual air temperature inside the oven chamber. The actual air temperature is supplied by a reference sensor device. Calibrations compensate for software drifts in the controller as well as deviations caused by the natural material evolution of the sensor probe in the heated chamber space. Calibrate as often as required by your laboratory or production protocol, or regulatory compliance schedule. Always calibrate to the industry or regulatory standards required for your application.

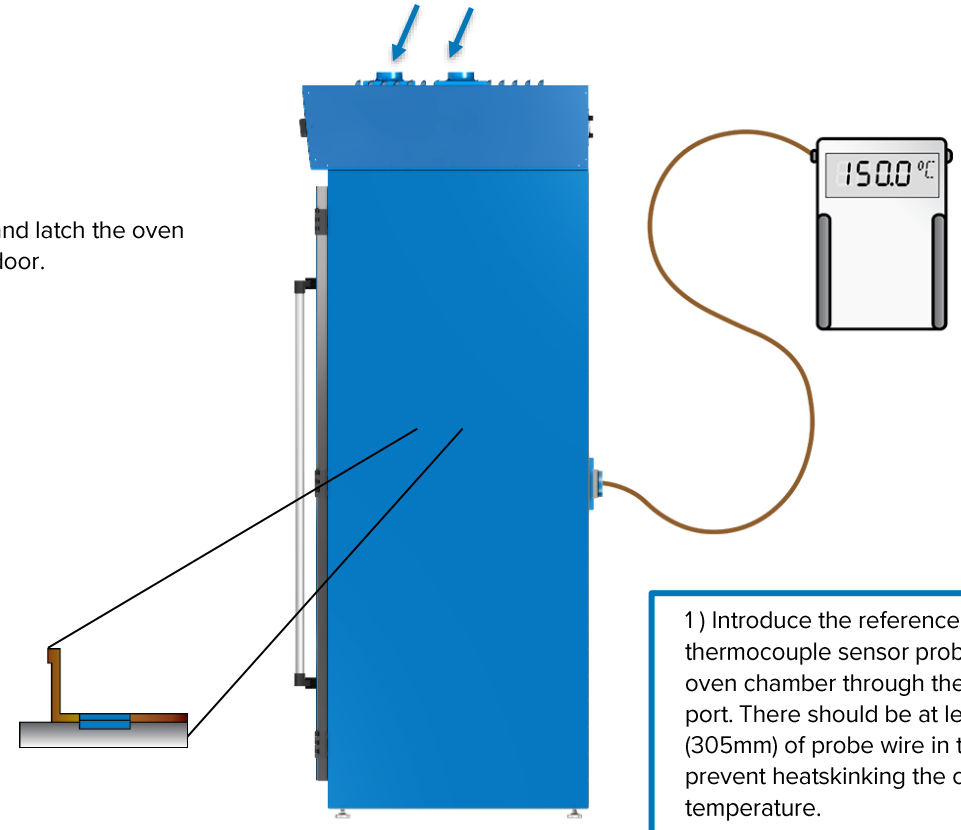
A Suggested Calibration Set Up



Heat-resistant non-stick tape recommended

5) The intake and exhaust vents should **both** be closed to ensure an accurate calibration

4) Close and latch the oven chamber door.



1) Introduce the reference device thermocouple sensor probes into the oven chamber through the rear access port. There should be at least 12 inches (305mm) of probe wire in the oven to prevent heatskinking the outside temperature.

2) Carefully close port slider. Leaving a ¼ inch gap (6mm) is acceptable when wire probes are in the port and should not interfere with the verification accuracy. The chamber air pressure is close to neutral while the oven is in operation, limiting the exchange with cooler external atmosphere.

3) Place the sesnor probes in the oven with the probe heads at least at least 2 inches (5cm) from the surface of the shelving or walls to prevent heatsinking. Secure with non-stick, heat-resistant tape.

If using a single thermocouple, place the sensor probe head as close to the geometric center of the oven chamber as possible.

6) Heat up and stabilization period: The oven temperature must be stable at temperature in order to perform an accurate calibration. The temperature is considered stabilized when the oven chamber has operated at your calibration temperature for at least 30 minutes with no fluctuations of **±0.2°C or greater** when the oven is running at **80°C**, **±0.3°C or greater at 150°C**, or **±0.4°C or greater at 306°C**.

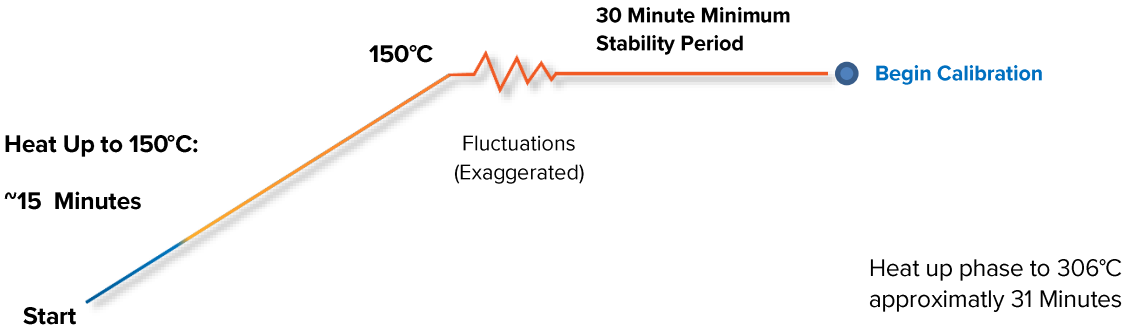


Figure 6: Oven Chamber Heat Up and Stabilization Phases

Suggested Calibration Procedure

1

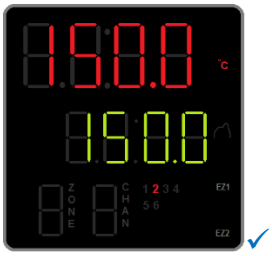
Once the chamber has stabilized, compare the reference temperature device and chamber temperature display readings.

a. If the readings are the same, or the difference between the two falls within the acceptable range of your protocol, the display is accurately showing the chamber temperature. **The Temperature Calibration procedure is now complete**.

-OR-

b. See Step 2 if a difference falls outside the acceptable range of your protocol.

Reference Device



2

The display requires a calibration adjustment.

- The difference between the reference device and the display is an **offset value**.
- Examples of offset values:

Reference Sensor Reading	Oven Temp. Display	Offset Value
152.0°C	150°C	2
149.1°C	150°C	-0.9
148.0°C	150°C	-2

- **Note the offset value for use in Step 5.**

Reference Device

Continued next page

Calibration continued

3

Unlock the controller.

a. See the Unlocking procedure on page 41.

Note: The temperature controller must be unlocked in order to access the Operations menu and enter a calibration offset.

4

Jump to the Operations menu after unlocking the controller.

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

b. Release the buttons when “A1” appears on the top display line and “oPEr” appears in the mid display line.

Operations Menu

5

Advance through the Operations menu options to the Temperature Calibration offset parameter.

a. Push the green **Advance button** repeatedly unit “i.CA” appears in the green mid display line and a number value in the red top line.

6

Adjust the number value in the top display line to match the offset value from step 2, using the arrow buttons.

7

Save the calibration offset and return to the homepage.

a. Push the Reset button three times so the display shows the homepage.

- The oven will begin to heat or passively cool to reach the current set point using the offset display value for the current temperature.

Continued next page

CASCADE TEK

Calibration continued

8

Allow the oven to stabilize after achieving the temperature set point using the offset display value.

Note: The unit is stabilized when no fluctuations are detected of **±0.2°C or greater** when the oven is running at **80°C, ±0.3°C or greater at 150°C**, or **±0.4°C or greater at 306°C**.

9

Once the chamber has stabilized, compare the reference temperature device and oven temperature display readings.

Reference Device

a. If the readings are the same or the difference between the two falls within the acceptable range of your protocol, the display is accurately showing the chamber temperature. **The calibration procedure is now complete**.

-OR-

b. See step 10 if the difference falls outside the acceptable range of your protocol again.

10

Repeat steps 2 – 9 up to two more times. You may skip Step 3 by leaving the controller unlocked until the unit is successfully calibrated.

Reference Device

- Three calibration attempts may be required to successfully calibrate ovens that are more than ± 2°C out of calibration.

Note: Always relock the temperature controller after a successful calibration has been carried out. This safeguards against a user accidently changing the controller configuration file and interfering with the functionality of the unit.

If the temperature reading difference still falls outside your protocol after three calibration attempts, contact your distributor or **Technical Support** for assistance.

End of procedure

UNLOCKING THE TEMPERATURE CONTROLLER

The oven temperature controller is software locked at the factory to ensure the integrity of its configuration file. This safeguards against end-users accidently altering the oven functionality or safe operating bounds.

The controller must be unlocked in order to access the Operations menu and enter calibration offsets.

Backing Up the Configuration File

The manufacturer recommends saving the controller configuration file prior to making any changes to Operations options. See the Configurator software description in the **Data Port entry** on page 31. This will allow you to restore the configuration file in the event a change is made that adversely affects the operation of the oven.

1

Both

Jump to the Lock menu

a. Press and hold **both** the **Reset** and **Advance** buttons for approximately 8 – 9 seconds.

Note: If the top red line shows the “CUSt” Custom option, use the Up or Down arrow keys to scroll to the “Loc” Security Setting option. Then press the Advance button as per Step 2.

2

Advance to the lock “LoC.o” parameter.

a. Push the Advance button once.

3

Adjust the LoC.o setting from 3 to 2

a. Use the **Down** arrow button.

Continued next page

Unlocking the Controller Continued

4

Advance to the second security parameter, “LoC.P”.

a. Push the Advance button once, saving the previous parameter and advancing to the next parameter.

5

Adjust the LoC.P setting from 2 to 3.

a. Use the Up arrow button.

6

Advance twice. Skip through the “PAS.E” Password Enable parameter to “rLoc”, leaving “PAS.E” set to Off.

x2

a. Press the Advance button twice.

Leave set to Off

7

Adjust the rLOC parameter from 2 to 5.

a. Use the Up arrow button.

8

Advance to the “SLOC” Write Security parameter.

a. Press the Advance button once.

Continued next page

Unlocking the Controller Continued

9

Change the "SLoC" parameter from 2 to 5.

a. Use the Up arrow button.

10

Return to the homepage to access the now unlocked Operations page.

x2

a. Push the Return button twice.

Relocking the Controller

Always relock the controller after completing a calibration or other Operations menu procedure.

- To relock controller, repeat the Unlocking procedure, only this time **restore** all of the Security lock parameters to the locked settings.
- When first jumping from the homepage to the Factory menu to relock the controller, the red top display line will show the "CUSt" Custom option.
- Use the arrow keys to scroll to the "LoC" Security option, then press the Advance button as per Step 2 and carryout the rest of the procedure.

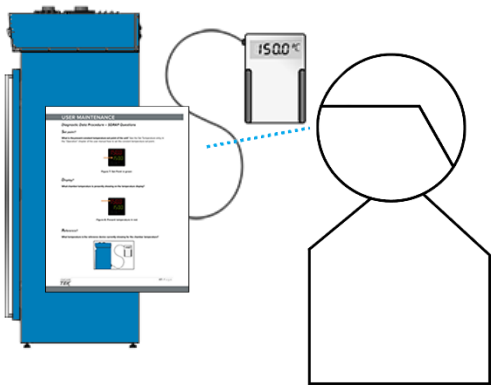
Parameter	Locked	Unlocked	Parameter Function
LoC.o	3	2	Operations Page
LoC.P	2	3	Profiling Page
PAS.E	Off	Off	Password Enable
rLoC	2	5	Read Lock
SLoC	2	5	Write Security

DIAGNOSTICS - HEATING ISSUES

If the unit is experiencing heating issues, use the following guide to gather information on the unit, prior to contacting Technical Support. Gathering and sharing this information with Tech Support significantly increases the chance a service technician will be dispatched with the parts needed to fix your unit during their first visit.

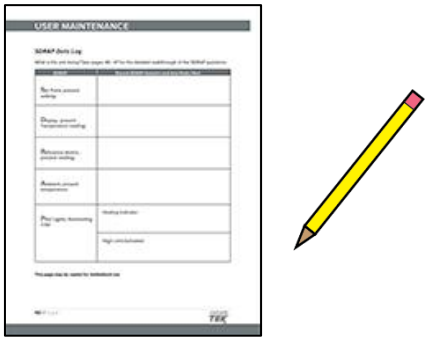
Steps

1



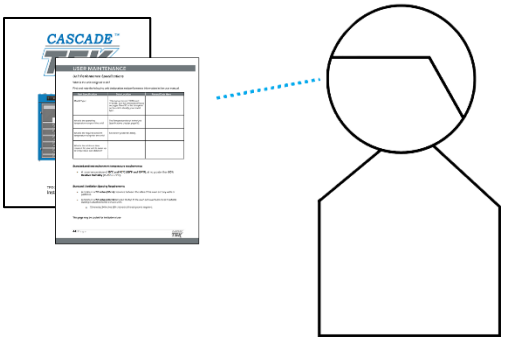
Read the SDRAP diagnostic questions on pages 49 and 50 and observe the unit in operation.

2



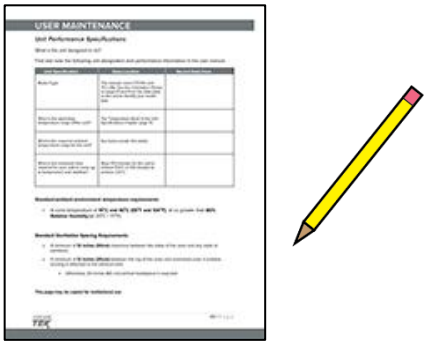
Record the observations in the SDRAP Data Log on page 45.

3



Read the Unit Performance Specification questions on page 46 and consult the user manual for answers.

4



Record the answers in the Unit Specifications Log on page 46.

5 **Share this information with Tech Support!**

SDRAP Data Log

What is the unit doing? See pages 49 - 50 for the detailed walkthrough of the SDRAP questions.

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:
	High Limit Activated:

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Unit Performance Specifications

What is the unit designed to do?

Find and note the following unit designation and performance information in the user manual.

Unit Specification	Data Location	Record Data Here
Model Type:	This manual covers TFO10s and TFO-28s. See the Orientation Photos on pages 11 and 10 or the data plate on the unit to identify your model type.	
What is the operating temperature range of the unit?	The Temperature block in the Unit Specifications chapter, page 55.	
What is the required ambient temperature range for the unit?	See below (under this table).	
What is the minimum time required for your unit to come up to temperature and stabilize?	Allow 15 minutes for the unit to achieve 150°C or 31 minutes to achieve 306°C.	

Standard ambient environment temperature requirements:

- A room temperature of **15°C and 40°C (59°F and 104°F)**, at no greater than **80% Relative Humidity** (at 25°C / 77°F).

Standard Ventilation Spacing Requirements

- A minimum of **12 inches (30cm)** clearance between the sides of the oven and any walls or partitions.
- A minimum of **12 inches (30cm)** between the top of the oven and overhead cover if suitable ducting is attached to the exhaust vent.
    - Otherwise, **24 inches (60 cm)** vertical headspace is required.

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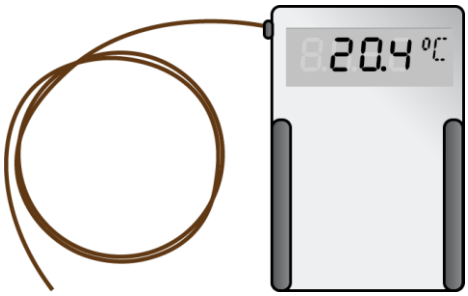
Required Items

You must have the following items on hand to answer the diagnostic questions.

A temperature reference device – A calibrated digital thermometer with at least one thermocouple sensor probe. The device must be at least accurate to 0.1°C.

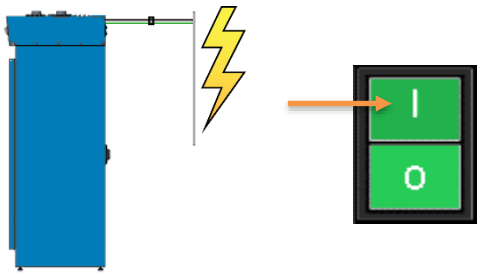


A copy of the user manual for the unit – Must be available in the same room as the unit for use.

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

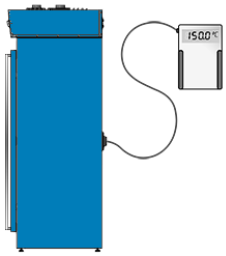
Before Starting

1. The unit must be Connected to a power source that meets the requirements in the Installation chapter (page 15) and turned on.

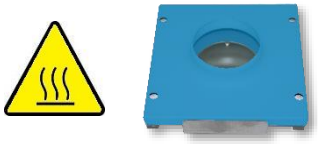


2. At least one reference temperature device sensor probe must be placed in the chamber.

    - See the probe placement suggestions in the **Temperature Display Calibration procedure** on page 37.



3. The oven chamber door must be closed and latched. The intake and exhaust vents must both be closed.



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

- Allow 15 minutes for the unit to achieve 150°C or 31 minutes to achieve 306°C from room temperature.
- Start the "Diagnostic Data Procedure" when the allotted time has passed, **even if the unit fails to achieve the set point temperature**.

Diagnostic Data Procedure – SDRAP Questions

Set point?

What is the present constant temperature set point of the unit? See the Set Temperature entry in the "Operation" chapter of the user manual how to set the constant temperature set point.

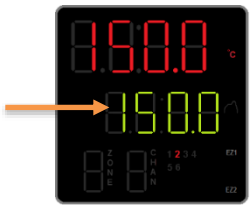


Figure 7: Set Point in green

Display?

What chamber temperature is presently showing on the temperature display?

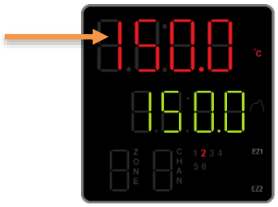
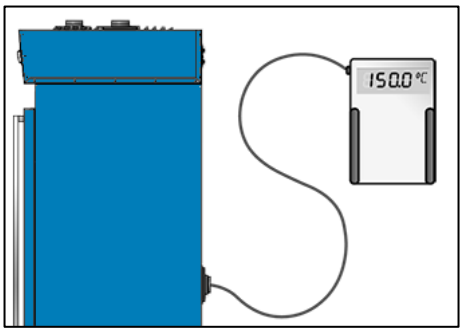


Figure 8: Present temperature in red

Reference?

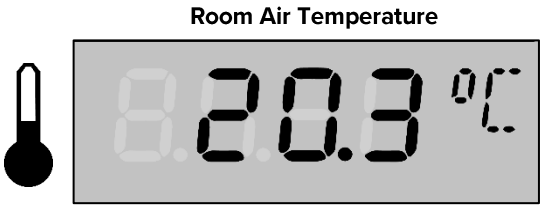
What temperature is the reference device currently showing for the chamber temperature?



Ambient?

What is the room temperature?

- For best results, measure the temperature in the same section of the room where the unit is located, but do not place your thermometer on the unit!



Pilot Lights?

1) Is the heating active indicator on the control panel flashing or otherwise illuminating.

Figure 9: Heating Indicator

2) Is the high limit heating cutoff activating? Answer yes if the limit is on continually or activating periodically.

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

Share!

Share the SDRAP and Unit Specifications data with Technical Support. This data is crucial for offsite personnel making accurate remote diagnoses. The information is used to help ensure service techs are dispatched with the tools and parts needed to fix your unit during their first visit.

Facilities Technicians

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

End Diagnostic Data Procedure


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

WEIGHT

Model	Shipping	
TFO-10	449.7 lbs. / 204 kgs	357 lbs. / 162.8 kgs
TFO-28	964.50 lbs. / 315.0 kgs	563 lbs. / 255.4 kgs

DIMENSIONS

By Inches

Model	Exterior W × D × H	Interior W × D × H
TFO-10	44.0 x 28.3 x 55.1	30.0 x 19.0 x 30.1
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	1118 x 719 x 1400	762 x 482 x 764
TFO-28	1080 x 866 x 2182	805 x 660 x 1546

UNIT SPECIFICATIONS

CAPACITY

Model	Cubic Feet	Liters
TFO-10	10.0	283
TFO-28	28.0	792

Shelf Capacity by Weight

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

AIR FLOW PERFORMANCE

Air Exchanges

Model	Cubic Feet	Cubic Liters
TFO-10	120 per Minute	3398 per Minute
TFO-28	125 per Minute	3560 per Minute

Air Flow Across the Shelf Space

Model	Cubic Feet	Liters
TFO-10	16.9 per Minute	480 per Minute
TFO-28	17.3 per Minute	490 per Minute

UNIT SPECIFICATIONS

Temperature Performance

Range

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

Uniformity

Model	@80°C	@150°C	@306°C
TFO-10	1.0°C	1.5°C	5.0°C
TFO-28	1.0°C	2.5°C	5.0°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	15 Minutes	31 minutes
TFO-28	6 Minutes	15 Minutes	31 minutes

Continued on next page

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

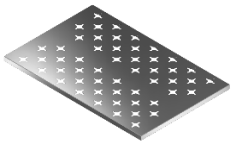
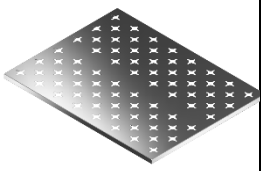
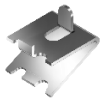
Recovery Times from a 60 Second Door Opening

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	 **3450642**	Shelf Assembly, 23 x 31", TFO-28	 **995-00005**
Power Exhaust Blower Unit 220 Volt, all models.	 **9990763**	Shelf Clip, 1	 **1250512**

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

SHELDON MANUFACTURING.INC

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