

TotalTemp Technologies, Inc.

Temperature Chamber Operator's Manual

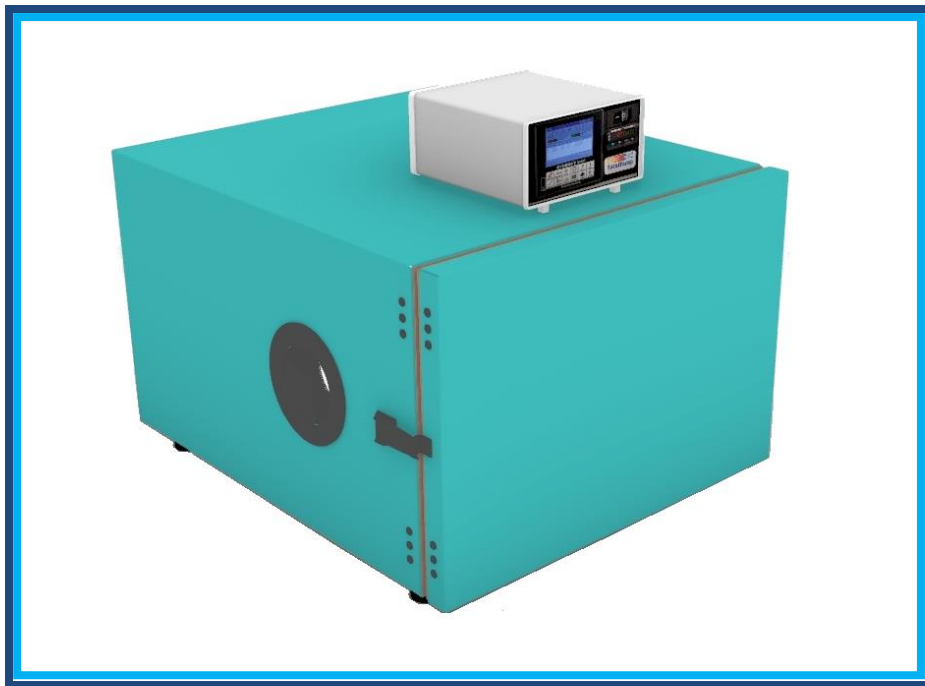


**Models CC230, CC460, CC900
With Mechanical Refrigeration
For operation from +175°C to -70°C**

Rev. 0 05/2019

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Introduction

Thank you for purchasing a Temperature Chamber from TotalTemp Technologies. This product was designed to provide years of efficient trouble free operation. Please read and understand this manual plus the controller manual for safe and best use of this product.

Safety

Safety Symbols:

The following symbol on equipment indicates the existence of a hazard that is explained in more detail in the manual.



The following symbol on the equipment indicates there is danger of electric shock if the indicated panel is removed while the product is connected to power.



The following symbol indicates the possible presence of danger caused by hot surfaces.



General Warnings:

This device employs line voltage connected components and caution should always be used to avoid electrical hazards.

Due to the extreme temperatures that these systems are capable of, always exercise caution in the vicinity of the system. Burns from either extreme hot or cold conditions may result. As a rule, hands off should be the policy for the temperature chamber interior and exterior. Do not operate with exterior panels removed.

When operating at cold temperatures, condensation or frost on the internal surfaces and interior walls will occur if operated with the door open or for longer periods of time with below ambient temperature

settings. At extreme cold operating temperatures, some frost or condensation may occur on the exterior of the chamber. Likewise, at very hot operating temperatures, the external surfaces will become very warm. Use caution. As a general rule, keep the door closed and avoid condensation inside the chamber.

Always avoid moisture near electrical power connections. Do not operate the product with the cover panels removed. The protective covers reduce the risks of exposure to electrical and thermal hazard, as well as protect the internal components from damage due to corrosion from condensation inside the unit. Excessive condensation or other electrical hazards may result if this precaution is not observed. Always keep the door closed while at very high or low temperatures.

TotalTemp provides an optional gas purge system that can be used to keep frost from accumulating on devices and the interior walls. It is recommended to keep the Nitrogen gas purge hooked up to this unit and flow rate adjusted for increased protection from excessive moisture accumulation on the devices under test, and interior walls. Soft plugs are provided to close off access ports at the sides of the chamber. They should be used to keep condensation and heat loss to a minimum. These systems employ recirculating refrigerants. Consult the factory in any event that the refrigeration charge seems to not be proper for reaching low temperatures.

Also – there is potential for harmful gases emitting from the material(s) in the DUT (Device Under Test) at higher temperatures. It is imperative that the user be aware of the temperature limitations of the material(s) used in the DUT. NEVER heat any explosive or flammable materials in a temperature chamber.

Built in out-of-range safety controls:

The controllers employed by TotalTemp have several built in watchdog features.

- 1) Setpoints above and below the allowable limits of product operation have been blocked at the factory. Do not attempt to defeat these limits.
- 2) Additionally, the controllers will go into an alarm/shutdown condition if the temperatures measured goes beyond preset limits
- 3) Open or shorted sensor or erratic readings will also put the controller into a shut down mode.

All TotalTemp systems have a fixed bimetal thermostat that latches power off for heating and cooling circuits in the event that temperatures exceed 205°C. On the rear electrical interface panel of the plate chassis, there are two LED indicator lights. The green LED light indicates power to the safety thermal switch and should always be on during normal operation. The red LED light indicates the thermal safety switch has tripped due to an over-temperature condition. It is only safe to use the system if the green light is on and the red light is off. If the system is turned ON and there is any other combinations of LED states besides Green ON and Red OFF, check or wait to be sure temperatures are within range, cycle system power off then on. If the green light ON and red light off is not re established. Remove power until the problem is resolved. If normal condition appears to be re established, use caution and do not operate system unattended until the reason for the tripped condition is determined.



1- Failsafe Working, Normal operation

Temperature limits set in the controller are intended to prevent operation at temperatures above 175C. Therefore, under normal operation the red LED should never come on. Device under test self heating, system component failure or other possible issues could cause the red LED to come on. Should the red LED come on, turn the system off immediately. Before using the system again, make sure the temperature of the system is back in normal operating range (< 200 deg C), then turn power back on again. Under normal conditions, cycling power resets the bimetal failsafe thermostat latch circuit. If the green light comes on and the red is off, the safety switch has reset itself and normal operation may be reestablished. If the red light continues to come on, the system needs to cool down or is in need of service. Remove power and consult factory.

Controllers may also be equipped with an independent redundant failsafe system, a high and low limit setting may be easily entered from the front panel to protect against unintended cooling and heating beyond user set limits. This controller uses its own sensor in the chamber and provides an enhanced level of safety. If a system does not have such and that is needed, it can be added on a retrofit basis. Consult factory for options and pricing.

Equipment Ratings

Power Supply:

Check the Voltage and Amperage ratings on your product label near the power connector of your system and on the rear of the controller. Make sure power provided is within the voltage range and current is limited above maximum requirement of chamber. The controller and rest of the system can operate in the 50/60Hz range.

The correct Environmental Conditions for proper operation of the temperature system are as follows:

- Indoor use only, unless specified differently on the product label
- Altitude up to 2,000 M maximum
- Ambient temperature range no lower than 10°C and no higher than 40°C
- Maximum relative humidity of 80% for temperatures up to 31°C
- Pollution index of degree 2 or better
- Mains power supply voltage fluctuations shall not exceed $\pm 10\%$ of the nominal voltage as indicated on the product label
- Transient overvoltage's according to overvoltage category II

System Description

Theory of Operation:

Testing of electronic or other items at specific temperatures is required for a variety of purposes and is a common requirement of modern design, production and diagnostics.

Temperature chambers provide a rapid and convenient method to perform this testing/conditioning.

The chamber is well insulated however at more extreme temperatures the external walls of housing may be extremely hot or cold. As with any system capable of extreme temperatures **use caution** when using or handling the system.

No environmentally hazardous gasses are released in normal operation.

Primary System Contents:

Convection chamber
Temperature Controller
Power cord

Accessories:

Optional independent redundant failsafe controller(built into front panel)

Purge accessories

Optional device hold down accessories or shelves

Coolant conversion options

DUT sensing probes and systems

Additional controller options

Adapter plates

Chassis mounted temperature probe terminal block for DUT sensor

Window

Cabling apertures

Complete list of options:

<https://www.totaltemptech.com/thermal-platforms-coldplates-options-and-accessories/>

Specifications:

C230 230v, 25A. 50-60 Hz. 16" x 12" x 12" workspace

C460 230v. 25A. 50-60 Hz. 19.5 x 16" x 12.4" workspace

C900 230v. 30A. 50-60 Hz. 25" x 25" x 25" workspace

Supplies required:

Coolant-TotalTemp systems are designed for one of five coolant configurations as noted on equipment. This manual covers models cooled with mechanical refrigeration however below are other options.

- 1) Standard configuration, high pressure L-N₂. 75-100 psi.
- 2) Special low pressure L-N₂ for applications where high pressure L-N₂ cannot be obtained. 15- 35 psi.
- 3) High pressure L-CO₂ 800-950 psi.
- 4) Low pressure L-CO₂ 300 psi.
- 5) Mechanical Refrigeration (compressors)

Consult factory if your available coolant does not match what the system you have is designed for. Read the label on product to determine proper coolant for existing system.

Models intended for Europe and Asia are always 230v. unless otherwise specified. ***Always confirm proper configuration before connecting power to controller and controller to system.***

The umbilical cable on TotalTemp Controllers are designed to be plugged into only the standard TotalTemp chamber systems, unless otherwise specified for a custom configured TotalTemp product.

Controller systems can operate on either 120, 208-240vac. 50/60 Hz.

Chamber and platform systems must be operated on specified voltage. Chamber power connectors are keyed to disallow mating systems intended for alternate voltages however always note that the voltage applied is in accordance with *system* product labeling.

Other power configurations are possible on special order basis.

Assembly:

The chamber system consists of 3 parts including the power source. Be aware of the following when installing:

- 1) The power source – Verify proper voltage and amperage capacity before applying power.
!!! Be aware of voltage and current rating on Chambers!!!
- 2) The temperature controller – Note power switch is off when applying power, be familiar with proper use and turn *off* before assembling or disassembling system.
Make sure switch(es) on rear of controller always stay ON. For test purposes and when familiarizing with remote programmability functions you may want to have the switch(es) at the rear of the controller OFF so that unintended heating, cooling or cycling of the compressor system does not happen. Controllers are universal 120-240 v. The chambers are not. For custom temperature chambers. See ID tag on system,
- 3) The chamber – Verify unintended items do not contact surfaces inside chamber, hands off and caution must be the general rule.

For testing and programming purposes the controller can easily be powered up without the chamber. Otherwise it is recommended to have all above system parts connected per this document before connecting the power source. Turn off circuit breaker switch(es) at rear just to shut of heating/cooling outputs only for test purposes.

Before Operating:

Verify that the voltage of the electrical supply matches the product ID tag for the product and it has adequate capacity to supply the required current for the system heaters.

Controllers are typically of universal voltage. Standard model 15A. controllers for thermal platforms are not designed for full compatibility with chambers. Systems have specific voltage/amperage ratings which must be observed.

Verify that the system power cord is plugged into a properly grounded receptacle.

Verify that the power cord plug in position at the receptacle is not blocked by any equipment for easy

access to disconnect.

Verify that the controller umbilicals are properly connected and secured to the chamber. A disconnected sensor connection will cause an alarm condition on the controller which must be manually cleared before operation can continue.

Be sure that the chamber power and chamber sensor connector are hooked to the chamber.

Never operate system without free access to ventilation on both sides of refrigeration condensing unit. Room air temperature must be lower than 31C or 86F.

Although the coolant valve(s) are designed to withstand continuous operation under all conditions, understand that it is more stressful on the coolant solenoid to run the system in the controlled cooling mode continuously.

Make sure that any items that might be burned by heat or damaged from extreme cold are removed from the surfaces of the chamber prior to use.

Hands off is a good rule for operation.

Operation

Please read the “Getting Started” and the detailed controller operation manual for a good understanding of proper use of the controller basic and extended functions.

Controller considerations:

Become familiar with the temperature controller to prevent accidental wrong settings or dangerous conditions. See ‘Getting Started’ document and detailed manual for your the specific controller.

Shut down:

Normal shut down.

The main power switch/breaker on the front of the controller may be used to apply and remove power from the system.

Failsafe shutdown:

TotalTemp thermal systems all have set point limits and safety out-of-range limits built into the controllers. The chamber has an internal, fixed high temperature limit switch that will also shut the system down if the temperature sensed exceeds 200°C(+15-0°).

When this temperature limit is exceeded, power will be removed from the heating and cooling circuits of the system. Normal operation may be restored when the temperature comes back into the operating range by turning power off, then back on.

NOTE: The built in failsafe shutdown system is designed for use as intended only. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Optionally, system controllers also can have a built in independent redundant high / low limit temperature safety limit control. This is done using a Watlow 1/32 DIN, EZ Zone PM limit controller at the front panel. When so equipped, the system will typically also have a series redundant coolant shut down valve

(liquid Nitrogen systems typically). This redundant valve is not cycled to maintain temperature, therefore it will not accumulate the wear and tear that the control solenoid does and will be ready to protect the system and device under test should the main control valve experience a failure that might otherwise result in an uncontrolled cooling condition.

Automatic refrigeration control:

The refrigeration system control is managed by the Synergy Temperature controller. Automatic startup and shut down of the refrigeration is controlled by parameters found in the “Setup” menu, L-Values. Careful consideration must be taken before altering these parameters. See the CD/Media supplied with equipment or download “Synergy Unified Technical Manual” online.

<http://www.totaltemptech.com/manualsdocs-total-temp-technologies/>

Setup Menu L-Values	
1L1 Main Cooling Turn ON (Preset to 85)	Percentage of PID cooling output that will trigger the compressor to turn on
1L2 Main Cooling Turn OFF (Preset to 75)	Percentage of PID heating output to trigger the compressor to shut off
L9 Ramp Up Cooling (Preset to 50)	Temperatures set above this threshold turns off the compressor when heating. Note L15 below will still apply
L15 Compressor Turn OFF delay (Preset to 2)	Compressor turn-off delay in minutes. <u>Prevents short cycling damage to the compressor</u>

Only use positive integers in these parameters. Under normal circumstances, these parameters should not require adjustment. For maintaining temperatures near or slightly below ambient (+25 to +10), the compressor may have to be allowed to cycle on and off.

Maintenance:

There is no required maintenance for the chamber system other than inspecting the airflow paths to verify unobstructed air flow. Primarily the airflow through the refrigeration heat exchanger. Additionally inside the chamber. Accumulation of lint and other obstructions in the heat exchanger will quickly result in damage to the refrigeration compressor system. Eventually, typically after several years of use, periodic rebuild of the coolant solenoid valves is also likely. The coolant valves are typically good for 5 million cycles so this is not an immediate concern. Cycle rate is 1-2 cycles per second when maintaining a cold temperature. The valve normally does not cycle when heating or going to a cold temperature. Doing the calculations, a typical valve life is found to be many years. If you experience erratic valve operation, inspect and troubleshoot the system before continuing to use the system to eliminate latent or pending valve problems and reduce the chances of further failures.

Motor bearings are permanently lubricated with wide temperature range lubricant.

Periodically inspect the hoses, power cord, controller umbilical and their associated connectors. Remove product from service if a hose or electrical connection appears damaged or worn.

Check to confirm the silicone door seal is complete around the door and make sure access panels are always in place during use to prevent safety hazards and to prevent damage due to buildup of condensation or frost inside unit. Do not use any abrasive cleaners

Doors and cabling feed thrus:

Be aware of condition of door seals and flap gaskets repair or replace any broken seals that are not in good condition. Keep door alignment and latch and adjusted to prevent excessive wear on the seal. Keep the door closed whenever possible and avoid operation with the door open as much as possible. Likewise keep provided soft plugs or suitable non flammable plugs in cabling notches when operating, as much as possible. Doors are reversable however due to the lift off feature, you will need a different set of hinges to reverse side which the door hinges. The hinges are a hardware store item but they are reinforced with a weld by TotalTemp Technologies. TotalTemp can provide hinges for reversing the door. They are simply reinforced (welded) standard models -left side McMaster Carr 1151A87; right side 1151A88) .

Troubleshooting:

After reading the operation manual, if problem persists or a clear solution is not provided, please consult the factory for resolution of the problem. Offices are open 8-5 Pacific time, weekdays.

Storage:

When in use, some condensation can occur on surfaces of the chamber interior. Make sure system is dry before closing into any packaging. It is recommended to put a cap over the coolant inlet and exhaust connections to prevent foreign objects from lodging in the plumbing, especially the inlet. When packing, be careful to prevent stress from being applied to the electrical or plumbing connections. You may want to remove any coolant filter from the product so that it is not damaged in shipping.

Special storage considerations for the chamber and controller:

Store in a dry environment. Normal safe packing procedures should be followed if the unit is to be shipped. Controllers must be stored in a non condensing environment.

Service:

TotalTemp Technologies, Inc

3630 Hancock St. Ste 'A'

San Diego, CA 92110

www.TotalTempTech.com Support@TotalTempTech.com

(888) 712-2228 x1

Parts: Contact the factory for any needs involving maintenance or accessory parts.

Warranty: following page



TotalTemp Technologies, Inc.
1 Year Domestic Warranty
(U.S.A. & Canada)

WARRANTY

TotalTemp Technologies, Inc (TotalTemp) warrants their standard Thermal Test Systems (Platforms, Chambers *and* Temperature Controllers) to be free from defects in material and workmanship for a period of one year from shipment date of product. If a defect is discovered in the product, TotalTemp will replace the failed component at their option. The replacement of failed components does NOT include labor for diagnosing the problem, or repairs and installation. In the event that TotalTemp will provide the warranty replacement components, TotalTemp will pay the least expensive transportation costs to the original sale destination of the product. The customer will be responsible for the costs and labor for installation of the new component.

If the customer wishes, for purposes of diagnosing the problem, TotalTemp will provide a reasonable amount of technical assistance to the customer via email or telephone. The purpose of which is to help both parties provide the fastest solution possible at a reasonable cost to the customer.

EXCLUSIONS

This warranty covers defects in manufacturing discovered while using the product as recommended by the manufacturer. This warranty does not cover loss or theft, nor does coverage extend to damage caused by misuse, abuse, unauthorized modification, repair, or shipping of the product, improper storage conditions, or natural disasters. This warranty does not cover parts that are subject to normal wear and tear such as cryogenic solenoid valves.

LIMITS OF LIABILITY

Should the product(s) fail, TotalTemp will provide replacement components, at their discretion, as described in the preceding paragraphs. TotalTemp cannot be held liable for any damage that results from the failure of this product. Damages excluded include, but are not limited to the following: lost profits, lost savings, lost data, damage to other equipment, and incidental or consequential damages arising from the use, or inability to use this product. In no event, under any circumstances, will TotalTemp be liable for more than the amount of the original purchase price, excluding tax, shipping and handling charges.

By installing or using this product, the user accepts all terms described herein.

Venue for enforcement of this warranty rests in San Diego County, California, U.S.A.

