**GENERAL DESCRIPTION**

**SYSTEM DESCRIPTION**


The chambers have a standard range of -100°F to +375°F (-73°C to +190°C) cascade, -50°F to +375°F (-45°C to +190°C) Tundra, and -30°F to +375°F (-34°C to +190°C) single stage which provide both heating and cooling as required. Chambers with optional humidity are designed to provide a minimum of 10% and a maximum of 98% relative humidity, as limited by a 40°F (5°C) dewpoint and a 185°F (85°C) maximum dry bulb temperature. Refer to Figure 3 for Achievable Humidity Points. The chambers are designed to operate in a commercial environment i.e., temperature of +75°F ±10°F (+23°C ±6°C) and a maximum relative humidity of 95%. Refer to the specifications at the end of this section for additional information.

1. **CHAMBER**

   A. **Chamber Interior**

      The chamber interior consists of the front workspace and the rear component area, separated by a stainless steel plenum cover. A probe bracket is attached to the upper left corner of the grill on top of the plenum. The bracket contains the probes for the controller, recorder (if required), and RH sensor (if humidity option is installed). The area behind the plenum cover contains the refrigeration evaporator coil, heater, thermal cutoff, evaporator fan(s), humidification inlet (if humidity option is installed), auxiliary cooling nozzle (if auxiliary cooling option is installed), and the dehumidification coil (if humidity option is installed). These items may be accessed by removal of the plenum cover. Refer to Figures 4 and 5.

   B. **Chamber Exterior**

      Fiberglass insulation is used with a high temperature binder for temperatures up to 500°F (260°C). The cabinet is constructed with a minimum of mechanical contact between the liner and the exterior to reduce conductive heat losses and minimize condensation on the exterior cabinet.

      A multiple-pane window assembly in the door of the chamber allows viewing of the chamber interior during operation. The window is constructed of tempered glass panes with a heater harness to assure frost-free viewing during low temperature chamber operation. Under certain ambient conditions, it may be normal to see some condensation around the outer window frame are during low temperature operation.
3. REFRIGERATION/HEATING COMPONENTS

A. Refrigeration

ZP-Series chambers use one of three types of mechanical refrigeration systems. Single stage, Tundra®, and cascade. A single stage system is used when the chamber’s ultimate low temperature is -30°F (-34°C) or higher. The Tundra system is used when the chamber’s ultimate low temperature is -50°F (-45°C) or higher. A cascade system is used when the chamber’s ultimate low temperature is -100°F (-73°C). The single stage system uses refrigerant R-404A. The cascade system uses refrigerant R-404A in System #1 and R-508B in System #2. The Tundra System uses refrigerant R-410A.

The refrigeration system can either be air cooled or water cooled depending on the model of chamber. All standard ZP-Series chambers are air cooled except for the 6hp models.

All refrigeration components are selected to ensure safe, reliable, and balanced operation. The components may be purchased from the CSZ Service Department or a local refrigeration wholesaler.

B. Heating

Open-coil nichrome heating elements are standard on all systems. The heaters are mounted in porcelain insulators attached to stainless steel frames. The heaters are located behind the rear plenum and do not radiate directly into the test space.

Limited temperature sheath heaters are an option for chambers that may contain flammable vapors. See item 11 of this section for more information.

4. HUMIDITY SECTION (OPTIONAL)

The ZPH-Series chambers provide the same temperature ranges for heating and cooling as the ZP-Series, but add the ability to control humidity within the range of 10% to 98% relative humidity as limited by a 185°F (85°C) maximum dry bulb temperature and a 40°F (5°C) dewpoint. The chambers have the ability to control humidity as low as 5% when the Dry Air Purge / Low RH option is utilized. Standard ZPH-8, 16 & 32 systems use a steam generation humidity system. Refer to Figure 3 for more information on achievable humidity points.
HUMIDITY PANEL COMPONENTS
(Steam Generator System)

The water supply connection for humidity is located at the rear of the unit. The following is a description and function of the major components (see Figure 4).

A. (OPTIONAL) Water Valve and Rack Assembly (Located at the rear of unit)
   1. The valve is used to temporarily turn off the water supply in order to change the demineralizer filter without interrupting chamber operation.
   2. The rack holds the demineralizer filter.

B. (OPTIONAL) Demineralizer Filter (Located at rear of unit)
   1. The filter removes most common impurities from tap or soft water.
   2. The outer casing of the filter is transparent and the crystals are visible. A new cartridge is violet or dark blue when water flows through it. A spent cartridge will turn brown, orange, yellow or white. The cartridge should be changed before it completely changes color. A reference mark is provided on the filter to indicate when it should be changed. Spare cartridges are available through the CSZ Service Department. Refer to the Humidity Maintenance Section for instructions on how to change the filter.

C. Water Fill Solenoid
   1. This is a normally closed solenoid valve and is energized (opened) only when the float switch in the steam generator drops below the reset level. The valve remains energized until the water is at the right level.

D. Steam Generator System - See Figure 4
   1. The steam generator provides humidity in the form of steam. The steam generator has a multi-level float switch which controls the water level. The heater boils the water to generate steam. The steam is injected into the chamber.
   2. A high temperature safety thermostat is located on the side of the steam generator. It will remove heater power if an over-temperature situation is reached.

E. (OPTIONAL) Water pressure regulator
   1. Reduces incoming water pressure to 10 PSI.
HUMIDITY CHAMBER COMPONENTS (OPTIONAL)

The chamber area contains the remaining components necessary to generate and maintain humidity levels within the work space. The following is a description of these components (see Figures 4 and 5).

A. Solid State Humidity Sensor

**DO NOT RELOCATE.** It has been located at the factory for maximum performance.

This unit utilizes a solid state relative humidity sensor which takes the place of the traditional wet bulb and dry bulb sensors. The solid state sensor is a highly accurate quick responding direct RH measuring device. It feeds an electronic signal to the controller that in turn controls and displays direct relative humidity.

B. Atomizing Nozzle (Optional)

Water flows from the control solenoid at a very slow rate. Air is pumped into this nozzle and picks up the water. The chamber is humidified by the air/water mixture.

C. Humidity Wet Coil

This coil is cooled by the R-404A (System 1) system and functions as a dehumidification coil. Dehumidification of the chamber air is accomplished by condensing water from the chamber air onto the refrigerated surface.

D. Wet Coil Pan

The wet coil pan is used to collect moisture from the wet coil and dispense it through the chamber drain.
Water Connections for 6HP Units

Demineralizer Filter (Optional)
With Humidity Option

Steam Generator Assembly
With Humidity Option

System #1 (404A)
Pressure Guages

Figure 4. Humidity Panel Location & Components (Steam Generator System)

Note: LR Environmental Equipment Co., may make upgrades and replace any worn parts. Consequently, physical appearance of certain components may vary from that shown.
Figure 5. Chamber Interior with Plenum Cover Removed

Figure 5. Chamber Interior with Plenum Cover
5. **PEN RECORDERS (OPTIONAL)**

The Circular Chart Recorder features fully programmable inputs ranging and linearization with stepper motor pen and chart drive speed. Refer to the chart recorder manual shipped separately with your unit. This eliminates the need for range cards and chart speed change gears. Configuration is field programmable for flexibility to meet changing test requirements. Replacement chart paper is available from the CSZ Service Department.

6. **REDUNDANT HIGH/LOW LIMIT CONTROL (Optional)**

The High/Low Limit Control is designed with set-points for high and low temperatures. These can be precisely set at temperatures to permit safe operation. The Limit Control will shut down the chamber operation and product operation if the safe operating temperature limit of the product, either hot or cold, has been exceeded.

7. **IEEE-488 SYSTEM (OPTIONAL)**

An optional IEEE communication interface can be provided on the chamber to allow the EZT-550 to communicate over the GPIB bus.

8. **BOOST COOLING SYSTEM (OPTIONAL)**

In addition to the main refrigeration system, the chamber is equipped with an optional connection port for supplying boost cooling from an external source of cryogenic liquefied gas (either carbon dioxide or liquid nitrogen). The boost cooling gas is vented directly into the chamber by a controller under the conditions of sustained cooling demand.

9. **GN2 PURGE SYSTEM (OPTIONAL)**

The GN2 Purge system must be vented outdoors. To prevent displacement of oxygen around the unit. DO NOT enter the chamber while the boost/purge is turned on. The door must be left open to ventilate the chamber before entering. A GN2 Purge system reduces condensation within the test chamber and is used when low humidity is required. The purge system consists of a control solenoid and flow meter. GN2 has a dewpoint approaching -300°F (-185°C) that when introduced into the chamber workspace, creates a slightly positive pressure within the chamber to minimize the migration of moist ambient air into the chamber. The system requires approximately 5 scfm (142 std liters/minute) of GN2 at 70 psig (560 kpa).
10. DRY AIR PURGE (OPTIONAL)

A Dry Air Purge system can be provided to reduce condensation within the test chamber and for use when low humidity is required. Compressed air is dried to a dewpoint below -40°F (-40°C) then introduced into the chamber workspace, creating a slightly positive pressure within the chamber to minimize the migration of moist ambient air into the chamber. The system requires approximately 5 scfm (142 std liters/minute) of compressed air at 90 psig (720 kpa) free of all oil and entrained water droplets. The system features a dropout filter and oil removal filter at the inlet.

11. LIMITED TEMPERATURE SHEATH HEATERS (OPTIONAL)

Each heater has its own temperature controller and redundant high limit safety. The temperature controller is set to maintain the heater sheath temperature below 80% of the auto ignition temperature of the fluid or vapor in the chamber. The temperature high limit is set +10°C above the temperature controller as a safety.

Per section 501-10 of the N.E.C.:

"The heater shall not exceed 80 percent of the ignition temperature in degrees Celsius of the gas or vapor involved on any surface that is exposed to the gas or vapor when continuously energized at the maximum rated ambient temperature."