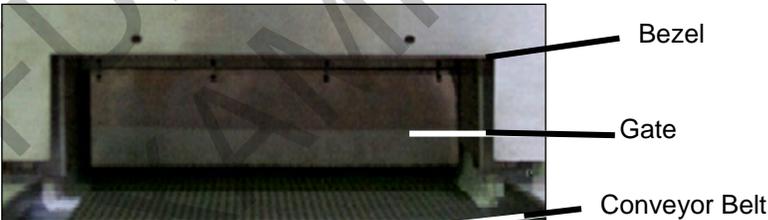
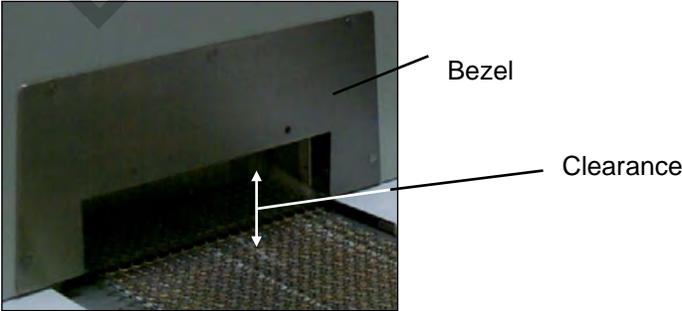
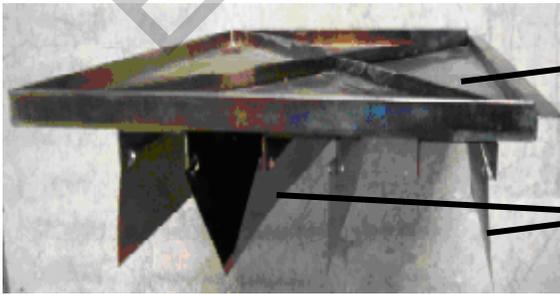
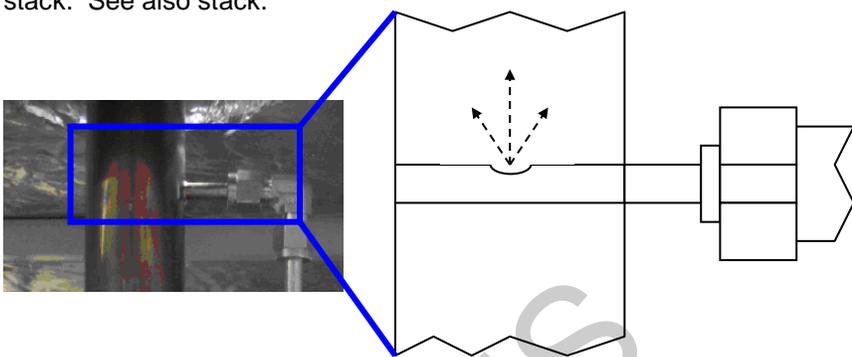
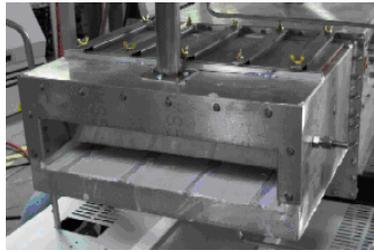


## 8.5 Glossary

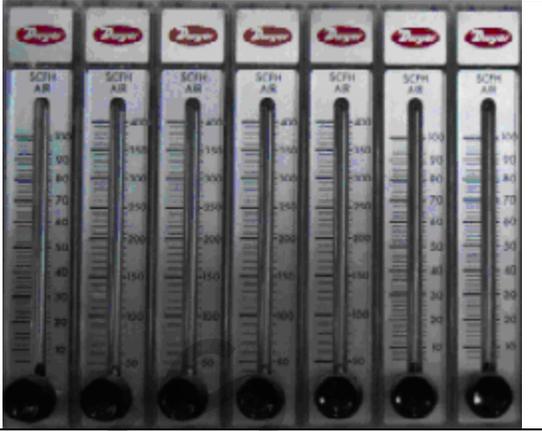
<b>Across-the-Belt</b>	In reference to an area perpendicular to the direction of travel through the furnace; the width of the conveyor belt.
<b>Actual Temperature</b>	The instantaneous temperature in the furnace as reported by the thermocouple.
<b>Air-Rake</b>	Long tube set across-the-belt with proportionally spaced small holes. 
<b>Air-Regulator Tubes</b>	Air rakes charged with air or N2 installed in the entrance and exit baffles, used in establishing a controlled atmosphere.
<b>Blade</b>	Hinged flaps at entrance and exit of furnace that help prevent furnace atmosphere from escaping. See also figure under Drip Trays. 
<b>Bezel</b>	Semi-permanent entrance guard at furnace entrance and exit. See also Gate. 
<b>CDA</b>	Clean dry air – filtered, dry compressed air used as process gas.
<b>Chamber</b>	See heating chamber.

## Section 8

<b>Clearance</b>	The distance at furnace entrance between the conveyor belt and the bezel. See diagram under bezel.
<b>Contaminants</b>	Anything present in the process section that could negatively impact product quality including but not limited to O <sub>2</sub> , moisture or particulate matter.
<b>Convection</b>	The process of heating a product via indirect transmission of heat from adjacent high-temperature air.
<b>Controller</b>	Control system that stabilizes temperature, monitors belt speed, alarm conditions and other functions.
<b>Controlled Atmosphere</b>	The atmosphere generated from the process gas, and gas flow patterns within the process section.
<b>Cooling Section</b>	The portion of the furnace that includes the transition tunnel, if any, exit baffle and any additional modules provided for the purpose of cooling the product.
<b>Derivative</b>	The calculated temperature rate of change; used in the PID equation.
<b>Dilution Purge</b>	The continuous process of adding clean gas while exhausting contaminated gas.
<b>Dominant Wavelength</b>	The wavelength of highest occurrence emitted by a radiating element at a specific temperature as described by Wein's Displacement Law.
<b>Drip Trays</b>	<p>Trays positioned beneath stacks with attached baffle gates; used to catch condensation or residue produced by the process.</p> 
<b>Edge Heater</b>	Heaters along edge of chamber used to maintain uniform temperature across-the-belt in a designated part of the heating chamber.

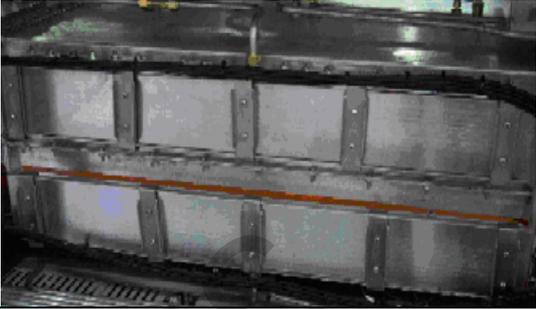
<p><b>Eductor</b></p>	<p>Metered gas exit used to draw exhaust gas out of the chamber and through the stack. See also stack.</p> 
<p><b>Effluents</b></p>	<p>Contaminants expelled from a product during a thermal process. See also volatiles.</p>
<p><b>EMO</b></p>	<p>An Emergency off switch.</p> 
<p><b>Entrance Baffle</b></p>	<p>The section at the entrance of the furnace incorporating an air-regulator tube, hanging gates and an exhaust stack; used to establish a controlled atmosphere inside the process section.</p> 
<p><b>Exhaust Gas</b></p>	<p>Spent process gas.</p>
<p><b>Error</b></p>	<p>Difference between actual temperature and setpoint.</p>
<p><b>Flash</b></p>	<p>The point at which organic vapors have reached the temperature and concentration necessary for spontaneous combustion.</p>

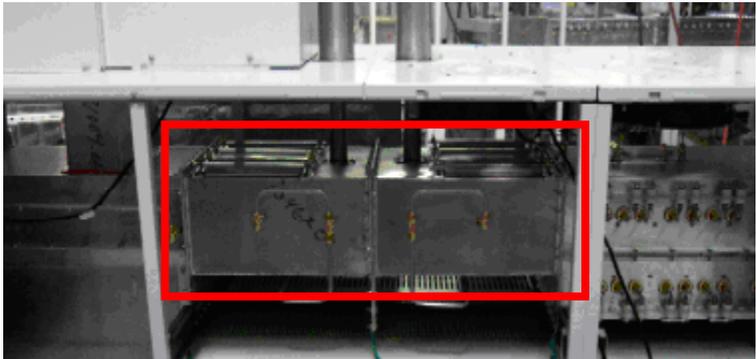
## Section 8

<b>Flow Meter</b>	<p>A manually adjustable gauge used to control the flow of gas or liquid to the process section.</p>	
<b>FG or Forming Gas</b>	<p>A type of process gas that consists of any mixture of H<sub>2</sub> and N<sub>2</sub> gasses.</p>	
<b>Furnace Length</b>	<p>The length of the entire furnace. The sum of the process section and any loading and unloading stations.</p>	
<b>Gain</b>	<p>Term in PID equation to calculate how far temperature is from setpoint.</p>	
<b>Gate</b>	<p>Plate that divides furnace into sections that can allow better control of the processing environment. See Blade and Drip Trays for picture.</p>	
<b>H<sub>2</sub></b>	<p>Hydrogen gas.</p>	
<b>Heat Lamp</b>	<p>Double ended metal sleeve clear quartz infrared (IR) heat lamp element or emitter.</p>	
<b>Heated Length</b>	<p>See “Heating Chamber”, next.</p>	
<b>Heating Chamber</b>	<p>Furnace area where heating takes place. Also referred to as the chamber, or heated length.</p>	
<b>Heating Section</b>	<p>The portion of the furnace including the entrance baffle and the heating chamber.</p>	
<b>Hydrogen Detector</b>	<p>Detect hydrogen escaping from furnace.</p>	
<b>Integral</b>	<p>Mathematical operation that is one term in the PID equation.</p>	
<b>Interlocks</b>	<p>Switches on some cabinet doors that stop furnace operation and removes power when doors are opened.</p>	

<b>IR</b>	Electromagnetic wave. Wavelengths between 0.78 and 1000 $\mu\text{m}$ in the electromagnetic spectrum.
<b>Lamp Strings</b>	<p>A single lamp circuit which may include one lamp, or two or more lamps in series.</p> <p>LA-309 Standard Power furnaces are wired with two lamps per string in zones 1 and 3. Zone 2 is wired with 3 lamps per string at all voltages above 240 Vac*.</p> <p>LA-309 High Power furnaces are wired with two lamps per string in all zones at all voltages above 240 Vac*.</p> <p>*208-240 Vac LA-309 furnaces are wired with one lamp per string in all zones.</p>
<b>LPM</b>	Liters per minute. Units of flow equivalent to 2.119 CFH.
<b>Micron</b>	One millionth of a meter, $1.0 * 10^{-6}$ m, 1.0 $\mu\text{m}$
<b>MMI</b>	Man machine interface software development tool for creating user interface to PLC controller.
<b>Module</b>	A section of the furnace designed for a specific function; may be 15, 30, 45 or 60 inches in length.
<b>N<sub>2</sub></b>	Nitrogen gas.
<b>O<sub>2</sub></b>	Oxygen gas.
<b>Oxygen Analyzer</b>	Detects oxygen content at predetermined locations. Usually installed to read process gas source, and up to three locations in the heating chamber.
<b>Phase Angle Firing</b>	Technique that activates AC power to be applied for only certain times during AC cycle.
<b>PC</b>	Personal computer. The PC provides the main operator interface for operating the furnace. The PC interfaces with the PLC.
<b>PID</b>	Proportional+Integral+Derivative: Three-term closed loop control equation that adjusts power sent to heat lamps. See also Gain, Integral and Derivative.
<b>PLC</b>	Programmable Logic Controller. An industrial computer which provides input and output control of the furnace.

## Section 8

<b>Plenum</b>	Cutout area of chamber insulation where process gas is injected.	
<b>Plenum Box</b>	Pressurized region, enclosing ends of heat lamps, part of the hermetic seal option.	
<b>PPM</b>	Parts per million. Useful ratio for measuring small amounts of one gas in an area dominated by another.	
<b>Process Gas</b>	The gas used in creating a controlled atmosphere. Some examples are CDA, N <sub>2</sub> , H <sub>2</sub> , forming gas or other N <sub>2</sub> /H <sub>2</sub> mixtures.	
<b>Process Environment</b>	The description of the area inside the furnace at any time including the temperature, flow patterns, and the presence or absence of product, process gas, process effluents, or contaminants.	
<b>Process Section</b>	The physical area inside the furnace from the entrance bezel to the exit bezel. The sum of the heating section and cooling section.	
<b>Profile</b>	See Temperature Profile.	
<b>Proportional Band</b>	The temperature range used in the PID equation in applying a portion of the available power to the heat lamps based on the deviation of the actual temperature from the setpoint.	
<b>Recipe</b>	Instructions, including temperatures and belt speed that the furnace follows.	
<b>Resonant Frequency</b>	The frequency at which the atomic structure of a material is easily excited into physical vibration resulting in excellent heat transfer characteristics.	
<b>SCFH</b>	Standard Cubic Foot per Hour. Measurement for gas flow volume. Equivalent to 0.472 standard liters per minute.	
<b>SCR</b>	Silicon Controlled Rectifier. The electronic device used to regulate power to the heat lamps through signals sent by the PLC controller.	
<b>Setpoint</b>	The target temperature for a zone.	

<b>Sparger Tubes</b>	Highly porous, sintered metal tube charged with process gas; typically used in controlled atmosphere cooling modules.
<b>Stack</b>	<p>Exhaust stack containing eductor.</p> <p>See also eductor.</p> 
<b>STP</b>	<p>Standard temperature and pressure:</p> <p>21.1 C (70 F)</p> <p>1 Atm, 1.013 Bar (14.7 psig)</p>
<b>Temperature Profile</b>	Temperature recorded over a period of time.
<b>Thermal Process</b>	The idealized process description for a particular product as it passes through the process section, including the product temperature profile and process environment.
<b>Thermal Process Profile</b>	Empirical record of the thermal process
<b>Thermocouple</b>	An electronic device that measures temperature.
<b>Throat</b>	The throat of the furnace describes the maximum height of any product allowable through the process section.
<b>Transition Tunnel</b>	<p>Chamber section between heat and cooling section.</p> 

## Section 8

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<b>Volatiles</b>	Hydrocarbon based product effluents.
<b>With-the-belt</b>	In reference to the area of the conveyor belt that extends through the process section.
<b>Zone</b>	Area within the chamber where temperature can be independently controlled.

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EXAMPLE