Section 1
FURNACE EQUIPMENT

Description of the CU-915 infrared furnace basic thermal process elements, standard and optional hardware and their functions. Refer to section 1.7 for optional equipment description and operation.

1.1 Furnace Description

The CU-915 is a computer controlled near-infrared, conveyor belt furnace for laboratory and production thermal processing in the range of 100-960 ^{0}C in a controlled atmosphere, free of outside contamination. This furnace is configured for a maximum 1000 ^{0}C temperature operation. Process gas may be CDA, N_2 and/or another inert gas like forming gas (FG). Dual gas furnaces may use Air with Nitrogen in the furnace process zones; or Nitrogen and a second gas such as Forming Gas (pre-mixed N_2/H_2) or another type of reducing gas introduced into the heating chamber.

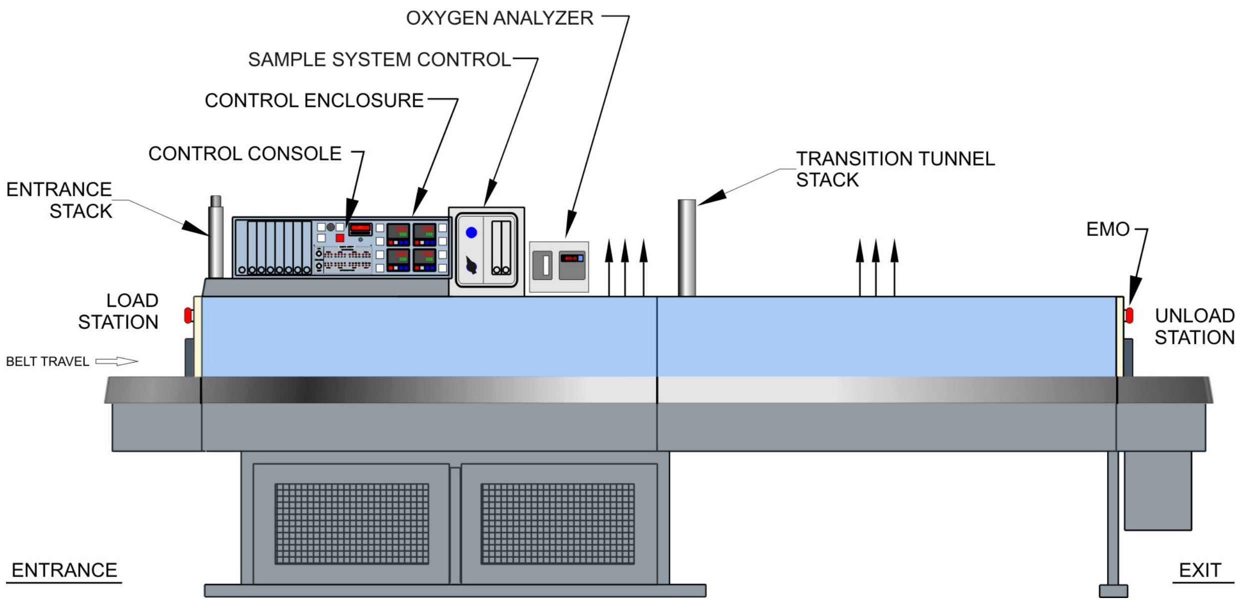


Figure 1-1 CU-915 IR Furnace Front Elevation

The CU-915 furnace transports product on a 380 mm (15-inch) wide belt. In the standard design the chamber clearance above the belt is 50 mm (2 inches). CU-915 furnaces feature a hermetically sealed heating chamber permitting control of the furnace chamber process environment. Baffle sections before and after the heating section contain curtains that hang down to just above the belt to further isolate the furnace chamber from the room atmosphere and from the cooling section.

The CU-915 can process substrates, wafers, PCBs, metal, ceramic, glass or polycarbonate parts for electronic package sealing, thermo-setting polymer curing, reflow soldering, copper and hybrid/thick film firing, brazing, brazing, tempering and metal sintering and annealing applications, or almost any kind of general thermal processing requiring precision temperature control in a controlled atmosphere environment.

The CU-915 can also be used for precise curing of coatings on optical lenses, advanced thin film crystalline silicon, cadmium telluride (CdTe alloys) and certain copper indium diselenide (CIS-alloys) as well as many dental lab and production applications.

1.2 Furnace Views

Figure 1-2 Furnace Front Elevation

Figure 1-3 Entrance Elevation

Figure 1-4 Exit Elevation

Figure 1-5 Furnace Rear Elevation

Figure 1-6 Front, Panels Off

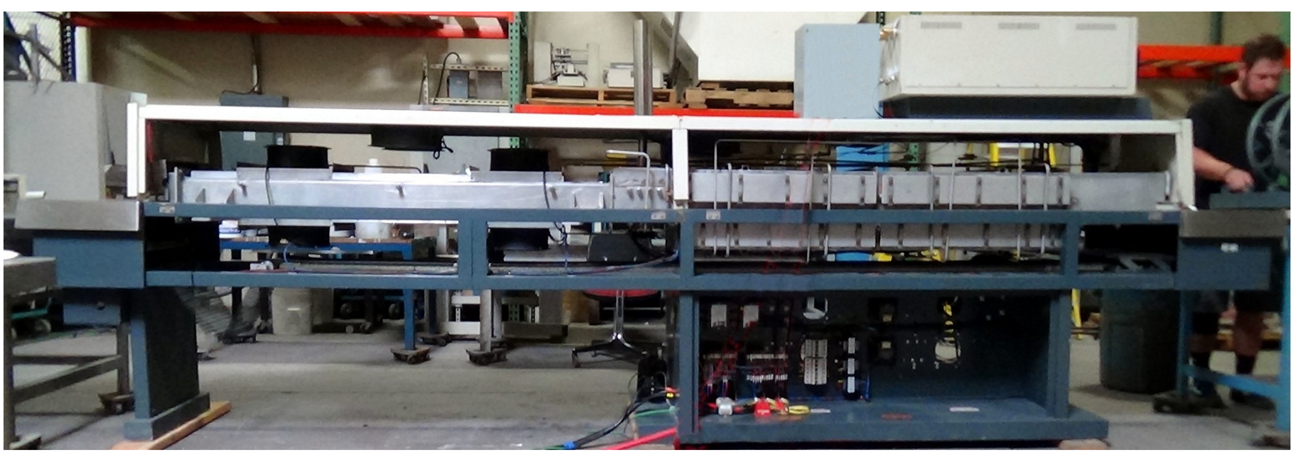


Figure 1-7 Rear, Lower Panels Off

1.3 Furnace Elements

1.3.1 Furnace System

The CU-915 furnace system is comprised of a high intensity, near infrared heating section followed by a rapid cool transition tunnel and closed atmosphere cooling section. The near infrared high intensity section first imparts a rapid rate of temperature rise to the product which is then followed by two holding zones and a final high intensity zone. The last zone can be used as a continuation of the holding zones, as a spike zone, or as a controlled cooling zone. Parts are carried from the load station through the heating and cooling sections of the furnace to the unload station on a 380 mm (15-inch) wide belt driven by an adjustable speed motor. Maximum vertical parts clearance inside the standard furnace is 50 mm (2 inches).

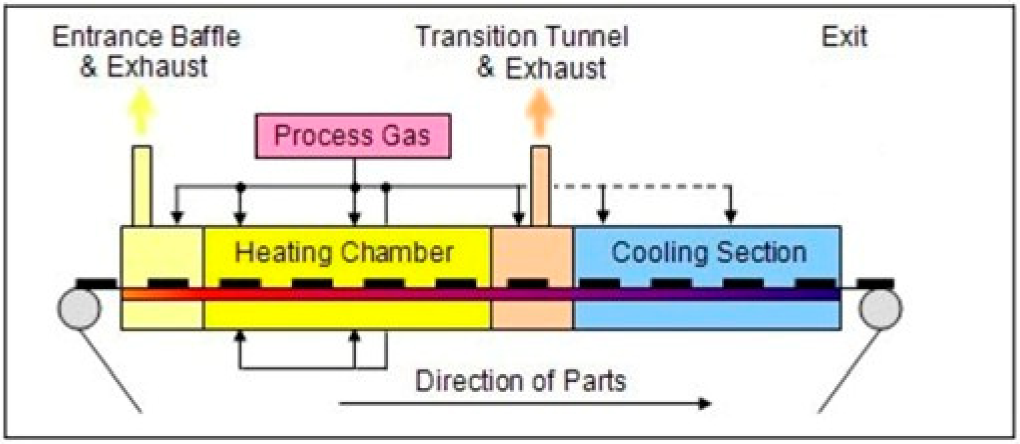


Figure 1-8 Process Sections

Process atmosphere is controlled much like a clean room: pressurized gas is pushed through the heating chamber insulated walls providing pre-heated, laminar flow for a uniform, stable atmosphere.

Zones. The heating chamber is divided into zones separated by insulating dividers so that adjacent zones can maintain different setpoint temperatures, if required. Control starts with K-type thermocouples in each zone quickly sensing changing conditions and feeding these signals to the discrete digital zone controllers which control power output from the SCRs to the lamps. The furnace controller PID loop algorithms control arrays of IR quartz heating lamps inside the heating chamber so as to maintain the desired temperature setpoint in each zone.

Product cooling is by radiant cooling and CDA or N2 gas convective cooling in the transition tunnel (RCT) and closed atmosphere cooling tunnel (CACT), with exterior fan heat removal.

1.3.2 Heat Transfer Methods

Transfer of heat in the furnace is by three different methods: Radiation, Convection and Conduction. In order of their contribution to heating the product, these methods are:

A. Radiation

The furnace lamps emit infrared electromagnetic waves which, when striking and absorbed by product on the belt, cause its temperature to rise. “Heat lamps” and microwave ovens work in a similar manner and it is also the way the sun heats the Earth. The infrared radiation does not directly heat the process gas within the furnace.

B. Convection

During operation, lamp radiation heats the chamber top, bottom and side wall insulation. As the process gas enters the furnace through the porous ceramic insulation, it is heated to near the setpoint temperature of the zone. This flow of heated gas transfers heat to the product on the belt. Hair dryers and home forced air heating function in the same fashion.

C. Conduction

Lamp radiation heats the transport belt which becomes a heat source for the product supported on the belt. Electric stoves and hot plates heat in this way.

1.3.3 Controlled Atmosphere

RTC furnaces are equipped with the ability to supply constant streams of a supplied process gas. This feature allows the user to reduce product oxidation or contamination, remove process effluents or reduce other potentially negative effects of ambient air at high temperatures.

A controlled atmosphere also helps establish higher consistency in thermal processes. When a product travels through the process section, slight changes in the atmospheric conditions in a non-controlled atmosphere environment can affect the stability and consistency of the product temperature profile.

1.3.4 Hermetically Sealed Systems

For most furnace systems, the lamps ends are enclosed in plenums. Gas fed to the plenums keeps the lamps cool and prolongs the life of the lamp and improves lamp IR performance. Balancing the furnace gas inflows and outflows enables the furnace to maintain a hermetic seal. While not air-tight, a hermetic seal resists the mixing of the outside atmosphere with the furnace atmosphere by maintaining a higher pressure inside the furnace chamber.

1.4 Furnace Process Equipment

1.4.1 Furnace Arrangement

The furnace process equipment includes an entrance baffle with an eductor equipped exhaust stack, a heating chamber, a rapid cool transition tunnel with exhaust stack between the heating and cooling sections, and a closed atmosphere cooling tunnel. The process section is configured for 50mm (2-inch) product height (PH2) arranged as shown in Figure 1-9. Together, the individual sections function as a unit to provide a carefully controlled gas atmosphere, precise temperature profile and two-stage controlled atmosphere cooling.

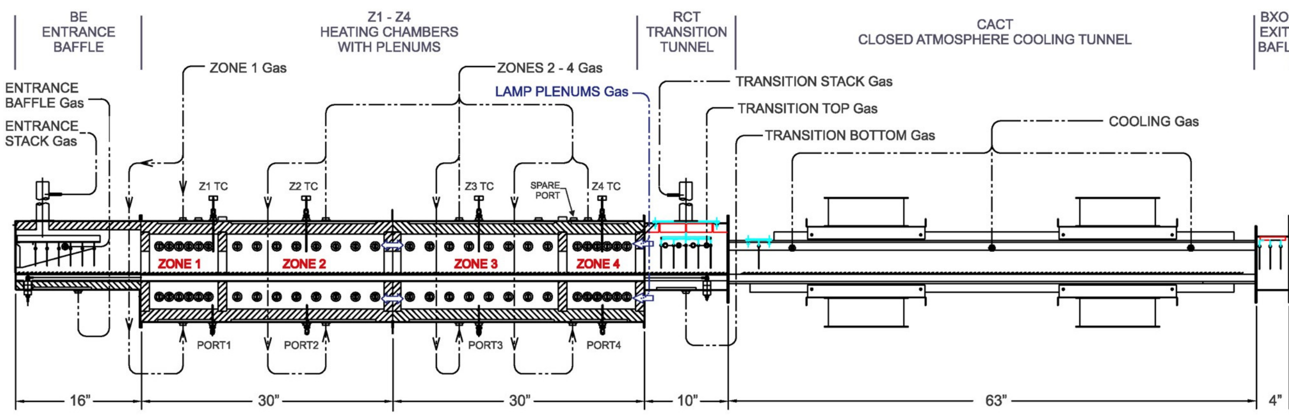


Figure 1-9 4-Zone CU-900 Series Internals

1.4.2 Load Station (LOAD)

Located immediately before the furnace entrance, the Load station consists of two (2) horizontal stainless steel surfaces 310 mm (12.25 inches) long x 150 mm (6 inches) wide positioned on either side of the belt. The Load station provides a convenient area for handling product and for holding profiling equipment.

1.4.3 Entrance Baffle & Exhaust Stack (BE)

The entrance baffle isolates the heating section from the ambient air outside the furnace entrance. It is housed in a welded stainless steel shell lined with ceramic fiber insulation. A process gas curtain with a series of hanging stainless steel baffle plates serves to act as a thermal barrier as well as purge the baffle and help prevent ambient air from entering the furnace. Owner can stipulate baffle clearance of 6 mm to 40 mm (0.25 to 1.5 inches) above the belt (or eliminate entirely). Adjust gas flow to the ENTRANCE BAFFLE flowmeter to isolate Zone 1 from room atmosphere.

A venturi-assisted exhaust stack, or “eductor”, draws furnace gases out of the furnace. Before exhausting via the stack, the process gas passes over a removable drip tray to collect exhaust condensation and prevent it from falling into the baffle section and contaminating the product. The eductor pulls 15 times its process gas flow from the furnace. Adjust gas flow to the ENTRANCE EDUCTOR flowmeter to balance the furnace gas outflow with the gas inflow. When a very low oxygen environment is required, adjust ENTRANCE EDUCTOR gas flow to a lower setting to allow gas to escape from the entrance to improve isolation from room atmosphere.

1.4.4 Heating Chambers

The two (2) furnace chambers are similar in construction to the entrance baffle and are hermetically sealed with plenum covers over the lamp ends. Inside this section, arrays of tungsten filament quartz heating lamp tubes located above and below the belt, generate intense near-wave (sometimes called "short-wave") infrared light with a color temperature of 2500 K (peak wave length of 1.16 µm). These lamps are very efficient heaters with very fast response times, producing up to 1500 W per lamp at full power and capable of heating the furnace chamber to a state of equilibrium within minutes.

Lamp Arrangement. The lamps are arranged symmetrically above and below the belt. The top and bottom lamps may be used independently or together to configure the best possible heat transfer mode for each individual process. **Table 1-1 Furnace Arrangement** shows the distribution of lamps and available power in each zone. See 802-101500 Power and Current datasheet in Section 5 for more information of the distribution of lamps and available power in each zone.

Table 1-1 Furnace Arrangement

Zone	Zone Length (in.)	# of Lamps Top / Btm	Lamp Spacing (in.)	Max. Available Zone Power* (W) 208 – 480 Vac	Max. Available Zone Power (W) 480 Vac
1	10	6 / 6	1.2	5500 - 18000	18000
2	20	8 / 8	2.3	7300 - 24000	24000
3	20	8 / 8	2.3	7300 - 24000	24000
4	10	6 / 6	1.2	5500 - 18000	18000

*Depends on line voltage.

Power Configurations. The CU-915 furnace is wired full power in all zones. Zones 1 and 4 are wired with three (3) parallel strings, each consisting of two (2) lamps in series. Zones 2 and 3 are wired with three (4) parallel strings, each consisting of two (2) lamps in series. This model will perform well throughout the design temperature range of the furnace (100-960 ^{0}C). Lamps within the furnace are arranged as shown in Table 1-2.

Table 1-2 Furnace Lamp Wiring Configuration

	Zone	Standard Configuration		Total Number of Lamps
		Strings Top/Btm	Lamps per String Top/Btm	
Ch1	1	3 / 3	2 / 2	12
	2	4 / 4	2 / 2	16
Ch2	3	4 / 4	2 / 2	16
	4	3 / 3	2 / 2	12

Zones. Each heating chamber is partitioned into 2 separate zones using ceramic fiber dividers. The dividers are designed with the smallest possible opening consistent with the parts clearance specifications. This partitioning assures very high thermal isolation between zones. Although the heating profile across the belt is extremely uniform, heat losses through the furnace side walls and at the belt edge supports produce a temperature drop near the edges of the transport belt. Away from the extreme edges of the belt, overall temperature uniformity across the belt is normally better than ±3 ^{0}C. Edge heaters can be used to improve the temperature evenness across the belt.

Temperature Measurement. Inside the furnace chamber, at the top center of each zone a type K thermocouple measures the temperature in that zone and provides feedback to each respective zone PID controller to determine the amount of power necessary to maintain setpoint temperatures. However useful these thermocouples are for controlling the temperature in each zone, the actual product temperature is influenced by three heat transfer methods and will most likely differ. As with any furnace, the most accurate way to determine what temperature product on the belt actually sees from these three methods of heating is to profile the furnace with a thermocouple placed directly on the product surface.

Chamber Process Gas. Process gas (CDA, N_2 , FG or other gas) is preheated before reaching the furnace interior by allowing it to permeate through the hot porous ceramic fiber insulation. This method of gas distribution has a limited effect on the temperature profile and helps keep the furnace interior clean. Adjust zone flowmeters to control the process atmosphere and to keep the lamps on as long as possible during.

1.4.5 Lamp Plenums (PLENUMS)

The heating lamps extend through the sides of the furnace chamber. The ends of the lamps are enclosed in a top or bottom plenum that is pressurized with furnace process gas (Gas 2) to seal the furnace interior from outside air. The plenums also serve to protect the lamp ends and termination wires from heat damage. Gas to all plenums is controlled by a single flowmeter. Adjust this flowmeter to assure process gas is always flowing at all times while the lamps are enabled during furnace operation.

1.4.6 Rapid Cool Transition Tunnel (RCT)

The Rapid Cool Transition Tunnel consists of a 10-inch long rapid cool transition tunnel with baffles designed to isolate the furnace heating section from the cooling section. The rapid cool transition tunnel is constructed of an insulated aluminum shell equipped with four (4) top air rakes and one (1) bottom air rake to promote atmospheric isolation and high rates of cooling. Process gas flow to the top and bottom air rakes can be adjusted independently, each via a separate flowmeter.

Hanging stainless steel baffle plates act as a thermal barrier and help contain the furnace heating and cooling atmospheres in their respective sections. The RCT is equipped with two (2) drip trays and one (1) exhaust stack with a single eductor for removing process gas from the RCT.

Adjust TRANSITION TOP flowmeter to control product initial temperature drop at it exits the IR chamber, and to isolate the furnace atmosphere from the cooling section. Adjust TRANSITION BOTTOM flowmeter to cool the belt and the product from the bottom. Adjust TRANSITION STACK to balance the furnace heating chamber environment and exhaust incoming Transition Tunnel gas flow. Note: Eductors exhaust 15 times the eductor flow.

1.4.7 Closed Atmosphere Cooling (CACT) with L-Rakes

The closed atmosphere cooling tunnel (CACT) is a 1600 mm (63 inch) long high efficiency heat exchanger that reduces the temperature of the product on the belt as it passes through the tunnel. The CACT is constructed of extruded aluminum heat sink material and is not insulated. Inside, process gas, CDA or N_2, is introduced via specially designed L-model air rakes that direct gas across the belt at 45 degrees downward to cool the product and 45 degrees upward to improve thermal transfer to the CACT internal cooling fins. Fans mounted on the exterior of the CACT transfer heat from the external cooling fins to the air inside of the furnace cabinet. This cabinet air is then exhausted by cabinet fans through openings in the furnace top cover into the room or for removal by facility exhaust ducting.

To inhibit drafts and ambient air from entering the CACT, hanging stainless steel baffle plates are mounted at the CACT exit. Adjust gas flow using the COOLING flowmeter to isolate the transition tunnel from room atmosphere and to control product cooling rate.

1.4.8 Unload Station (UNLOAD)

Located immediately after the final cooling stage exit, the Unload station consists of two (2) horizontal stainless steel surfaces 310 mm (12.25 inches) long x 150 mm (6 inches) wide positioned on either side of the belt. The Unload station provides a convenient area for placing parts exiting the furnace.

1.5 Console Controls & Indicators

1.5.1 Control Console

Interface with the furnace is via the Control Console (Figure 1-10) mounted over the heating section of the furnace. The Control Console is divided into 7 logical panels: Power panel, Energize Lamps panel, Temperature panel, Transport panel, Test panel, Status panel and Gas Flow Control panel. The Control Console is used to control furnace operation.

Figure 1-10 Furnace Control Console

1.5.2 GAS FLOW CONTROL Panel(s)

Indicates and Controls Process Gas flow. Atmosphere control is adjusted manually using needle valve flowmeters which control gas flow to the various parts of the furnace and out the exhaust stack in order to achieve overall gas flow balance within the furnace. The flowmeters are graduated in standard cubic feet per hour (SCFH). (See Figure 1-11).

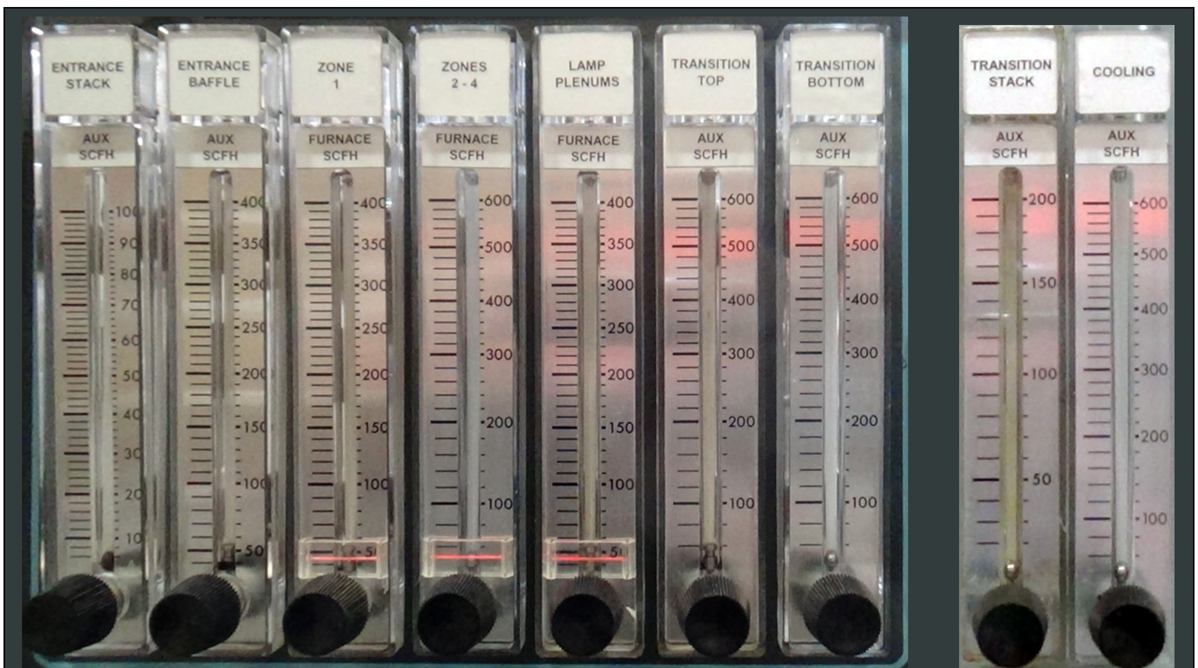


Figure 1-11 Gas Flowmeters - Dual Mode

Each flowmeter is identified with a label as to specific function and is adjustable from zero flow to full scale by means of a needle valve control knob. Turning this knob CW decreases flow; CCW increases flow. Flow is read on the graduated scale at the mid-point of the bead.

DUAL MODE. To accommodate the dual mode design, each flowmeter is connected to one of two manifolds, FURNACE or AUX. The FURNACE manifold supplies Gas 2 to the furnace chambers and plenums. The AUX manifold supplies Gas 1 to the auxiliary areas, all flowmeters except the furnace flowmeters. Dual mode control allows the user to select single gas or dual gas mode. See 1.7.5 Three Gas, Dual Mode system Three Gas, Dual Mode Operation.

A. ENTRANCE STACK (AUX)

Controls flow to the entrance exhaust stack venturi. stack flow has the capacity to exhaust from the furnace atmosphere with a volume 15 times the flow setting (for example, 10 SCFH Stack flow removes 150 SCFH of furnace atmosphere). Stack settings that are too high will draw room atmosphere into the furnace.

B. ENTRANCE BAFFLE (AUX)

Controls flow to the entrance baffle isolating the furnace from room air.

C. ZONE 1 (FURNACE)

Controls flow to furnace chamber zone 1.

D. ZONES 2 - 4 (FURNACE)

Controls flow to furnace chamber zones 2,3 and 4.

E. LAMP SEALS (FURNACE)

Controls flow to the sealed lamp plenum boxes on each side of the furnace heating chamber.

> For furnaces equipped with a PLENUM flowmeter, to prevent damage and avoid premature lamp failure:
> - When operating at 400 °C or below, set the SEALS flowmeter to at least 20 L/min.
> - When operating above 400 °C, set the SEALS flowmeter to a minimum of 24 L/min.

F. TRANSITION TUNNEL TOP (AUX)

Controls flow to the transition tunnel isolating the heating chamber and cooling chamber from one another. Floods area above belt with Aux process gas.

G. TRANSITION TUNNEL BOT (AUX)

Controls flow to the transition tunnel isolating the heating chamber and cooling chamber from one another. Cools bottom of belt and product with Aux process gas.

The following flowmeters are located on the OSS Control Enclosure.

H. TRANSITION STACK

Controls flow to the exhaust stack venturi located above the transition tunnel. Transition stack flow has the capacity to exhaust from the furnace atmosphere a volume 10 times the flow setting (for example, 10-12 SCFH Stack flow removes approximately 110 SCFH of furnace atmosphere).

The transition stack eductor is designed to exhaust gas from both entrance and exit ends of the transition tunnel. Stack flow will be approximately 1/3 from entrance end and 2/3 from the exit end of the transition tunnel. Lower flow from the entrance end can reduce the opportunities to draw oxygen into the furnace heating chambers from the cooling section. Generally transition stack settings that are too high can draw room atmosphere into the furnace heating and cooling sections.

I. COOLING (AUX)

Controls flow to the CACT closed atmosphere cooling tunnel gas rakes. Gas rakes in the cooling section are located in three (3) three places and are designed to increase thermal exchange between the product, belt and furnace atmosphere and the aluminum cooling section. Set flow to minimum level required to achieve satisfactory cooling at the furnace exit.

> Warning: When operating at high zone temperatures, if product exiting the furnace is too hot even at high Cooling gas flow rates, reduce belt speed to allow the product and furnace conveyor belt enough time to properly cool.

1.5.3 STATUS Panel

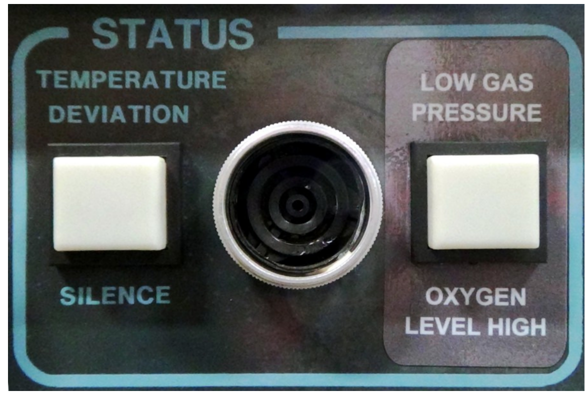


Figure 1-12 Status Panel and Alarm Controls

A. ALARMS

Indicates the condition that caused an alert or alarm. An alert condition will only produce an audible and visual warning. An alarm condition produces a visual warning and immediately shut off the lamps. Indicators stay lit until alarm or alert condition is satisfied.

B. TEMP DEVIATION alert indicator

Lights when any zone has experienced a process temperature outside the setpoint temperature (ALM1) limits set in its zone controller. Factory setting is +/- 10°C. Upper lamp will remain lit in alert condition until all zone controllers detect temperature deviations less than their setpoint.

C. OVER TEMPERATURE alarm indicator

If an Overtemp alarm is triggered on this furnace, the main contactor shuts off with an audible snap, the lamps go off, and the ALM3 LED lights up on the SOLO zone controller that recorded the alarm.

D. LOW GAS PRESSURE alert indicator

Upper lamp lights when the designated gas, or either designated gas in dual mode, has insufficient gas pressure, effecting operation. Factory setting is 55-60 psi on the pressure switch on each manifold. Check regulated gas pressure for each gas selected on the SUPPLY GAS SELECT panel. Lamp will remain lit in alert condition until detected pressure for all selected process gases is above the minimum setpoint.

WARNING: DO NOT RUN THIS FURNACE WITHOUT PROCESS GAS. Assure an adequate supply of process gas is available at 70 PSIG at the furnace before energizing the lamps to avoid damaging the furnace chamber, seals, and/or heating elements.

E. OXYGEN LEVEL HIGH alert indicator

Lower lamp lights when the oxygen analyzer detects oxygen concentrations above the level preset in the analyzer. See Oxygen Analyzer section in the Appendix to change the alarm setpoint. OXYGEN LEVEL HIGH lamp will remain lit and buzzer will sound until either

1. the oxygen concentration detected by the analyzer is below analyzer AL1, and
2. the Enter/Reset key on the Analyzer front panel is pressed to reset/re-arm the alert detector.

or

3. the OSS oxygen sampling system is turned OFF.

F. BUZZER

Audible warning. Broadcasts with an audible signal of any alert or alarm condition. Note: Alerts and alarms will not clear until all conditions are satisfactory.

G. SILENCE pushbutton with lamp

Silences audible alarm. Under any alert condition, the buzzer provides audible warning. Press the SILENCE button to disable the buzzer; this action will turn the SILENCE indicator ON (lower half of button) as a reminder to the user that the buzzer has been shut OFF. When the alert condition has been cleared, it is good practice to press the SILENCE button again to re-enable the buzzer and to turn the SILENCE indicator OFF.

1.5.4 POWER Panel

Figure 1-13 Power control panel

A. CONTROLS pushbuttons with indicator

The white pushbutton is an indicator light that stays ON while the control system is ON.

Pressing the white button applies power to the furnace controls, belt motor and cooling fans and lamps, if already enabled.

Pressing the red button shuts off power to the furnace and acts electrically in the same way as pushing an EMO button.

The white pushbutton is an indicator light that stays ON while the control system is ON.

B. COOL DOWN sequence

Press Energize Lamps button to disable lamps and allow all furnace zones to cool below 100C **before** pressing red button to disconnect power to control system and stop the belt.

1.5.5 TRANSPORT Panel

Figure 1-14 Transport Panel

A. SPEED ADJUST Knob

Sets belt speed setpoint. The SPEED ADJUST knob adjusts the belt speed. CW rotation increases speed, CCW rotation decreases speed setpoint. Fine tuning is possible with roughly 10 turns between minimum and maximum speed.

B. BELT SPEED Indicator

Displays belt speed. The digital display meter shows belt speed in inches per minute (ipm), millimeters per minute (mm/m), centimeters per minute (cm/min), or other custom units of rate.

The PAR, ▼ and ▲ are only used to change the display parameters and are normally disabled during furnace operation.

C. SPEED ADJUSTMENT & CONTROL

Normal operation. During normal operation, the belt speed is automatically controlled by the motor speed control board to a setting determined by the user. Turn the SPEED ADJUST knob to change the belt speed. Stop turning when the desired setpoint appears on the BELT SPEED display.

Note: Once set, belt speed may vary over time as the furnace warms or the room temperature changes. Periodically monitor and, if necessary, adjust belt speed by turning the Transport Speed Adjust knob.

1.5.6 EDGE HEAT Panel

A. EDGE HEATERs

Edge Heaters are heating elements that run the parallel to the furnace chamber. The furnace is equipped with one pair of edge heaters, one located under each side of the transport belt running the full length of the heating section. Edge heaters are used to compensate for temperature differences across the belt. Each edge heater is controlled by a knob on the EDGE HEAT panel.

B. EDGE HEATER control

Each edge heater is controlled by a single turn knob that is graduated from 0 to 10, representing 0-100% power for each heater. The top knob labeled LEFT controls the edge heater on the rear side of the belt. The bottom knob labeled RIGHT controls the edge heater on the front side of the furnace. Turn either knob clockwise to increase edge heat power for that heater. Turn knob fully counter-clockwise until switch clicks to disconnect an edge heater from operation.

C. EDGE HEATERs in operation

Because the edge heaters introduce heat that is not controlled by the temperature controllers, their use should be minimized. Excess edge heat can reduce IR lamp on time and lessen process control.

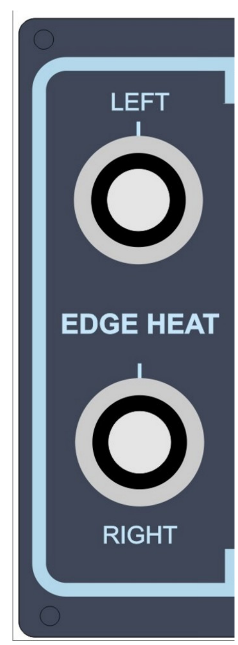


Figure 1-15 Edge Heat Panel

1.5.7 ELEMENT MONITOR Panel

A. TOP LAMP STRING and BOTTOM LAMP STRING indicators

Failed lamp indicators display lamp string current flow. Whenever a ZONE SELECTOR button is ON and current is flowing to the energized zone, a red LED lamp is lit continuously for the corresponding furnace lamp string above and/or below the belt.

Lamp strings are numbered starting from the furnace entrance. For example, **T1** refers to first top lamp string in Zone 1, B1 indicates the first bottom lamp string in Zone 1.

Note: A lamp "string" is one IR heating lamp, or two or more IR lamps wired in series to maximize each lamp's efficiency. See Figure 1-16 for correlation of lamp strings to zones.

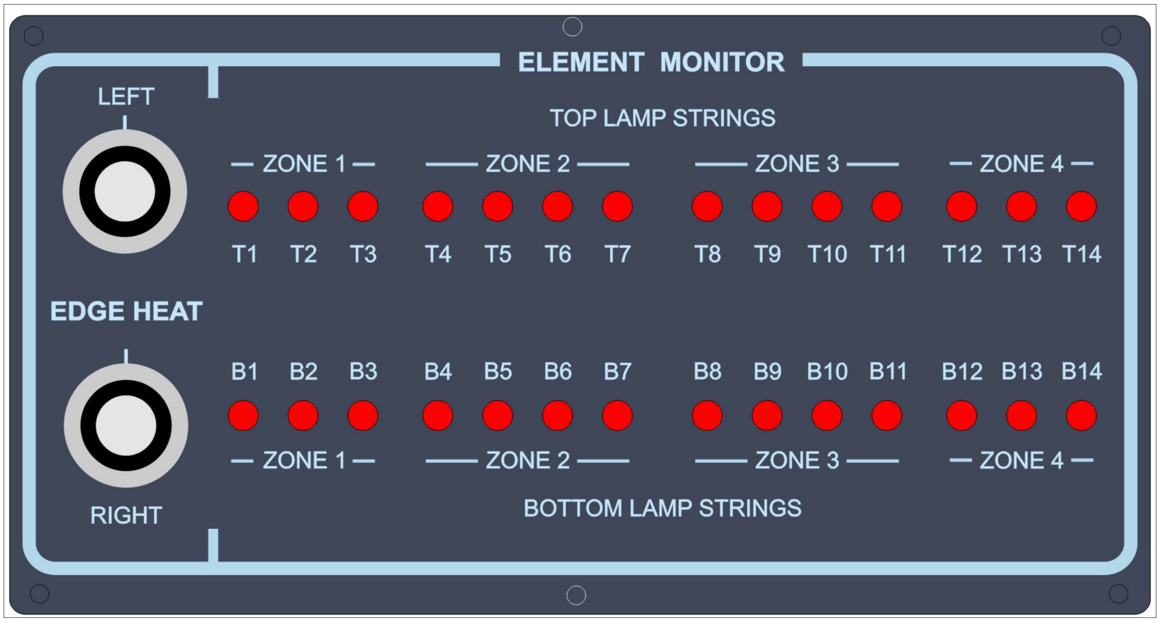


Figure 1-16 Zone Lamp Element Monitor Panel

B. Lamp Strings by Zone

LEDs that should be lit for each zone are indicated in Figure 1-16. In each zone, if energized all TOP and all BOTTOM LEDs, if energized, should be lit at the same time. If one LED in a zone does light, any others that do not light indicate the lamp string may contain a failed lamp or loose wire.

Table 1-3 Lamp Strings by Zone

Number of strings	Zone 1	Zone 2	Zone 3	Zone 4
Top Lamp Strings	3	4	4	3
Bottom Lamp Strings	3	4	4	3
Total Zone Lamp Strings	6	8	8	6

C. EM During Normal Operation

During normal operation, if an indicator is lit, the lamps in the string are fine. If unlit while current if flowing to an energized zone, the commanded power may be too low or OFF for an accurate assessment (a condition most likely during actual operation of the furnace); one of the lamps in that string may have failed; or the string may not be in the group of lamps selected on the ENERGIZE LAMPS panel. For a more definitive assessment, let the furnace cool and monitor the lamp string indicator LEDs during warmup. Immediately upon start of warmup, the red LED's for all selected zones should be lit.

1.5.8 TEMPERATURE Panel

The Temperature Control panel enables and controls zone infrared lamps.

A. Energize Lamps Buttons with indicator

There are four (4) pairs of Energize Lamps pushbuttons, 2 buttons for each zone. Each pair of buttons is located next to its respective zone temperature controller. Each pushbutton switch turns its respective top or bottom heating elements in the designated zone ON and OFF. When a button is pressed, those elements are selected to be ON and the switch light turns ON. Pressing the button again turns those elements OFF.

Selected zones remain selected even when furnace power is OFF.

Figure 1-17 Energize Lamps controls

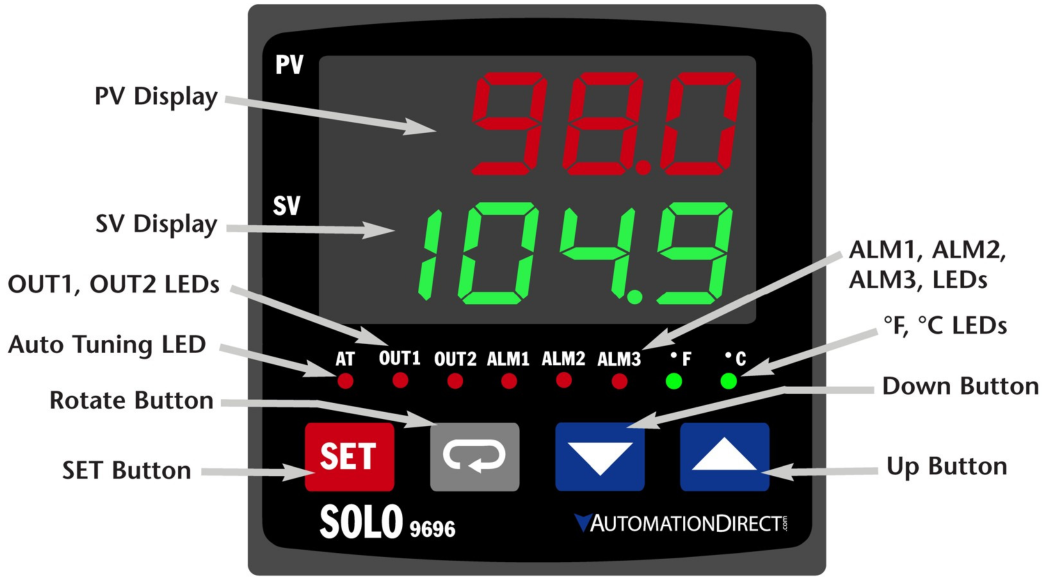
> NOTE: Change zone selection only with LAMPS OFF to maximize zone selection switch life.

B. Zone Temperature Control

Independent control of each furnace zone is provided by type K sensing thermocouples, located above the belt in each zone, coupled to digital temperature controllers that regulate the power output of the lamps and sense alarm or alert conditions in each zone. The behavior of the furnace zone heating elements is controlled via these sophisticated PID temperature controllers (Figure 1-18).

Figure 1-18 Zone Temperature Controllers

Each zone controller is a digital single-loop PID controller with loop Auto-tune and three alarm functions. The controller's closed loop temperature control system uses K-type thermocouples for feedback. For each zone, four individual PID models are independently optimized to provide excellent furnace performance throughout the 100-960°C operating range of the furnace. The zone controllers automatically select the PID control model closest to the target setpoint. Zone temperature controller indicators and controls are illustrated in Figure 1-19.



PV Display: process value or parameter type	**ALM1-ALM3:** alert/alarm LEDs, light when ON
SV Display: setpoint or parameter value	**ºF, ºC:** temperature units selected. Default is °C
AT: flashes when Autotuning operation is ON	**SET:** press to select mode or set parameter value
OUT1: lights when control output is ON	**ROTATE:** selects next parameter within a mode
ALM1-ALM3: alert/alarm LEDs, light when ON	**DOWN:** press to decrease displayed SV values
ºF, ºC: temperature units selected. Default is °C	**UP:** press to increase displayed SV values

Figure 1-19 Temperature Controller Indicators and Control Buttons

1.6 Furnace Auxiliary Equipment

1.6.1 Fans

Cabinet Fans. The furnace is equipped with two (2) pairs of 10-inch diameter fans mounted on the underside of the top of the furnace cabinet. This fan exhausts heat emitted from the outside of the furnace chamber and cooling tunnel into the room or customer installed exhaust system.

Control Enclosure Fans. The control enclosure does not require fan cooling.

Lower Electrical Enclosure Fans. Three (3) 4" fans are located on the top of each of the two (2) lower electrical enclosures. An additional two (2) fans are located between the front and rear enclosures to direct cooling are across the SCR heatsinks.

Cooling System Fans. The exterior of the CACT cooling tunnel is cooled by two (2) pairs of fans mounted on the top and bottom of the tunnel. Cabinet air forced over the cooling tunnel removes heat conducted from the tunnel interior. This air is evacuated via the cabinet fan.

1.6.2 Belt Travel (LTR)

The CU-915 belt operates in standard direction of travel from left to right when facing the furnace control console. As an option, furnaces can be configured for right to left belt travel.

1.6.3 Transport Belt

The standard CU-915 standard conveyor belt is designed for high temperature applications. The belt is a close weave design manufactured from high temperature Nichrome-V wire, comprised of 80% nickel and 20% chromium. This belt offers fast heat-up times, more uniform operating temperatures and excellent mechanical stability. It also exhibits minimum shrinkage, growth, sag or distortion in use.

These belts offer fast heat-up times, more uniform operating temperatures and excellent mechanical stability. This belt exhibits minimum shrinkage, growth, sag or distortion in use.

1.6.4 Universal Transformers

All primary transformers used in the furnace are manufactured specifically for RTC furnaces. These transformers are 50/60 Hz multi-tap and can be configured to operate the furnace at most commonly available voltages worldwide.

1.6.5 Transport Drive

A. Major Components

The major transport drive components are listed in Table 1-4 .

Table 1-4 Transport Drive Components

Item	Brand	Model	Drive RPM	HP	Torque, (in-LB)	Motor RPM	Gear Ratio	Belt Speed (ipm)
Controller	Minarik	PCM23011C	-	1/20-1/8	-	-	-	-
Motor, Medium Speed	Bison	011-336-3062	13	1/8	254	1800	143:1	4.0 – 75
Motor, Low Speed	Minarik, Bison	011-656-2206 (507-01-416)	0.9	1/20	710	1980	2206:1	0.3 - 4.0
Encoder	Servotek	PTB2-30-05-A	-	5 Vdc	-	30 ppr	-	-

B. Motor Controller

Variable speed SCR drive controller operated in the manual mode with a control panel-mounted potentiometer to scale output voltage to the motor. Drive is mounted in the furnace control enclosure. Drive must be set for 90 Vdc motor operation. Single motor controller can operate either medium speed or low speed motor. See Figure 1-20.

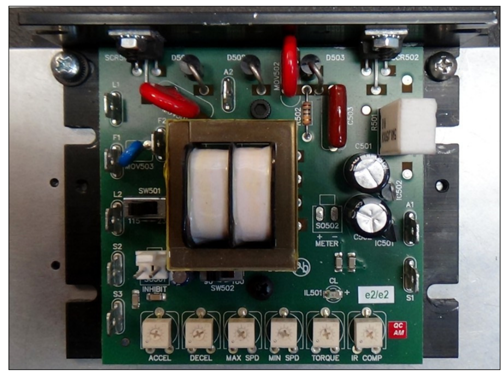


Figure 1-20 Motor Controller

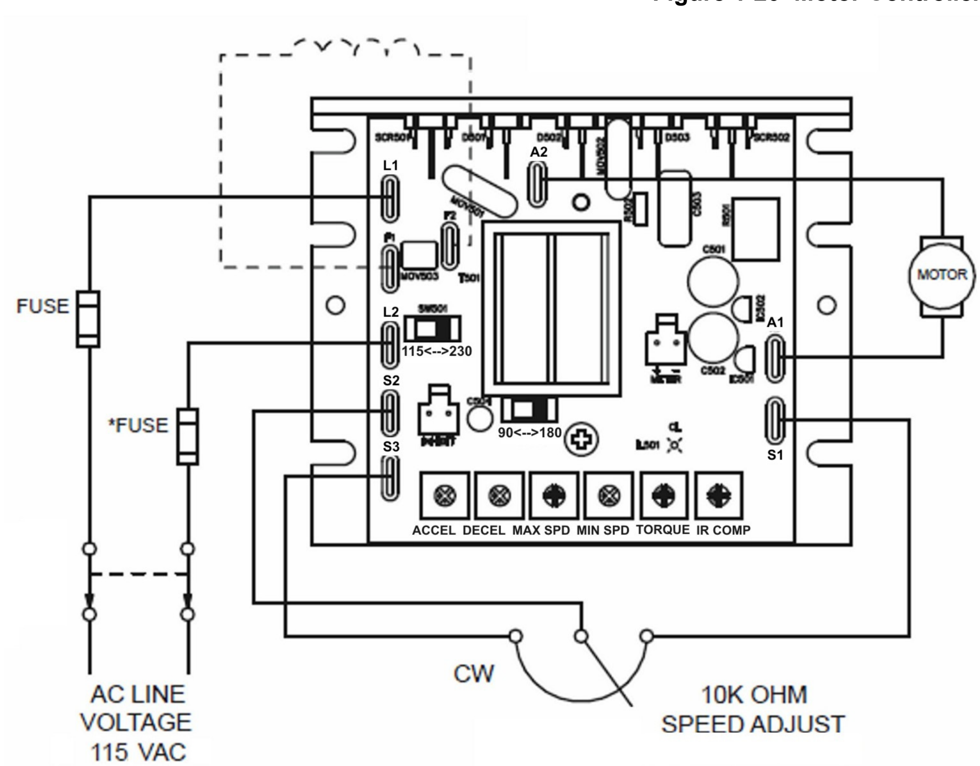


Figure 1-21 PCM23011C Motor Controller

C. Primary Motor, Medium Speed

The primary transport drive motor is a 1/8 HP TENV Brushless parallel shaft DC gearmotor and encoder assembly. The transport motor assembly is mounted in an enclosure at the exit end of the furnace. Drive chain and motor sprocket sized to provide the desired belt speed range shown in Table 1-4. The medium speed motor is shown in Figure 1-22 and Figure 1-23. Store primary motor and chain on large pedestal alternate motor is in use.

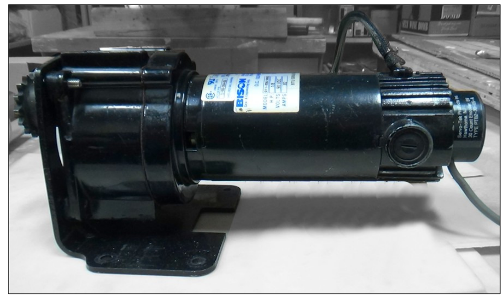
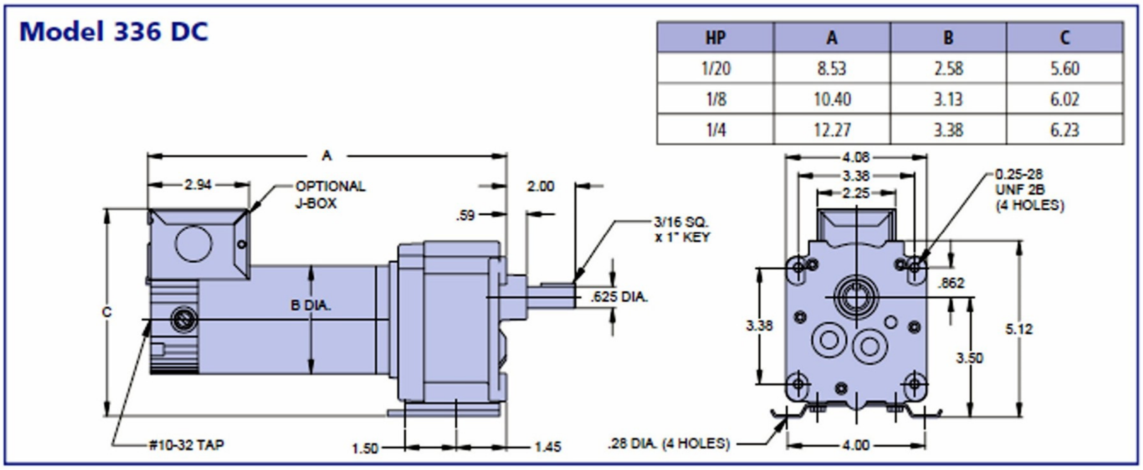


Figure 1-22 Drive Motor, Medium Speed



HP	A	B	C
1/20	8.53	2.58	5.60
1/8	10.40	3.13	6.02
1/4	12.27	3.38	6.23

Figure 1-23 DC Drive Motor, Medium Speed

D. Alternate Motor, Low Speed

A second transport drive motor is included to allow operation of the furnace at very low speeds (see Table 1-4. This motor is a Bison 650-series 1/20 HP TEFC permanent magnet parallel shaft DC gearmotor and encoder assembly. The transport motor assembly is mounted in an enclosure at the exit end of the furnace. Drive chain and motor sprocket sized to provide the desired belt speed range shown in Table 1-4. The medium speed motor is shown in Figure 1-24 and Figure 1-25 . Store alternate motor and chain on large pedestal primary motor is in use.

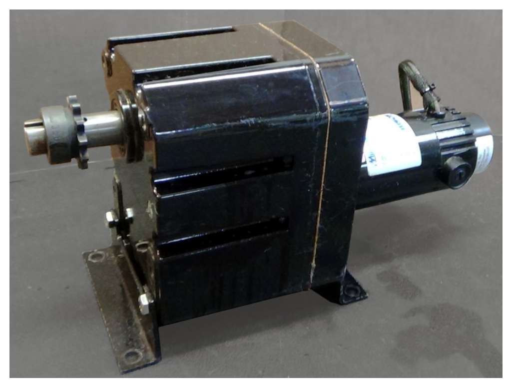


Figure 1-24 Motor, Low Speed

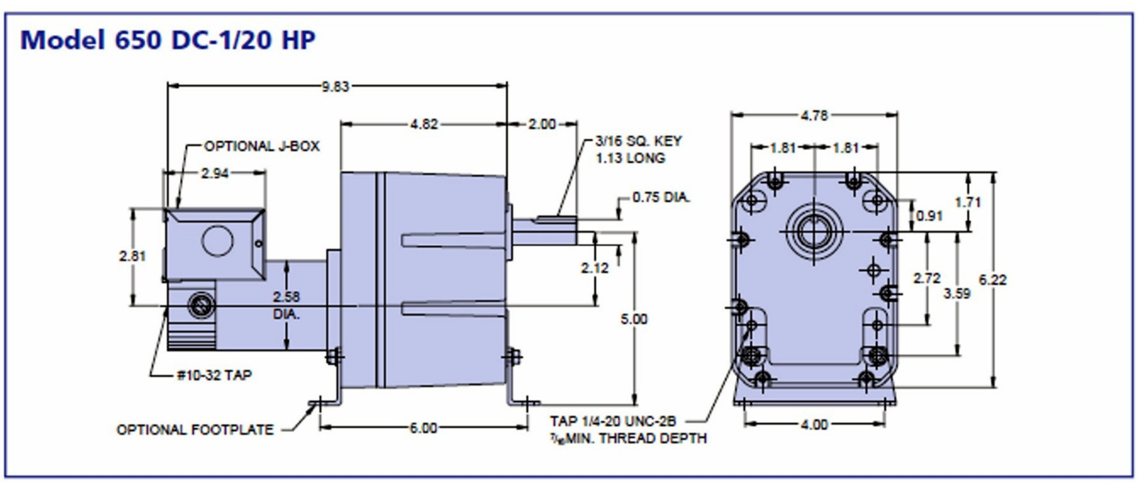


Figure 1-25 DC Drive Motor, Low Speed

1.7 Optional Equipment

Features and operation of the selected furnace equipment options that were been included with the furnace. See Table 1-5 for a summary of featured options. Unshaded items in bold were supplied on the furnace.

Table 1-5 Summary of Advanced Features & Options

Installed Options				Popular Options	
aBeltSpeed	**Alternate Belt Speed**	**OA**	**Oxygen Analyzer**	HSK	Handshake, Upstream/ Downstream
DGO	**Dual gas operation**	**OSS**	**Gas sampling system**	PH1, PH4	25, 100 mm chamber height
DTC	**Dual Thermocouples**	**SSP**	**Sample ports**	RTL	Right to Left Belt Travel
EM	**Element Monitoring system**			**SENSLAS**	**Laser product alert system**
				UPS	Uninterruptable power supply

1.7.1 Air Filter Regulator (AFR option ❒, not supplied)

High volume compressed gas filter, moisture trap and pressure regulator to assure supply compressed gas is clean, dry and at the proper pressure before entering the furnace. If this option is not selected, customer must assure that an adequate supply of clean dry compressed gas not exceeding 5 bar (70 psig) is connected to the furnace.

Figure 1-26 3-Phase Circuit Breaker

1.7.2 Circuit Breaker (CB-3 option ❒, not supplied)

A three phase circuit breaker can be installed in a lower panel or in an enclosure on the top of the furnace for convenient shutoff of the furnace when not in use. (Figure 1-26).

On three phase systems, the standard single phase circuit breaker switch is omitted.

1.7.3 Load Extension (CXE15 option ❒, not supplied)

Increases standard 368 mm (14.5-inch) stainless steel Load station at the entrance of the furnace in 380 mm (15-inch) increments. Useful if a longer product load area is needed. (Similar to Figure 1-27). Increases furnace length by a like amount.

1.7.4 Unload Extension (CXX15 ❒, not supplied)

Increases standard 368 mm (14.5-inch) stainless steel Unload station length at the exit of the furnace in 380 mm (15-inch) increments. Used for product inspection or to provide a longer period for product removal.

Increases furnace length by a like amount.

Figure 1-27 LA-309 Unload station with CXX15

1.7.5 Three Gas, Dual Mode system (DGO supplied option ◙)

Dual mode systems can allow a specialty gas to be introduced into the furnace chamber while another gas is be provided to all furnace auxiliaries.

A. DGO Equipment

Includes separate manifold for supply of a different gas to the furnace heating zones (Furnace Gas2). Aux (Gas 1, CDA or nitrogen) is supplied to eductors, transition tunnels baffle sections and closed atmosphere cooling. Furnace (Gas 2) can be either the same as Gas 1, or Gas 2, forming gas or other specialty gas supplied to the furnace chambers and lamp plenums. The Control Console will sound an audible alarm and provide visual indication for a low Gas 1 or 2 supply pressure condition.

B. Single Gas Operation

A furnace plumbed for dual gas can be operated in single gas mode. To operate in single gas mode:

4. Assure that gas is flowing from supply source at the proper supply pressure (70 psig).
5. AUX GAS VALVE: Select CDA or N2 gas.
6. FURNACE GAS VALVE: Select SINGLE GAS mode.

The furnace will operate with Gas 1, either CDA or nitrogen flowing to all auxiliary and furnace sections.

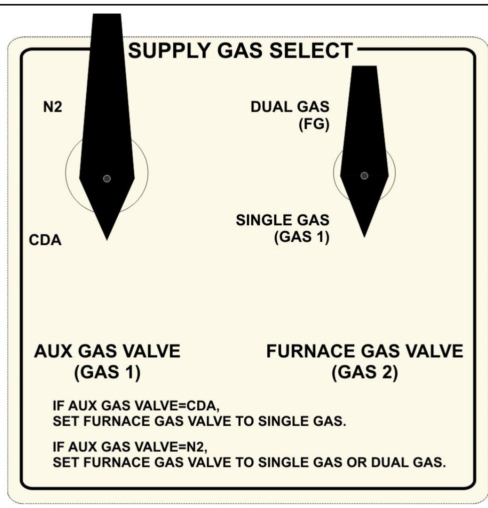


Figure 1-28 CDA - Single Gas mode

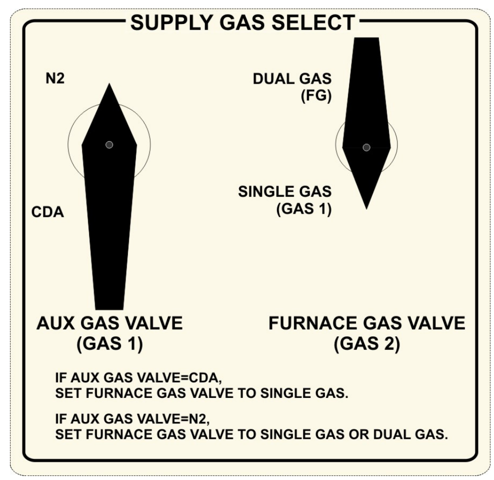


Figure1-29 N_2 – Single Gas mode

C. Dual Gas Operation

A furnace plumbed for dual gas is operated in much the same way as a single gas furnace. To operate in dual gas mode:

1. Assure that gas is flowing from both supply sources at the proper supply pressure (70 psig).
2. AUX GAS VALVE: Select N2 gas.
3. FURNACE GAS VALVE: Select DUAL GAS mode.

The furnace will operate with nitrogen flowing to the Aux furnace sections and Gas 2, forming gas or other gas flowing to furnace and lamp plenums.

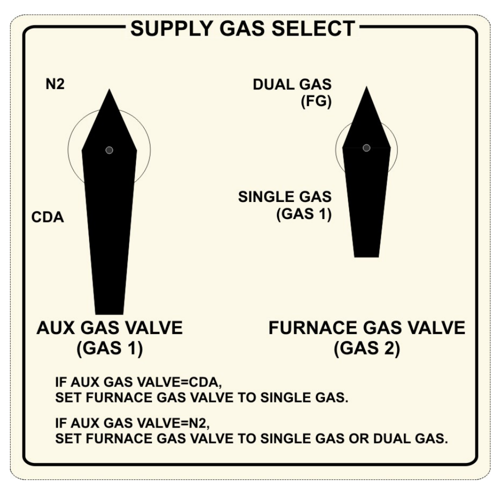


Figure 1-30 N_2/FG - Dual Gas mode

1.7.6 Dual Thermocouples (DTC supplied option ◙)

Dual type K thermocouples are installed on each zone. Each dual thermocouples is comprised of two (2) separate thermocouples enclosed in a single sheath. On each zone, one thermocouple is connected to the furnace control system. The second connection is available for other uses such as independent over temperature alarm system or data logging.

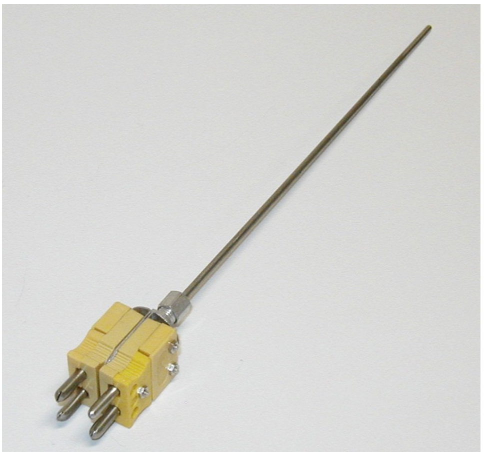


Figure 1-31 Dual Thermocouple

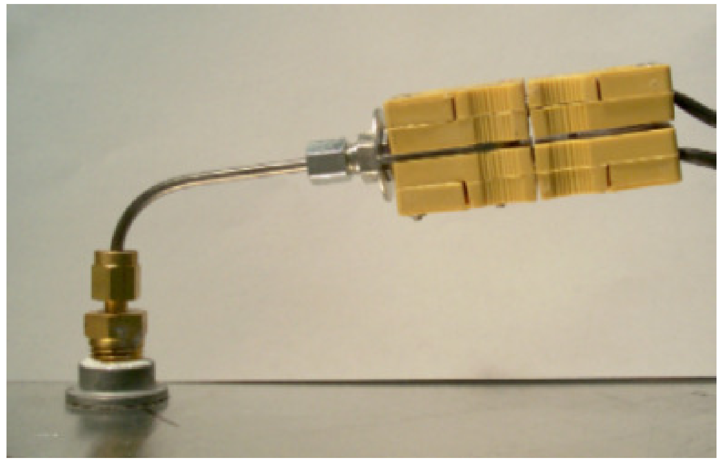


Figure 1-32 Dual Thermocouple Installed

1.7.7 Element Monitoring System (EM supplied option ◙)

The Element Monitoring system is a lamp failure alert system that senses current in the lamps when firing and alerts users of an element or lamp failure if current is not detected when power is applied to the lamps. See 1.5.7 for Element Monitor system description.

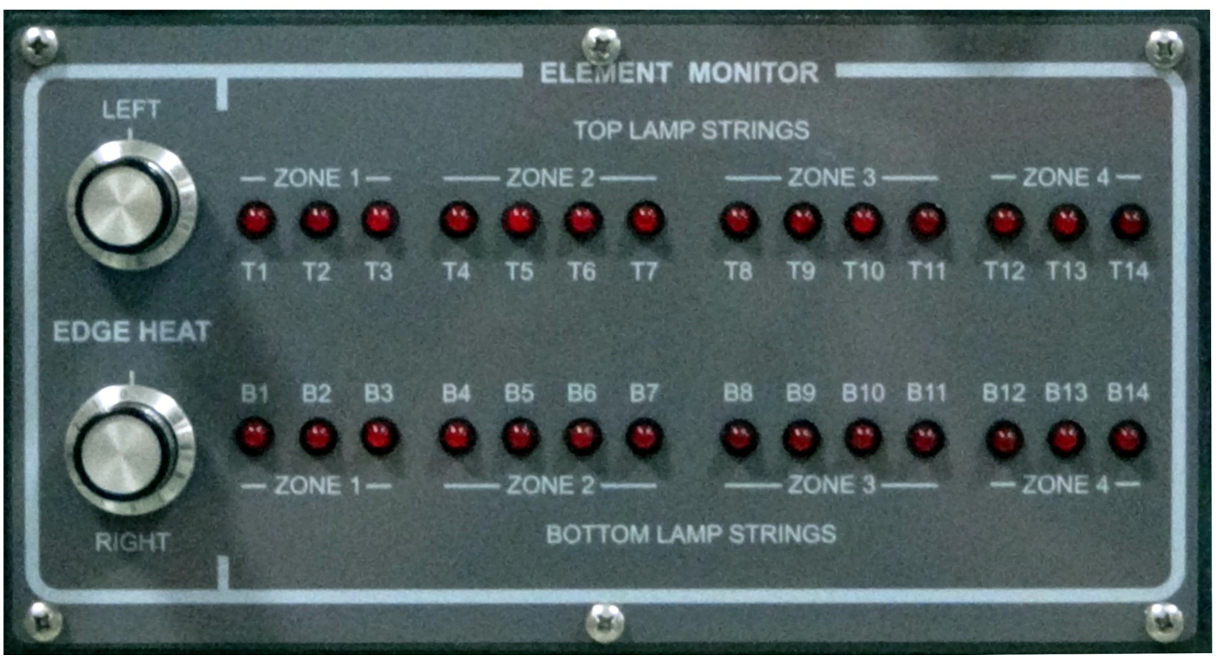


Figure 1-33 Zone Lamp Element Monitor Panel

1.7.8 H2/N2 Mixing (HO/NHM option ❒, not supplied)

Hydrogen/nitrogen mixing allows hydrogen and nitrogen to be introduced separately into the furnace gas mixing system where it is blended before being introduced into the furnace heating chamber.

A. HO/HNM Equipment

Hydrogen/nitrogen mixing requires the addition of a special gas mixing console and combustible gas sensors at key points on the furnace as well as additional flow and pressure sensors to assure the hydrogen introduced in an oxygen free furnace environment. Exhaust stack ignitors are also added to harmlessly flame any free hydrogen that maybe evacuated from the furnace.

B. HO/HNM Operation

Use of Hydrogen (H2) in the heating chamber requires special furnace owner safety considerations including:

1. Furnace installation ensuring proper ventilation and safe source gases,
2. Special warm up and cool down procedures must be followed.
3. Gas flow balance is critical to the safety of all personnel working near an infrared furnace operating with hydrogen process gas. Escaping hydrogen gas, or the admission of oxygenated gas into the process section is extremely hazardous.

These three elements ensure that no additional H2 gas is allowed into the furnace and that the remaining H2 is diluted and removed as quickly as possible.

Separate operating instructions will be provided for the HO/NHM option.

	**DANGER: DO NOT CONNECT COMBUSTIBLE GAS TO THIS FURNACE. Forming gas or other gas mixtures which have a combustible gas component can be safely introduced into furnace provided the delivered concentration is below its lower flammable limit (LFL) in air. This system does not have combustible gas sensors and will not alert users to escaping combustible gas, if present.**

1.7.9 Handshake (HSK, option ❒, not supplied)

Normally Open and Normally Closed contacts supplied at entrance and exit of the furnace that are activated when PROCESS READY is reached. Facilitates notification to upstream and downstream equipment that the furnace is ready to process product.

1.7.10 Line Filter (LFI option ❒, not supplied)

An AC power line interference filter reduces the potential electrical interference generated by SCRs and motor controls within the furnace. Compliant with IEC 60950. This option is included on furnaces with the European CE option.

1.7.11 Light Tower (LT option ❒, not supplied)

Three color light tower that indicates when furnace is in Process Ready, Warmup or Alarm condition.

Figure 1-34 Light Tower

1.7.12 Moisture Analyzer (MA option ❐, not supplied)

For processes that are sensitive to moisture, a moisture analyzer can provide status of monitored zones.

The moisture analyzer can be connected to any one sample port (with SSP option) or can used with a 3-port sample system (OSS option).

Figure 1-35 MM510 Moisture Analyzer

A. MA Equipment

The brand of moisture analyzer can generally be specified by the owner. A high quality choice, the MM510 electrolytic moisture analyzer is designed for precise measurement of moisture in gas over a wide range (0.1 ppm to 1000 ppm with ± 5% accuracy). The analyzer is configured with an internal sample pump. The sample systems are manufactured using stainless steel throughout with 1/8-inch tube connections on the sample line. Sample flow is 0.05-0.5 L/min (50-500 cc/minute) controlled.

MM510 Sensor. The phosphorus pentoxide moisture sensor consists of a dual platinum winding formed around a quartz tube about 8 cm long. A constant voltage is applied across the windings and the current monitored. The moisture in the sample gas stream causes the resistance of the platinum coil to change. The change in resistance results in a change in measured current providing an absolute measure of the moisture contained in the process sample gas. Unlike aluminum oxide sensors, the phosphorus pentoxide sensor does not require annual factory calibration.

B. MA Operation

The model of moisture analyzer selected will be factory set for your application.

1. Startup of the furnace will start the moisture sampling if the analyzer is left enabled by the operator.
2. A switch on the back of the analyzer allows shutoff of the analyzer while the furnace is running, if desired.
3. Sample line flow is controlled by the valve knob on the back of the analyzer Adjust to 0.15 L/min.

1.7.13 Oxygen Analyzer (OA, supplied option ◙)

This furnace is equipped with an oxygen analyzer and 3-port sampling system with source gas purge.

An oxygen analyzer can assure furnace settings result in a low oxygen environment in the furnace chamber during operation.

The EC913 process oxygen analyzer uses an electrochemical RACE™ cell for accurate measurement of oxygen (measuring range: 0.1 ppm-30% at ± 2%) and features microprocessor controlled functions, large auto-ranging LED display, and fast response. To avoid interference, indicate if hydrogen gas will be present.

Figure 1-36 EC913 Oxygen analyzer

The analyzer is fitted with an integral sample pump downstream of the sensor. The sample Out valve on the back of the analyzer is used for flow control and is adjustable from 0.05-0.5 L/min (50-500 cc/min) sample rate (default is 0.1 to 0.15 L/min).

On the CU-915 furnace, the oxygen analyzer is placed on top of the furnace next to the OSS Sample System enclosure. The analyzer is integrated with the furnace control system and if energized will turn on when the furnace is started. High oxygen level lights the OXYGEN LEVEL HIGH indicator light on the Furnace Control Console. The oxygen concentration is displayed on the analyzer front panel. The high O2 alert (ALR1) is set in the analyzer itself.

Figure 1-37 shows the Oxygen analyzer in place next to the OSS Enclosure. The analyzer can be disconnected from the furnace and used elsewhere.

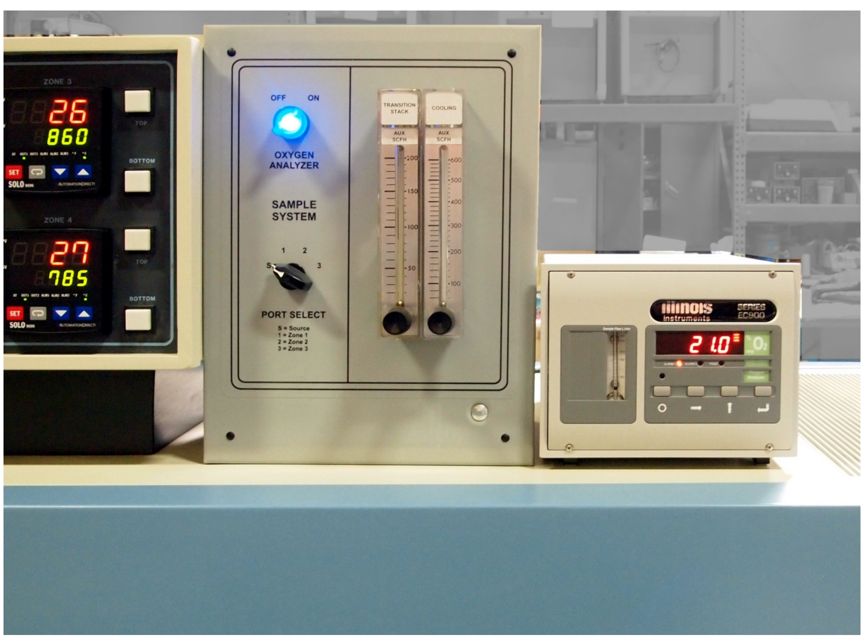


Figure 1-37 Oxygen analyzer next to OSS sample system

1.7.14 OSS, Manual (supplied option ◙)

The Oxygen Sample System (OSS) provides user selection of any one of 3 furnace ports or the source gas (nitrogen) to a sample gas line to the gas analyzer equipment (typically moisture and/or oxygen analyzer).

A. OSS Equipment

This system consists of electrical controls and piping of a 4-port manifold to a source gas and 3 sample ports. The sample ports are located on the bottom of each furnace chamber zone. The Source is piped from Gas1 (or the nitrogen source) through a pressure regulator adjusted to 35 mbar (0.5 psig) and connected to port 1 on the manifold.

B. Analyzer Initial Setup (with OSS)

Enable analyzer by turning Power Switch on back of analyzer (Figure 1-39) to ON position.

Open IN valve full CCW (on back of analyzer, (Figure 1-39).

> **Note A: In this configuration, analyzer will start when the white furnace POWER ON button is pressed and stop when the red furnace POWER OFF button is pressed.**

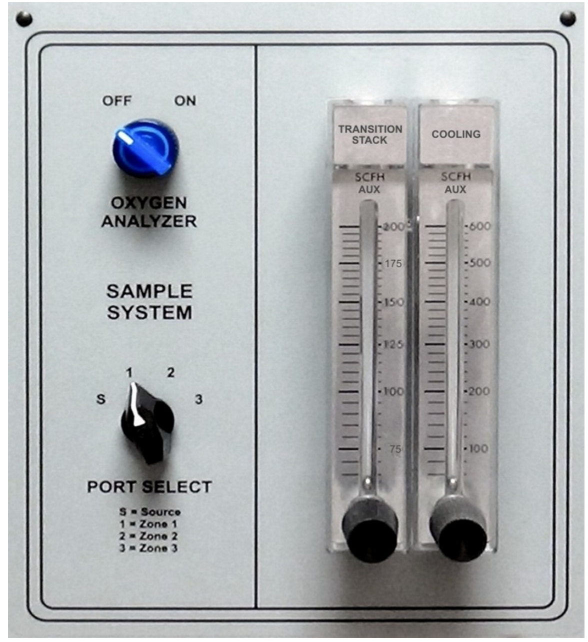


Figure 1-38 Sample System control panel (shown with 2 Aux Flowmeters)

C. OA Operation (with OSS)

Start furnace.

On the control panel:

1. select sample port using Port Select switch,

2. turn Analyzer ON switch to energize system and start analyzer.

During initial startup, adjust OUT valve until Sample Flow flowmeter on front of analyzer reads 0.1-0.15 L/min (Figure 1-39).

On subsequent startups, the flow rate does generally not need to be adjusted.

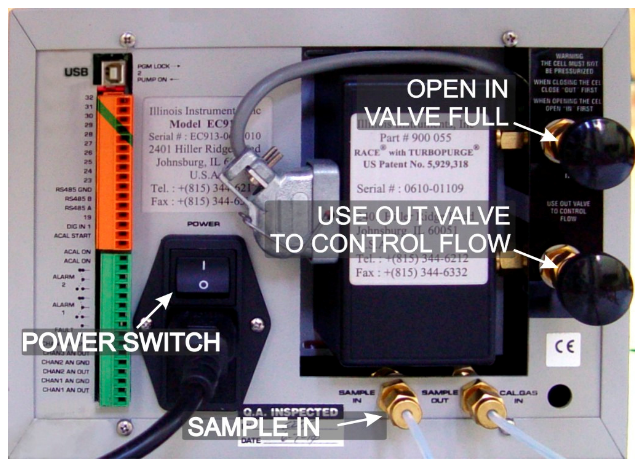


Figure 1-39 EC913 Oxygen Analyzer Rear Controls

> **Note A: When the sample line is dry, accurate readings can be obtained within minutes. If the sample line contains moisture, it may take from 20 minutes or longer. Moisture may be purged from the sample line by disconnecting the line from the analyzer and using a dry gas (nitrogen) to flush the line. Be careful to keep the pressure under 2.5 bar (35 psig) to avoid disconnecting the sample line from the furnace.**
>
> **Note B: When nitrogen is connected to Gas 1, Port Select S will sample the source nitrogen. Ports 1, 2 and 3 sample the respective furnace zones.**

D. Shut Down Analyzer (with OSS)

If the analyzer is to be out of service for a period of time, further isolate the cell to prolong its life.

If system is not equipped with a check valve on the Sample OUT line, close OUT valve on back of analyzer (to isolate cell).

If analyzer is disconnected from the OSS, Close IN valve on back of analyzer (to isolate cell).

> **Note A: Analyzer valves can be left in open position while connected to the CU-915 as the sample port manifold will isolate the analyzer cell from gas flow when the system is off.**
>
> **Note B: To prolong cell life, limit sampling of air.**

1.7.15 Over Temperature Alarm Operation (OT option ❒, not supplied)

The Over Temperature Alarm system consists of independent redundant zone thermocouples, a scanner/annunciator and digital panel meter hardware integrated into the furnace control system. The scanner/annunciator and digital panel meter are mounted on top of the furnace.

NORMAL OPERATION. The system scans each zone and passes a temperature signal to the digital panel meter. The operator can view the temperature on the panel meter and the respective zone being monitored will be indicated on the scanner

ALARM. If the temperature in any zone reaches the alarm set point, an alarm will sound in the scanner/annunciator and the furnace will go into Cool Down, the heating elements will be shut off by the controller. To silence the alarm, press ACK on the scanner/annunciator. The furnace cannot be restarted until the zone temperature drops below the alarm set point.

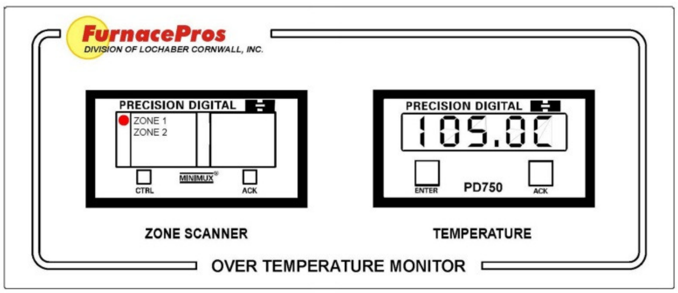


Figure 1-40 Over Temperature Monitor

The OT system is in addition to the standard high/low temperature Alert/Alarm system included with the furnace controllers and/or software.

1.7.16 Cabinet Over Temperature (option ❒, not supplied)

For high temperature furnaces (1000C), a secondary thermocouple can be attached near the center of the heating chamber between the chamber and the outside panel. The sensor is attached to and indicator to allow the user to monitor the cabinet temperature, which can reveal possible furnace control problems, cabinet fan failure, or blocked air inlets or exits.

1.7.17 Product Clearance (PH1, PH4 option ❒, not supplied)

Furnace chamber with a product clearance of 50 mm (2 inches) is standard. As an option, alternate chamber sizes can be ordered.

PH1 – Precision chamber height that will allow a maximum of 25 mm (1 inch) clearance above the belt for product. Allows for tighter temperature and atmospheric control.

PH4 - Large chamber height that will allow a maximum of 100 mm (4 inches) clearance above the belt for product. Allows for large product processing at the expense of increased power and process gas requirements.

1.7.18 Product Alert (SENSLAS option ❐, not supplied)

The SENSLAS system alerts operators when product exits the furnace. For longer processes, operators can perform other tasks in the same work area and respond when product appears at the furnace Unload station (Figure 1-41).

Figure 1-41 SENSLAS System

A. SENSLAS Equipment

This system consists of a laser sensor and audible chime with volume control. The SENSLAS system is conveniently controlled at vertical face of the furnace exit. The sensor is mounted on an adjustable bracket approximately 74-90 mm (3-3.5 inches) from the furnace exit (Figure 1-43).

Figure 1-42 SENSLAS Control Panel

B. SENSLAS Operation

Easy to operate, the operate turns the system on using a lighted switch. Each time product passes under the sensor, the Clear button lights and a gentle audible chime continues to sound until the Clear button is pressed. Turning a four position selector switch changes the volume of the chime from quiet to loud. To disable the system, the ON/OFF switch is turned counter-clockwise (Figure 1-42).

1. Turn the SENSLAS Off/On clockwise.
2. Place hand under laser sensor and adjust the volume selector (1=low, 4=high) to desired sound level.
3. When parts pass under sensor, chime will sound and clear button lights until reset.
4. Press CLEAR button to reset chime.

When enabled, the system can be switched on and off at the furnace Control Console when either of the CONTROLS buttons is pressed.

C. Sensor Calibration

The sensor can be calibrated using two objects: a sample of the product (foreground) and a thin flat sheet of metal or other material (background).

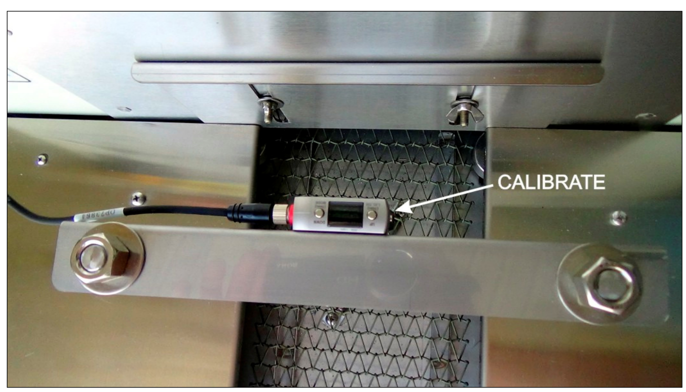


Figure 1-43 Calibrate Sensor

1. Turn on the SENSLAS system.
2. Set the belt at a slow speed (125-250 mm/min (5-10 ipm).
3. Place the two objects in line just before the laser sensor with background object on the center of the belt first immediately followed by the foreground object.
4. As the background object passes under the laser beam, press calibrate button on the side of the sensor for less than 1 second Figure 1-43.
5. As the foreground object passes under the sensor press the button again for less than 1 second.

The sensor is now calibrated to sense objects between the height of the background and the foreground.

1.7.19 Sample Ports (SSP supplied option ◙)

This option includes control enclosure port connection to one or more of the sample ports located on the underside of each zone. Allows connection of an oxygen analyzer, moisture analyzer or other gas analyzer. Must be used with a sample pump (not included). Port connections are located under chamber . Figure 1-44 shows a typical port location on a chamber. Note: The chamber is fitted so that even if this option is not included at the time of manufacture, sample ports can be added later, if required. Included with OA, MA and OSS options.

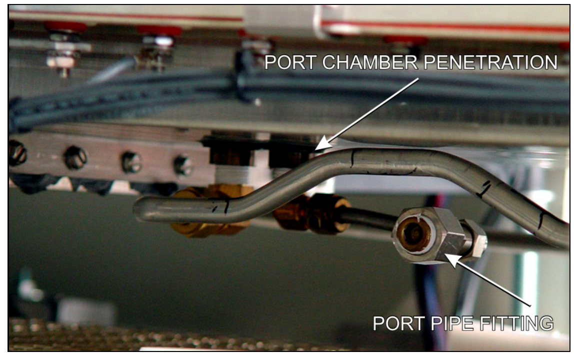


Figure 1-44 Sample Port Chamber Penetration

PORT CONNECTIONS. This RTC model CU-915 furnace has been retrofitted with sample port connections on all four zones. Ports on zones 1, 2 and 3 will be connected to the OSS Sample system. The port on zone 4 is for provided for separate sampling. This port will be extended to the furnace enclosure for easy connection to owner's separate control system.

SPARE PORT. A fifth port located on the top of the Zone 4 chamber will be provided and capped with a fitting for future use with IR or other equipment.

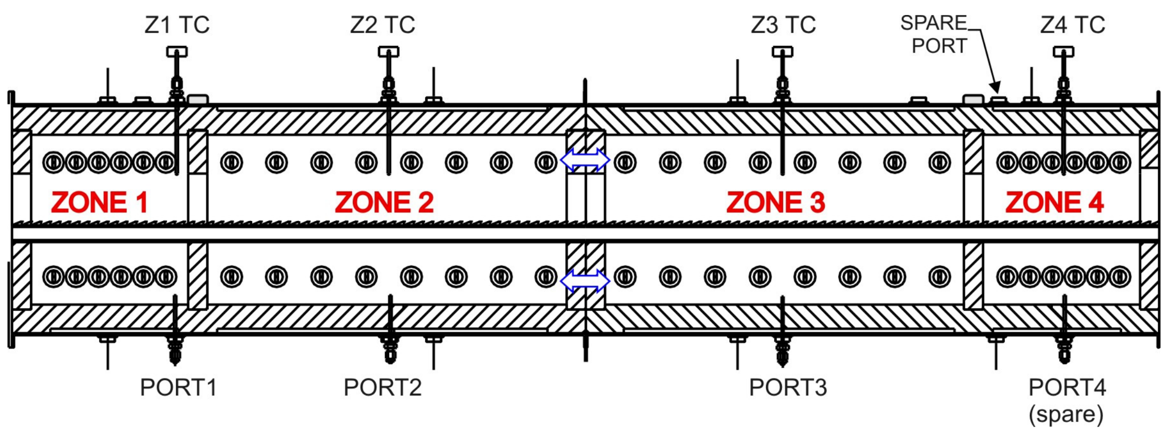


Figure 1-45 Sample Port Locations

1.7.20 Ultrasonic Cleaner/Dryer (UCD option ❒, not supplied)

This furnace can be equipped with an ultrasonic belt cleaner dryer system integrated furnace control system.

The ultrasonic belt cleaning system removes contamination that accumulates on the belt during normal furnace operation. This system includes a heated ultrasonic tank, belt dryer and timer system to enable automatic cleaning of the belt. A fan-driven air blow-off removes water droplets and can be provided with an optional heater to further drive moisture from the belt. The belt is drawn through an ultrasonic tank that is automatically filled and drained by computer controlled timer and control circuitry. The cleaning/drying of the belt takes place when the belt is moving, but the furnace lamps are off-line.

This option requires connection to facility water source and water drain.

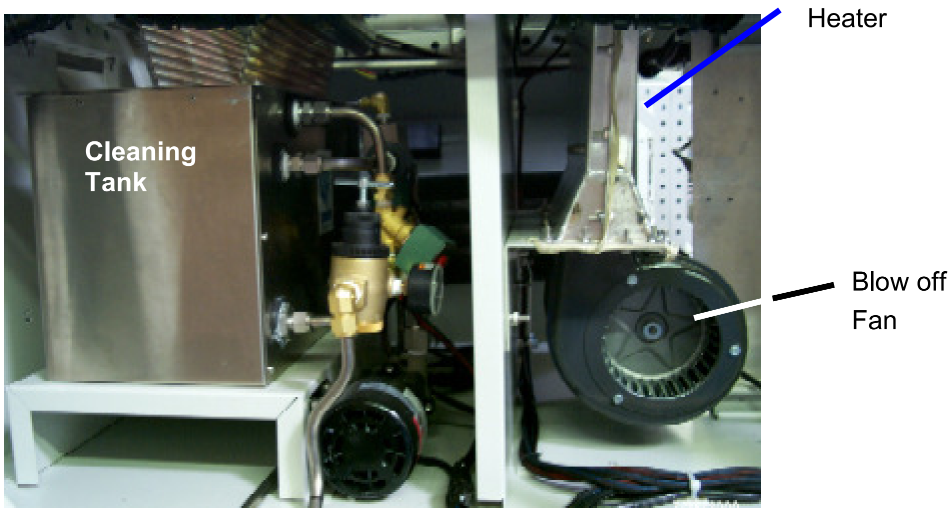


Figure 1-46 Ultrasonic Cleaner installation

1.7.21 Factory UPS (UPS, option ❒, not supplied)

This option adds an uninterruptable power supply to keep the computer, monitor and PLC controller running for at least six (6) minutes in the event the power to the furnace is disconnected or during a power outage. The UPS provides time for the operator to properly power down the furnace computer using the Windows operating system.

Figure 1-47 Factory UPS

When the furnace loses power either by:

Throw open furnace circuit breaker

Open EMO or interlock

Loss of facility power

Press Furnace Control Panel OFF

The belt and all auxiliaries will stop, but the computer, monitor and PLC will continue to run. Use the Windows™ "Shut down" procedure to shut down the computer. The PLC will shut down after 6 minutes or so.