Chapter 6

OPTIONAL EQUIPMENT

Features and operation of the most common LA-309P equipment options that may have been included with the furnace or added later. See Table 6-1 for a summary of featured options.

6.1 Options Summary

Table 6-1 Summary of Advanced Features & Options

AFR	Air filter/trap regulator	DGO	Dual gas operation	PH1	25 mm chamber height
AR10	Gas Reservoir	GSM	Supply gas mixing system	PH2	50 mm chamber height (standard, section 1.10)
Belt Speed	Alternate belt speed	HO/NHM	H_2 operation N_2/H2 mixing	PH4	100 mm chamber height
CB-3	3-phase circuit breaker	IE	Intermediate exhaust stack	RTL	Right to Left Belt Travel
CDA MIX	CDA mixing	LFI	Line Interference Filter	SENSLAS	Laser product alert system
CE	CE mark	MA	Moisture analyzer	SSP	Sample ports
CXE15	Load station extension	OA	Oxygen Analyzer	UCD	Ultrasonic belt cleaner
CXX15	Unload station extension	OSS	Gas sampling system	UPS	Uninterruptable Power Supply

6.1 Air Filter Regulator (AFR option ❒)

High volume compressed air filter, moisture trap and pressure regulator to assure supply compressed air 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.

6.2 Gas Reservoir (AR10 option ❒)

Pressure vessel for compressed air or nitrogen, 30-56 L (8-15 gal). Acts as a local reservoir to reduce process gas pressure fluctuations. Also can assure that in the event of process gas supply failure, an adequate supply of compressed gas is available to purge furnace of volatile or toxic gases.

Consists of an ASME tank, plumbing, pressure relief valve and drain.

6.3 Alternate Belt Speed (option ❒)

Standard belt speed is 5-500 mm/min. Alternate belt speeds can be offered increasing or decreasing the current min/max belt speed. Special conveyor belt speeds may require changes to motor speed, horsepower and/or gearing for this option.

6.4 Circuit Breaker (CB-3 option ❒)

A three phase circuit breaker can be installed in an enclosure on the top of the furnace for convenient shutoff of the furnace when not in use. (Figure 6-1). On three phase systems, the standard single phase circuit breaker switch is omitted.

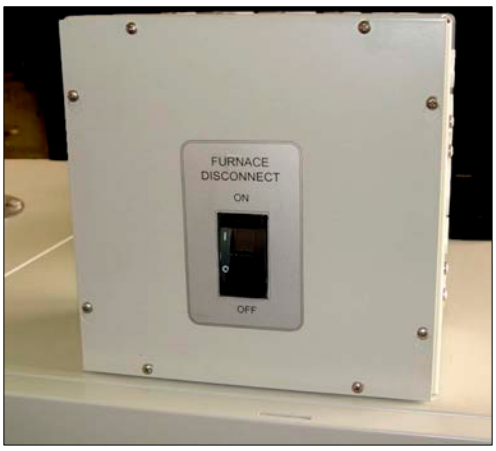


Figure 6-1 3-Phase Circuit Breaker (Option)

6.5 CDA Mixing (CDA MIX option❒)

A flowmeter with a ball valve are used to introduce a second gas into the furnace chamber zones 2 and 3. Adjust gas 1 flow to zones 2 & 3 using the ZONES 2 & 3 flowmeter on the GAS FLOW CONTROL console. Add up to 10 Lpm of CDA or specialty gas to the flow to zones 2&3 by opening the CDA Mix ball valve and adjusting the CDA MIX flowmeter.

To use the CDA MIX feature, with CDA MIX valve OFF, set flow for Zones 2 & 3. Open CDA MIX valve. Adjust CDA MIX flowmeter to add GAS 2 to the process gas flowing to Zones 2 & 3.

Close the CDA Mix ball valve when CDA MIX is not in use to assure complete isolation of the Gas 2 from the furnace chamber during nitrogen or low O_2 firing.

Figure 6-2 CDA Mix controls (Option)

6.6 European Certification (CE option ❒)

A strict implementation of CE requirements is followed according to the following documents:

Council Directive 2004.108/EC (EMC)

Council Directive 2006/42/EC (MSD)

Council Directive 2006/95/EC (LVD)

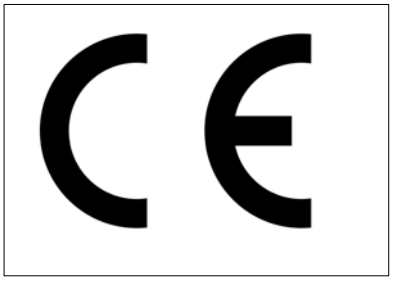


Figure 6-3 CE Mark

Compliance with all safety relevant provisions referring to:

- Controls
- Protection against mechanical hazards
- Required characteristics of guard and protection devices
- Protection against other hazards such as electrical, fire, noise and vibration

The following supplemental options must also be added to achieve the standard:

- Operation Manual for European Union (included)
- Circuit Breaker (must purchase CB-3 option separately)
- Line Filter (included)

6.7 Load Extension (CXE15 option ❒)

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 6-4)

Increases furnace length by a like amount.

6.8 Unload Extension (CXX15 option ❒)

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 6-4 Unload station with CXX15

6.9 Dual Gas (DGO option ❒)

Dual gas systems can allow more expensive specialty gas to be introduced into the furnace chamber while another gas can be provided to all furnace auxiliaries.

6.9.1 DGO Equipment

Includes separate manifold for supply of a different gas to the furnace heating zones. Gas 1 can be CDA or nitrogen supplied to eductors, entrance baffle, transition tunnel, lamp seals, and the cooling system. Gas 2 is usually nitrogen, forming gas or other specialty gas (Figure 6-5). The flowmeters may be in a different array to accommodate grouping of zone flowmeters for Gas 2 supply.

An alarm will sound if either Gas 1 or Gas 2 supply is low in pressure. The Control Console Status panel will have an indicating light for each gas area of the furnace.

Figure 6-5 Control Enclosure showing 3 options: Circuit Breaker; Dual Process Gas; & Sample Port

6.9.2 DGO Operation

A furnace plumbed for dual gas is operated in much the same was as a single gas furnace.

0. Operators must assure that gas is flowing from both supply sources.
1. Dual gas systems have a second alert lamp for Gas 2.
2. Typical systems will have nitrogen gas supplied for Gas 1 and forming gas supplied for Gas 2.

6.10 H2/N2 Mixing (HO/NHM option ❒)

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.

6.10.1 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.

6.10.2 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.

6.11 Supply Gas Mixing (GSM option ❒)

The GSM system option allows for rapid switching between two gas sources to the furnace heating zones. The GSM system provides pressure regulation of two gas sources at pressures within the range 100-3500 psig down to a furnace operating pressure of 70 psig.

Supply Gas 1 is typically nitrogen (N2) or air (CDA) and plumbed to all furnace areas including inlet baffle, stack eductor, transition tunnel and cooling section as well as through the Gas 1 flowmeter to the furnace heating zones.

Supply Gas 2 is typically nitrogen (N2) or forming gas (FG) and plumbed through the Gas 2 flowmeter to the furnace heating zones.

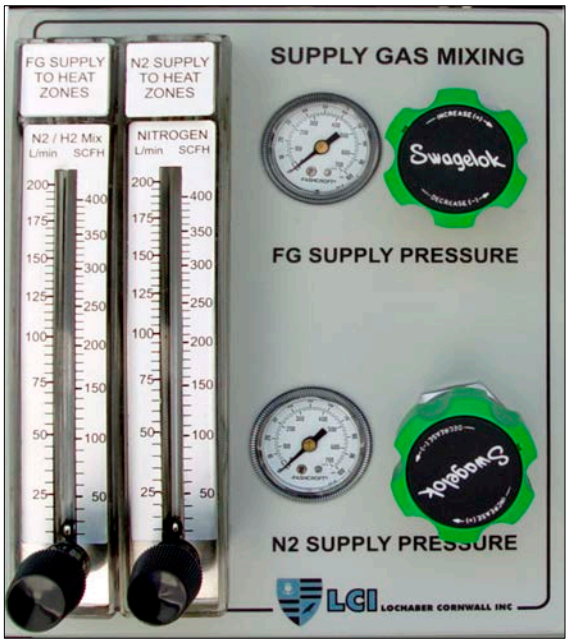


Figure 6-6 Supply Gas Mixing System Control Panel

6.11.1 GSM Equipment

The GSM system includes two (2) high flow 0-3500 psig pressure regulators each with a 0-100 psi pressure gauge and flowmeter. Users can adjust for 100% forming gas to the furnace for critical reducing operations and later quickly switch to nitrogen to conserve higher cost specialty gas. User can also adjust flowmeters to increase amount of nitrogen in the forming gas mix (Figure 6-6).

The system can be ordered with alternate pressure ranges.

6.11.2 GSM Operation

To operate the furnace with Gas1 only (nitrogen):

1. Adjust Gas1 pressure.
2. Open Gas1 flowmeter and adjust Gas1 pressure to 70 psig.
3. Close Gas2 flowmeter.

To operate with Gas2 (forming gas) to furnace zones, Gas 1 to furnace auxiliaries:

1. Adjust Gas2 pressure.
2. Open Gas2 flowmeter and adjust Gas2 pressure to 70 psig.
3. Close Gas1 flowmeter.

To operate with both Gas1 and Gas2 to furnace zones, Gas 1 to furnace auxiliaries:

1. Adjust Gas1 and Gas2 pressure.
2. Open Gas1 flowmeter and adjust Gas1 pressure to 70 psig.
3. Open Gas2 flowmeter and adjust Gas2 pressure to 70 psig.
4. Adjust Gas1 and Gas2 flowmeters to achieve volume percent balance of gas entering the furnace chamber. Both should read the same pressure to assure even mixing.

NOTE: Note: Each GSM flowmeter is sized to accommodate full flow to all zones through the furnace. Consequently when the individual zone flowmeters on the Control Console are at low settings, the flow through the larger Gas1 and Gas2 flowmeters may appear to near zero if the sum of the flow is near the minimum operating range of the flowmeter (minimum is 10% of full flow).

6.12 Line Filter (LFI option ❒)

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.

6.13 Moisture Analyzer (MA option ❒)

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 6-7 MM510 Moisture Analyzer

6.13.1 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.

6.13.2 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

6.14 Oxygen Analyzer (OA option ❒)

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

Figure 6-8 EC913 Oxygen Analyzer

6.14.1 OA Equipment

The brand of moisture analyzer can generally be specified by the owner. A high quality choice, 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.

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).

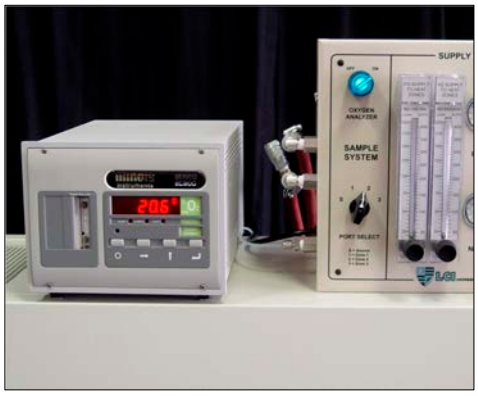


Figure 6-9 Oxygen Analyzer with OSS

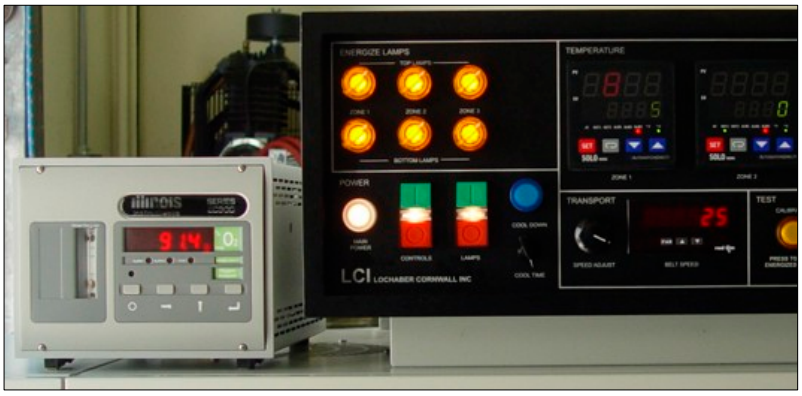


Figure 6-10 Oxygen Analyzer next to Control Console

6.14.2 Analyzer Initial Setup (without OSS)

1. Open IN valve full CCW (on back of analyzer, Figure 6-11).
2. Enable analyzer by turning Power Switch on back of analyzer to ON position.

Note A: In this configuration, analyzer will start and stop with furnace CONTROLS switch.

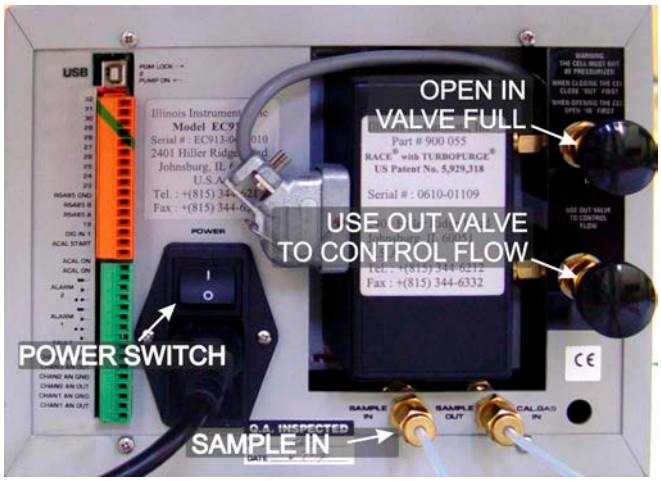


Figure 6-11 EC913 Oxygen Analyzer Rear View

6.14.3 OA Operation (without OSS)

1. Start furnace.
2. Press Controls ON to energize Sample System and to start analyzer.
3. Adjust lower OUT valve CCW until Sample Flow flowmeter on front of analyzer reads 0.1-0.15 L/min (Figure 6-11).
4. Wait until sample line has been completely refreshed with new sample gas (usually 2-5 minutes at startup).

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.

6.14.4 Shut Down Analyzer (without OSS)

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

1. Close OUT valve first on back of analyzer (to isolate cell).
2. Close IN valve on back of analyzer (to isolate cell).

Note A: Analyzer valves can be left in open position while connected to the LA-306 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. Close valves on back of analyzer to isolate the cell.

6.14.5 Startup Operation and Shutdown with OSS

See section 6.15 OSS Option for OA oxygen analyzer initial setup, operation and shutdown with the Oxygen Sampling System.

6.15 Sample System (OSS option ❒)

The OSS option 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).

6.15.1 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 heating zone.

6.15.2 OSS Source Gas

The Source gas is piped from Gas1 (the nitrogen source) through a pressure regulator in the Control cabinet and connected to one of the ports on the manifold.. Adjust regulator to 35-103 mbar (0.5 – 1.5 psig), Figure 6-13. Use the Source port to purge and dry the OSS manifold and the sample line from the manifold to the analyzer sample port.

6.15.3 Analyzer Sample Port

The standalone OSS system includes a single port for connecting external analyzer equipment. The external gas analyzer must include a vacuum sample pump to extract gas from the furnace chamber.

1. Locate the sample system analyzer port connection.
2. Remove the tube plug and immediately connect the sample line connected to the external analyzer.

6.15.4 Sample System Operation

1. Turn Port Select switch to Source.
2. Enable Sample System by turning blue selector switch ON.
3. Select port to be sampled.
4. Adjust Sample pump flow to 0.1-0.15 L/min.

Note A: In this configuration, analyzer will start and stop with furnace CONTROLS switch.

Note B: 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

Figure 6-12 Sample System control panel (shown with Supply Gas Mixing System)

Figure 6-13 Source Pressure Regulator

Figure 6-14 Sampling Port

6.15.5 OSS and External Analyzer Shut Down

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

1. Turn OFF external analyzer and sample pump if connected.
2. Turn OFF blue OSS OFF/ON switch.
3. Disconnect sample line from sample port to analyzer.
4. Replace sample port cap.

Note A. To prolong cell life, limit sampling of air.

6.15.6 OA Analyzer Initial Setup (with OSS)

1. Enable analyzer by turning Power Switch on back of analyzer (Figure 6-11) to ON position.
2. Open IN valve full CCW (on back of analyzer, (Figure 6-15).

Note A: In this configuration, analyzer will start and stop with furnace CONTROLS switch.

6.15.7 OA Operation (with OSS)

1. Turn blue selector switch ON.
2. Select port to be sampled.
3. Start furnace.
4. Press Controls ON to energize Sample System and start analyzer.

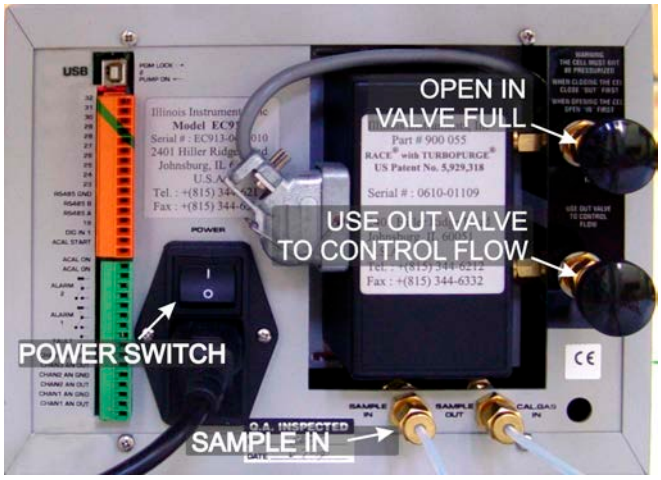


Figure 6-15 EC913 Oxygen Analyzer Rear Controls

5. Adjust OUT valve until Sample Flow flowmeter on front of analyzer reads 0.1-0.15 L/min (Figure 6-15).

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.

6.15.8 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.

1. If system is not equipped with a check valve on the Sample OUT line, close OUT valve on back of analyzer (to isolate cell).
2. 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 LA-309P 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.

6.16 Chamber Height, 1-in (PH1 option ❒)

Standard clearance throughout the furnace chamber, baffles and cooling sections provide for a 50 mm (2-inch) clearance for product travelling on the belt. The furnace can be ordered with a chamber height of 25 mm (1-inch) to improve heating profile characteristics. With a smaller heating cavity and smaller internal volume throughout, the PH1 option offers energy and process gas savings. Owner can stipulate entrance baffle and transition tunnel baffle clearance of 6 mm to 13 mm (0.25 to 0.5 inches) above the belt (or eliminate entirely).

6.17 Chamber Height, 4-in (PH4 option ❒)

Standard clearance throughout the furnace chamber, baffles and cooling sections provide for a 50 mm (2-inch) clearance for product travelling on the belt. The furnace can be ordered with a chamber height of 100 mm (4-inch) to allow for processing taller product. With a larger heating cavity and larger internal volume throughout, the PH4 option will consume more energy and process gas. Owner can stipulate entrance baffle and transition tunnel baffle clearance of 6 mm to 90 mm (0.25 to 3.5 inches) above the belt (or eliminate entirely).

6.18 Belt Travel, Right to Left (RTL option ❒)

The furnace can be configured so the belt travels from right to left when facing the control panel. This option is useful when furnaces are located opposite one another in parallel production lines. Allows one operator to manage furnaces in two production lines (one standard LTR and one RTL).

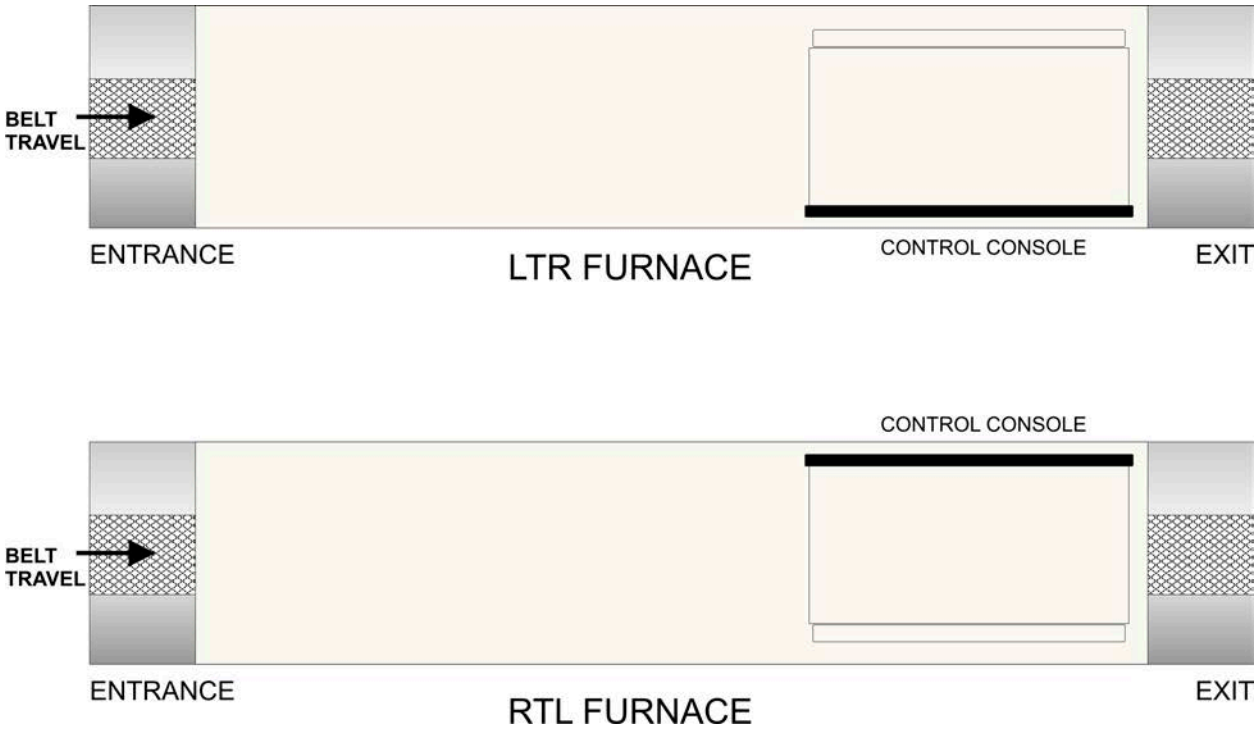


Figure 6-16 LTR and RTL Furnaces

6.19 Product Alert (SENSLAS option ❒)

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 6-17).

Figure 6-17 SENSLAS System

6.19.1 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 mm (3 inches) from the furnace exit (Figure 6-19).

6.19.2 SENSLAS Operation

Easy to operate, the operator 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 6-18).

Figure 6-18 SENSLAS Control Panel

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.

6.19.3 Sensor 2 Point 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).

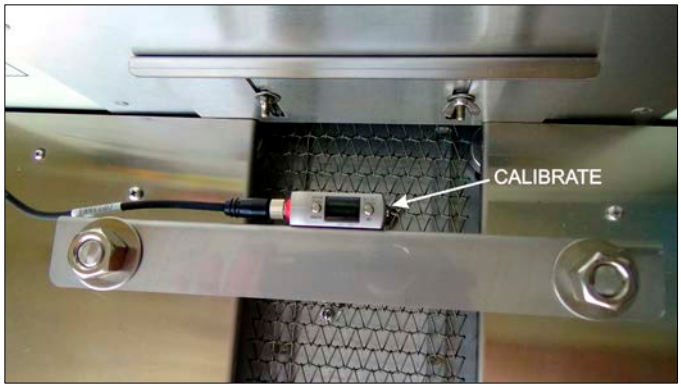
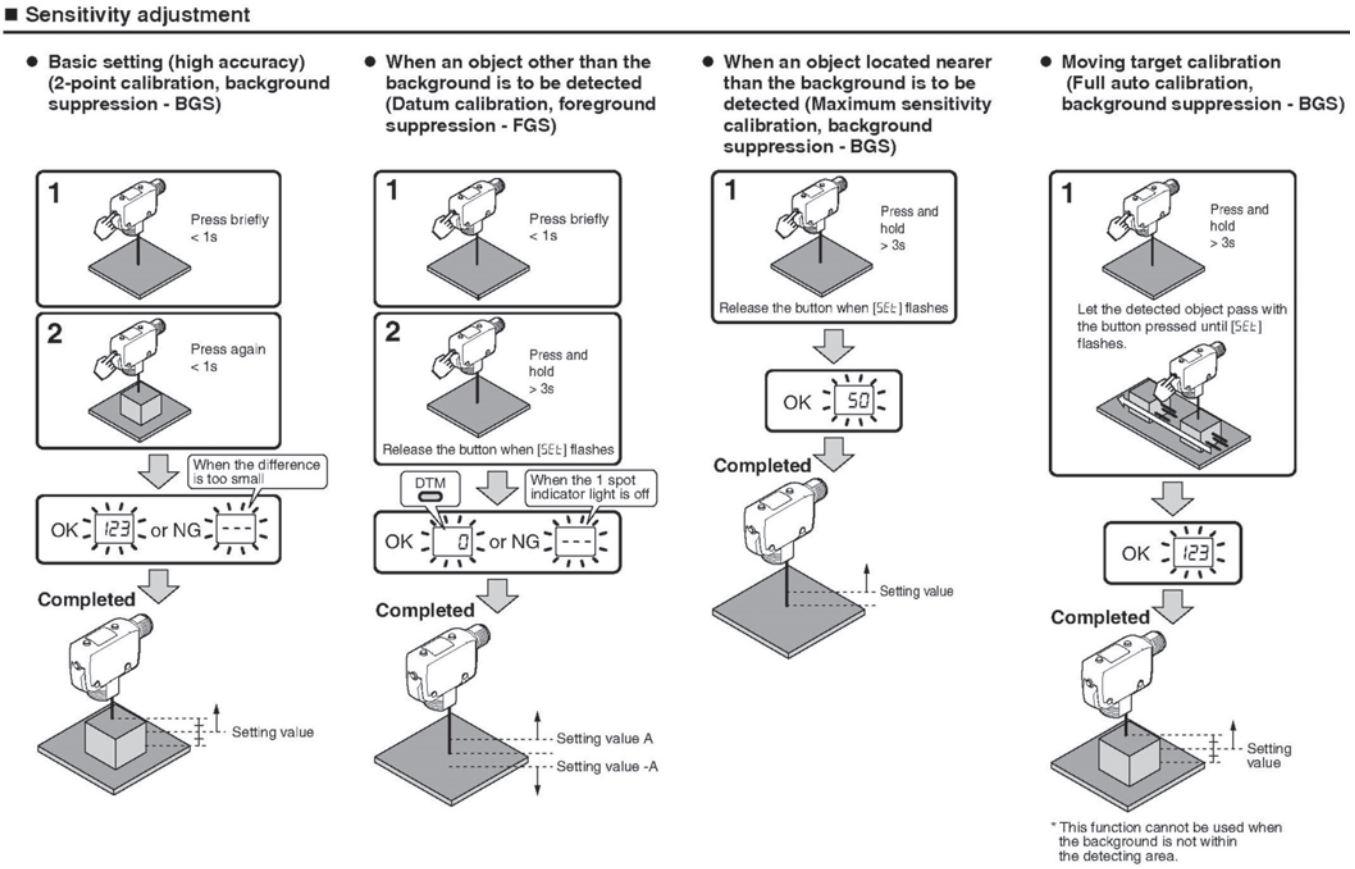


Figure 6-19 Calibrate Sensor

5. Turn on the SENSLAS system.
6. Set the belt at a slow speed (125 mm/min (5 ipm).
7. 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.
8. As the background object passes under the laser beam, press calibrate button on the side of the sensor for less than 1 second Figure 6-19.
9. As the foreground object passes under the sensor press the button again for less than 1 second.
10. The sensor is now calibrated to sense objects between the height of the background and the foreground.

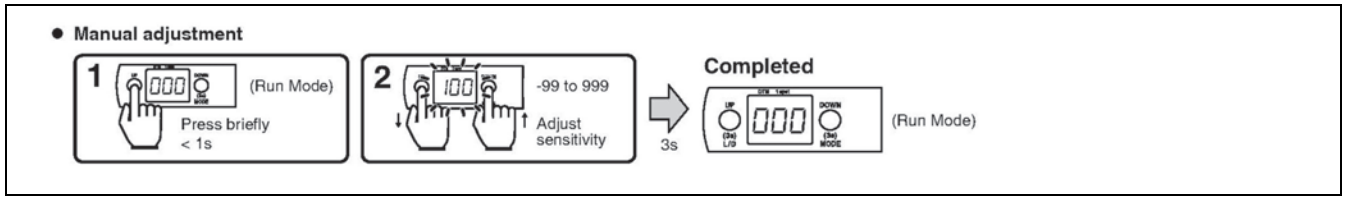
6.19.4 Sensor Sensitivity Adjustment

The Keyence LR-ZB CMOS Laser Sensor can be adjusted a number of ways:



6.19.1 Sensor Sensitivity Adjustment

Manually adjust the Keyence LR-ZB CMOS Laser Sensor as follows:



6.20 Sample Ports (SSP option ❒)

Allows connection of an oxygen analyzer, moisture analyzer or other gas analyzer. Must be used with a sample pump (not included).

This option includes a drilled and shrouded sample port connection located on the underside of one or more zones (see Figure 6-20 and Figure 6-21 Zone Port Locations). Also includes plumbing to the Control Enclosure or OSS enclosure for easy analyzer hookup. See typical port for analyzer sample line connection in Figure 2-18 and Figure 2-19. Figure 6-5 shows analyzer port connection on a RTC LA-309P.

SSP is included for 3 ports standard in the OSS option.

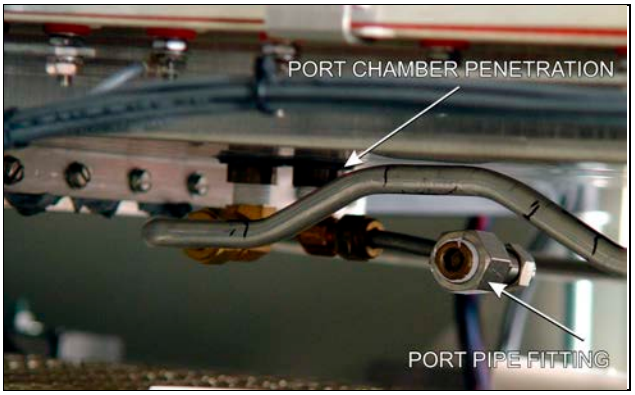


Figure 6-20 Sample Port Chamber Penetration

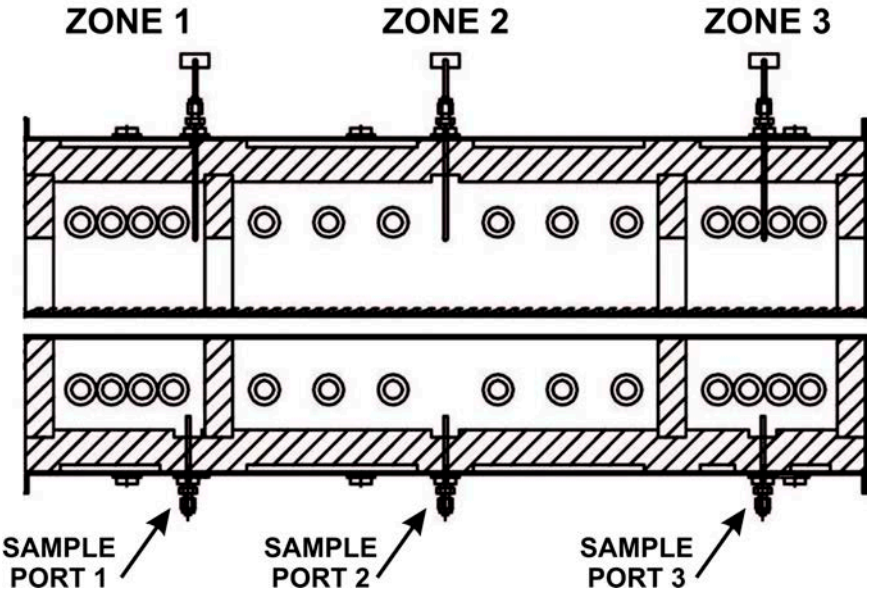


Figure 6-21 Zone Port Locations

6.21 Ultrasonic Cleaner (UCD option ❒)

The ultrasonic belt cleaning system removes contamination that accumulates on the belt during normal furnace operation.

6.21.1 UCD Equipment

This system includes an ultrasonic tank, belt dryer and timer system to enable automatic cleaning of the belt. A fan-driven air dryer removes water droplets and can be provided with an optional heater to The ultrasonic belt cleaning system removes contamination that accumulates on the belt during normal furnace operation. This system includes an 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 a timer and control circuitry. The cleaning/drying of the belt takes place when the furnace is off-line. This option requires connection to facility water source and water drain.

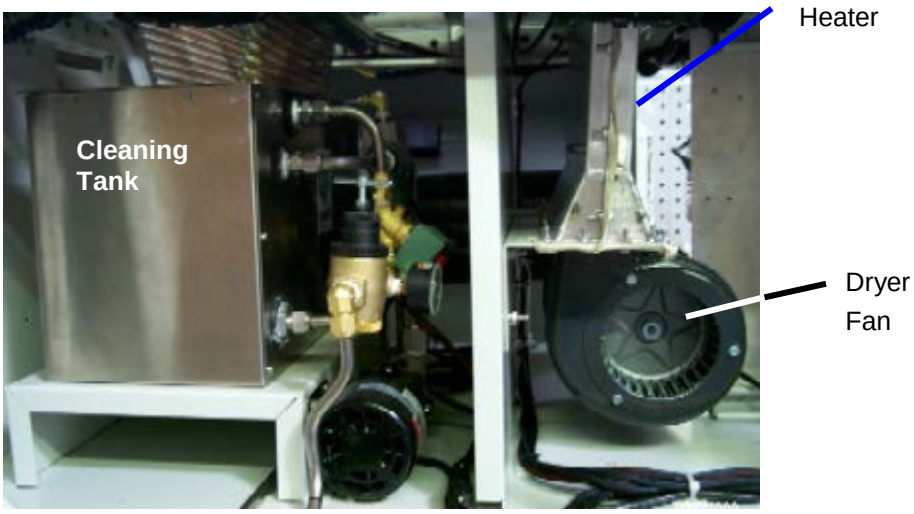


Figure 6-22 Ultrasonic Cleaner installation

6.22 Uninterruptable Power Supply (UPS option❒)

This option adds an uninterruptable power supply to keep the belt, fans, and control system running for at least twenty minutes during a power outage. The transport belt continues to run at set speed which minimizes product loss during brief power failures. The unit automatically switches from standby to process start upon restoring power, whether provided by generator backup or city power.