



Owner's Manual

High-Performance Ovens

Steam & Thermal Fluid Models

MODEL: _____

SERIAL NUMBER: _____

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LEWCO, Inc.

Warranty

Drum & Tote Heating Products

1. Unless separately agreed to otherwise, Warranty is for three (3) years, free from defects of faulty material or workmanship, effective from Buyer's receipt of goods and services.
2. Warranty does not include maintenance items (door gaskets, fan belts, thermocouples, etc.).
3. LEWCO, Inc. will replace or repair equipment proving defective in material or workmanship. Defective parts need to be shipped back to LEWCO, Inc. for inspection, at Buyers cost.
4. Failure due to abuse, overloading, maintenance neglect, exposure to corrosive or abrasive materials, operation under any degree of dampness, or improper use shall not be subject to this warranty.
5. Any modification to equipment or systems without LEWCO, Inc.'s written consent voids this warranty.
6. Standard warranty does not include labor to remove and/or install defective equipment.
7. If LEWCO, Inc.'s service is required for assistance on a warranty claim, labor will be charged at prevailing rate plus travel expenses.
8. LEWCO, Inc. shall not be liable for loss of profits, delays or expenses incurred by failure of said parts, whether incidental or consequential.
9. LEWCO, Inc. shall not be liable for failure of the goods to comply with federal, state or local laws.
10. LEWCO, Inc.'s warranty becomes null and void if payment in full is not received for goods and services.
11. See LEWCO, Inc.'s **GENERAL TERMS AND CONDITIONS** for additional warranty detail.



INTRODUCTION

Thank you for choosing LEWCO, Inc. for your process heating needs. This manual has been prepared by LEWCO engineers for use in familiarizing personnel with the design, installation, operation and maintenance of your LEWCO Drum or Tote Oven. Information presented herein should be given careful consideration to assure safe, optimum performance of the equipment. This manual should always be accessible to the operators for quick reference.

This Industrial Oven has been designed and manufactured in accordance with applicable National Codes and Standards in effect as of the date of manufacture. It is the responsibility of the end user to update equipment as necessary to comply with future code changes or revisions.

This manual should be used in conjunction with the drawing(s), data sheets, and component manufacturer's literature attached hereto that clarify specific features, installation, utility connections, operation, etc.

If you have any questions regarding this manual or the use of your LEWCO Industrial Oven, please contact our Industrial Oven department by phone at (419) 502-2780 or by email at ovensales@lewcoinc.com.

NOTE: The information in this manual is subject to change without notice and does not represent an obligation on the part of LEWCO, Inc. LEWCO does not assume any responsibility for any errors that may appear in this manual and under no circumstances will LEWCO be held liable for technical or editorial omissions made herein, nor for direct, indirect, special, incidental, or consequential damages resulting from the use or defect of this manual.



NOTICE: No installation or operation of this equipment should take place until this manual has been studied and understood by the person(s) responsible.

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Manual Specific Safety Symbol Definitions	
	Safety Instruction where an electrical hazard is involved.
	Safety instruction where non-compliance would affect safety.
	Safety instruction where non-compliance could potentially cause an explosion.
	Safety instruction where non-compliance could potentially cause a fire.
	Safety instruction relating to safe operation of the equipment (ATTENTION).
	Safety instruction where non-compliance could potentially result in a pinch point or a description of a known existing pinch point.
	Safety instruction where non-compliance could potentially result in a pinch point or a description of a known existing pinch point.
	Indicates a hazardous situation which, if not avoided, will result in death or serious injury. The signal word "DANGER" is to be limited to the most extreme situations. DANGER [signs] should not be used for property damage hazards unless personal injury risk appropriate to these levels is also involved.
	Indicates a hazardous situation which, if not avoided, could result in death or serious injury. WARNING [signs] should not be used for property damage hazards unless personal injury risk appropriate to this level is also involved.
	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. CAUTION [signs] without a safety alert symbol may be used to alert against unsafe practices that can result in property damage only.
	Is used to describe preferred to address practices not related to personal injury.
Equipment Specific Safety Definitions	
	DANGER: Hazardous voltage will cause severe injury or death. LOCK OUT POWER before servicing.
	WARNING: Potential arc flash hazard.
	CAUTION: Hot surface. Do not touch.

CONTENT DEFINITIONS:

Arc Flash: An arc flash is a phenomenon where a flashover of electric current leaves its intended path and travels through the air from one conductor to another, or to ground. The results are often violent and when a human is in close proximity to the arc flash, serious injury and even death can occur.

Circulating Fan: The fan used to “move” the air around the workspace in order to more evenly distribute and more efficiently transfer the heat from the heat source to the material.

Class A Oven: Ovens that can be utilized in processes with solvents present, volatile materials or other flammable or combustible contents. NFPA 86 cites several materials requiring the Class A rating, specifically including:

- Paints, powders, inks and adhesives from finishing processes such as dipped, coated, sprayed and impregnated materials
- The substrate material
- Wood, paper and plastic pallets, spacers or packaging materials
- Polymerization or other molecular arrangements. Potentially flammable materials such as quench oils, waterborne finishes, cooling oil, or cooking oils that present a hazard are ventilated according to Class A standards.

Class B Oven: Oven and furnaces in which no flammable volatiles or combustible materials are present in the work space.

Differential Flow Switch: A switch that is activated by the flow of a gaseous or liquid fluid. This flow is detected by measuring pressure at two different points to produce a pressure differential across the sensor.

Exhaust Fan: A fan used to remove air with contaminants from the work space through a duct to outside of the plant. This air may also include products of combustion.

Heater Box: The insulated box containing the burner or heating elements and circulating fan(s). The heater box is USUALLY found on top of the workspace. No material may be placed in the heater box.

Interlocks: Are devices for preventing a mechanism from being set into action when another mechanism is in such a position that the two operating simultaneously might produce undesirable results.

Limit Switch: A switch that actuates when an operating limit has been reached.

SCR: Silicone Control Rectifier, used to control output to the heating elements.

Safety Device: An instrument, a control or other equipment that acts, or initiates action, to cause the unit to revert to a safe condition in the event of equipment failure or other hazardous event.

Temperature Controller: A device that measures the temperature and automatically controls the input of heat into the oven.

SECTION 1 – GENERAL INFORMATION

1-1 PRODUCT DESCRIPTION

This oven is heated by a steam or thermal fluid system. Steam coils are mounted in the heater box which is directly attached to the oven. The casing is an insulated mild steel shell. Temperature is controlled by thermocouple actuated electronic temperature controllers.

Process heating applications involve a combination of time and temperature to achieve desired material properties. Although the process can sometimes be pre-determined based on heat transfer calculations and empirical data, these values are an engineering estimate at best. The precise combination of time and temperature, for a specific application, is best determined through actual trial use. By accurately monitoring time, temperature, and material properties closely, in a controlled environment, optimum process parameters can be safely and accurately determined.

1-2 SAFETY



WARNING: Only properly trained and qualified operators may use this equipment. Improper use may cause equipment damage, injury or death. Oven control systems are designed to react to system and operator input. Be sure to understand the system reaction before making any system adjustments.

Typically an oven is purchased for a specific application. If the application for this equipment has changed, or you have reason to doubt the adequacy of the equipment for the application, consult your LEWCO, Inc. representative for proper use.



DANGER



- Explosion or fire may result from misapplication of this equipment. Know the properties of the materials you are putting into the oven and be sure they can be heated safely at elevated temperature. Applications that may introduce flammable solvents or combustible materials into an oven require special nonstandard safety features. The National Fire Protection Association (NFPA) designates these as “Class A” Ovens.



- Materials with auto-ignition temperatures below the oven operating temperature should never be introduced into the oven.
- Electric heating cabinets are NOT suitable for heating flammable or combustible materials. Explosion or fire may result from misapplication of this equipment.



- Disconnect and lockout electrical power and all other sources of energy before performing maintenance. Know where arc flash is possible and take proper precautions.



- Be sure any fan shafts have stopped rotating. Keep body, hands and foreign objects away from the inlet and outlet, and the other moving parts of the fan such as shafts, belts and pulleys.
- Do not stand in front of explosion relief areas



WARNING



- Prior to placing drums or totes in the heating cabinet, loosen the bung fittings to relieve pressure that may build during heating.



- Do not operate the oven above its rated maximum temperature.
- Do not store contents or materials on top of, or directly against, the unit. Fire may result.



CAUTION



- Do not leave the oven in operation unattended. Property damage or injury to personnel may result.
- **Maintain cleanliness inside and around the unit.** Plenums and ducts may be subjected to a build-up of flammable deposits, fluid, or combustible debris that may be **fire hazards**.



- Use caution when opening doors to avoid breathing air from inside the oven. Heated air can burn lungs.
- Do not breathe air from exhaust vent.
- This equipment is to be operated by trained personnel only.
- The oven’s outer skin may be hot and burns could result. Use caution.
- When heating materials that generate hazardous vapors, venting or exhausting of the unit is required.
- This equipment may create a confined space hazard. The user is responsible for analyzing the installation in order to make a determination, posting warnings and complying with applicable OSHA standards pertaining to confined space hazards.
- Do not operate fans without belt & bearing guards in place as bodily injury may result. Always disconnect and lockout power before removing covers or guards.



- Pinch points may exist at door(s). Keep hands and arms clear.
- Vertical lift doors must be blocked before entering the oven.

To reduce the possibility of injury to personnel operating, or in the vicinity of the oven, warning signs are posted at potential hazard points on the equipment. Examine the equipment and become familiar with potential hazard areas. Instruct all personnel to be aware of these areas and to heed all posted caution and warning signs.

Properly rated fire extinguishers should be located near the oven. Extinguishers should be inspected periodically in accordance with NFPA 10, "Standard for Portable Fire Extinguishers."

After complete installation of the equipment, a safety study should be made of the application and additional guards and warnings should be installed and posted as necessary. Any code requirements are the responsibility of the user and not that of LEWCO, Inc. Violation of the above safety rules hereby removes all product liability claims from LEWCO, Inc.



NOTICE: It is the responsibility of the owner to comply with all safety standards, including OSHA and other Federal, State, and Local codes or regulations.

1-3 PPE (PERSONAL PROTECTIVE EQUIPMENT)

PPE (Personal Protective Equipment) required will be site and process specific. LEWCO, Inc. recommends conducting a detailed study of your installation and process to determine what PPE will be required for safe operation.

Hearing Protection: According to OSHA protection against the effects of noise exposure shall be provided when the sound levels exceed those determined as unsafe.

Safety Glasses: It is never recommended to enter the workspace with the circulating fan(s) running. However, if anyone must do so for any reason, safety glasses **MUST** be worn.

Steel Toe Boots (Metatarsals): Nothing inherent to the oven or its process should require foot protection aside from the loading and unloading of the material from the oven. Use proper plant safety considerations for material handling and PPE.

Gloves/Sleeves: If unloading hot material always wear high temperature gloves. If the material being loaded/unloaded is sharp, protective gloves should be worn.

Temperature/Flame Resistant Clothing: If the material is being unloaded hot, wear the appropriate clothing. This may include temperature resistant sleeves, jacket, pants or any combination of the aforementioned clothing.

Fall Protection: Normal operation of the oven will not require the operator to be on top of the equipment, however, some maintenance and troubleshooting may require personnel to be more than 6' off of the ground. If this is the case, proper fall protection must be used at all times.

1- 4 RECEIVING & HANDLING

Special care must be taken in handling this equipment due to its configuration, size, and weight. Most LEWCO heating cabinets are equipped with either fork pockets or lifting lugs, also known as lifting eyes.

1- 4.1 RIGGING

When applicable, lifting lugs are provided at the top (4) corners of the unit. It is important to note that rigging cables or chains must not exceed a maximum angle of 10 degrees from vertical (see *Figure 2*). Use a spreader beam, or rigging of adequate length, to avoid damage to the equipment. Please refer to any assembly drawings for specific assembly and rigging instructions.

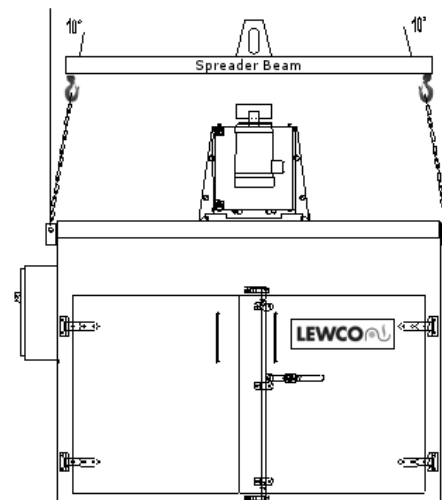


Figure 2: Typical Rigging

1- 4.2 RECEIVING INSPECTION

Before removing banding and/or packaging materials, locate the packing slip. The packing slip contains a complete list of all materials shipped. Verify completeness of shipment against packing slip for each item. Inspect each item for damage that could have occurred during shipment.

On collect shipments, all claims for shipping damage must be made against the carrier by the purchaser. All shipments received “short or damaged” must be noted on the freight bill when signed by the receiver. The delivering carrier may deny a claim if not noted on the freight bill when signed by the receiver. However, if damage is concealed, and not discovered at the time of delivery, an inspection must be requested to the delivering carrier within 24 hours.

All claims for shortages against the packing list must be made against LEWCO, Inc. within 48 hours of receipt. Claims for replacement materials and equipment submitted after 48 hours of receipt will be invoiced to the customer.

SECTION 2 – INSTALLATION

Prior to installation, the owner should consult their insurance underwriters for recommendations and requirements regarding the installation and maintenance of industrial ovens.

2-1 LOCATION

Standard LEWCO ovens are designed for indoor use only. Installation in unheated areas or areas without climate control may result in non-uniform temperatures or the inability to attain desired temperature. Condensation may also occur, which could damage the oven.

Due to the inherent hazards of heat processing equipment, including the possibility of fire, property damage, and personal injury, selection of the oven’s location must be carefully planned. In planning the location, consideration should be given to the following:

PERSONNEL SAFETY:



CAUTION: Avoid installations near exits or main aisles to minimize the risk to personnel associated with fire, explosion, or asphyxiation.

FLOOR: The oven should always be placed on a non-combustible surface with adequate load capacity. Consideration must be given to the weight of the oven, weight of the materials being processed, and the weight of any carts or fixtures.

PROXIMITY:



DANGER: Do not locate the oven against walls. To protect adjacent structures and equipment from excessive temperatures, provide an air space of approximately 12” around the unit. If 12” cannot be achieved, LEWCO requires a minimum airspace of at least 4”. Ensure there is adequate distance for the door(s) to fully open. Consider maintenance access to controls, thermocouples, filters, and heating coils. Consideration should also be given to the proximity of adjacent storage areas, particularly those that may include flammable liquids or gasses, or combustible materials as these vapors or materials may be drawn into the oven through circulating fan(s) or exhaust vent(s).

VENTILATION: The unit should be located so that air circulation around the equipment is not restricted. Do not block fresh air inlets or exhaust outlets. Particular consideration should also be given to all fans and motors. Avoid installations in basements or other areas with restricted fresh air.

2-2 LEVELING & ANCHORING

Set the oven on a level, non-combustible, surface. The unit should be leveled both side to side and front to back in reference to the inside grating or floor of the unit. If necessary, shim or grout the unit. Leveling is important to insure proper door alignment and swing. Anchor the oven with expansion anchors through the holes provided. Use anchors 1/8” smaller than the holes provided.

2-3 STEAM & THERMAL FLUID PIPING

Standard heat exchanger coils are rated for a maximum pressure of 125 psig. at 353°F (178°C). If the plant steam system is capable of generating higher pressure, a pressure relief device is required. A pressure-reducing valve must be installed prior to the unit's control valve or manifold piping.

Heat exchangers are located in the heater box on the roof of the oven. Refer to the model drawings provided for the location of heat exchanger inlets and outlets.

Connect supply and return piping to the oven's heat exchanger(s). Refer to **figure 2** for steam installations and **figure 3** for thermal fluid installations. If the oven was purchased with multiple heat exchangers, the owner is required to install manifold piping. Always install shut-off valves on each heat exchanger. Insulate supply and return piping with a minimum of 2" thick pipe insulation. Temperature control and/ or high-temperature limit controls, must be installed prior to the heat exchanger inlet or manifold piping. Control and limit valves should be aligned with the highest heat exchanger inlet. These valves and/ or valve assembly are ship loose items, and is the owner's responsibility to install conduit and wiring to valves.

To ensure maximum heat transfer on steam systems, each exchanger requires a steam trap. The trap provides fast and efficient condensate removal. It is recommended that a trap be installed on each heat exchanger. The number, location, and style of steam trap should be evaluated for each installation. Use a trap with an integral strainer or provide a "Y" strainer prior to the trap to avoid clogging and assure optimum performance. If condensate must be elevated to return to the boiler, a condensate return pump must be employed to aid in evacuation of the coil.

Use Teflon® thread sealant on screwed connections and tighten securely. Thoroughly inspect all flange bolts and threaded connections for adequate tightness prior to operation.

Figure 2:
Typical Valve & Piping Arrangement for Steam

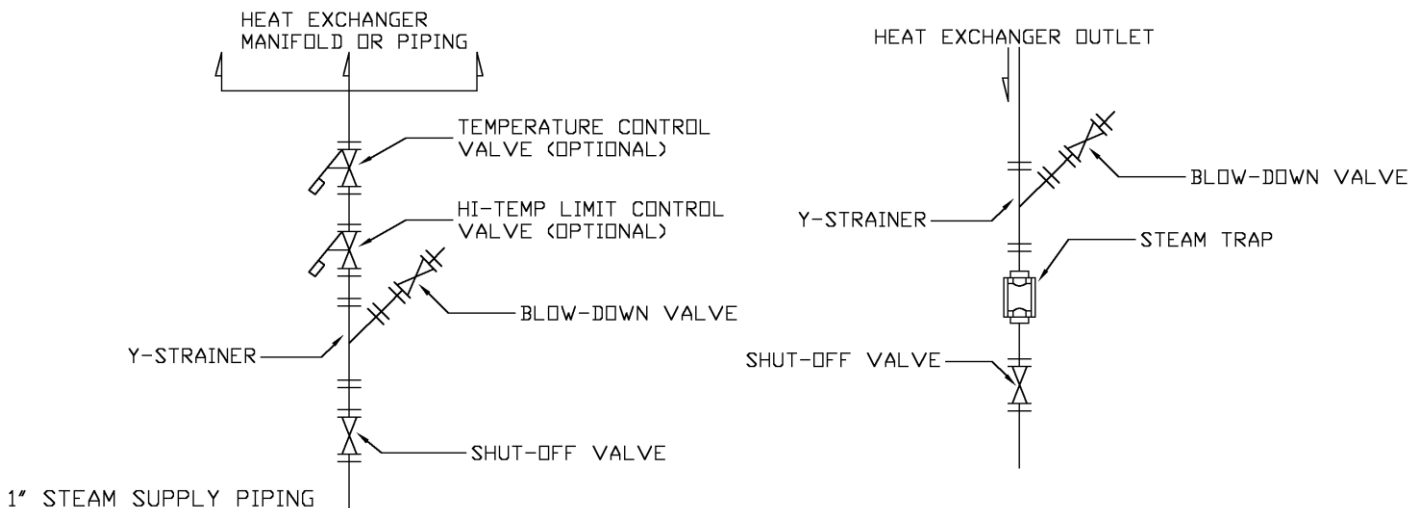
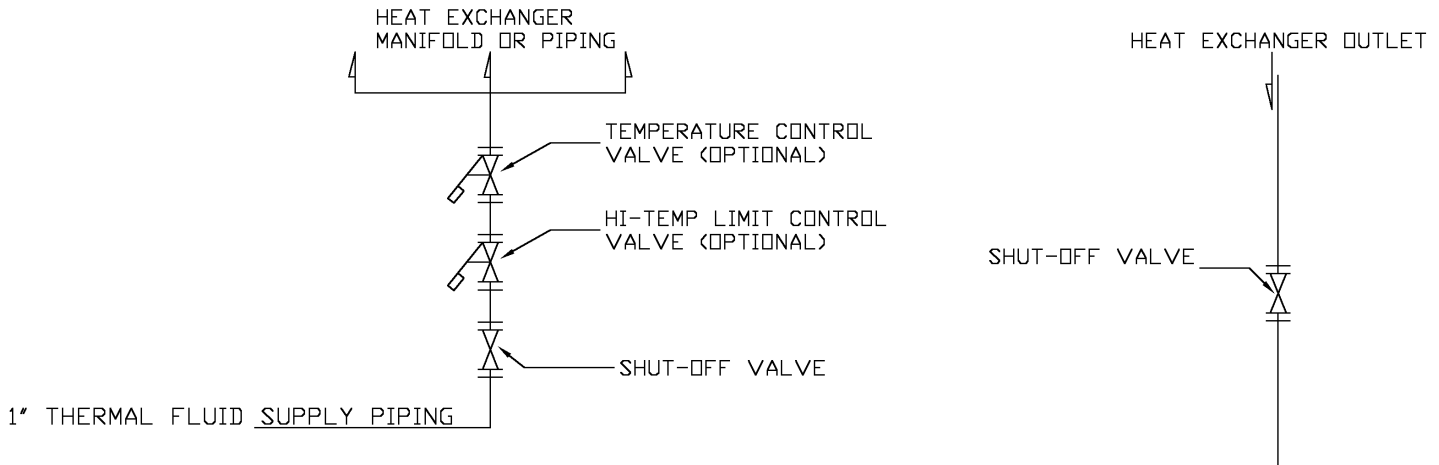


Figure 3:
Typical Valve & Piping Arrangement for Thermal Fluid



2-4 EXHAUSTING & VENTING

If the oven was purchased with a vent option, a number of acceptable connection methods are available to exhaust the oven. To avoid exposure to operating personnel, the owner must determine a suitable vent/exhaust method based on the toxicity, amount, and weight of vapor being generated. Consult local stack emission restrictions if the vapors being exhausted may affect air quality.

Connection to an existing plant fume removal system is the preferred vent connection method. The vent connection is 5" OD duct. A sheet metal slip-on, draw band connection is adequate. At installations where a plant exhaust system is unavailable, a "chimney" connection is also an acceptable method to remove lower concentrations of lighter vapors. An outdoor vertical section of duct, of adequate height to produce a chimney effect, has proven successful in many applications. A rain cap is required on outdoor stacks.

Use the blast gate provided to attain an optimum combination of vapor exhaust and unit temperature. This may be especially important when trying to attain relative operating temperatures.

Ovens may be equipped with a powered exhaust fan. The exhaust fan may also be required to remove flammable vapors in the case of NFPA 86 Class A ovens. The fan outlet must be connected to an exhaust stack of adequate size for discharge to an outside location. Exhaust stacks are to be installed in accordance with applicable state and local codes and regulations. The shortest and most direct path should always be used. Stack temperatures are the same as oven temperatures and care must therefore be taken to protect building materials from the hot exhaust stack. Stacks passing through combustible walls or roof must be insulated. Stacks must be constructed of sheet metal or stove pipe with tight seams and laps in the direction of air flow. Never install dampers or restrictions that can impede flow. Stacks installed lower than 8 feet off the floor must be insulated to protect personnel. For Class A ovens handling flammable solvents, the exhaust rate must be checked against the minimum safe exhaust rate shown on the oven data plate.

2-5 ELECTRICAL INSTALLATION

Electrical connections should be made by a qualified electrician in accordance with NFPA 70, The National Electric Code. The installation must also meet the requirements of any applicable state and local codes.

Oven models shipped as single units are factory wired complete. Connect power to the main disconnect switch using wire of adequate size to carry the full load current rating of this device. Secure all connections and ground the unit adequately. A grounding lug is provided in the main control panel.

After wiring is complete, make a final check of all electrical connections to confirm that none have vibrated loose in transit from LEWCO. Tight power connections will reduce component failure due to poor contact.

Check the fan(s) for proper rotation direction. An arrow on each blower housing indicates proper direction of rotation. The installer should also verify that the fan drive components (belt and pulleys) have not become misaligned or loose during shipment. Excessive noise and/or vibration may be the result of loose or misaligned drive components.

Ovens shipped disassembled due to size may require additional field wiring. Refer to installation and wiring drawings at the end of this manual as applicable.

Verify the settings on any pressure switches and the outputs from any regulators agree with the site settings listed on the appropriate drawings and component literature. Be sure to correct any settings before attempting to heat the oven.

NOTE: If the equipment was purchased with an explosion proof fan motor, sealing fittings must be filled with the appropriate sealing compound prior to turning power on to the fan.

2-6 TEMPERATURE CONTROLS

Generally, digital temperature control packages are shipped completely assembled with the exception of the control valve that must be installed in the heating medium supply piping. Refer to drawings provided for location and details. After completion of the supply piping, make final electrical connections to the control valves.

2-7 PRIOR TO START-UP

Prior to releasing the oven to production, all safety systems **MUST** be inspected and tested for function and operation. Safeties installed on your LEWCO oven include, but may not be limited to, a High-Limit Temperature Controller and a differential air pressure switch. To check operation of a safety circuit, force the input criteria into a failure state and verify the oven reacts correctly.

Example: High-Limit Temperature Controller – While the oven is operating, adjust the high-limit setting to a temperature lower than the current oven temperature. The heating circuit for the oven should be disabled immediately.

Once the safety systems have been checked and proper operation verified, document all component settings for the unit. These settings should be kept with your operating instructions for reference during maintenance and annual safety inspections. Documentation of this information and annual inspection of the system is required per NFPA 86.

SECTION 3 – OPERATION & USE

3-1 GENERAL OPERATING PROCEDURES

Operators must be adequately trained in start-up and shut-down procedures, as well as the oven's safety features. It is the owner's responsibility to insure that operators are also familiar with the oven's intended application and aware of the design limitations of the equipment in order to avoid misapplication.

For optimum performance, do not overload the oven. Restricted airflow caused by too densely, or improperly packed parts will adversely affect temperature uniformity. Leave space between parts on shelves or racks to allow air to move freely between the parts. If possible, stagger parts in order to minimize dead spots in the airflow pattern.

For safety, temperature uniformity, and operating efficiency, proper balance of exhaust and fresh air are essential. If applicable, adjust intake and exhaust damper(s) enough to prevent fouling of the work. For Class A ovens handling solvents, the exhaust rate must be confirmed to be at least the minimum listed on the data plate. If the process generates significant amounts of smoke or moisture, it is necessary to exhaust enough air to remove these materials. When exhaust is increased fresh air intake must also be increased. Failure to provide adequate fresh air will result in air being drawn into the oven via the door gaskets, thus creating cold spots within the oven workspace. Excessive exhaust or inadequate fresh air intake can also create negative pressure in the oven. When the fresh air intake dampers are properly adjusted, there should be a slight leaking of hot air out of the door gaskets.

Operating instructions specific to this equipment are detailed in the **Appendix, section 6-1**.

NOTE: Minimum operating temperature for standard models is 125°F (52°C). Temperature control below this minimum may be erratic. Consult LEWCO for applications requiring operation below minimum.

3-2 EMERGENCY SHUT-DOWN

Your LEWCO, Inc. oven has been engineered and built to the highest industry standards. Only in the unlikely event of equipment malfunction or emergency, should the following steps be performed:

1. Press the red "Emergency Stop" button. If access to the emergency stop button is limited, or the oven does not have an emergency stop button, turn off the electrical disconnect providing power to the unit.
2. Close the Equipment Isolation Valve.
3. Depending on the severity of the issue, evacuate or restrict access to the area until the issue has been resolved.
4. When it is deemed safe to resume operation, twist the red emergency stop button to release it. The button should "pop-up" indicating its disengagement. Open supply valves, then follow normal start-up procedures.

SECTION 4 - MAINTENANCE

4-1 GENERAL

Industry experience indicates that improper maintenance is another leading cause of equipment failure, often resulting in property damage or injury to personnel. To maximize service life and assure safe, optimum, performance of this equipment, the owner should develop and follow a preventative maintenance program.



WARNING: Do not attempt any maintenance on this equipment unless all sources of energy are disconnected and locked out. Before performing work on fan(s), special caution must also be taken to secure the wheel.

4-2 MAINTENANCE ITEMS

This list of maintenance items is a general overview of the minimum items that may need to be addressed on your LEWCO Drum or Tote Heater. The actual list may vary depending on the specific equipment provided. The owner should make the final determination on maintenance intervals and tasks to be performed while considering the working environment. Please review the supplied component literature for further detail and potential additional maintenance items.

NOTE: Maintenance items should only be completed by a qualified technician. All verified data and settings should be documented, at least annually.

Maintenance Items	Frequency			
	Daily	Monthly	6 Months	Annual
Inspect the oven workspace, and if applicable, the circulating fan(s), ductwork, and vent stack for accumulation of foreign matter. Clean as required.	■			
Inspect oven door(s) for gasket wear and tear. Replace as needed.	■			
Test and calibrate all L.E.L. (lower explosive limit) monitors		■		
Inspect electrical connections and components periodically for tightness and signs of wear.		■		
Oil the pivot joint and apply grease to the latch spring and cam on the door(s).		■		
Inspect circulating and exhaust fan(s). Tighten set-screws between bearings and shaft, and also wheel set-screws on all circulating and exhaust fans.		■		
Check for belt tension and wear on belt driven fans. Replace belt as needed.		■		
Lubricate circulating fan(s) shaft bearings every 500 hours of operation. As standard, no special heat resistant grease is required.		■		
Test pressure switch settings by checking the switch movements against pressure settings and comparing these with the actual impulse pressure.		■		
Motors should be lubricated at least every 5,500 hours of service.			■	
Confirm exhaust rate at the stack outlet with the oven nameplate or drawing attached hereto. Inspect exhaust stack for cleanliness and integrity.			■	
All pressure and explosion relief devices must be visually inspected to ensure they are unobstructed and properly labeled.				■
Strainers and steam traps should be blown-down to remove dirt and other foreign mater. This may be required more frequently depending on steam quality.				■
Steam coils should be manually drained. Depending on the installation, this procedure may be required more frequently to maintain efficiency. If the equipment is removed from service, draining the coils is recommended.				■
Test all equipment isolation valves and emergency shutoff valves for proper movement.				■
All safety interlocks should be tested for proper function. Refer to schematics.				■
Verify proper function of Limit Controller (High-Limit Temperature Controller).				■
Calibrate recording devices per component literature.				■
Validate all thermocouples / RTD's. Replace as necessary.				■
Conduct operator training course or refresher course.				■

NOTE: Air streams containing particulate or chemicals can cause abrasion or corrosion of fan parts. When such wear is discovered, a decision must be made as to whether to rebalance or replace the wheel.

4-3 SERVICE & REPLACEMENT PARTS

For service or replacements parts, please contact LEWCO's Customer Service Department by calling 419-625-4014, ext. 4012 or emailing customerservice@lewcoinc.com. Please be prepared to provide both your SERIAL NUMBER and MODEL NUMBER when ordering. A list of replacement parts may be found in the Appendix, section 6-3.

SECTION 5 – TROUBLESHOOTING

PROBLEM	CAUSE	SOLUTION
Control panel does not have power	No power supplied to the control panel	Verify main disconnect switch is on
	Blown fuse(s)	Verify continuity of the fuses before and after the main transformer
	Emergency Stop push button has been activated	Verify the initial reason for the E-Stop activation. If reason has been corrected, release the E-Stop.
Safety interlock will not prove (Interlock Proven light not illuminated)	Circulating or exhaust fan(s) airflow switches are not making contact	Check the inputs to and output from switches
		Check air filter if applicable
		Verify direction of fan rotation against fan label
	High-temperature limit controller alarm active	Temperature is above designated high temperature limit set-point
		Reset limit controller
		If controller wont reset after temperature falls below set-point, replace controller
Oven will not heat, Heats slow, or will not reach set temperature	No supply steam/ or low steam pressure	Ensure supply valve is fully open
		Inspect Y strainer & steam traps for clogs. Clean as needed.
		See Appendix 6-1, Figure 5 (Steam Pressure VS. Cabinet Temp.)
	Flooded heat exchanger	Drain condensate from the outlet side of the heat exchanger (preferably through a steam trap)
	Control valve failure	Confirm valve opens & closes.
	Power loss	Check incoming power to control panel from source. If line voltage is not present, check and make necessary corrections at source.
		Check voltage on load side of fuses and replace if needed.
	Thermocouple burned out	Replace thermocouple
	Circulating fan(s) rotating in wrong direction	Verify fan rotation against fan direction label. If fan is rotating in the wrong direction, there is an incorrect phase sequence. To correct, reverse any two leads anywhere from source to fan motor.
	Temperature Controller	Auto Tune Temperature Controller
		Verify controller settings. Refer to temperature controller manual
		Replace temperature controller
	Thermometer	Inspect thermometer. Replace if damaged.
Door switch	If door is not securely closed, door switch will disable heat; close door. If door is closed, inspect door switch for proper function. Replace if necessary.	

PROBLEM	CAUSE	SOLUTION
Oven exceeds desired temperature (overheats)	High steam supply pressure	See Appendix 6-1, Figure 5 (Steam Pressure VS. Cabinet Temp.)
	Control valve failure	Confirm valve opens & closes.
	Temperature Controller	Check temperature controller for error messages and adjustments. Refer to temperature controller manual.
		If known, set P, I, D, constants on Temperature Controller. If unknown, initiate auto tune sequence. Refer to temperature controller manual for auto tune instructions.
	Check output of process controller to see if it cycles. If output power is continuously present when controller does not call for power, replace process controller.	
Limit Controller High-Temp. Alarm will not turn off	High-Temp. condition exists	Wait for temperature to go below high-temp. set-point
	Limit Controller	Reset Limit Controller. If temperature is below set-point and alarm will not turn off when manually reset, replace Limit Controller.
	Hysteresis value	Hysteresis value is factory set at 20. Temperature must go 20°F. below Limit Controller set-point, before high-limit alarm can be rest. Verify Hysteresis value hasn't been changed.
	Limit Controller set wrong	Verify parameters and correct as necessary.
	Thermocouple	Inspect thermocouple. Replace if necessary
Circulating fan will not start	Motor failure or control power loss	Check fuses. Replace as needed.
		Check load side voltages on overload relay with fan control on. If three-phase imbalance voltage appears, service fan motor.
		Check 120V power across starter coil A1 - A2 with fan control on. If power appears and starter does not energize, replace starter.
	Circulating Fan Start switch	Inspect wiring to switch. Verify all connections are secure. Tighten as necessary. If all wiring is secure, replace switch.
Circulating fan running slow & sluggish	Phase missing	Check fuses. Replace if needed.
		Check for balanced three-phase power from source and correct as necessary.
Excessive fan noise or vibration	Loose mounting bolts, setscrews, bearings or couplings.	Tighten hardware to the proper torque
	Fan shaft bearings	Lubricate or replace
	Motor	Lubricate
	Misaligned or excessive wear of couplings, bearings or misaligned or unbalanced motor.	Replace couplings and bearings, and realign balanced shaft and wheel.
	Accumulation of foreign matter on the wheel or wear/erosion of the wheel.	Clean or replace fan wheel depending on extent of damage

SECTION 6 – APPENDIX

The Appendix of this manual contains installation and operation specific information. If your installation requires non-standard information requirements, such as calibration certifications or equipment specific data, it will be found at the end of this section.

6-1 OPERATING INSTRUCTIONS

6-2 OPTIONAL EQUIPMENT

6-3 REPLACEMENT PARTS

Also included with this manual:

- 1. DRAWINGS**
- 2. SCHEMATICS**
- 3. COMPONENT LITERATURE**

6-1 OPERATING INSTRUCTIONS


Standard ovens are shipped from the factory with control parameters set-up for typical heating applications. The following operating procedures apply to all standard models. It is recommended that the owner post a copy of these instructions at the unit. Refer to the supplied component literature for further set-up and operation details.

NOTE: It is important to also read Appendix 6-2, Optional Equipment prior to initial start-up.



CAUTION: Do not leave this equipment in operation unattended.

START-UP

1. Turn the main power disconnect switch to the “ON” position.
2. Push the “CONTROL POWER ON” button
3. Push the “CIRCULATING FAN START” button.
4. If applicable, push the “EXHAUST FAN START” button
5. Once the fan(s) are running and all internal safeties are verified, the “INTERLOCKS PROVEN” light will be illuminated.
6. Using the Temperature Controller (also known as Process Controller) set the desired operating temperature. The controller will display two temperatures. The upper temperature indicates the current oven temperature. The lower temperature indicates the set temperature. Refer to the applicable controls specific to your unit:
 - a. **Eurotherm 3216** Temperature Controllers: To set the operating temperature; simply push the “Mode” up or down arrows to the desired temperature.
 - b. **Eurotherm Nanodac** Temperature Controllers: Press the **SCROLL** button twice, once to highlight the SP field and once more to select the SP field. Once selected a set of arrows  will be shown in the right side of the highlighted field. Use the arrows to set the desired temperature, then press the SCROLL button to store the value. Lastly, press the PAGE button to exit the selection.
7. Push the “HEAT ENABLE” button. Once the heat is enabled, the oven will heat to set-point.

NOTICE: The Limit Controller(s) have been factory set 20°F (11°C) above the maximum operating temperature. Never raise above this temperature or damage may occur. The high-limit set-point may be lowered at the owner’s discretion; however it should always exceed the Temperature Controller set-point by 20°F (11°C).

SHUT-DOWN

1. Push the “HEAT DISABLE” button.
2. High-temperature fans cool themselves while they are running. To avoid damage to fan(s), allow the oven to cool below 200°F (93°C) before terminating fan operation. To help cool the unit quicker, open the oven doors.
3. Push the “CIRCULATING FAN STOP” button(s).
4. Push the “EXHAUST FAN STOP” button.
5. Push the “CONTROL POWER OFF” button.
6. *Optional:* Turn the main power disconnect switch to the “OFF” position. This disconnects the main power feed to the control panel.

GENERAL CONTROL INSTRUCTIONS

This document is a general guide to assist LEWCO customers in becoming familiar with their Eurotherm Temperature Controllers. Guide does not replace respective owner's manuals and anyone using the products mentioned herein should review the owner's manual prior to use. Further, user is responsible for setting up and configuring these devices to meet their application requirements.



BUTTON LEGEND:

Page key	
Scroll key	

TO CHANGE THERMOCOUPLE TYPE:

- ❑ Press and hold the **PAGE** button until **LEV3** shows in the upper display and **GOTO** shows in the lower display. Release the **PAGE** button.
- ❑ The word **CODE** will be shown in the lower display and a **"0"** will be shown in the upper display
- ❑ Press the **UP** and **DOWN** arrows and change the **"0"** to a **"3"**
- ❑ Press the **PAGE** button until **INPUT** is shown in the lower display.
- ❑ Press the **SCROLL** button until **IN.TYP** is shown in the lower display and the current type is shown in the upper display (**J.TC**)
- ❑ Press the **UP** and **DOWN** arrows and change to desired units type
- ❑ Press the **SCROLL** button to save
- ❑ Press and hold the **PAGE** button again and until **CONF** is in the upper display and **GOTO** is in the lower display
- ❑ Press the **UP** and **DOWN** arrows and change **LEV3** to **LEV1**
- ❑ Controller will cycle power and automatically restart.

TO CHANGE ENGINEERING UNITS (°F TO °C):

- ❑ Press and hold the **PAGE** button until **LEV1** shows in the upper display and **GOTO** shows in the lower display. Select access level will scroll through the lower display.
- ❑ Press the **UP** and **DOWN** arrows and change **LEV1** to **LEV2**
- ❑ The word **CODE** will be shown in the lower display and a **"0"** will be shown in the upper display
- ❑ Press the **UP** and **DOWN** arrows and change the **"0"** to a **"2"**
- ❑ Press the **SCROLL** button until **UNITS** is shown in the lower display and the current units are shown in the upper display
- ❑ Press the **UP** and **DOWN** arrows and change to desired units °F

INSTRUCTIONS - Temperature Controller: 3216

Description: The 3216 Process Controller is a 1/16-DIN highly precise temperature controller. **Purpose:** Provide precise temperature control

TO CHANGE SET-POINT: Press the **UP** and **DOWN** arrows until desired set-point is reached

TO VIEW THE WORKING OUTPUT:

- ❑ Press the **SCROLL** (2nd from the left) button
- ❑ Press the **UP** and **DOWN** arrows, value will show between **0-100%**

NOTE: If heat output is on **OP1** or **OP2** will show in the upper left hand corner of the controller

TO AUTOTUNE THE CONTROLLER:

- ❑ Press and hold the **PAGE** (1st on the left) button until **Lev1** shows in the upper display and **GOTO** shows in the lower display. Select access level will scroll through the lower display.
- ❑ Press the **UP** and **DOWN** arrows and change **Lev1** to **Lev2**
- ❑ The word **CODE** will be shown in the lower display and a **“0”** will be shown in the upper display
- ❑ Press the **UP** and **DOWN** arrows and change the **“0”** to a **“2”**
- ❑ Press the **SCROLL** button until **A.TUNE** is shown in the lower display and **OFF** is shown in the upper display
- ❑ Press the **UP** and **DOWN** arrows and change the **OFF** to **ON**

NOTE: When Autotune is running **TUNE** will flash in the upper display. When this stops flashing the Autotune is complete.

INSTRUCTIONS - Limit Controller: 3216i

Description: The 3216i is a 1/16-DIN FM approved alarm indicator with one FM Approved form C relay output. Terminals AA, AB, and AC are dedicated to this Alarm. **Purpose:** If an alarm set-point is exceeded or a sensor failure occurs, the alarm relay will change state. Once the sensor fault and PV return to a safe state and have been acknowledged the relay will return to their original state.

TO ACKNOWLEDGE / RESET THE ALARM RELAY:

- ❑ The alarm relay is FM approved and must be manually acknowledged. Once the process variable has returned to a safe value and the alarm is acknowledged the relays will automatically reset. The alarm can be acknowledged by pressing the **PAGE** and **SCROLL** buttons at the same time.

TO CHANGE ALARM SET POINTS:

- ❑ Press the **SCROLL** button. The display will show the current set point in the upper display and **A1.HI** in the lower display
- ❑ Press the **UP** and **DOWN** arrows until desired set point is reached
- ❑ Press the **PAGE** button to exit

NOTE: Limit Controller set-point should be 20°F. above maximum operating temperature.

TO ADJUST THE ALARM HYSTERESIS VALUE:

Hysteresis is the difference between the point at which the alarm switches **ON** and the point at which it switches **OFF**. It is used to prevent relay chatter.

- ❑ Press the **SCROLL** until **A1.HYS** is shown in the lower display the current hysteresis value is shown in the upper display.
- ❑ To adjust the hysteresis value, use the **UP** or **DOWN** button; the minimum value is 1.

LEWCO PARAMETERS FOR EUROTHERM 3216 WITH 4-20mA OUTPUT			
INPUT			
Name	Description	Value	Value Description
IN.TYP	Input Type	J Tc	J Thermocouple
UNITS	Display Units	°F	Degrees Fahrenheit
DEC.P	Decimal Points	nnnn	
RNG.HI	Range High Limit	300	
RNG.LO	Range Low Limit	0	
PV.OFS	PV Offset	0	
FILT.T	Filter Time	1.6	
CJC.TYP	CJC Type	AUTO	Automatic Compensation
SB.TYP	Sensor Break Type	ON	
CJC.IN	CJC Temperature	75.75	
PV.IN	Process Variable	75.61	
MV.IN	Millivolt Input Value	0	
RC.FT	ROC Filter Time	1.6	
RC.PV	PV Derivative	--	
OP2			
Name	Description	Value	Value Description
2.ID	Output 2 Type	dC.rt	DC Output
2.FUNC	Output 2 Function	HEAT	Heat Output
2.RNG	DC Output Range	4.20	
LA			
Name	Description	Value	Value Description
L.TYPE	Logic Input Type	NONE	Unconfigured
l.din	Logic Input Function	NONE	Unconfigured
l.sens	Logic Input Sense	nor	
LB			
Name	Description	Value	Value Description
L.TYPE	Logic Input Type	NONE	Unconfigured
l.din	Logic Input Function	NONE	Unconfigured
l.sens	Logic Input Sense	nor	
ct.inp			
Name	Description	Value	Value Description
CT.ID	Module Type	NONE	Unconfigured
ct.src	CT Source	NONE	Unconfigured
CT.rng	CT Range	10	
ct.lat	CT Alarm Latch Type	NONE	Unconfigured
ld.alm	Load Current Threshold	OFF	
lk.alm	Leak Current Threshold	OFF	
hc.alm	Overcurrent threshold	OFF	
ld.amp	Load Current	24	
lk.amp	Lead Current	0	
ct.mtr	Current Meter Range	10	

SP			
Name	Description	Value	Value Description
SP.SEL	Setpoint Select	SP1	Setpoint 1
SP1	Setpoint 1	0	
SP2	Setpoint 2	0	
SP.HI	Setpoint High Limit	300	
SP.LO	Setpoint Low Limit	0	
REM.SP	Remote Setpoint	0	
L-R	Remote Setpoint Select	NO	
SP.RAT	Setpoint rate Limit	OFF	
RampU	Setpoint Ramp Units	MIN	Minutes
LOC.T	Local Setpoint Trim	0	
REM.HI	Remote Input High Scalar	9999	
REM.LO	Remote Input Low Scalar	-1999	
ROP.HI	Setpoint Retrans. High	300	
ROP.LO	Setpoint Retrans. Low	0	
CTRL			
Name	Description	Value	Value Description
CTRL.H	Heating Type	Pid	Control Output Configured as PID
CTRL.C	Cooling Type	OFF	Unconfigured
CTRL.A	Control Action	rEv	Reverse Acting (Negative Feedback)
PB.UNT	Proportional Band Units	EnG	Engineering Units
A.TUNE	Auto-tune Enable/Disable	OFF	
PB	Proportional Band	30	
TI	Integral Time	360	
TD	Derivative Time	60	
CB.HI	Cutback High	AUTO	
CB.LO	Cutback Low	AUTO	
MR	Manual Reset	0	
LBT	Loop Break Time	OFF	
OP.HI	Output High	100	
OP.LO	Output Low	0	
Safe	Safe Output Power	0	
F.MOD	Forced Manual Output Mode	NONE	Track
F.OP	Forced Output	0	
A-M	Loop Mode	AUTO	
LBR	Loop Break Status	NO	
TU.HI	Tune High Limit	100	
TU.LO	Tune Low Limit	0	
ALARM			
Name	Description	Value	Value Description
A1.TYP	Alarm 1 Type	NONE	Unconfigured
TIMER			
Name	Description	Value	Value Description
TM.CFG	Timer Configuration	NONE	Unconfigured
COMMS			
Name	Description	Value	Value Description
ID	Comms Identity	NONE	Unconfigured

CAL			
Name	Description	Value	Value Description
PHASE	Calibration Phase	NONE	
VALUE	DC Output reading	-	
GO	Calibration Start	-	
ACCESS			
Name	Description	Value	Value Description
Goto	Select Access Level	-	
LEV2.P	Level 2 Passcode	2	
LEV3.P	Level 3 Passcode	3	
CONF.P	Config Passcode	4	
ID	Customer ID	0	
HOME	Home Display	STD	SP / Manual Power
K.LOCK	Keyboard Lock	NONE	
COLD	Cold Start Enable/Disable	NO	
STBY.T	Standby Type	Abs.A	Hi & Lo Alarms Active on Standby
PASS.C	Feature Passcode	3237	
PASS.2	Feature Passcode 2	3455	

6-2 OPTIONAL EQUIPMENT

This is a general guide. Equipment listed below may or may not be applicable to your specific model. For more information and operating instructions on specific equipment, refer to the supplied component literature.

NOTE: Ensure all switches are turned off prior to turning the main disconnect switch off. Failure to do so may result in damage to controls.

EXHAUST FAN: Exhaust fan(s) should be left on throughout the entire heating cycle.

1. To turn the exhaust fan(s) **on**, simply push the “EXHAUST FAN START” button(s). To turn the exhaust fan(s) **off**, push the red “EXHAUST FAN STOP” button(s).

NOTE: High-temperature fans cool themselves while they are running. To avoid damage to the fan, allow the oven to cool below 200°F (93°C) before terminating fan operation.

BATCH TIMER: The batch timer is infinitely adjustable up to 100 hours. It includes an ON/ OFF switch to indicate timed operation and sounds an audible alarm when time has elapsed.

1. For **Eurotherm 3216** Temperature Controls:

- On the temperature controller, press the **SCROLL** button until “dWELL” is shown in the lower display and the current time is shown in the upper display. “Set Time Duration” will scroll across the bottom of the screen.
- Press the **UP** and **DOWN** arrows to change the hours and minutes. The maximum time is 99 hrs. and 59 mins.
- On the control panel, physically turn the **Timer selector switch** to the “**ON**” position.
- When timer is running, “RUN” will be illuminated on the bottom of the controllers screen and “Timer Running” will scroll across the bottom of the screen.
- When batch time is complete the alarm horn will sound, “Timer Running” will stop scrolling across the bottom of the screen, and “OP4” will be shown on the lower left corner of the display.
- To turn off the alarm horn and reset the timer, turn the Timer selector switch to the “**OFF**” position.

NOTE: If the Timer selector switch is turned **OFF** in the middle of a batch time, the timer will reset and start over when the switch is turned back **ON**. Batch time cannot be paused in the middle of a cycle.

CHART RECORDER: Single pen circular paper chart recorder allows for continuous monitoring of temperature data. Chart recorder comes with (1) Type “J” thermocouple input.

1. To turn the chart recorder on/ off, simply turn the “CHART RECORDER” switch to the “ON” or “OFF” position. The chart recorder should typically be turned on at the beginning of the batch.

DATA LOGGER: Multiple input digital data logger continuously records temperature and other process data. Data logger allows downloading of digital data files through USB or Ethernet connection. Data can also be viewed on a full color display or on a web server when connected to a network. *Note:* There are a couple different ways to retrieve the recorded data.

1. Setup the channels that need to be recorded. Recording is done automatically. The recorded data can then be retrieved in several different time intervals. The amount of data able to be recorded is limited only by memory present on the data logger. Once the memory fills up the data will begin overwriting the oldest data first. Connect computer or USB to data logger and archive at desired time frame.
2. Data can also be logged to a computer by permanently connecting the data logger to a network and continuously archiving the data.

DOOR SWITCH: Disables heat when the door is opened on electrically heated ovens; holds burner at low fire on fuel-fired ovens. Normal operation, at previously set parameters, is initiated when the door is closed again. The door switch does not require any set-up. Please note that the door switch does not turn the circulating fan off.

RAMP/ SOAK CONTROLLER: Programmable ramp/ soak temperature controller with capability to store different recipes with multiple segments.

1. Enter or open the desired ramp/ soak program, then run it.

HUMAN MACHINE INTERFACE (HMI): The HMI is a touchscreen user interface with color display that allows control of the oven's functions. The operator has the ability to monitor the oven's status, operate circulating & exhaust fans, enable/disable heat, load and run recipes, view temperature/ process control data, and much more.

PROGRAMMABLE LOGIC CONTROLLER (PLC): Ideal for processes with numerous inputs and outputs; or requiring automation of material handling equipment. The PLC can also allow for Ethernet connectivity for remote system monitoring.

VACUUM PUMP: Typically includes motor starter circuit and connection to vacuum header pipe. The vacuum pump can be turned on at any time after the control power is turned on.

ZERO SPEED SWITCH FOR FANS: Minimizes nuisance tripping associated with standard airflow switches.

6-3 REPLACEMENT PARTS

We apologize for any inconveniences you are having with your equipment. Below is a minimum list of common parts that may need to be replaced on your LEWCO Industrial Oven. If the part you need is not listed, please contact our customer service department and we'd be happy to help. Please be prepared to provide both your MODEL AND SERIAL NUMBER when ordering.

Phone: 419-625-4014, ext. 4012

Email: customerservice@lewcoinc.com

Part Description	Part #
Modulating Valve	PCP0097-.500
Safety Valve	PCP0098-.500
Gasket, Tadpole, Woven Fiberglass	PCP1771-.750-2.00
Process Controller - Eurotherm 3216, 4-20 DC Output	PCP2339-DC
Process Controller/ Recorder - Eurotherm Nanodac	PCP2328
Limit Controller - Eurotherm 3216i	PCP2338
Process Controller – Honeywell UDC1200, DC Output	PCP0797
Limit Controller – Honeywell UDC120L	PCP0798
Thermocouple, _" Long Probe	PCP0735- ___ (probe length)
RELAY,GP,MINI,120 VAC,2-POLE	PCP1668
USB Port - RECEPTACLE,SIMPLEX,120V,15A,USB	PCP6541
USB Port - RECEPTACLE,USB,1M	PCP6552
___ AMP Fuse, Class CC, 500 VAC	PCP1914- ___ (amps)
___ AMP Fuse, Class M, 250 VAC	PCP1297- ___ (amps)
__-__ AMP Fuse, Class CC, 600 VAC	PCP1296- ___ (amps)
___ AMP Fuse, Class J, 600 VAC	PCP1304- ___ (amps)
30 AMP Fuse block, Class CC	PCP8730-C-30
30 AMP Fuse block, Class J	PCP8730-J-30
60 AMP Fuse block, Class J	PCP8730-J-60
30 AMP Fuse block, Class M	PCP8730-M-30
Non-Reversing Contactor, 3-POLE, ___ AMP	PCP1335- ___ (amps)
Transformer, 100VA, 240-480/3/60 (Add "I" to the end of the part number for international series: 208, 380-575/3/50 or 60 Hertz)	PCP1298- ___ (VA)
Panel Mounted Horn, 85dB	PCP1695
Purge Timer,1 sec - 50 hrs.120 V	PCP1801
Master Control relay, 4-Pole, 120VAC	PCP1690
Chart Recorder, Single Pen, Non-Indicating	PCP6891
Solid State Overload Relay, ___ AMP	PCP1337- ___ (amps)