Nordson EcoDry[®] Series Induction Dryers

Customer Product Manual Part 1045354A03 Issued 8/08

For parts and technical support, call the Industrial Coating Systems Customer Support Center at (800) 433-9319 or contact your local Nordson representative.

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Nordson EcoDry® Series Induction Dryers

Safety

Read and follow these safety instructions. Task- and equipment-specific warnings, cautions, and instructions are included in equipment documentation where appropriate.

Make sure all equipment documentation, including these instructions, is accessible to persons operating or servicing equipment.

Qualified Personnel

Equipment owners are responsible for making sure that Nordson equipment is installed, operated, and serviced by qualified personnel.



WARNING: The control enclosure and coil tray contain high voltages and high power levels that can be fatal. Allow only qualified personnel to access these enclosures.

Qualified personnel are those employees or contractors that

- have experience operating and maintaining high-power and high-voltage electrical equipment.
- can safely perform their assigned tasks.
- are familiar with all relevant safety rules and regulations and are physically capable of performing their assigned tasks.

Intended Use

Use of Nordson equipment in ways other than those described in the documentation supplied with the equipment may result in injury to persons or damage to property.

Some examples of unintended use of equipment include

- using incompatible materials and atmospheres
- making unauthorized modifications
- removing or bypassing safety guards or interlocks
- using incompatible or damaged parts
- using unapproved auxiliary equipment
- operating equipment in excess of maximum ratings

Regulations and Approvals

Make sure all equipment is rated and approved for the environment in which it is used. Any approvals obtained for Nordson equipment will be voided if instructions for installation, operation, and service are not followed.

Refer to the CE Declaration of Conformity for approvals standards.



WARNING: Never disarm any diagnostic device including but not limited to:

A. Current sensor

B. Overtemperature switches

C. Air pressure switch

D. Coil tray lid safety switches

Disarming diagnostic devices will void the warranty and may cause equipment failure.

Personal Safety

To prevent injury follow these instructions:

- Do not operate or service equipment unless you are qualified.
- Do not operate equipment unless safety guards, doors, or covers are intact and automatic interlocks are operating properly. Do not bypass or disarm any safety devices.
- Make sure that the ventilation system is operating properly to prevent dangerous concentrations of volatile particles or vapors.
- Keep clear of moving equipment. Before adjusting or servicing moving equipment, shut off the power supply and wait until the equipment comes to a complete stop. Lock out power and secure the equipment to prevent unexpected movement.
- Disconnect, lock out, and tag switches before servicing electrical equipment.
- Keep parts of your body and metal implements away from the induction heating zone while the system is energized. Metal objects will heat up very quickly. Remove all jewelry, watches, and rings.
- Obtain and read Material Safety Data Sheets (MSDS) for all materials used. Follow the manufacturer's instructions for safe handling and use of materials, and use recommended personal protection devices.
- To prevent injury, be aware of less-obvious dangers in the workplace that often cannot be completely eliminated, such as hot surfaces, sharp edges, energized electrical circuits, and moving parts that cannot be enclosed or otherwise guarded for practical reasons.
- Hearing protection is recommended.

Fire Safety To avoid a fire or explosion, follow these instructions: All equipment must be grounded and bonded to the building ground. Do not heat materials to temperatures above those recommended. Make sure heat monitoring and limiting devices are working properly. ٠ Provide adequate ventilation to prevent dangerous concentrations of volatile particles or vapors. Refer to local codes or your material MSDS for guidance. Do not disconnect live electrical circuits while working with flammable ٠ materials. Shut off power at a disconnect switch first to prevent sparking. • Know where emergency stop buttons, shutoff valves, and fire extinguishers are located. Clean, maintain, test, and repair equipment according to the instructions in your equipment documentation. Use only replacement parts that are designed for use with original equipment. Contact your Nordson representative for parts information and advice. Action in the Event of a Malfunction If a system or any equipment in a system malfunctions, shut off the system immediately and perform the following steps: Disconnect and lock out system electrical power.

• Identify the reason for the malfunction and correct it before restarting the system.

Disposal

Dispose of equipment and materials used in operation and servicing in accordance with applicable laws, regulations, or codes.

Description

The Nordson EcoDry Series Induction Dryers provide simple, efficient, and uniform drying of water-based end-sealing compounds applied to can ends. The dryers use solid-state induction heating to generate heat within the can ends to dry the sealing compound, at line speeds of up to 500 ends a minute. The dryers can be designed for can end diameters from 57 to 170 mm.

The dryers are available with single or dual channels and can be configured to mate to almost any line height. Each dryer is designed to handle a particular can end size and material, according to the customer's specifications.



Figure 1 EcoDry Series Induction Dryer (with Optional Magnetic Separator)

EcoDry Features		
Instant On/Off	When the line starts, heating within the can ends instantly starts. Since heat is created directly within the ends, there is no thermal inertia. When the line stops, heating instantly stops. This produces a very uniform product.	
No Jams	The short length of the dryer and straight-through design minimizes jams.	
Energy Savings	Solid state induction heating is extremely efficient. Greater than 80% of the power consumed is directly realized as heat in the can ends. When the line stops, almost no power is consumed.	
Reliability	The solid-state design of the dryers minimizes downtime. There are few moving parts to wear out.	
Small Footprint	Because induction drying is so fast, the dryer is much smaller than conventional ovens.	
Temperature Control	The dryer continuously monitors the temperature of the can ends as they exit the dryer and adjusts coil power to maintain the desired setpoint temperature, providing uniform control of product quality.	
Magnetic Separator	An optional magnetic separator can be installed at the dryer exit.	

Dryer Components

See Figure 2	2.
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Item	Description		
1	Coil Tray —Contains the induction coil, glass tube, heater blower, and exhaust blower. The can ends travel through the glass tube and are heated by the induction coil. The heater heats the dryer cooling air and blows it through the tube to help carry off the moisture vaporizing out of the sealing compound. The exhaust blower draws the heated air and moisture out of the tube. The coil tray attaches to the customer infeed and outfeed system.		
2	Motion Sensor —A laser sensor that monitors the movement of can ends at the entrance to the dryer. The controller will only apply power to the induction coil when the motion sensor detects can ends moving through the dryer.		
3	Operator Control Console —Contains the operator controls, temperature controller, and LED indicators for operational modes and faults.		
4	Control Enclosure —Contains the system controller (PLC), cooling air filters and fan, and power inverter devices and circuit boards.		
5	Temperature Sensor —Low-mass type K thermocouple. As the can ends exit the coil tray they pass by the temperature sensor, which sends the can end temperature to the temperature controller. The power applied to the induction coil is regulated to produce the desired can end exit temperature.		



Figure 2 EcoDry Series Induction Dryer (Shown with Optional Magnetic Separator)

1. Coil tray

4. Control enclosure

2. Motion sensor

5. Thermocouple

6. Magnetic separator (optional) 7. Coil and coil tube

- 3. Operator panel

Theory of Operation

See Figures 3 and 4.

The can ends move through a glass tube inside the coil tray. The tube is surrounded by the induction coil. As can ends enter the dryer, the motion sensor at the entrance signals the controller. The controller causes the power inverter to apply alternating current to the coil windings. The coil windings generate an alternating magnetic field that creates large eddy currents in the can ends. The resistance to the eddy currents generates heat within the can ends and dries the sealing compound. If the can end line stops, the motion sensor signals the controller, which shuts off power to the coil windings.

The temperature sensor (thermocouple) at the exit senses the can end temperature and signals the temperature controller, which adjusts the power going to the coil windings to maintain the temperature at the setpoint. The controller uses a PID (Proportional-Integral-Derivative) loop that automatically adjusts the amount of power supplied to the coil to eliminate temperature variations due to line voltage fluctuations, applied compound weight, and can end start temperature.

A blower in the controller/power inverter enclosure pulls in room air and directs it over the electrical components to cool them. The air then flows into the coil tray and over the coil to cool it. An air heater mounted on the tube hub at the entrance end of the coil tray interior then heats the air as it enters the coil tube to carry off moisture vaporizing out of the sealing compound. An exhaust blower mounted in the tube exit hub draws the air out of the tube and exhausts it out into the room. If an optional magnetic separator is installed at the tube exit, heated air is also ducted directly into the separator.

Safety interlocks include door interlock switches, thermocouples, and a pressure switch. A customer interlock is also provided. Interlock status is indicated on the operator control panel.



WARNING: Never disarm any diagnostic device including but not limited to:

- A. Current sensor
- B. Overtemperature switches
- C. Air pressure switch
- D. Coil tray lid safety switches

Disarming diagnostic devices will void the warranty and may cause equipment failure.









Specifications

Manufacturing Date Code

Serial Number:

BKXX	X X – X X X
year	month

Operating Parameters

Ambient Temperature Range:	-5 to 35 °C (40–95 °F).
Humidity:	0-70% for full system functionality
Elevation (Altitude):	Less than 1524 meters (5000 ft) Above 5000 ft system must be de-rated. Contact your Nordson representative.

Power Supply Requirements

380–480 Vac, 3 phase, 50/60 Hz at 30 amperes Class J fusing required.

System Weight (Crated)

340 kg (750 lbs) to 362 kg (800 lbs)

Operating Sound Levels





Installation



WARNING: Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.

Inspection

The EcoDry system is shipped fully assembled, except for the glass coil tube and coil, which are packed separately to prevent breakage. Unpack and carefully inspect the dryer, coil tube, and coil for obvious shipping damage and shortages. If you see any damage or shortages, notify the shipper and your Nordson representative immediately.

NOTE: A $\frac{5}{16}$ inch hex wrench is required to unlock and lock the coil tray lid and control enclosure doors.

Lift Points



Figure 6 Lift Points for EcoDry Series Induction Dryer (Shown with Optional Magnetic Separator)

System Positioning and Mounting

See Figure 6 for lift points and uncrated weight.

Flow Direction

The dryer must be positioned so that can ends pass through it in the correct direction. When moving the dryer into position in the production line, note the position of the motion sensor head. This is the dryer entrance. A flow direction arrow is also located inside the coil tray.

NOTE: Optional magnetic separators are always installed at the exit end of the dryer.

Clearances

Provide clearances around dryer as follows:

- Make sure blower intake (filters), and vents are not obstructed.
- Provide enough space in the rear of the dryer to remove the access panel for power and interlock connections and repairs.
- Provide enough space in front of the dryer to open the enclosure doors.

Mounting and Line Connections

The dryer legs are made at the factory to the height listed in the purchase order. Level the dryer and bolt it to the floor.

Before connecting the can end rod cages or trays to the dryer, cut the air baffles secured to the entrance and exit hubs to the shape of the can ends, so that the baffle just clears the can ends as they enter and exit the dryer. The baffle retains the heated air within the tube to help dry the can ends.

See Figure 7. Six evenly spaced 1/4-20 NCB threaded holes are provided in the dryer exit and entrance hubs. Secure your can end rod cages or trays to the entrance and exit hubs as required.



Figure 7 Entrance and Exit Hub Mounting Hole Pattern

Coil and Tube Installation

See Figure 8. Install the coil and glass tube as follows:

- 1. Remove the screws securing the rear access panel with a hex wrench.
- 2. Remove the screws (1) securing the air heater and exhaust vent to the entrance and exit hubs. Move the air heater and exhaust vent away from the hubs.
- 3. Remove the slotted nylon screws (2) from the entrance and exit hubs.
- 4. Unpack the coil and tube. Carefully insert the glass tube (3) through the coil (4).
- 5. Carefully install the coil and tube assembly in the coil tray, positioning the ends of the tube into the hubs. It does not matter which end of the coil is at the entrance or exit unless the coil is marked with the flow direction.
- 6. Re-install the two nylon slotted screws into the entrance and exit hubs.
- 7. Route the coil wires through the grommeted hole in the bottom of the coil tray.
- 8. Re-install the heater blower and exhaust vent on the entrance and exit hubs.
- 9. Connect the coil wiring to the bus bar terminals (5) (no polarity).

Coil and Tube Installation (contd)



- -igure 8 Coll and Tube Installatio
- Screws (4 on each hub)
 Nylon slotted screws (1 on each hub)
- 3. Glass tube
- 4. Coil

5. Bus bar terminals

System Wiring

Schematics and Wiring Diagrams

Refer to the Addendum to this manual for dryer schematics and wiring diagrams.

Power Input

See Figure 9 for connections. Service requirement is 380–480 Vac, 3 phase, 50/60 Hz at 30 amperes. Class J fusing required.



WARNING: If plant supply is not through current limiting Class I 30 amp fusing, customer is required to follow arc flash hazard criteria and label appropriately.



WARNING: Install a locking breaker or disconnect in the electrical supply line ahead of the dryer so that power to the dryer can be disconnected and locked out when repairs are made. All electrical connections must be made according to code, including a proper ground connection. Failure to observe this warning could result in severe personal injury or death from electrical shock.

Line power is supplied to the system through a $^{3}/_{4}$ -in. (1.9-cm) conduit fitting in the lower left-hand corner of the exit end of the dryer.

- 1. Route three 10 AWG (5.3 mm²) wires to the L1, L2, and L3 terminals on the input side of the line filter.
- 2. Route one 10 AWG (5.3 mm²) ground wire to the cabinet grounding terminal (PE).



WARNING: DANGER! Line filter terminals remain live with dryer main disconnect in Off position.



Figure 9 Power Connections

Customer Interlock

The customer interlock requires an external 24 Vdc source at 100 mA to power an internal relay coil (refer to Note 1). This indicates to the dryer system that the production line is running. Without this signal, the controller will not apply power to the induction coil (refer to Note 2).

Note 1: This relay coil is relay R6. Optional relay voltages available as special order are: 6, 12, and 48 Vdc, and 6, 12, 24, and 120 Vac, 50/60 Hz.

Note 2: Unit is shipped with a jumper installed from +24 Vdc wire #140 to wire # 213, input #3 on the PLC. If no external interlock is installed, leave the jumper in place.

The interlock terminals are located behind the control enclosure doors, in the front of the enclosure.

CAUTION: Nordson engineering recommends that the customer interlock be connected and activated for safety. Without the interlock connection, random line motion can cause the controller to apply power to the coil while the line is stopped. Stationary can ends inside the coil could be overheated and damaged.

See Figure 10.

- 1. Drill a hole or use a knockout tool to bring your interlock cable into the enclosure. Install a properly sized strain relief or conduit connector in the knockout.
- 2. Remove the jumper (1) installed between the top front and rear terminal #10 (wires 140 and 213) to activate the customer interlock.
- 3. Connect your interlock wiring to the terminals.
- 4. Install the rear access panel.



Figure 10 Customer Interlock Connections

- 1. Interlock jumper
- 2. Interlock terminals (#10, input)
- 3. Status contact (#11, output)

Optional Status Contact

See Figure 10. The status contact is used in conjunction with the customer interlock. The contact indicates when the dryer is off or in a fault condition. The contact is off when:

- The dryer has not been started (turned off).
- Any fault on the operator panel is activated.
- If a run signal is received and motion is not detected by the Motion Sensor before the External Interlock Timer expires. Refer to page 21 for timer setting instructions.

NOTE: To use run signal received/motion not detected with the status contact, input 6 on the PLC must have wire #171 installed (24Vdc).

Status Contact Connection: Terminal 11 Output Contact (output)

Motion Sensor

See Figure 11. The motion sensor mounting is designed to locate the sensor in either of the two positions shown. Use the 12:00 o'clock position when possible. If a rod cage entry is used with a rod at 12:00 o'clock or if an overhead guide interferes with the sensor line of sight, reposition the motion sensor to the 30° position as shown.

Remove the protective cap (2) from the bottom of the motion sensor head (1). Leave the cap attached to the sensor head for future use.

Adjust the motion sensor sensitivity as described in *Setup* on page 18.



Figure 11 Motion Sensor Position and Cover

Rear Access Panel

To complete the dryer installation, install the rear access panel. This panel does not need to be removed again unless you are replacing an electrical component or the coil.

Magnetic Separator (Optional)

Refer to the Magnetic Separator Adjustments instruction sheet, part number 1040053, for instructions on adjusting the magnetic separator for correct operation.

Exhaust Ducting (Optional, Customer-Supplied)

Small amounts of water vapor and hot air are released from the exhaust vents located on the entrance end and rear. Exhaust hoods and ducting is not required but can be installed if desired. Do not restrict the air flow from the exhaust vents.

Return Shipping Instructions

Refer to page 9 for lift points and uncrated weight.

Domestic/USA

- 1. Remove glass coil tube and carefully pack the tube separately.
- 2. Remove the leveling pads and place the system on a heavy duty shipping skid. Bolt the system to the skid through the leveling pad mounting holes.
- 3. Wrap the system with plastic wrap or shrink wrap.

Export

Prepare using steps in Domestic/USA return shipping instructions. In addition, do the following:

- Fully crate the system with all sides protected with 13 mm (¹/₂ in.) minimum OSB material or equivalent.
- If shipping by ocean freight add silica gel to the shipping crate.

Setup



WARNING: Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.

Setup consists of:

- Motion sensor sensitivity adjustment
- Ramp mode power level adjustment
- Ramp timer setting
- Motion timer setting
- External interlock timer setting (optional)

Theses procedures will normally only need be performed at initial startup. Refer to *Dryer Controls* on page 24 for an overview of the controls you will be using for these procedures.



WARNING: The dryer contains high voltages which can be fatal. Do not touch any electrical terminals or connections inside the enclosure while the dryer is powered up. Do not operate the dryer with the coil tray lid open.

Preparation

- 1. Use a 5/16 inch hex wrench to unlock and open the control enclosure doors.
- 2. Override the enclosure door interlock switch by pulling the switch actuator all the way out.



Figure 12 Enclosure Door Interlock Switch Override

Preparation (contd)

- 3. Make sure your production line is ready to start. For both motion sensor sensitivity adjustment and ramp mode power level adjustment you must run can ends through the dryer.
- 4. Turn the main disconnect to the ON position.
- 5. Press the POWER button on the operator panel. The dryer powers up.

NOTE: With the enclosure doors open and the door interlock switch overridden, the Cooling Blower Fault LED lights. The motion sensor and PLC will remain powered for making adjustments. The inverter will not turn on, so product in the dryer while the fault LED is on will not be cured and must be removed from production.

Motion Sensor Sensitivity Adjustment



WARNING: Laser radiation. Do not look directly into the laser beam. Doing so could result in serious eye injury.

The motion sensor focal point is adjustable between 30–60 mm from the sensor face. Adjust the sensor focus so it senses the motion of the can ends as follows:

- 1. Make sure the protective cover is removed from the sensor head.
- 2. Run product through the dryer.
- 3. See Figure 13. Observe the LED indicator:
 - Green = Operating
 - Yellow = Reception.
- 4. Use a small screwdriver to adjust the Distance/Gain screw. The LED should turn blink yellow when as can ends pass under the sensor head.



GAIN/DISTANCE Screw

LED Indictor: GREEN = Operating YELLOW = Reception

Figure 13 Motion Sensor Module

The motion sensor should now be calibrated to your product. As can ends pass under the sensor head, the Motion LED on the operator panel should flash.

If the sensitivity adjustment failed, repeat the procedure again. Clean the sensor head lens with a clean soft cloth if necessary.

Ramp Mode Power Level Adjustment

The ramp mode power level is the percentage of total power needed to reach the setpoint temperature during the ramp time. The ramp mode is activated every time coil power is turned on.

See Figure 14. Note the large, round, four-position hat switch on the PLC control panel. This switch is used to set both the ramp timer and motion timer settings. The large decal on the inside of the left door describes the hat switch position (P1, P2, P3, and P4) functions.



Figure 14 PLC Control Panel and Monitor

- 1. Press P1 to enter setup mode.
- Press P3 to toggle between the Ramp Timer, Motion Timer, and External Interlock Timer (EXINTLK). Select the Ramp Timer. The default Ramp Timer setting is 70 seconds.
- 3. Press and hold P2 for 5 seconds. The center line on the display should read 0009999. The Ramp Timer is now set to 9,999 seconds.
- 4. Close and lock the enclosure doors.

NOTE: For dryers with the dual lane control option, the screen will read TEST MODE in place of 9999.

5. Refer to *Temperature Controller Setup* on page 22. Set the desired can end setpoint temperature, using the up and down buttons on the Nordson SD temperature controller on the operator panel. The green numbers on the display are the setpoint end temperature, the larger red numbers are the actual end temperature.

Ramp Mode Power Level Adjustment (contd)

- 6. Start your production line and run can ends through the dryer. The dryer will remain in Ramp Mode for approximately 166 minutes for power level adjustments.
- 7. With the line still running, adjust the Ramp Power Level thumbwheel in small increments until the actual can end exit temperature equals or is within ±5 degrees of the setpoint temperature. The thumbwheel setting is not linear (500 does not equal 50% power). Increasing the setting increases power, decreasing the setting decreases power.



Figure 15 Ramp Power Level Thumbwheel

NOTE: Press P4 (Figure 14)to return the Ramp Timer setting to the factory default (70 seconds).

Ramp Timer Setting

See Figure 14 for PLC hat switch positions.

This procedure assumes you just completed the Ramp Mode Power Level Adjustment procedure. If not, open the enclosure doors, override the interlock switch, restart the dryer, then press P1 to enter Setup mode, then P3 until Ramp Timer is displayed on the PLC monitor.

The Ramp Time is the time it takes a can end to travel the length of the dryer, from the entrance to the exit. This time is dependent on your line speed. The factory default is 70 seconds.

Adjust the Ramp Timer to your line speed by pressing P2 (increase) or P4 (decrease). Each press and release adds or subtracts one second.

Motion Timer Setting

See Figure 14 for PLC hat switch positions.

The Motion Time setting delays coil power off when can end motion stops. This prevents control cycling to ramp mode. The factory default setting is 3 seconds. Do not set the motion timer for more than 6 seconds.

Recommended settings are:

- 2 seconds for lines with continuous motion
- 3 seconds for lines with intermittent motion

This procedure assumes that you just completed the Ramp Timer setting. If not, open the enclosure doors and override the interlock switch, restart the dryer, then press P1 on the PLC to enter setup mode.

- 1. Press P3 to toggle to the Motion Timer.
- 2. Press P2 (increase) or P4 (decrease) to adjust the Motion Timer setting.
- 3. Press P1 to exit Setup mode.

External Interlock Timer Setting (Optional)

The External Interlock timer starts when a run signal is received from the customer line. If the motion sensor does not detect motion before the timer expires, the alarm relay will change state and activate a customer-supplied external alarm. The timer setting is dependent on line speed.

This procedure assumes that you just completed the Motion Timer setting. If not, open the enclosure doors and override the interlock switch, restart the dryer, then press P1 on the PLC to enter setup mode.

- 1. Press P3 to toggle to EXINTLK.
- 2. Press P2 (increase) or P4 (decrease) to adjust the timer setting.
- 3. Press P1 to exit Setup mode.

Temperature Controller Setup

This procedure covers the operator-configurable temperature controller parameters. These parameters are set at the factory but can be changed by the customer.

See Figure 16. During normal operation, the controller displays the actual and setpoint end temperatures. This is the default display. Pressing the **Infinity** button returns the controller to this display.



Figure 16 Temperature Controller

- 1. Actual temperature display
- 2. Advance button
- 3. Infinity button

- 4. Up and down buttons
- 5. Setpoint temperature display
- 6. % (Auto/Manual) indicator

NOTE: Refer to page 35 for Celsius to Fahrenheit conversions.

Adjusting the Setpoint Temperature

Press the **Up** (\blacktriangle) or **Down** (\bigtriangledown) buttons to change the setpoint temperature. This can be done at any time, as long as the controller is in Auto mode (% indicator off). Typical setpoint is 65–70 °C.

Operator-Configurable Parameters

Press the **Advance** button to step through the operator-configurable parameters. The prompt for each parameter appears in the setpoint temperature display, while the parameter value appears in the actual temperature display.

Press the Up or Down buttons to change the parameter value.

Parameter	Prompt	Factory Setting
Power Output Level	(Live reading)	none
Operation Mode	8-11	Auto
Calibration Offset	[AL	0
Heat Control Method	<u> </u>	PID (Proportional-Integral- Derivative)
Proportional Band Heat	PbhE	Customer specific: Refer to Addendum
Integral Heat	IELE	Customer specific: Refer to Addendum
Derivative Heat	бЕЛЕ	Customer specific: Refer to Addendum
Alarm 2 High Temperature	82 <u>5</u> i	20 (setpoint plus 20 degrees)
Alarm 2 Low Temperature	AZL o	-10 (setpoint minus 10 degrees)

Press the **Infinity** (∞) button to return to the default display at any time.

PID Parameters

For the microcontroller to control temperature properly, three parameters must be set:

- Proportional band (P) heat
- Integral (I) heat
- Derivative (D) heat

These parameters make up the PID loop that controls the duty cycle used to regulate the amount of power applied to the induction coil and ends. PID settings for your dryer are optimized to provide the best possible response (fastest rise time with minimum overshoot). Refer to the Addendum in this manual for your PID settings.

Operation

Dryer Controls

See Figure 17. The following controls are available to the operator:

- Main Disconnect (on left side of control enclosure)
- Emergency Stop switch
- Power pushbutton/indicator (Start)
- Off pushbutton (Stop)
- Fault pushbutton/indicator (Fault Reset)
- Temperature controller
- Run Status and Fault LEDs



Figure 17 Operator Control Panel

Temperature Controller

See Figure 18. The temperature controller is configured to display the actual end temperature and the setpoint end temperature. The setpoint temperature can be changed during normal operations with the up and down buttons. It is the only parameter that can be changed without entering the controller's setup menus. Refer to *Temperature Controller Setup* on page 22 for the setup procedure and parameters.

Indicators 1 and 2 light when outputs are active. The % indicator lights only when an input error (such as a can end thermocouple failure) is detected and the controller is switched to Manual mode (open-loop control). The normal operating mode is Auto (closed-loop control).



Figure 18 Temperature Controller

- 1. Actual temperature display
- 2. Advance button
- 3. Infinity button
- 4. Up and down buttons

- 5. Setpoint temperature display
- 6. % indicator
- 7. Output indicators 1 and 2

NOTE: Refer to page 35 for Celsius to Fahrenheit conversions.

Run Status and Fault LEDs

Run status LEDs are green; Fault LEDs are yellow. The system will shut down if any of these faults occur. Correct the problem, then clear the fault by pressing the Fault pushbutton/indicator.

Refer to Troubleshooting for information on correcting faults.

LED	Lights when:	
RF ON/RUN	ramp mode completed and PID control of heating begins.	
MOTION	motion is detected at dryer entrance, flashes as can ends are detected.	
AIR HEATERS ON	air heater is operating.	
RAMP MODE	dryer is in ramp mode. Ramp mode is activated whenever power to the coil is turned on, at dryer startup or after an idle period. When ramp mode is complete, this LED turns off and the RF On/Run LED lights.	
INTERLOCK FAULT	steady on: bad lid proximity sensor. blinking: external interlock mode time out.	
AIR HEATER FAULT	air heater temperature too high or heater contactor fails.	
COOLING BLOWER FAULT	pressure in coil tray falls, indicating a blower or air flow problem (opening coil tray lid during operation will cause this fault).	
PRODUCT TEMP WARNING	product temperature at exit exceeds Alarm High setting or falls below Alarm Low setting. Temperature controller displays A2.Hi (temperature too high) or A2.Lo (temperature too low).	
OVER CURRENT	excessive current is detected in RF tank circuit.	
TANK VOLTAGE FAULT	over or under voltage is detected in tank voltage.	
OUT OF LOCK	the phase-lock loop fails to lock phase with the resonant tank frequency.	
INVERTER TEMP FAULT	the inverter temperature exceeds the factory preset.	
EXTERNAL INTERLOCK	a stop signal is received from the external customer interlock.	

Startup

- 1. Turn the main disconnect switch to the ON position.
- 2. Make sure that the:
 - coil tray lid is closed and locked
 - enclosure doors are closed and locked
 - rear access panel is fastened into place
 - · Emergency Stop switch is in the released position
- 3. Press the green POWER pushbutton.

The power indicator lights and the system runs a self test.

The temperature controller displays the temperature of the product in contact with the thermocouple at the exit hub, or the air temperature if no product is present in the exit hub.

NOTE: Refer to page 35 for Celsius to Fahrenheit conversions.

When the self test is complete:

- If no faults are detected then the system is ready to operate.
- If a fault occurs during the test, the FAULT pushbutton/indicator and appropriate yellow fault LED is lit. Refer to *Troubleshooting* on page 28 to correct the problem.
- 4. Start your production line and run can ends through the dryer.

The system powers the induction coil and heats the can ends whenever the motion sensor detects moving can ends. When the line stops, the dryer automatically stops heating the ends. It automatically resumes heating when the line restarts.

High and Low Alarms

If the actual end temperature falls above the Alarm High setpoint or below the Alarm Low setpoint, the Product Temperature LED will flash and the dryer will continue to operate for a pre-determined period of time. In addition, on the temperature controller the alarm message (A2.Hi or A2.Lo) will alternate with the setpoint end temperature on the setpoint display.

If the can end temperature returns to within the alarm limits before the time limit expires, the LED will turn off. If the alarm continues after the time limit expires, the coil power will shut off, the LED will light continuously and the FAULT pushbutton/indicator will light.

Refer to *Troubleshooting* on page 28 for information on troubleshooting persistent high or low alarms.

Shutdown

To shut down the dryer, press the OFF pushbutton on the operator panel.

NOTE: While you can stop the dryer by pressing the EMERGENCY STOP button or by switching the main disconnect switch to the OFF position, you should use the OFF pushbutton, which provides a controlled power down.

Maintenance

The following parts of the dryer should be checked on the indicated schedule.



WARNING: Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.



WARNING: Disconnect and lockout all power to the system before perfoming any procedures that require working inside the coil tray or control enclosure. Failure to observe may result in fatal injury to personnel.



WARNING: Never disarm any diagnostic device including but not limited to:

A. Current sensor

B. Overtemperature switches

C. Air pressure switch

D. Coil tray lid safety switches

Disarming diagnostic devices will void the warranty and may cause equipment failure.

Monthly

ltem	Procedure	
Thermocouple	Check the thermocouple for wear and good contact with the can ends. Replace the thermocouple as needed.	
Motion Sensor	Clean the sensor head lens with a clean, soft cloth. When the system is not being used, cover the lens with the attached cover.	
Cooling Blower Filter	Inspect the blower filter for dust or obstruction. Replace the filter as needed. If the air flow is reduced, the system electronics can overheat. End drying may also be affected by reduced air flow.	
Coil Tray	Periodically inspect the glass coil tube for cleanliness and integrity. Clean the tube with common solvents. Do not to get any solvent on the nylon hubs at the dryer entrance or exit. Some solvents may also have an adverse effect or the dryer's exterior finish.	
	If the glass tube is cracked, replace it with a new tube supplied by Nordson only. Different sizes and wall thicknesses are used depending on the can end size and the application.	

Quarterly

Item	Procedure	
Electrical Connections	Check all wiring connections for vibration loosening.	
Electrical Components	Check for excessive dust and dirt. Vacuum if needed.	

Troubleshooting

This section contains troubleshooting procedures. These procedures cover only the most common problems that you may encounter. If you cannot solve the problem with the information given here, contact your local Nordson representative for help.



WARNING: Allow only qualified personnel to perform the following tasks. Follow the safety instructions in this document and all other related documentation.



WARNING: The dryer contains high voltages which can be fatal. Use extreme caution when defeating safety interlocks to check components at high power.



WARNING: Never disarm any diagnostic device including but not limited to:

A. Current sensor

B. Overtemperature switches

C. Air pressure switch

D. Coil tray lid safety switches

Disarming diagnostic devices will void the warranty and may cause equipment failure.

NOTE: Use the schematics provided with your system when performing troubleshooting procedures.

	Problem	Possible Cause	Corrective Action
1.	Dryer will not turn on when POWER button is pressed	Main disconnect off	Turn main disconnect switch to ON position.
		Coil tray lid or control enclosure doors open	Close and lock lid and doors.
		EMERGENCY STOP switch pushed in	Pull switch out to release.
2.	Can ends not heating, RF ON/RUN or RAMP MODE LED lit	Fuses F1A, 1B, or 1C open	With power disconnected and locked out at an external breaker or disconnect switch, test the fuses and check for loose connections.
3.	Can ends not heating, MOTION LED off	Motion sensor lens dirty	Clean lens with a clean, soft cloth.
		Motion sensor not calibrated	Perform the <i>Motion Sensor</i> <i>Sensitivity Adjustment</i> procedure in the <i>Setup</i> section.
4.	Actual temperature reading erratic, over or under setpoint	Thermocouple worn or defective	Replace the thermocouple. Refer to <i>Thermocouple Replacement</i> in the <i>Repair</i> section.
5.	INTERLOCK FAULT LED lit	Coil tray lid or control enclosure doors open	Close and lock lid and doors.
			Continued

Problem		Possible Cause	Corrective Action
6.	Air heater not heating air flowing into coil tube	Fuses 3A, 3B, 4A, or 4B open	Test fuses, replace if blown.
		Broken heater element or thermal one-shot opened	Replace heater.
		Heater housing thermostat open	Shut down system. Heater will auto-reset on cool down. Check air filter to ensure air flow is not reduced by dirty filters.
7.	COOLING BLOWER FAULT	Obstructed or dirty air filter	Remove any obstructions that might impede air flow, replace filter if dirty.
		Fuse F6 open	Test fuse, replace if blown.
		Rear access panel loose or removed	Install access panel properly.
8.	Temperature overshoots on startup	Incorrect ramp mode power level adjustment	Perform the <i>Ramp Mode Power</i> <i>Level Adjustment</i> procedure in the <i>Setup</i> section.
9.	System stays in Ramp Mode (Ramp Mode LED stays lit, RF ON/RUN LED never lights)	Motion timer set too short to compensate for line jogging and surges	Increase motion timer setting. Refer to <i>Motion Timer Setting</i> in the <i>Setup</i> section.
10.	INVERTER TEMP FAULT	Rear access panel loose or removed	Install access panel properly.
		Obstructed or dirty air filter	Remove any obstructions that might impede air flow, replace filter if dirty.

Repair



WARNING: Disconnect and lockout all power to the system before perfoming any of the procedures in this section. Failure to observe may result in fatal injury to personnel.

Repair of the dryer consists mainly of replacing damaged or failed components. Most repairs require no more then basic tools. Electrical repairs should always be done by a qualified electrician with knowledge of high voltage systems.

For help with repairs not covered in this manual, contact your Nordson representative.



WARNING: Never disarm any diagnostic device including but not limited to the current sensor, overtemperature switches, air pressure switch, or coil tray lid safety switches. Disarming diagnostic devices will void the warranty and may cause equipment failure.

Coil and Coil Tube Replacement

The coil and coil tube can be replaced separately. They both must be removed to replace one or the other.

- 1. Shut down the dryer, turn the main disconnect to the OFF position, then disconnect and lockout power at an external disconnect.
- 2. Unlock and open the coil tray lid.
- 3. Remove the screws securing the rear access panel with a hex wrench.
- 4. See Figure 19. Remove the screws (3) securing the exhaust vent housing (1) and air heater (2) from the entrance and exit hubs (4). Move the exhaust vent housing and air heater out of the way.
- 5. Remove the nylon slotted screws (5) from the face of the hubs.
- 6. See Figure 20. Disconnect the coil wiring from the bus bar terminals. Push the wiring up through the grommeted hole in the bottom of the coil tray.
- 7. Lift the coil and tube assembly out of the dryer. Get help if needed.
- 8. Slide the coil tube out of the coil.
- 9. Unpack the new component(s) and re-assemble the coil and tube.
- 10. Carefully install the coil and tube assembly in the coil tray, positioning the ends of the tube into the hubs. It does not matter which end of the coil is at the entrance or exit.
- 11. Check the clearance between the end of the glass tube and the output hub. There must be 0.8–1.6 mm (0.03–0.06 in.) of clearance to allow for thermal expansion. If this clearance does not exist, shim the hub as follows:
 - a. Loosen the six output hub mounting screws and install shim stock between the hub flange and the sheet metal end plate.
 - b. Tighten the hub mounting screws and check the tube clearance.
 - c. Trim away any protruding shim stock.
- 12. Re-install the two nylon slotted screws into the entrance and exit hubs.
- 13. Re-install the heater blower and exhaust vent on the entrance and exit hubs.
- 14. Route the coil wires through the grommeted hole in the bottom of the coil tray.
- 15. Connect the coil wiring to the terminals on the inverter bus (no polarity).



Entrance



- 1. Vent housing
- 2. Air Heater
- 3. Screws (4 on each hub)
- 4. Hubs
- 5. Nylon slotted screws

- 6. Glass tube
- 7. Coil



Figure 20 Coil Wiring Connections

Thermocouple Replacement

See Figure 21.

- 1. Loosen the screw (2) in the face of the exit hub.
- 2. Remove the thermocouple (1) from the exit hub and unplug the thermocouple wiring from the wiring harness.
- 3. Install a new thermocouple.



Figure 21 Thermocouple Replacement

Air Filter Replacement

See Figure 22. To replace the filter, pull it out of the right side of the holder.



Figure 22 Filter Replacement

Spare Parts

Refer to the Addendum to this manual for spare parts.

Service and Parts Ordering Information

Field Service Call Procedure

If you need a Nordson field technician to come to your plant, call Nordson between the hours of 8 AM–5 PM, Monday–Friday at the following:

800-321-2870 or 440-988-9411 Ask for Mountaingate Service

Supply the following information:

Customer purchase order number Serial number and model number of unit Name of person requesting service Address of plant Phone and fax number Nature of the service call

Parts Ordering Information

All parts can be ordered through Nordson Corporation. Current parts pricing will be supplied at the time of order.

Nordson Customer Service 7:30 AM-6 PM EST Phone: 888-226-1697 Fax: 888-229-4580 Email: csc@nordson.com

Attn: Container Customer Service Mail Station 46 300 Nordson Drive Amherst, OH 44001

When ordering, have the following information available:

- Customer purchase order number Customer phone and fax numbers Customer address Special delivery instructions
- Required delivery date Nordson part number Part description Part quantity

Temperature Conversions

Celsius-Fahrenheit Temperature Table

Celsius	Fahrenheit
50	122.0
51	123.8
52	125.60
53	127.40
54	129.20
55	131.00
56	132.80
57	134.60
58	136.40
59	138.20
60	140.00
61	141.80
62	143.60
63	145.40
64	147.20
65	149.00
66	150.80
67	152.60
68	154.40
69	156.20
70	158.00
71	159.80
72	161.60
73	163.40
74	165.20
75	167.00
76	168.80
77	170.60
78	172.40
79	174.20
80	176.00

Conversion Equations

Celsius to Fahrenheit: $F = \frac{9}{5} * C + 32$

Fahrenheit to Celsius: C = $\frac{5}{9} \times F - 32$

DECLARATION of CONFORMITY

Product: EcoDry Induction Oven

Models: EcoDry Series

Description: This is an induction oven used for curing components typically used as part of a container (can) assembly.

Applicable Directives:

2006/42/EC(Machinery Directive)2006/95/EC(Low Voltage Directive)2004/108/EEC(Electromagnetic Compatibility Directive)

Standards Used for Compliance:

EN12100 (2009) EN55011 (2009) NFPA79 (2012) EN60204-1 (2006) EN61000-6-2 (2005) UL508a (2010) EN61000-6-3 (2007)

Principles:

This product has been manufactured according to good engineering practice. The product specified conforms to the directive and standards described above.

Certificates:

TUV – EN60204 / ISO/EN12100 Cert. for EU *TUV – UL508a and NFPA79 Cert. for US DNV – ISO9001: 2008

*TUV is a National Recognized Test Lab accredited by OSHA for US Certifications.

Wall

Date: 30 October 2012

Justin Hall Engineering Manager Industrial Coating Systems

Nordson Authorized Representative in the EU Person authorized to compile the relevant technical documentation.

Contact: Operations Manager Industrial Coating Systems Nordson Deutschland GmbH Heinrich-Hertz-StraBe 42-44

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