# AHM-1D HOPPER MOUNT DRYER OPERATING MANUAL



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# <u>DRYER</u> DESCRIPTION



The **AHM-1D** dryer is a fully assembled dryer and hopper combination that can be mounted directly to the feed throat of small molding machines. It is ideal where floor space is limited and material changes are infrequent. This dryer model will dry most materials at throughputs up to 10 pounds per hour.

The AHM-1D utilizes our HP4-X dual desiccant bed design that provides a constant supply of dry air to the attached 30-pound material hopper. While one bed is removing moisture from the process air stream, the other bed is regenerated by heating the desiccant to a high temperature. The entire process is controlled by an ELC, factory or our Advanced Dryer programmed, Control (ADC) microprocessor. Once the regenerated bed cools down, the zone valve switches the air stream and the newly regenerated bed is now used for drying the process air. The saturated bed is then regenerated, repeating the cycle. This cycle is described below and depicted in the schematics on pages 8 and 9.

The airflow design of the HP4-X dryers makes the regeneration cycle more efficient because we utilize a small amount of the desiccated process air rather than ambient air to regenerate the desiccant bed. This reduces the impact of the high moisture content of the ambient air, which would contaminate the desiccant bed, and allows the dryer to attain a lower dew point. Please see figure on page 8.

# HP4-X Design

Our patented HP4-X design incorporates 4 desiccant beds where two are stacked, one over the other. This nearly doubles the amount of desiccant available for drying the process air stream, and because of the tower design, the dryer is able to regenerate the desiccant in the same time as our ARID-X series. This allows the dryer to operate in very high humidity conditions without affecting the process air dew point. In fact, this design produces dew point levels of -40° to -80° C for faster more complete drying of your material. Please see Airflow and Regeneration Cycle diagrams on the following pages.

# Hopper Design

Our "all stainless" hopper design utilizes a stainless steel inner shell surrounded by a stainless steel jacketed insulation layer. The easily removable stainless steel spreader cone promotes proper material flow to ensure that the material is dried efficiently and no dried material is left at the hopper bottom. You must ensure that your hopper is kept filled, to ensure that you have sufficient time to dry the material.

# **DRYER DESCRIPTION**

(Cont'd)

## **Dryer Controls**

The AHM-1 dryer is supplied with a factory programmed ELC Control Module and Digital Temperature Controller or our Advanced Dryer Control (ADC) microprocessor.

#### ELC Control Module

The ELC Control Module controls the regeneration cycle described above. It has been factory programmed and does not require any additional input by the operator. The module will automatically monitor and control the dryer's operation by controlling the regeneration cycle, heaters and alarms.

#### Digital Temperature Controller

The Digital Controller works in tandem with the ELC Control Module to monitor and control process air temperature. Its touch pad allows you to input the operational settings and alarm points for the dryer. These are explained in more detail later in this manual.

#### ADC Advanced dryer control

The new ADC (Advanced Dryer Control) was introduced for optimum operation of the dryer and is as user friendly as possible. The easy-to-see alphanumeric display indicates all operating parameters and leads the operator through a menu driven program for all settings and information. All fault conditions are shown on the display in a format that is easy to understand. As with earlier designs, the ADC is driven by thermocouples strategically located in the towers, hoses to the hoppers, and other locations to properly control the operation of the dryer. Other inputs monitor the performance of the dryer for safe and efficient operation.

# **DRYER DESCRIPTION**

(Cont'd)

# **Dri-Air Electric Rotary Zone Valve**

The AHM-1 utilizes our exclusive electric rotary valve technology, which allows the dryer to operate without the need of compressed air. As the valve does not need compressed air to operate, it is far more reliable and requires less maintenance than other valves that depend on clean compressed air at a constant pressure.

The valve is designed to be practically maintenance free, as the seals are self-seating and are designed to provide years of trouble free service. The electric controls are easily accessible for trouble-shooting, and are equipped with lights to indicate the zone position of the valve.







# INSTALLATION PROCEDURE

# **Press Mounting**

Each AHM-1 dryer hopper is supplied with a 6" x 6" blank adapter with drain port. The top flange is configured with two rectangular  $3.25 \times 5$  inch bolt hole patterns, rotated 90° from each other to allow for the dryer to be oriented in any quadrant. This bolt hole pattern matches up to the bolt hole pattern on the mounting flange of the dryer.

Depending on the user's requirements, the bottom side of the mounting adapter will need to be drilled to match the bolt hole pattern on the molding machine feedthroat.



6x6" to 6x6"

To install the adapter to the molding machine, drill the adapter's bottom mounting flange with holes corresponding to the bolt hole pattern on the molding machine's feed throat mounting flange. Bolt the adapter to the feed throat, using grade 5 bolts or better. **CAUTION:** Please note the orientation of the adapter drain port prior to drilling and attaching the adapter. Position this port to best facilitate the draining of material from the hopper.

To install the dryer, utilize a hoist or other suitable means (The unit weighs 95 pounds when empty.) to lift the unit and place it on the mounting adapter. For ease of use, orient the unit with the hopper door facing the operator. Bolt the dryer in place using the bolts provided.



(Cont'd)

# **Electrical Connection**

The AHM-1 dryer is available in 110 or 220 volt, single-phase models. The 110 volt model is supplied with a power cord and grounded three prong plug, while the 220 volt model requires an appropriately grounded plug, suitable to the user's power supply to be attached to the power cord.

To connect the dryer to electrical power, plug in the cord to any suitably grounded power source. With all units being single phase, blower rotation will be correct.

# **Post-Installation Inspection**

Prior to starting the dryer, inspect the unit to ensure the following:

- 1. All hose couplings are tight and secure.
- 2. Hoses are not crushed or obstructed.
- 3. Process Air Thermocouple is connected.
- 4. Inside of hopper is clean before filling with material



# **DRYER OPERATION**

# **STARTUP PROCEDURE**

CAUTION: Only personnel qualified to operate this dryer should start and run this dryer.

## **Dryer Controls**

<u>Main Power</u> - The rocker switch located on the right hand side of the dryer face panel. This rocker switch not only controls all power to the dryer, but it functions as the main circuit breaker for the dryer and in emergencies, it will cut all power to the unit.

# **Dryer Start-up**

To initiate dryer start-up, press the rocker switch on the unit's face panel. The Rocker Switch should illuminate; indicating power is supplied to the unit. The dryer is now operating; follow the instructions below to set the process air temperature or to shut the dryer off.

Dryer process operating temperatures are 140 degrees F (minimum) to 325 degrees F (maximum) with an accuracy of +/- 3 degrees. When the drying temperature is 275 degrees F or higher, it is necessary to install a water cooled heat exchanger on the return hose of the dryer to ensure maximum dryer efficiency. If you do not have a heat exchanger and will be operating 275 degrees F or higher, please contact the factory for heat exchanger pricing.

## **To Set Process Air Temperature:**

Using the Digital Temperature Controller:

1. Press <u>SEL</u> button on the controller to enable the red Temperature Set display (labeled SV) to be altered.



**CONTROL PANEL** 

**Digital Controller** 



2. Press the up arrow key  $\uparrow$  key to increase the set point or the down arrow  $\downarrow$  key to decrease the setting until the

desired process air set point is displayed.

3. Press the <u>SEL</u> key again to enter the new temperature setting.

CAUTION: Do not operate this dryer below 140 degrees F (60 deg. C) or above 350 degrees F (177 deg. C).

# ALARMS

The High Temp Alarm condition discussed below will initiate a "Dryer Shutdown" that cuts power to the blower, digital controller and ELC output relays. See Trouble-Shooting section of this manual.

# **Process Air Temperature Alarms**

The ELC/Digital Control system is preprogrammed with alarm set points that will shut the dryer down and activate the TEMPERATURE ALARM light on the dryer control panel and the ALM1 light on the digital controller.

The alarm will be activated if either the process air temperature fails to reach the set point within the specified time period or the temperature exceeds the high limit. The HIGH TEMP ALARM light will illuminate for both conditions.

# **Thermocouple Failure Alarm**

If a failure is detected with the Process Air Thermocouple, the upper Process Air Temperature display (labeled PV) on the Digital Controller will flash and display 0000. This alarm will be displayed if the thermocouple is not connected or is faulty.



When operating this dryer please follow the procedures detailed below:

# **ROUTINE OPERATION &** MAINTENANCE PROCEDURES

# **Routine Operation**

The dryer should be operated in a dry environment at ambient temperatures between 50 and 110 degrees F (10-44 deg. C). The unit should be situated so that the air hoses are not crimped or restricted after connection with the material hopper and the controls are easily accessible to the operator.

When moving the dryer allow the dryer to cool completely before handling. Recheck the hose and thermocouple connections to ensure that they are tight.

To shut the dryer down, press the OFF button on the Control Panel and press the rocker switch to the off position. Always unplug the unit when not in operation.

## **Emergency Shutdown**

In the event that a condition should arise that requires the operator to immediately halt the dryer's operation, the operator can press the rocker switch to the off position and the unit will shut down completely. Remove the power plug from the facility outlet to cut all power from the dryer.

## **Hopper Maintenance**

- 1. Always clean hopper, air inlet port and diffuser basket prior to adding or changing materials.
- 2. Never over-fill the hopper. Material should not obstruct the exhaust port at the top of the hopper.

## **Filter maintenance**

- 1. Open filter canister and clean filter element on a daily basis.
- 2. Change filter cartridge every 6 months (Sooner if materials dried are dusty.).

# Never operate dryer without filter element installed.

# **Dryer Cleaning**

# Always unplug the dryer before cleaning.

The dryer is supplied with a surface coating that is easily cleaned and maintained by simply wiping the dryer with a moistened cloth or rag. Never clean the dryer with solvents or corrosive liquids. Always allow the dryer to cool completely before cleaning. All maintenance and trouble-shooting should be performed by a qualified electrician and a trained operator.

Nearly all diagnostic procedures can be performed with a volt ohmmeter and an AC/DC Ammeter.

In the event that the dryer will not start or shuts down in an alarm condition please take the following steps prior to other diagnostic steps.

# <u>TROUBLE-</u> <u>SHOOTING GUIDE</u>

# BASIC TROUBLE-SHOOTING

# VALVE TROUBLE SHOOTING

To determine proper ZONE POSITION for valve, follow procedures detailed below:

1. Open front panel of dryer to view ELC's LCD.

 Open Right Side Panel to view Valve Control Board.
Note if enunciator under #4 on ELC LCD is on, indicating dryer is in Zone 2. If no enunciator is visible, the dryer is in Zone 1.

4. Note which Zone Light is illuminated on Valve Control Board. Light should correspond to ELC LCD.

# **<u>1.</u>** Check the Power Circuit:

- **a.** Incoming power fuses (F1 & F2).
- **b.** Dryer fuse (F3). It has a blown fuse indicator that lights up if the fuse is defective.
- **c.** Is POWER light in Rocker Switch illuminated?
- **d.** Check heater's continuity using a volt ohmmeter.

# 2. Air Flow Circuit:

- a. Ensure Zone Valve is operating correctly and is in proper zone position. See VALVE TROUBLE SHOOTING.
- **b.** Make sure that all hoses are connected, not crushed, and free from obstructions.
- c. Inspect filter and make sure cover is tight.

# 3. Control Circuit:

**a.** Using the ELC LCD Output/Input Enunciators as a guide for the status of the dryer regeneration cycle, check that all inputs are proper for the part of the regeneration cycle that the unit is in. See page 18.

# 4. Operating Conditions:

**a.** Check the process temperature. It should <u>not be</u> set below 140 °F (60 °C) because the unit will go into high temp alarm.

# **DETAILED TROUBLE- SHOOTING**

#### Rocker Switch light is <u>not</u> on. Unit will notstart:

Check small fuse. The LED will be lit if it is blown. Replace if necessary by opening the fuse holder and put new fuse into holder.

- 1. Check that incoming power to the unit is proper.
- 2. Check safety snap disc with multi-meter. (Should be normally closed)

#### HIGH TEMP ALARM light is illuminated. Unit will not run:

This indicates that the process air temperature has; exceeded the high limit programmed into the temperature controller, failed to reach the process air temperature set point, or there has been a thermocouple failure. To determine which of the aforementioned conditions caused the alarm, perform the procedure below.

Press Rocker Switch to OFF position and restart machine by moving switch to ON position. View what is displayed on the digital controller Process Air Temperature display. If it exceeds the set point an overtemp condition has occured. If it is below the set point, the dryer cannot reach the set point. If 0000 is displayed, a thermocouple failure has occured. Perform the following procedures for the indicated failure.

Depending on when the operator discovered the alarm, the dryer may restart if it had sufficient time to cool down. If this happens simply allow the dryer to operate until the alarm occurs and then perform the above procedure.

#### Machine will not reach temperature:

- 1. If the <u>Output Light (C1)</u> on Digital Controller is <u>not</u> lit.
  - A. Check position of the Process Air Thermocouple. The probe tip should be in the middle of the hose.
  - B. Check Digital Controller may be faulty.
    - 2. If the <u>Output Light (C1)</u> on Digital Controller is lit.
      - A. Check the solid-state relay on panel.
      - B. Check airflow through process air hose.

Check the alarm limit first, by pressing and holding the <u>SEL</u> button on the temperature controller until <u>STBY</u> is displayed. Then press the <u>DOWN</u> arrow key until <u>AL1</u> is displayed in the upper (PV) display. The setting displayed in the lower (SV) display indicates the number of degrees over the set point that the alarm will be actuated. It is factory set to 50°F (30°C) and should not be set below 30°F (16°C) or it will actuate too quickly.

## If the temp exceeds the set point, check the following:

- 1. Remove the hose from the top of the hopper to check airflow. There should be airflow out of the hopper exhaust port and a vacuum on the hose. If there is little or no flow, check the inlet hose.
- 2. Inspect the filter to make sure that it is clean and not affecting the airflow.
- 3. Check to see if the solid state relay has failed on by using a multi-meter on the output to the heater. The relay has failed if there is power to the heater when the Solid-state relay's input power is not activated.

## If thermocouple has failed, check following:

- 1. Ensure thermocouple plug is securely inserted into dryer outlet.
- 2. Check thermocouple continuity with multimeter.

# TROUBLE-SHOOTING ROTARY ZONE VALVE

The Rotary Zone Valve is designed to provide very little flow restriction and no leakage. It incorporates high temperature, self adjusting seals for years of trouble free service. The electrical controls are built into the end of the valve and include position lights.

Trouble-shooting is easy. If the lights indicating position do not match the zone displayed on the ELC, or there are no lights, the valve is not working properly. See if the pointer on the valve spool is actuating a switch.

# DO NOT PUT FINGERS INTO VALVE WITH POWER ON

Check all electrical connections to make sure they are tight.

Contact factory for a replacement valve P/N 83707 with serial number of dryer.

# **ELC Control Module**

The dryer control package includes a ELC controller (F) that is programmed for the drying cycle discussed previously. Each input/output terminal on the Module has a corresponding enunciator displayed on the Module's LCD display that can be used for trouble-shooting. In normal operation the LCD displays numbers 1 to 6 with with a row of enunciators above the numbers for the inputs and a row of enunciators below for the outputs. (See Reference Guide to the left.) When the enunciator is displayed the input or output is actuated. All ELC inputs/ outputs are 120 volts AC.

## **Dryer Control Panel**

The Control Panel for the dryer includes an ON/ OFF Rocker switch that acts as the Main Power Switch and EMERGENCY STOP. When this switch is in the OFF position all power is cut to the Controllers, Blower and Electric Valve.

# TROUBLE-SHOOTING CONTROLS - ELC

# REFERENCE GUIDE LCD ENUNCIATORS

The following list details the corresponding inputs & outputs to the numbered enunciators displayed on the ELC's LCD.

## UPPER ENUNCIATOR ROW

<u>NO.</u>		<u># DESC.</u>
1	11	Main Power
2	12	High Temp Alm
3-6	Spare	

## LOWER ENUNCIATOR ROW

<u>NO.</u>	<u>OUTP</u>	UT# DESC.
1	Q1	Z1 Heaters
2	Q2	Z2 Heaters
3	Q3	Main Contactor
4	Q4	Zone Valve

# <u>ADC</u>



# ELC





# PARTS LIST: AHM-1





		DESCRIPTION	ELC	ADC
ſ	8	FILTER CARTRIDGE	84231	84231
	1	REGEN HEATER 220V 250W	86927	86927
	4	PROCESS HEATER 220V 1250W	84410	84410
	7	DEWPOINT SENSOR	N/A	85374
Mechanical	5	ZONE VALVE	83707	85438
	6	BLOWER	82125	82125
	3	THERMOCOUPLE	84054	84054
	1	REGEN HEATER 110 V 250W	86927	86927
	4	PROCESS HEATER 110V 1250W	84409	84409
L	2	THERMAL SWITCH 500	80221	80221
١	K	CONTACTOR MAIN	82086	N/A
	G	1 POLE RELAY	82496	N/A
	Ι	SOLID STATE RELAY	81649	N/A
	Ν	.5A FUSE HOLDER	82035	82035
		.5A FUSE	83443	83443
	L	LARGE FUSE HOLDER	84691	N/A
		AMBER LIGHT	80907	N/A
	Н	ROCKER SWITCH	83079	N/A
Electrical -		7 DAY TIMER	81942	N/A
		DISPLAY BOARD	N/A	84930-1
	Е	MOTHERBOARD	N/A	85584-6
	М	CIRCUIT BREAKER	84183	84183
	А	TRANSFORMER	85959 230V only	87184
	В	POWER SUPPLY 24VDC	N/A	85351
	С	CONTACTOR MAIN	N/A	86704
	D	SOLID STATE RELAY 20A	N/A	87165

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