



DESICCANT DRYER USER MANUAL

AEHD Series | Externally Heated | 150 - 3,000 scfm



WARRANTY NOTICE

Failure to follow the instructions and procedures in this manual, or misuse of this equipment, will void its warranty.



WARNING!

Users are required to read the entire User Manual before handling or using the product. Keep the User Manual in a safe place for future reference.

DRYER DATA SHEET

Model Number: _____ Serial Number: _____

Date of Manufacture: _____

Ship Date: _____ Installation Date: _____

Customer Address: _____

Customer City: _____ State/Zip: _____

Other: _____

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SECTION 1: SAFETY

1.1 Introduction

To ensure maximum performance and safe operation of an Aircel desiccant dryer covered by this manual, everyone involved with the dryer's installation, operation, and maintenance must read and carefully follow the instructions in this manual.

Misuse or modification of this equipment may result in personal injury. Do not misuse or modify. The high efficiency heated regenerative desiccant dryer is used exclusively for purifying compressed air in non-hazardous locations.

The state-of-the-art system is designed and constructed in accordance with the rules and regulations regarding adsorption technology and industrial safety. There are hazards accompanying this type of product if not operated for the intended purpose by trained and specialized personnel.

1.2 Safety Signal Words

Throughout this manual, signal words are present to advise of safety precautions and/or standard practices. Obey these signal words as defined below:

DANGER! - Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING! - Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION! - Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE - used to address practices not related to personal injury.

NOTICE

For optimum performance, use only Aircel replacement parts.

1.3 General Safety Procedures


CAUTION!

Misuse / modification hazard

Misuse or modification of this equipment may result in personal injury.

Do not misuse or modify this equipment under any conditions.

- Electrical work must conform to the specifications indicated by Aircel and any local or state laws that may apply. In the absence of such codes, install unit according to National Electrical Code, NFPA No. 70 latest edition.
- Personnel must wear appropriate safety gear including eye and ear protection before working on any electrical or mechanical aspects of the machine.
- Appropriate tools have to be used for all installation and maintenance work. If special tools are not available to the installation crew, contact the factory or your Aircel representative.
- A copy of the Operation Manual must be made available to all personnel involved with the installation, operation, and maintenance of the equipment.
- Before performing any maintenance operations on the equipment, the unit must be shut down, isolated, electrical power removed, and completely depressurized.
- To ensure compatibility and continued trouble free operation, only genuine Aircel parts must be used.
- **DO NOT** make any constructional changes to the unit. Only Aircel or its authorized representatives with the prior approval can perform any constructional work on the machine.
- **DO NOT** use foreign parts.
- **DO NOT** use compressed air from the dryers for breathing purposes - install a breathing air package to ensure conformance with OSHA regulations.
- **DO NOT** disable or disengage any protective equipment used on the machine.

1.4 Safe Operating Procedures

- Pressurize and depressurize compressed air SLOWLY! Always open air valves slowly when pressurizing the airline system or equipment. Repair air slowly when depressurizing your air system or equipment.
- Circuit breakers, fusible disconnect, and wiring should conform to national and/or local electrical codes. Make certain that qualified electrical personnel perform the electrical installation for this unit.
- Only use original fuses for the rated voltage and current.
- Shut down the unit in the correct recommended procedure.
- Before any work on system, always depressurize the unit and remove all electrical power.
- After shut down, put up warning notice to prevent the unit from being switched "ON" accidentally.
- Inspect all piping, hoses, and connections. Make sure that all hoses are in good condition and are rated for the correct working pressure. Do not allow hoses to come into contact with oils, chemicals, or sharp objects.
- Secure condensate drain lines. Unsecured, flexible drain lines may whip violently under pressure and may cause bodily harm.

NOTICE

These dryers do not supply breathing quality air

Aircel AEHD Series dryers do not remove carbon monoxide and is not safe for human respiration (breathing). Breathing air must be at least grade D quality as described in compressed air and gas association (CAGI) commodity specifications 67.1-1966.

User may refer to OSHA 29 CFI 1910.134 for special precautions and equipment suitable for breathing air applications. Aircel disclaims any liability what so ever for loss, injury or damage.

1.5 Desiccant Safety Precautions



WARNING!

Inhalation, Skin, & Eye Irritant

The desiccant used in this equipment is not considered hazardous. Contact with and disposal of desiccant must be in accordance with the relevant MSDS and all local codes and regulations. The following lists the more common safety measures to be observed during loading and unloading operations. Reference the MSDS in the appendix for complete safety measures.

1.5.1 DESICCANT FIRST AID RECOMMENDATIONS

1.5.1.1 INHALATION

Use a contoured dust mask during loading and unloading operations. If high concentrations are inhaled, immediately move to fresh air. Keep person calm. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

1.5.1.2 SKIN CONTACT

In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes.

1.5.1.3 EYE CONTACT

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

1.5.1.4 SPILLS

Clean accidental spills by vacuuming, sweeping, or flushing to a sewer treated for suspended solids. Avoid creating excess dust.

1.6 Implementation of lockout/tag-out

The energy control procedure defines actions necessary to lockout a power source of any machine to be repaired, serviced, or set-up, where unexpected motion, or an electrical or other energy source, would cause personal injury or equipment damage. The power source on any machine shall be locked

out by each employee doing the work except when motion is necessary during setup, adjustment, or troubleshooting.

1.6.1 PROCEDURES

The established procedures for the application of energy control shall cover the following elements and actions and shall be initiated only by Authorized Persons and done in the following sequence:

1. Review the equipment or machine to be locked and tagged out.
2. Alert operator and supervisor of which machine is to be worked on, and that power and utilities will be turned off.
3. Check to make certain no one is operating the machine before turning power off.
4. Turn off the equipment using normal shut-down procedure.
5. Disconnect the energy sources:
 - a. Air and hydraulic lines should be bled, drained, and cleaned out. There should be no pressure in these lines or in the reservoir tanks. Lockout or tag lines or valves.
 - b. Any mechanism under tension or pressure, such as springs, should be released and locked out or tagged.
 - c. Block any load or machine part prior to working under it.
 - d. Electrical circuits should be checked with calibrated electrical testing equipment and stored energy and electrical capacitors should be safely discharged.
6. Lockout and/or tag out each energy source using the proper energy isolating devices and tags. Place lockout hasp and padlock or tag at the point of power disconnect where lockout is required by each person performing work. Each person shall be provided with their own padlock and have possession of the only key. If more than one person is working on a machine, *each* person shall affix personal lock and tag using a multi-lock device.
7. Tag-lock devices shall be used only when power sources are not capable of being locked out by use of padlocks and lockout hasp devices. The name of the person affixing the tag to power source must be on tag along with date tag was placed on power source.
8. Release stored energy and bring the equipment to a “zero mechanical state.”
9. Verify isolation: Before work is started, test equipment to ensure power is disconnected.

1.6.2 GENERAL SECURITY

1. The lock shall be removed by the Authorized Person who put the lock on the energy-isolating device. No one other than the person/persons placing padlocks and lock out hasps on power shall remove padlock and lockout hasps and restore power. However, when the authorized person who applied the lock is unavailable to remove it, her or his Supervisor may remove padlock(s) and lock out hasp(s) and restore power only if it is first:
 - a. verified that no person will be exposed to danger..
 - b. verified that the Authorized Person who applied the device is not in the facility.
 - c. noted that all reasonable efforts to contact the Authorized Person have been made to inform her or him that the lock out or tag out device has been removed.
 - d. ensured that the Authorized Person is notified of lock removal before returning to work.
2. Tag out system - Tags are warning devices affixed at points of power disconnect and are not to be removed by anyone other than the person placing tag on power lockout. Tags shall never be by-passed, ignored, or otherwise defeated.

SECTION 2: DESCRIPTION

2.1 Introduction

Aircel AEHD Series dryers are engineered and manufactured to provide you with many years of trouble free service. To ensure that you get the get first class service from this equipment, we recommend you take some time and read the contents of this manual.

This manual contains information required for installing and maintaining your new equipment. It also includes the safety procedures and corresponding drawings. We strongly suggest that all personnel involved with the machine, read the entire contents of the manual before proceeding with the installation or maintenance activities.

The manufacturer reserves the right to make changes without any prior notification and is not obligated in any manner. Information in this manual is deemed current at the time of publication and Aircel disclaims all liability for any errors resulting in any loss or damage.

2.2 System

The AEHD Series externally heated desiccant air dryer products cover the flow range listed on the manual front cover and provides reliable dew point performance. The heated regenerative desiccant dryer is a continuous-duty compressed air dryer used in industrial applications to provide high drying efficiency for large volume airflows. Continuous duty means no downtime. A switching valve alternates the desiccant chambers between the drying and regeneration phases. While one chamber is drying, the other is regenerating.

The self-contained heated regenerative desiccant dryer includes a control system, dryer, heater, and silencers.

Untreated compressed air contains many contaminants such as water, compressor oil, pipe scale and contamination from ambient air. These contaminants cause excessive corrosion, erosion, freezing and product contamination to all components that come in contact with the untreated compressed air.

A regenerative type dryer system with all recommended filtration will remove these contaminants to harmless levels. The end result is that instruments that come in contact with the dry compressed air stay clean and do not corrode, therefore lasting much longer. Products that may come in contact with clean dry compressed air are virtually unaffected, hence rejection rates are reduced.

Aircel AEHD series externally-heated regenerative desiccant compressed air dryers dry compressed air to -40°F PDP (Pressure Dew Point). The compressed air stream is passed

through a desiccant bed, which removes the moisture through the process of adsorption. Twin towers filled with activated alumina desiccant alternate between drying and regeneration. These dryers offer fail-safe design in the event of power interruption, as air will continue to flow through the dryer without dead heading and purge exhaust valves will close, preventing loss of air pressure.

An LCD display provides operation information and tower operating status. The highest quality non-lubricated air/gas valves are used to ensure reliable operation for many years to come.

2.2.1 HOW IT WORKS

The Aircel model AEHD is an externally-heat reactivated desiccant compressed air dryer system, with two vessels each loaded with activated alumina desiccant to adsorb moisture from the inlet moisture-laden air stream.

While one vessel is drying (removing) moisture vapor from the inlet air, the other vessel is regenerating (desorbing) moisture from desiccant media that was adsorbed onto the desiccant surfaces during the drying cycle to enable the regenerated desiccant to dry the inlet air again.

During the regeneration process, a small portion of dry outlet air is heated to a temperature of 400°F to regenerate (remove) the moisture from the desiccant bed.

The drying and regenerating process is repeated continuously between the two towers every 4 hours to provide an uninterrupted continuous clean, dry airflow to the customer process.

The inlet moisture-laden, dirty, compressed air is filtered as it passes through the standard high-efficiency inlet coalescing pre-filter where moisture and possible oil-mist are coalesced into larger droplets. These droplets are then removed via an automatic drain before the filtered air enters the dryer.

NOTE: The dryer is designed to remove moisture in vapor form only - liquid moisture and oil is detrimental to the dryer system.

The inlet moisture-vapor laden compressed air continues to the inlet valve and is directed to the bottom of the on-line, pressurized drying desiccant vessel. The air stream is dried by the vessel desiccant media and exits the top of the vessel to the outlet valves (typically check valves), then directed to the standard outlet high temperature particulate after filter to remove particulates from the dry outlet air stream before entering the downstream customer process.

The standard EMS (Energy Management System) control system continually monitors the mid-bed humidity level

in the on-line drying vessel. At the end of the drying cycle, if the moisture level is below the set level, the drying cycle will continue on the same vessel for an extended time until the moisture level reaches the set point. The EMS control system saves energy by extending the drying cycle, thus reducing the overall average process air consumption used for regeneration, as well as reducing overall heater on-time in periods of low load demand.

While one vessel is drying the inlet moisture-laden compressed air, the other vessel is regenerating the desiccant bed. During the regenerating cycle, the regenerating vessel is first depressurized slowly to atmospheric pressure through a purge exhaust valve and muffler to ambient. A small portion of the outlet dried compressed air flows through a purge adjustment valve to an orifice to reduce the regenerating airflow.

The regeneration purge air flows to the heater at near atmospheric pressure where the regeneration air temperature is heated to a temperature of 400°F. The air then passes through the regeneration heater check valve on the upper line and into the regenerating vessel where the moisture is desorbed (removed) from the vessel desiccant bed.

The hot, moist regeneration air then flows from the bottom of the vessel to the purge exhaust valve and muffler to ambient.

Dryer system operation is performed automatically by the APC (Aircel Programmable Controller) control system. The standard drying and regeneration time cycle is an 8 hour NEMA cycle. While one vessel is drying incoming compressed air for 4 hours, the other vessel is (1) depressurizing for 2 minutes, (2) heat regenerating/purging for 3 hours, (3) cooling/regenerating/purging for 55 minutes, (4) repressurizing the vessel to the line pressure for 3 minutes before (5) switching over to the other vessel, any finally, (6) just before the end of the repressurization period the EMS system checks the moisture level in the drying vessel.

If the EMS senses moisture levels are below the set point, the drying vessel will remain online, drying for an extended time and the regenerated vessel will be in standby and repressurized. When the drying vessel reaches the set moisture level, the vessels will switch. Switching from one vessel to the other vessel is performed only when both desiccant towers are at line pressure to prevent line surge and to minimize desiccant abrasion.

The dryer system process is fully automatic and continuous, typically switching vessels every 4 hours, alternating between drying and regenerating.

NOTE: The EMS (Energy Management System) control system will extend drying mode for longer than the 4 hour period.

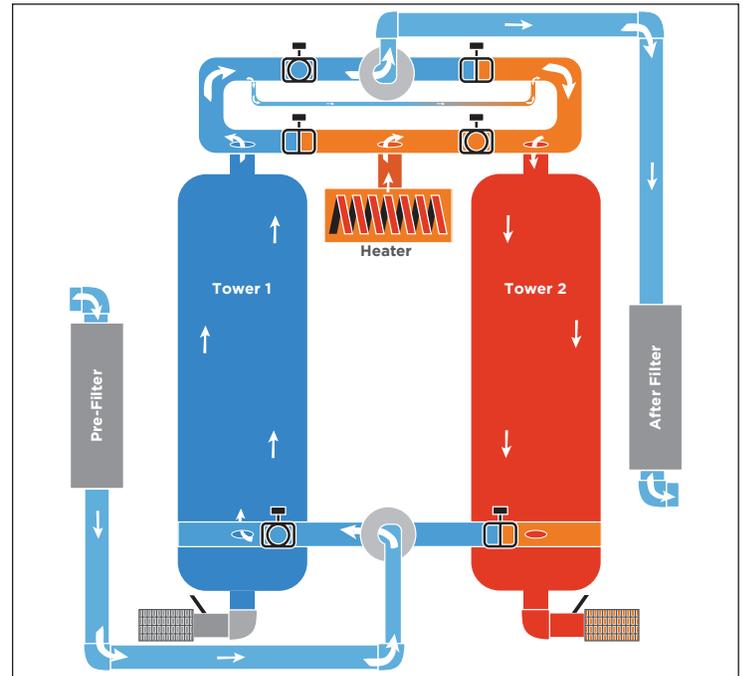


FIGURE 2-1: TYPICAL SCHEMATIC FLOW DIAGRAM
AEHD Series 150 - 3,000 scfm rated model

SECTION 3: INSTALLATION

3.1 Inspection on Arrival

All heated regenerative desiccant dryers are tested and operated before shipment. However, shipping vibration may cause damage such as loosening of certain parts. To ensure smooth installation, it is recommended that immediately upon receipt of the unit, the system is checked for the following:

1. Inspect unity on delivery.
2. Report any damage to the delivery carrier.
3. Request a written inspection report from the Claims Inspector to substantiate the claim.
4. File claims with the delivery carrier.
5. Compare unit received with description of product ordered. Check the serial plate label and make sure that it is the correct Model was ordered. Note the equipment Capacity and Power Supply requirements and ensure that they are in accordance with your specifications. The rated conditions of the dryer are indicated on the serial plate label. If there is any discrepancy, contact your representative listed on the manual back cover.
6. Vibration during shipping can loosen the connections. Inspect all pipe and tubing and make sure they are all tightened and secured.
7. Report incomplete shipments to the delivery carrier and your service representative.

3.2 Lifting Information



WARNING!

Lifting Hazard

Failure to lift the unit correctly can result in severe personal injury or property damage.

- Use appropriate lifting equipment and adopt all safety precautions needed for moving and handling the equipment.
 - A forklift, or crane is recommended for unloading and installation.
 - Lift unit by lifting lugs and frame only. Do not lift by piping.
1. Use all lifting points provided. Special care must be used when lifting the dryer to prevent tip-over.
 2. Use clevis connectors, not hooks, on lifting slings.
 3. Only lift unit under support frame/base by using the fork lift openings provided. Do not lift by piping.
 4. Check the approximate weight provided on the specification control drawing to ensure adequate lift truck capacity.
 5. Allow only qualified operators to lift the equipment.
 6. Refer to applicable OSHA regulations and local codes when using cranes, forklifts, and other lifting equipment.

3.3 Installation Codes and Procedures

 WARNING!

Electric Shock Hazard

This machine is connected to high-voltage power, which can cause severe electrical shock and injury.

- Follow proper lock out/tag out procedures before performing service or maintenance work.
- Electrical installation must be performed by a qualified electrician and comply with all applicable national and local codes.

- Safe and efficient operation of the unit depends on proper installation.
- Authorities with jurisdiction should be consulted before installing to verify local codes and installation procedures. In the absence of such codes, install unit according to the National Electric Code and NFPA No. 70-latest edition.
- A qualified installation and service agent versed in all regulatory codes must complete installation of this unit.
- All shipping materials, including shipping covers, must be removed from the unit prior to, or during, unit installation.

3.4 Locating and Installing the Dryer

1. Locate unit on a level foundation. Dryer should be mounted on a suitably structured flat and level floor or base that is free from vibration. Special care must be used when lifting the dryer to prevent tip-over.
2. Bolt dryer skid to the foundation using the bolt holes provided in the frame. The frame(s) must be securely bolted to the foundation to prevent movement resulting from earth tremors and induced piping vibration.
3. Make certain all shipping materials have been removed such as crating, plastic wrap, fitting covers, etc.
4. Install unit to provide adequate clearance for maintenance services. Dryer and accompanying filters should be installed with at least three (3) feet clearance from the adjoining walls to provide easy access for routine maintenance and adequate air flow.
5. Unit should be located in a weather protected area with a

temperature range between 70 - 100°F.

7. Install flanges, fittings, and piping on system using the correct pipe size and pressure rating.
- 7.1 Outlet piping and components should be rated for a minimum of 250°F

 CAUTION!

High Heat Hazard

During vessel switchover, the dryer outlet line and filter may become extremely hot (250°F) for approximately 20 minutes.

Dew point spike may be a longer duration if airflow through the dryer is lower than the rated flow. In an upset condition, outlet temperature could exceed 400°F.

- 7.2 Connect inlet piping and shutoff valve of the dryer to the moist air from the compressor/receiver/inlet filter.
- 7.3 Connect outlet piping with outlet shutoff valve.
8. A block and bypass valve system can be installed around dryer system to keep the downstream air supply pressurized during repair or maintenance of the dryer system.

 CAUTION!

Moisture contamination hazards

Air supplied while the regenerative desiccant dryer is bypassed will be wet and saturated. Some downstream processes may not tolerate this air supply due to the risk of contamination of sensitive equipment.

 WARNING!

High heat hazards

Ensure the bypass valve(s) are rated for a minimum of 250°F. An upset condition could exceed 400°F.

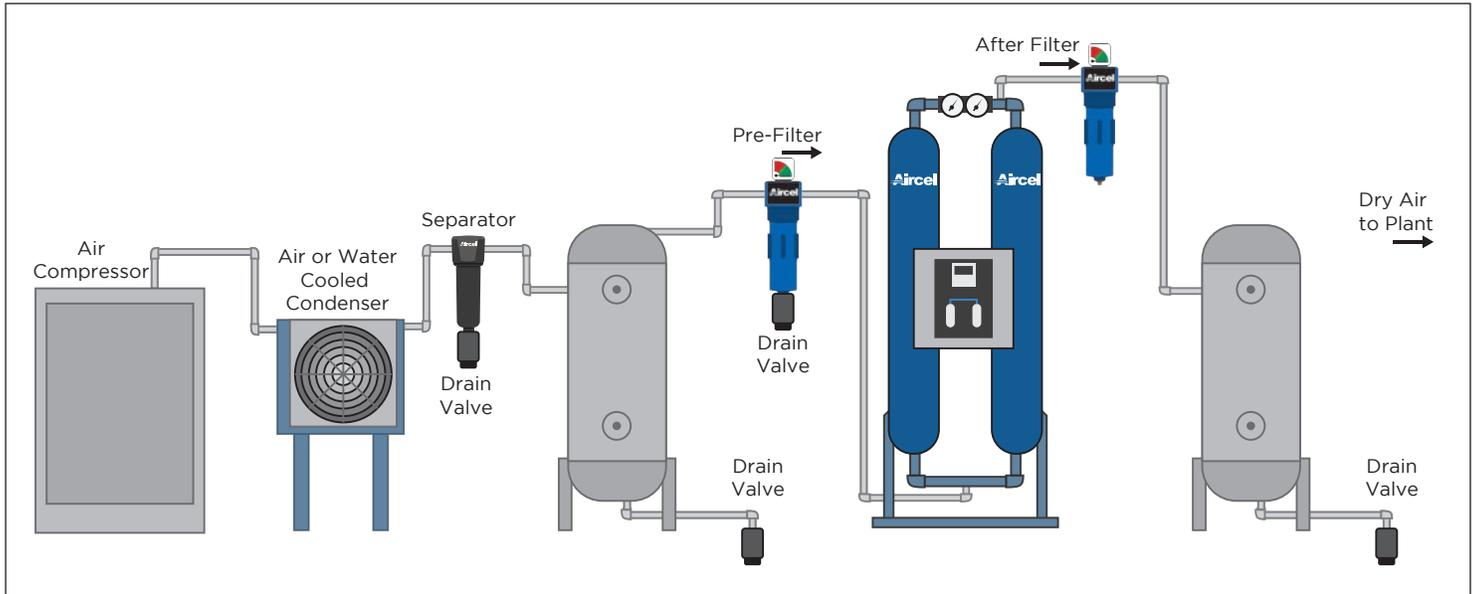


FIGURE 3-1: Typical Installation Setup

9. Compressed air piping must be at least the same size as that of the inlet and outlet connections of the dryer. If necessary, larger pipe sizes can be used with reducers.
10. Provide adequate power supply. See rating and specification information on dryer data label and drawing package information. Make certain dryer system is properly grounded.
11. A back pressure regulator can be installed at the air outlet of the dryer to keep the dryer at a constant pressure regardless of downstream demand. This prevents the dryer media bed from fluidizing (lifting/moving) due to a high downstream demand and high pressure loss in the dryer system. This fluidization causes high velocity in the media bed and leads to fluidization of the media, affecting dryer performance and reducing the life of the desiccant bed media.
12. The dryer relief valves are designed and sized to relieve excess pressure resulting from the thermal expansion of air trapped in the vessels in the event the vessels are subjected to heat, such as in a conflagration. Valves are set to relieve at the maximum design pressure of the desiccant vessels.
13. In the event that mufflers have been shipped loose, install and secure to the back of the desiccant towers.
14. Ensure the dryer towers are filled with desiccant. Larger dryers may have desiccant shipped separately; in which case, the media has to be filled into the pressure vessels from the desiccant fill ports at top of each vessel. Care must be taken when filling the media and must be done gradually to prevent powdering.

15. Install the Aircel inlet compressed air particulate pre-filter drain to an open drain system for safety and to prevent puddling of water at dryer system area. Piping should be secured and angled slightly downward to drain condensate. Drain system must have a vented air gap to prevent a pressurized condition.

WARNING!

Unsafe personnel conditions hazard

Keep personnel safely away from desiccant dryer relief valves. In the event of discharge, the relief valves can cause an unwanted condition or hazard to personnel.

Some discharge ports could be piped to a safe location.

16. If you intend to vent your exhaust with additional piping, the discharge piping from the exhaust should not be piped upward without an arrangement for removing trapped condensate. Make sure that you do not apply a back pressure on this exhaust system. If exhaust piping is to be extended, stay within 15 to 20 feet and use larger diameter piping.
17. The automatic drain can be piped to an open drain system if allowed, or to a condensate treatment system, then to an open drain system. Make sure the piping is secured and rated for the pressure and temperature of the application,

and can be removed if filter bowl (in some systems) needs to be removed for servicing.

 **CAUTION!**

Follow local codes

Before connecting condensate to open drainage system make certain this is allowed, user or local codes may require treatment before discharging into drain system.

18. Make all electrical connections to the system as shown on the wiring diagram. Special care must be taken in connecting the proper voltage as indicated on the specification sheet and wiring schematic. It is recommended to supply power to the dryer system through a customer supplied fused disconnect switch to remove all power to the system.

 **WARNING!**

Electric Shock Hazard

This machine is connected to high-voltage power, which can cause severe electrical shock and injury.

- Follow proper lock out/tag out procedures before performing service or maintenance work.
- Electrical installation must be performed by a qualified electrician and comply with all applicable national and local codes.

Aircel LLC is not liable for any code violations, component damage, downtime or consequential damage related to customer supplied electrical components and connections.

19. If proper system pressure cannot be maintained in the adsorption vessel during drying, install a system back pressure valve downstream of the dryer to protect the dryer from high velocity resulting from low service pressure. Failure to maintain the correct operating pressure will cause elevated dew point and premature failure of the desiccant.
20. If there are any changes in the operating conditions of the system from those published in this manual, contact Technical Support at the number published on the back of

this manual.

3.5 Preliminary Start-Up Checklist

 **WARNING!**

- Tower/vessel relief valves are set from manufacturer. DO NOT adjust these valves.
- Always pressurize and depressurize the system slowly.
- This system must be operated or serviced by qualified persons familiar with pressurized systems and electrical controls.
- Before servicing any component make certain the system is depressurized and de-energized.
- Hearing protection is recommended for personnel protection when the system is in operation and/or pressurized in order to protect from any loud bursts of pressurized air to atmosphere. This can occur through the depressurization and purge exhaust mufflers, vent ports, and filter drain ports.
- Eye protection safety glasses are recommended for personnel protection when the system is in operation and/or pressurized in order to protect from possible flying debris expelled from the purge exhaust mufflers during tower, vent, or drain depressurization or any other possible flying debris.
- Do not use the dryer without the inlet filter element or outlet filter element.
- Do not use the dryer without the vessel desiccant media in place.

In addition to the below notes, cautions and warnings, refer to the previous sections on General Safety Procedures, Safe Operating Procedures and any safety procedures required by end user.

1. Check the inlet and outlet connections are the correct size, pressure rating, and tightened securely.
2. Ensure the wet inlet air line is connected to the inlet pre-

filter with automatic drain valve (typically, the inlet piping flows from inlet pre-filter to bottom of vessels).

3. Ensure the dry outlet air is connected to the outlet after filter with the manual drain valve which is piped from top of vessels to outlet after filter.
4. Check that the correct power supply is connected to the desiccant air dryer system with an adequate disconnect switch.
5. Check that all manual valves are in correct open and closed positions and that compressed air is available to be supplied to the desiccant air dryer system.
 - a. Dryer system block and bypass valving (if applicable): Outlet isolation block valve should be closed, inlet isolation block should be open, and the bypass valve should be open.
 - b. Inlet coalescing pre-filter automatic drain isolation valve should be open.
 - c. If a manual vent/drain valve is used near the inlet coalescing pre-filter automatic drain valve to ambient, this valve should be closed. (This inlet pre-filter manual drain valve is used in some systems in case of automatic drain valve failure.)
 - d. Outlet particulate after filter manual drain/vent valve should be in closed position.
 - e. Any filter differential pressure gauge isolation valves should be in open position.
 - f. Any pressure gauge isolation valves should be in open position.
 - g. Control air isolation valve, to be open position and set to 100 psi, adjustable via the control air pressure regulator located near the electrical enclosure.
6. With the customer-supplied compressed air to the system, OPEN the inlet valve slowly (two to three minutes) to gradually pressurize the system. Do not open valve too quickly. Opening valve and suddenly pressurizing the system can cause damage to the dryer heat exchanger and other components. One vessel will pressurize slower than the other; if one vessel does not pressurize, open the purge adjustment valve to pressurize.
7. Check the complete dryer system for leaks. Use soap and water to test all joints and fittings. If found, immediately depressurize the system, repair all leaks, and re-test.
8. Turn the dryer system on via the power on/off switch.
9. After the dryer is on and operating, one tower will depressurize to atmospheric pressure. The purge adjustment valve can now be adjusted to 50-55 psig read on the purge pressure gauge (located at back of dryer). Increase or decrease purge pressure via purge adjustment valve. The heater outlet temperature should reach at least 375 - 400°F after approx. 20-30 minutes; if temperature is

too low, start closing the purge adjustment valve in small increments. If temperature is too high, open the purge adjustment valve in small increments until temperature is stable and the heater does not cycle on and off continually. The heater should stay on almost continuous during the heating mode. **NOTE:** Typical purge pressure setting is 50 - 55 psig.

10. Refer to the system screenshots and descriptions for additional information. The controls have an advancing feature to check operation quicker if required and allows the operator to make certain the dryer operates correctly in each step in a shorter time period.
11. Open the outlet block valve slowly, then close the bypass valve (if bypass valve was not initially closed).

CAUTION!

Some downstream systems may take a long time period to pressurize. Make certain dryer pressure remains at normal operating pressure while pressurizing downstream system.

12. When unit is in operation, the display on the enclosure door will show the dryer status and any alarm conditions.
13. When a common shutdown alarm condition is active, the system will display the shutdown alarm condition active in the alarm screen area. Common shutdown alarms include temperature alarms and incorrect pressure alarms (or failure to switch), which stop dryer operation and require manual reset. After alarm problem has been corrected the system will need to be manually reset. The common shutdown alarm red light will be on, and the common shutdown alarm relay inside the enclosure will de-energize.

NOTE: High humidity could be displayed in the alarm screen even though an actual shutdown alarm is active. This occurs because of how the alarms overlap on the display. The only alarm with automatic reset is the high humidity alarm, which does not activate the common shutdown alarm light and relay. A number of dry common shutdown alarm contacts for remote indication are available inside the enclosure. See electrical drawings for terminal numbers.
14. Heater temperature control settings are factory set. The typical setting is as follows:
 - a. Heat Control: 400°F
 - b. Heater Mid-Range: 850°F
 - c. Heater High Limit: 1,000°F
 - d. Purge Air High Limit: 500°F

15. If the system has an optional outlet dew point readout with high humidity, the outlet dew point will be displayed on the system display. Verify the needle valve prior to the dew point sensor is fully open, the valve after the sensor is slightly open with a slight amount of air at the end of the exhaust coiled tube to ambient. These adjustments will set up the airflow for the dew point sensor.
16. The optional dew point control settings are recommended to be set at the following levels:
 - a. PDP: -50
 - b. Humidity Alarm: 10°F

These settings can be changed as necessary. The dew point control adjustment should be within -20 to -70 PDP.
17. Verify the mid-bed RH sensor exhaust valve (part of the standard Energy Management System on the AEHD series dryers) is adjusted properly. This valve is located near electrical enclosure. A small rectangular block of aluminum houses the mid-bed RH sensor and has a needle valve attached to it. The needle valve should be slightly opened until a small amount of air is exhausted to ambient. This will set up the flow of air for the mid-bed RH sensor to operate the Energy Management System.
18. Dryer cycle times are as follows:
 - Drying: 4 hours
 - Depressurizing: 2 minutes
 - Heating: 180 minutes
 - Cooling: 55 minutes
 - Repressurizing: 3 minutes
19. Check drain valve for proper operation and discharge of liquids (filters and separators, etc.). If automatic drain valve has a drain isolation valve, make certain the valve is open so condensate can be properly drained.
20. Verify the purge exhaust valves open slowly within a 5-8 second time period to depressurize the vessel at a slower rate. Some adjustment of the flow control valve attached to the actuator may be required; after adjustment, tighten down the locking collar.
21. Verify complete dryer operation. Do not allow system to operate unattended until satisfied the dryer system is operating correctly.
22. After the initial start-up, the dryer operation is completely automatic.

SECTION 4: OPERATION

4.1 Operating Procedures

After the initial startup, the dryer operation is completely automatic. To understand the details of the operation, see *Figure 2-1: Typical Schematic Flow Chart* on page 5.

4.2 Short-Term Shut Down (For Maintenance)

 **WARNING!**

Non-purified/moist bypass air could damage sensitive downstream equipment components. Some operations may not tolerate the contaminated air.

In these situations, do not utilize a bypass valve.

 **WARNING!**

Electric Shock Hazard

This machine is connected to high-voltage power, which can cause severe electrical shock and injury.

- Follow proper lock out/tag out procedures before performing service or maintenance work.
- When the system is shutdown and power removed, lock out power supply and depressurize system before performing maintenance or service work to avoid injury to personnel or property damage.

1. Slowly close the outlet shut off valve (customer supplied).
2. Slowly close the inlet shut off valve (customer supplied).
3. Next, turn on power off/on switch to off position at the dryer system electrical enclosure.
4. Disconnect main electrical power supply to dryer system.
5. Open vent valve located on bottom of the outlet after filter to depressurize the system.
6. The system is now able to be serviced.

4.3 Short-Term or Long Term Non-Usage Period Shut Down

 **WARNING!**

This type of dryer operates best if left on with air supplied to the unit whenever possible.

This unit can be left pressurized after the dryer is switched off.

 **WARNING!**

Electric Shock Hazard

This machine is connected to high-voltage power, which can cause severe electrical shock and injury.

- Follow proper lock out/tag out procedures before performing service or maintenance work.
- When the system is shutdown and power removed, lock out power supply and depressurize system before performing maintenance or service work to avoid injury to personnel or property damage.

The desiccant air dryer system can be shut down at any time.

Some systems may have a customer supplied bypass valve. This can be slowly opened to allow air downstream.

**WARNING!**

This type of dryer operates best if left on with air supplied to the unit whenever possible.

This unit can be left pressurized after the dryer is switched off.

For best purity, the system is best left isolated and pressurized.

Some systems may have a customer supplied bypass valve. This can be slowly opened to allow air downstream.

**WARNING!**

Non-purified/moist bypass air could damage sensitive downstream equipment components. Some operations may not tolerate the contaminated air.

In these situations, do not utilize a bypass valve.

1. Slowly close the outlet shut off valve (customer supplied).
2. Slowly close the inlet shut off valve (customer supplied).
3. Next, turn on power off/on switch to off position at the dryer system electrical enclosure.
4. If an optional outlet dew point sensor is included in the system, ensure the outlet needle valve attached to the sample cell is closed. The needle valve is located closest to the exhaust coil to ambient. No airflow should be felt at end of coiled tube.
5. The system should now be isolated and pressurized.

SECTION 5: CONTROLLERS

5.1 Main Screens

5.1.1 Alarm Screen



FIGURE 5-1: Alarm Screen

No alarm is when there are no active alarms. During this state, the alarm relay contact will be active. (Normally open contact will be closed/normally closed contact will be open). This allows the remote alarm to trip when power is lost to the unit.

For more detailed alarm screens, refer to section 5.3.

5.1.3 Control Menu Screen

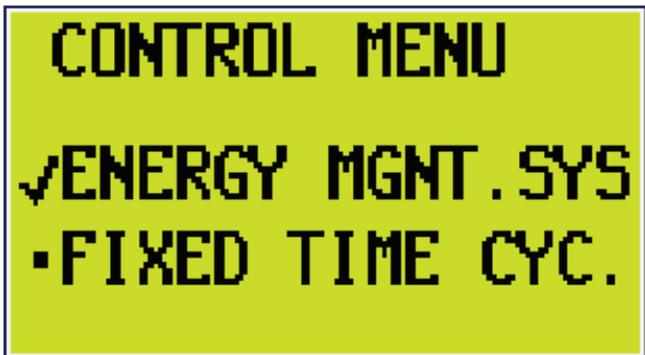


FIGURE 5-3: Control Menu Screen

This is the screen where extended drying can be selected or turned off. To select, press the OK button twice then press the up or down arrow to highlight the appropriate selection. Press OK to make the selection then press ESC back to the main menu. The check mark will indicate which selection has been made.

5.1.2 Failure to Shift Entry Screen



FIGURE 5-2: Failure To Shift Entry Screen

This screen allows the user to change the set point for the failure to shift alarm. It is not recommended to change this setting without first contacting the Aircel Service Department.

5.1.4 Main Screen

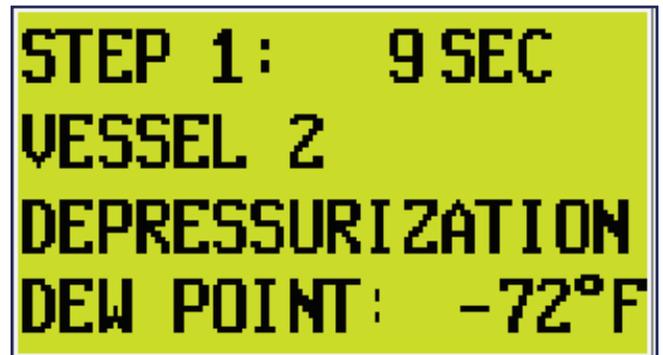


FIGURE 5-4: Main Screen

Fixed Time Cycles. With Energy Management selected, the unit has the ability to save energy when regenerating is not needed. In Energy Management, the deciding factors are the dew point setting and the relative humidity setting. These can be changed on the Settings Screen. Once both values have been met, the unit will go into savings mode labeled Extended Drying.

5.1.5 Analog Screen



FIGURE 5-5: Analog Screen

The analog screen allows the user to view the sensor outputs.

5.1.6 Operation Hours Screen



FIGURE 5-6: Operation Hours Screen

The total hours of operation and total hours of energy savings can be viewed from this screen.

5.1.7 Settings Screen



FIGURE 5-7: Settings Screen

The settings menu allows you to make changes to the set points of the relative humidity, dew point and high humidity control set points. These set points are used to control the unit for energy savings.

The high humidity set point is to alert the user of high dew point that could possibly lead to moisture downstream of the dryer. To make changes to the set points, press the OK button twice.

Next press the up or down arrows to highlight the setting to



FIGURE 5-8: Settings Screen

be changed, then press the OK button again. The individual numbers should now be flashing. Press the left or right arrows to move to the particular number that needs to be changed and press the up or down arrow to make the change. Once the changes are made to the selection, press the OK button to confirm the change.

Once all selections have been completed, press the ESC button to return to the main menu.

5.2 Dryer Operation Screens

5.2.1 STEP ONE: Depressurizing

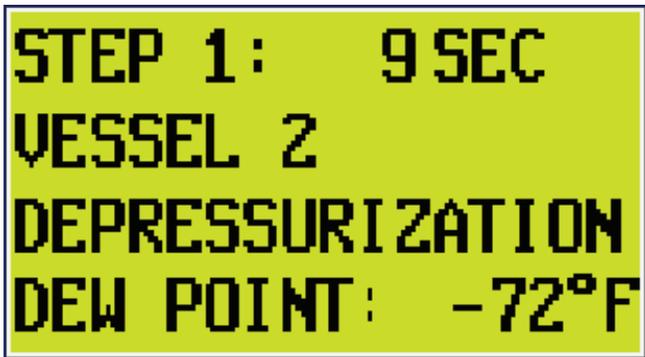


FIGURE 5-9: Step One

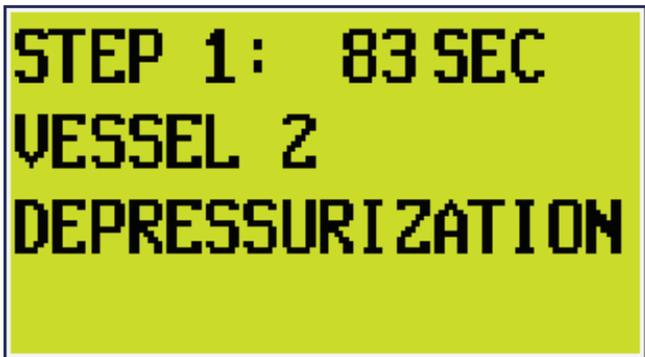


FIGURE 5-10: Step One

Step 1 is the depressurization step. In this step, Vessel 2 depressurizes to allow for regeneration of that tower. This step is 120 seconds (2 minutes).

5.2.2 STEP TWO: Regenerating



FIGURE 5-11: Step Two Heating



FIGURE 5-12: Step Two Cooling

Step 2 is the regeneration step. In this step, vessel 2 will be heated then cooled to help regenerate the media. The heating/cooling step is 235 minutes (3hrs, 55mins).

To advance from heating to cooling, press and hold the up arrow button for approx. 6 seconds then release. If not released within another 6 seconds, the cooling step will also be skipped. To skip the cooling mode, press the up arrow again for up to 12 seconds.

5.2.3 STEP THREE: Repressurizing

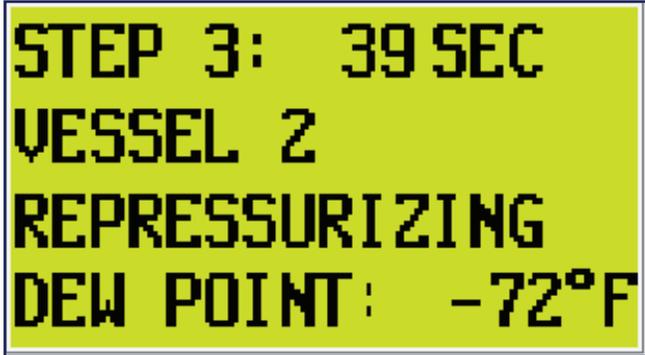


FIGURE 5-13 Step Three

5.2.4 STEP FOUR: Extended Drying



FIGURE 5-15: Step Four

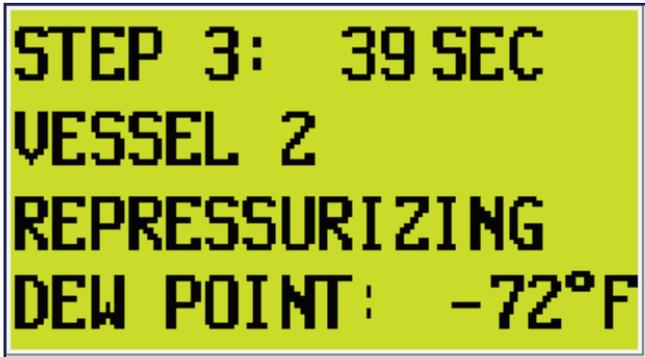


FIGURE 5-14: Step Three



FIGURE 5-16: Step Four

Vessel 2 is preparing for regeneration and Vessel 1 is drying the inlet air.

The PLC control system energizes Solenoid SOL6, opening purge exhaust valve K4.

Vessel 1 regeneration valve K3 and depressurization valve V1 should all be closed.

Depressurization valve V2 and Vessel 1 inlet valve K1 should be open.

Step 4 is the extended drying step, which is determined by several features. Extended drying is controlled from the controller menu screen.

On this screen, you can select either Energy Management or Fixed Time Cycles. With Energy Management selected, the unit has the ability to save energy when regenerating is not needed. In Energy Management, the deciding factors are the dew point setting and the relative humidity setting. These can be changed on the Settings Screen. Once both values have been met, the unit will go into savings mode labeled Extended Drying.

5.2.5 STEP FIVE: Depressurization

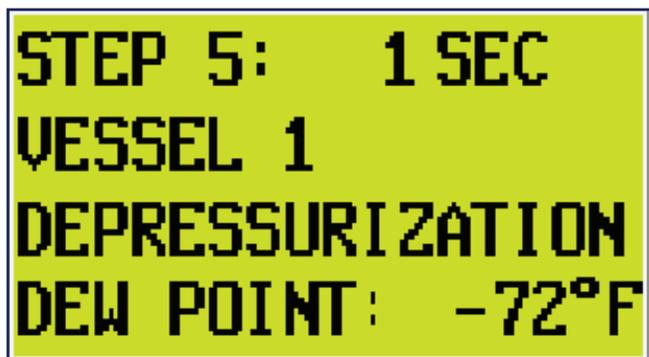


FIGURE 5-17: Step Five

5.2.6 STEP SIX: Heating

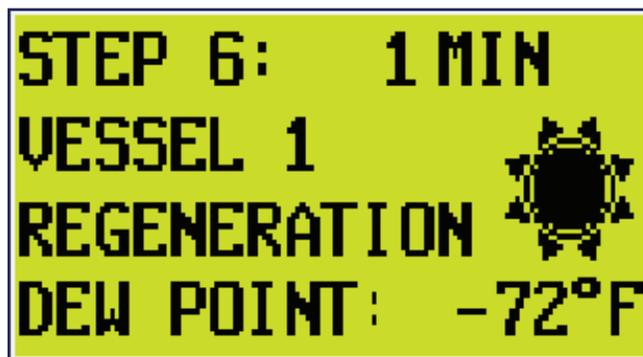


FIGURE 5-19: Step Six Heating

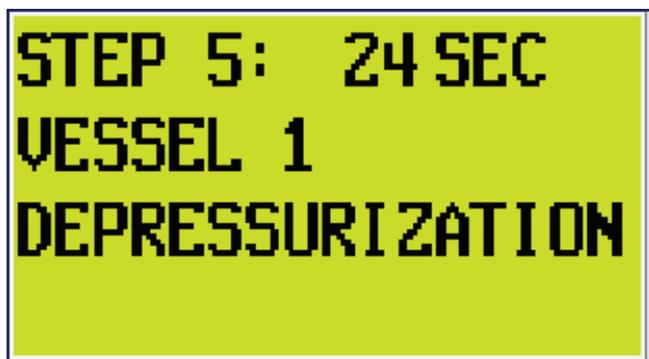


FIGURE 5-18: Step Five

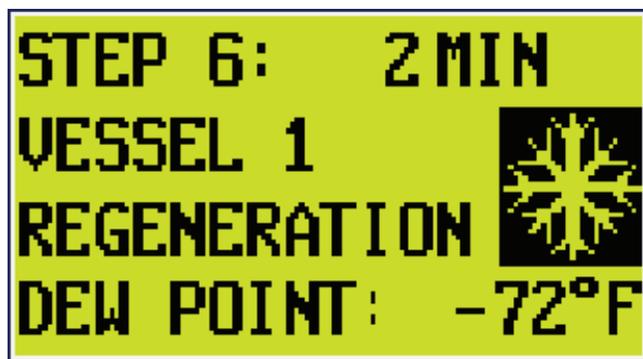


FIGURE 5-20: Step Six Cooling

Step 1 is the depressurization step. In this step, Vessel 1 depressurizes to allow for regeneration of that tower. This step is 120 seconds (2 minutes).

Step 2 is the regeneration step. In this step, vessel 1 will be heated then cooled to help regenerate the media. The heating/cooling step is 235 minutes (3hrs, 55mins).

To advance from heating to cooling, press and hold the up arrow button for approx. 6 seconds then release. If not released within another 6 seconds, the cooling step will also be skipped. To skip the cooling mode, press the up arrow again for up to 12 seconds.

5.2.7 STEP SEVEN: Repressurization

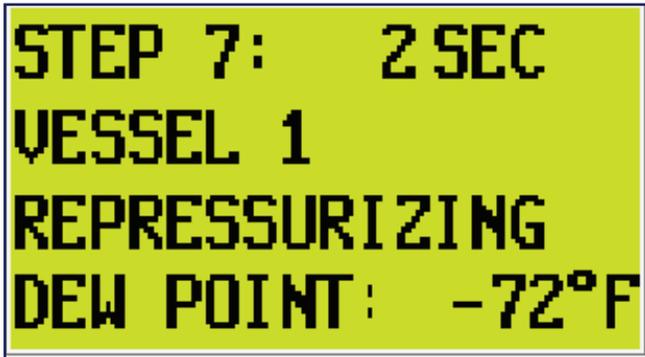


FIGURE 5-21: Step Seven

5.2.6 STEP EIGHT: Extended Drying



FIGURE 5-23: Step Eight

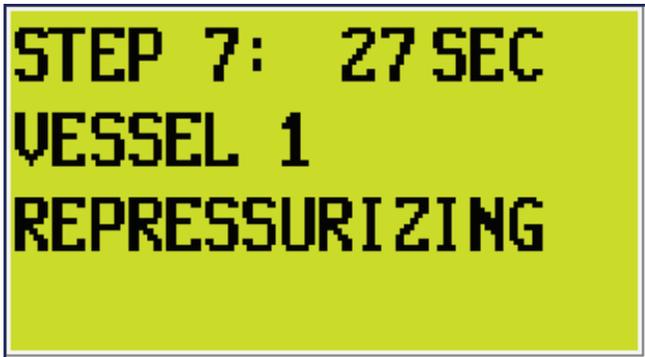


FIGURE 5-22: Step Seven



FIGURE 5-24: Step Eight

Vessel 1 is preparing for regeneration and Vessel 2 is drying the inlet air.

Step 8 is the extended drying step, which is determined by several features. Extended drying is controlled from the controller menu screen.

On this screen, you can select either Energy Management or Fixed Time Cycles. With Energy Management selected, the unit has the ability to save energy when regenerating is not needed. In Energy Management, the deciding factors are the dew point setting and the relative humidity setting. These can be changed on the Settings Screen. Once both values have been met, the unit will go into savings mode labeled Extended Drying.

5.3 Alarm Screens

5.3.1 No Alarm



FIGURE 5-25: No Alarm

No alarm is when there are no active alarms. During this state, the alarm relay contact will be active. (Normally open contact will be closed/normally closed contact will be open). This allows the remote alarm to trip when power is lost to the unit.

5.3.2 High Purge Temperature



FIGURE 5-26: High Purge Temperature

The high purge temp alarm trips when the heater outlet temperature reaches 500°F. This causes the heater contactor to kick out until the temperature drops down below the alarm setting. Once the temperature comes back down, the alarm must be reset to resume operation.

5.3.3 Failure to Shift



FIGURE 5-27: Failure to Shift

The fail to shift alarm trips if one of the vessels has not re-pressurized, depressurized or has lost pressure during any of the operations. Once the pressure has been restored, the alarm will need to be manually reset to resume operation. To do this, press the down arrow on the alarm screen.

5.3.4 Heater High Limit



FIGURE 5-28: Heater High Limit

The heater high limit alarm trips when the heater sheath temperature reaches 1000°F. Once the temperature falls below the setting, the alarm will need to be manually reset to resume operation. To do this, press the down arrow on the alarm screen.

5.3.5 Bad RH Probe

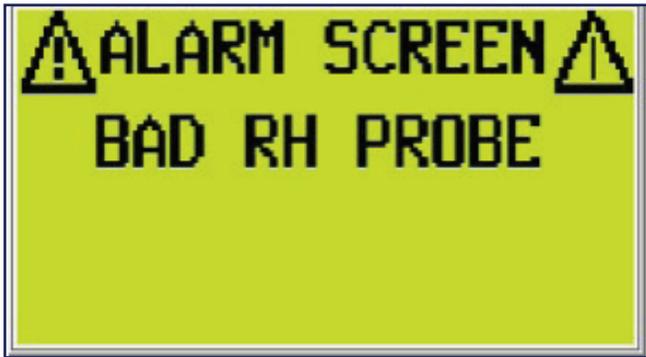


FIGURE 5-29: Bad RH Probe

The bad RH probe alarm trips when the Relative Humidity sensor is out of range. This can be high (above 98%) or low (below 1%). Once the probe has reached a number in the range of the sensor, the alarm will automatically reset.

5.3.6 Dew Point



FIGURE 5-30: Dew Point

The dew point probe alarm will trip when the sensor is out of range. This can be high (above 67°F) or low (below -155°F). Once the probe has reached a range that the sensor can read, the alarm will automatically reset.

5.3.7 High Humidity

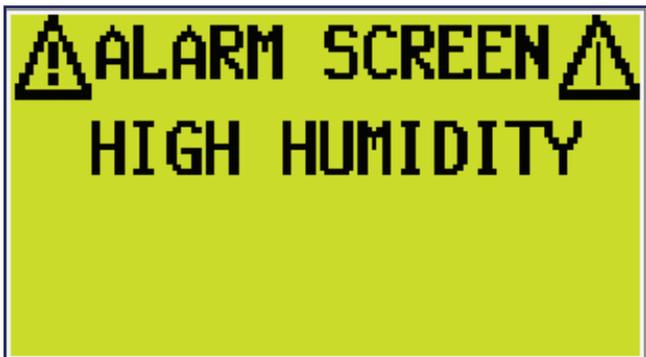


FIGURE 5-31: High Humidity

The high humidity alarm will trip when the dew point range is higher than the high dew point setting on the settings screen. Once the dew point falls below the setting, the alarm will automatically reset.

SECTION 6: MAINTENANCE

6.1 Introduction

To reach a field service technician or for technical support, please call the number on the manual back cover.



WARNING!

Refer to shutdown procedures for maintenance in Section 3 prior to starting any maintenance on the dryer system



WARNING!

Electric Shock Hazard

Ensure power is disconnected from the dryer prior to performing maintenance on the electrical or mechanical system..

- Follow proper lock out/tag out procedures before performing service or maintenance work.
- Prior to performing any maintenance on the dryer, all personnel are strongly advised to familiarize themselves with the equipment by reading the entire contents of this operation manual.
- Follow all safety procedures prior to performing any maintenance activity on the dryer.



CAUTION

If you notice anything unusual at any point during the maintenance process, contact your Aircel representative or the factory at once.

6.2 Maintenance

Desiccant air dryers require regular maintenance for satisfactory operation. Optimum performance can be expected if the following routine maintenance steps are taken.

6.2.1 WEEKLY

- Check the operating conditions inlet flow, inlet temperature, inlet pressure, and outlet dew point are in accordance with system design parameters.
- Check all drain valves and separators.
- Check the pressure differential indicators (Delta-P) on the pre-filter and after filter. If red or above 7 psi, replace the filter elements. Verify the pre-filter drain is operating.
- For standard normal operation, verify the following settings:
 - Control air pressure: 100 psig
 - Purge air pressure: 50 - 55 psig
 - EMS control setting: 7
- Verify the after-filter vent valve is closed and the inlet pre-filter drain isolation ball valve is open.
- Verify the dew point sensor is achieving the correct dew point and needle valves are set correctly, if applicable.
- Verify all temperature settings are correct.
- Verify no alarms are present. *Refer to Section 5 for screen shots and descriptions if necessary.*
- Check mufflers. Clean or replace as needed. After first 2-3 weeks of operation, change the exhaust mufflers; after that, replace as necessary.
- Verify EMS RH sensor needle is set correctly and exhausting a slight amount of air to ambient.

6.2.2 SEMI-ANNUAL

- Repeat all weekly inspections and record data in the Maintenance Log in this manual.
- Verify the system is operating properly in each sequence or step of operation (*Refer to Section 5 for more information*)..
- Verify the operation of all pressure gauges, temperature indicators, and outlet dew point sensor.
- Verify the system is free of leaks, fix any air leaks as needed.
- Remove and inspect all filters for excessive particulate loading and physical damage. If required, replace elements

on pre-filters, after filters, and pilot air filters.

- Check desiccant condition. Powder in the mufflers is an indication of the status of the desiccant.
- Check tightness of high and low voltage terminations.



- Check all solenoid valves - check valve seating, coil condition, and control circuit.

6.2.3 ANNUAL

- Repeat all weekly and semi-annual inspections.
- Replace all filter elements including pre-filter, after filter, and pilot air filter.
- Replace purge exhaust mufflers.
- Verify the operation of all pressure gauges and temperature indicators.
- Verify system is leak-free
- Verify the system is operating properly in each sequence or step of operation (*refer to Section 5 for screen shots and descriptions if necessary*).

SECTION 7: TROUBLESHOOTING

7.1 Introduction

The following section briefly discusses the various faults that can occur in the desiccant air dryer, the reason of the fault, and how it can be rectified. If you do not find the solution to your problem, contact your Aircel representative or the factory. All necessary safety and precautionary steps must be followed before attempting to perform any of the recommended measures to resolve any faults in the air dryer.

If at any time, you notice anything unusual that can not be resolved through this troubleshooting guide, contact your Aircel representative or the factory at the phone number found at the back of this manual.

Do not assume these are the only problems that may occur. All available data concerning a problem should be systematically analyzed before undertaking any repairs or component replacement procedures.



WARNING!

In addition to the below notes and warnings, refer to general safety procedures, safe operating procedures, and any safety procedures required by end user.



WARNING!

Pressure Hazard

This machine contains contents under low to medium pressure, which can cause injury.

- To avoid possible hazard or injury, the operator should be fully familiar with the refrigerated dryer system and its operation.
- When the system is shutdown and power removed, lock out power supply and depressurize system before performing maintenance or service work to avoid injury to personnel or property damage.



WARNING!

Electric Shock Hazard

This machine is connected to high voltage power, which can cause severe electrical shock and injury.

- Follow proper lock out/tag out procedures before performing service or maintenance work.
- Prior to performing any maintenance on the dryer, all personnel are strongly advised to familiarize themselves with the equipment by reading the entire contents of this operation manual.
- Follow all safety procedures prior to performing any maintenance activity on the dryer.
- Some troubleshooting may have to be done while system is pressurized and energized. Use extreme caution.



CAUTION

Inappropriate Tools Hazard

Using inappropriate tools for installation or maintenance work can lead to personal injury or property damage.

Appropriate tools must be used for all installation and maintenance work.

7.2 AEHD Series Troubleshooting Guide

Problem	Probable Cause	Remedy
High Dew Point	High inlet air flow	<ul style="list-style-type: none"> Reduce inlet air flow
	Inlet air temperature above design specification	<ul style="list-style-type: none"> Reduce inlet air temperature to design specification
	Poor inlet pre-filtration	<ul style="list-style-type: none"> Check pre-filter element(s); replace as needed
	Inlet air pressure below design specification	<ul style="list-style-type: none"> Increase pressure to dryer
	Purge flow shut off or not properly adjusted	<ul style="list-style-type: none"> Set purge flow to correct setting using purge adjustment valve
	Back pressure in regenerating chambers	<ul style="list-style-type: none"> Muffler(s) are clogged, install new muffler(s). Desiccant bed screen(s) are clogged, clean screens.
	Inlet pre-filter drain not working	<ul style="list-style-type: none"> Clean or replace drain
	Exhaust valve(s) not fully opening or closing	<ul style="list-style-type: none"> Clean and/or replace exhaust valve or actuator
	Outlet check valve leaking	<ul style="list-style-type: none"> Clean and/or replace check valve
	Purge check valve leaking	<ul style="list-style-type: none"> Clean and/or replace check valve
	Low heater temperature or heater not working	<ul style="list-style-type: none"> Check heater temperature controller; adjust if necessary. Check thermocouples. Check PLC. Check fuses. Adjust purge adjustment valve if needed.
High Pressure Drop	High inlet flow rate	<ul style="list-style-type: none"> Reduce inlet flow rate to meet dryer specification
	Inlet pre-filter dirty	<ul style="list-style-type: none"> Inspect and replace as needed
	Low inlet pressure	<ul style="list-style-type: none"> Increase inlet pressure to design specification
	Desiccant dusting	<ul style="list-style-type: none"> High inlet flow velocities due to high flow

APPENDIX A: SPECIFICATIONS

A.1 Dryer specifications - AEHD Series

For dimensions, weights, and connection sizes, see the drawing of the dryer model provided at purchase.

Type of dryer: Desiccant

Desiccant type: Premium grade activated alumina

Power supply: 460 VAC, 3 Ph, 60 Hz

APPENDIX B: MATERIAL SAFETY DATA SHEETS

B.1 Activated Alumina Desiccant



The Chemical Company



eCompressedair.com | 866-650-1937

Safety data sheet

F200

Revision date : 2009/12/04
Version: 3.0

Page: 1/5
(30286124/MDS_GEN_US/EN)

1. Substance/preparation and company identification

Company
BASF CORPORATION
100 Campus Drive
Florham Park, NJ 07932, USA

24 Hour Emergency Response Information
CHEMTREC: 1-800-424-9300
BASF HOTLINE: 1-800-832-HELP

2. Composition/information on ingredients

<u>CAS Number</u>	<u>Content (W/W)</u>	<u>Chemical name</u>
1333-84-2	>= 94.0 - <= 100.0 %	Aluminum oxide (Al ₂ O ₃), hydrate

3. Hazard identification

Emergency overview

CAUTION: MAY CAUSE EYE, SKIN AND RESPIRATORY TRACT IRRITATION.
May cause difficulty breathing.
Prolonged or repeated contact may result in dermatitis.
Contact with the eyes or skin may cause mechanical irritation.
Contains material which may indicate/cause the possibility of sensory and pulmonary irritation.
Avoid contact with the skin, eyes and clothing.
Avoid inhalation of dusts.
Use with local exhaust ventilation.
Wear a NIOSH-certified (or equivalent) particulate respirator.
Wear safety glasses with side-shields.
Wear chemical resistant protective gloves.
Wear protective clothing.
Eye wash fountains and safety showers must be easily accessible.

Potential health effects

Primary routes of exposure

Routes of entry for solids and liquids include eye and skin contact, ingestion and inhalation. Routes of entry for gases include inhalation and eye contact. Skin contact may be a route of entry for liquified gases.

4. First-aid measures

If inhaled:

Keep patient calm, remove to fresh air. If necessary, give oxygen. If not breathing, give artificial respiration. Seek medical attention if necessary.

C.1 Activated Alumina Desiccant

Safety data sheet

F200

Revision date : 2008/12/04
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If on skin:

After contact with skin, wash immediately with plenty of water and soap. Consult a doctor if skin irritation persists.

If in eyes:

In case of contact with the eyes, rinse immediately for at least 15 minutes with plenty of water. Immediate medical attention required.

If swallowed:

No hazards anticipated. If large quantities are ingested, seek medical advice.

5. Fire-fighting measures

Flash point: Non-flammable.

Additional information:

Use extinguishing measures to suit surroundings.

Hazards during fire-fighting:

No particular hazards known.

Protective equipment for fire-fighting:

Wear self-contained breathing apparatus and chemical-protective clothing.

NFPA Hazard codes:

Health : 0 Fire: 0 Reactivity: 1 Special:

6. Accidental release measures

Cleanup:

Vacuum up spilled product. Place into suitable container for disposal.

7. Handling and storage

Handling

General advice:

Avoid dust formation in confined areas. Avoid contact with the skin, eyes and clothing. Ensure adequate ventilation.

Storage

General advice:

Keep container tightly closed in a cool, well-ventilated place.

Storage stability:

Keep container dry.

8. Exposure controls and personal protection

Components with workplace control parameters

Aluminum oxide (Al ₂ O ₃), hydrate	OSHA	PEL 5 mg/m ³ Respirable fraction ; PEL 15 mg/m ³ Total dust ;
	ACGIH	TWA value 1 mg/m ³ Respirable fraction ;

C.1 Activated Alumina Desiccant

Safety data sheet

F200

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Advice on system design:

Provide local exhaust ventilation to control dust. Provide local exhaust ventilation to maintain recommended P.E.L.

Personal protective equipment

Respiratory protection:

Wear a NIOSH-certified (or equivalent) particulate respirator. Observe OSHA regulations for respirator use (29 CFR 1910.134). Wear appropriate certified respirator when exposure limits may be exceeded.

Hand protection:

Wear chemical resistant protective gloves., Consult with glove manufacturer for testing data.

Eye protection:

Safety glasses with side-shields.

Body protection:

Body protection must be chosen based on level of activity and exposure.

9. Physical and chemical properties

Form:	powder, granules, pellets, balls	
Odour:	odourless	
Colour:	off-white	
pH value:	9.4 - 10.1	
Melting point:	2,050 °C	
Boiling point:		No data available.
Vapour pressure:		No data available.
Density:		No data available.
Bulk density:	approx. 650 kg/m3 38.0 - 52 lb/ft3	(68 °F)
Partitioning coefficient n-octanol/water (log Pow):		No data available.
Viscosity, dynamic:		No data available.
Solubility in water:		insoluble

10. Stability and reactivity

Substances to avoid:

water

Hazardous reactions:

The product is chemically stable.
Addition of water leads to increase in temperature.

11. Toxicological information

Oral:

Information on: Aluminum oxide
LD50/rat: > 5,000 mg/kg (OECD Guideline 401)

C.1 R-134a Refrigerant



June 10, 2015 (rev. 1)

SAFETY DATA SHEET R-134a

7. HANDLING AND STORAGE

NORMAL HANDLING: Always wear recommended personal protective equipment. Avoid breathing vapors and liquid contact with eyes, skin or clothing. Do not puncture or drop cylinders, expose them to open flame or excessive heat. Use authorized cylinders only. Follow standard safety precautions for handling and use of compressed gas cylinders. R-134A should not be mixed with air above atmospheric pressure for leak testing or any other purpose.

STORAGE RECOMMENDATIONS: Store in a cool, well-ventilated area of low fire risk and keep out of direct sunlight. Protect cylinder and its fittings from physical damage. Storage in subsurface locations should be avoided. Close valve tightly after use and when empty. Cylinder temperatures should not exceed 52° C (125° F).

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS: Provide local ventilation at filling zones and areas where leakage is probable. Mechanical (general) ventilation may be adequate for other operating and storage areas.

PERSONAL PROTECTIVE EQUIPMENT

SKIN PROTECTION: Skin contact with refrigerant may cause frostbite. General work clothing and gloves (leather) should provide adequate protection. If prolonged contact with the liquid or gas is anticipated, insulated gloves constructed of PVA, neoprene or butyl rubber should be used. Any contaminated clothing should be promptly removed and washed before reuse.

EYE PROTECTION: For normal conditions, wear safety glasses. Where there is reasonable probability of liquid contact, wear chemical safety goggles.

RESPIRATORY PROTECTION: None generally required for adequately ventilated work situations. For accidental release or non-ventilated situations, or release into confined space, where the concentration may be above the PEL of 1,000 ppm, use a self-contained, NIOSH- approved breathing apparatus or supplied air respirator. For escape: use the former or a NIOSH-approved gas mask with organic vapor canister.

ADDITIONAL RECOMMENDATIONS: Where contact with liquid is likely, such as in a spill or leak, impervious boots and clothing should be worn. High dose-level warning signs are recommended for areas of principle exposure. Provide eyewash stations and quick-drench shower facilities at convenient locations. For tank cleaning operations, see OSHA regulations, 29 CFR 1910.132 and 29 CFR 1910.133.

EXPOSURE GUIDELINES

<u>INGREDIENT NAME</u>	<u>ACGIH TLV</u>	<u>OSHA PEL</u>	<u>OTHER LIMIT</u>
1,1,1,2-Tetrafluoroethane	None	None	*1000 ppm TWA (8hr)

* = Workplace Environmental Exposure Level (AIHA)

OTHER EXPOSURE LIMITS FOR POTENTIAL DECOMPOSITION PRODUCTS:

Hydrogen Fluoride: ACGIH TLV: 3 ppm ceiling

C.1 R-134a Refrigerant



June 10, 2015 (rev. 1)

SAFETY DATA SHEET R-134a

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE:	Clear, colorless liquified gas
ODOR:	Slight ethereal
PHYSICAL STATE:	liquified gas
BOILING POINT (@ 736 mm Hg):	F: -15.7 C: -26.5
VAPOR PRESSURE (psia):	96 @ 77F (25C)
VAPOR DENSITY (AIR = 1):	3.6 @ 77F (25C)
SPECIFIC GRAVITY (H ₂ O = 1):	1.208 @ 77F (25C)
EVAPORATION RATE (CCL ₄ =1):	>1
SOLUBILITY IN WATER (@14.7 psia):	0.15 WT% @ 77F (25C)
PERCENT SOLIDS BY WEIGHT:	Gas
PERCENT VOLATILE:	100% By Wt
VOLATILE ORGANIC COMPOUNDS (VOC):	Gas

10. STABILITY AND REACTIVITY

NORMALLY STABLE (CONDITIONS TO AVOID):

The product is stable.

Do not mix with oxygen or air above atmospheric pressure. Any source of high temperature, such as lighted cigarettes, flames, hot spots or welding may yield toxic and/or corrosive decomposition products.

INCOMPATIBILITIES:

Under specific conditions: e.g. very high temperatures and/or appropriate pressures – Freshly abraded aluminum surfaces may cause strong exothermic reaction. Chemically active metals: potassium, calcium, powdered aluminum, magnesium and zinc.

HAZARDOUS DECOMPOSITION PRODUCTS:

Halogens, halogen acids and possibly carbonyl halides. These materials are toxic and irritating.

HAZARDOUS POLYMERIZATION:

Will not occur.

11. TOXICOLOGICAL INFORMATION

IMMEDIATE (ACUTE) EFFECTS:

LC₅₀ : 4 hr. (rat) - > 500,000 ppm / Cardiac Sensitization threshold (dog) > 80,000 ppm

DELAYED (SUBCHRONIC AND CHRONIC) EFFECTS:

Teratogenic NOEL(rate and rabbit) – 40,000 ppm
Subchronic inhalation NOEL (rat) - 50,000 ppm / Chronic NOEL – 10,000 ppm

OTHER DATA:

Not active in four genetic studies
Toxicity to reproduction: Did not show mutagenic or teratogenic effects in animal experiments

C.1 Activated Alumina Desiccant

Safety data sheet

F200

Revision date : 2008/12/04

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(30286124/MDS_GEN_US/EN)

Skin irritation:

*Information on: Aluminum oxide
rabbit: non-irritant (OECD Guideline 404)*

12. Ecological information

*Information on: Aluminum oxide
Acute and prolonged toxicity to fish:
DIN 38412 Part 15 static
golden orfe/LC50 (96 h): > 500 mg/l
The product has not been tested. The statement has been derived from products of a similar structure and composition.*

*Information on: Aluminum oxide
Acute toxicity to aquatic invertebrates:
OECD Guideline 202, part 1 static
Daphnia magna (48 h): > 100 mg/l*

13. Disposal considerations

Waste disposal of substance:

Dispose of in accordance with local authority regulations.
Check for possible recycling.
Disposal requirements are dependent on the hazard classification and will vary by location and the type of disposal selected.
All waste materials should be reviewed to determine the applicable hazards (testing may be necessary).

14. Transport information

Land transport

USDOT

Not classified as a dangerous good under transport regulations

Sea transport

IMDG

Not classified as a dangerous good under transport regulations

Air transport

IATA/ICAO

Not classified as a dangerous good under transport regulations

15. Regulatory information

Federal Regulations

C.1 Activated Alumina Desiccant

Safety data sheet F200

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(30286124/MDS_GEN_US/EN)

Registration status:
TSCA, US released / listed

OSHA hazard category: ACGIH TLV established

SARA hazard categories (EPCRA 311/312): Acute

SARA 313:

<u>CAS Number</u>	<u>Chemical name</u>
1333-84-2	Aluminum oxide (Al ₂ O ₃), hydrate

State regulations

State RTK

<u>CAS Number</u>	<u>Chemical name</u>	<u>State RTK</u>
1333-84-2	Aluminum oxide (Al ₂ O ₃), hydrate	MA, NJ, PA

16. Other information

HMIS III rating

Health: 1 Flammability: 0 Physical hazard: 1

HMIS uses a numbering scale ranging from 0 to 4 to indicate the degree of hazard. A value of zero means that the substance possesses essentially no hazard; a rating of four indicates high hazard.

Local contact information

prod_reg@basf.com

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END OF DATA SHEET

WARRANTY INFORMATION

Aircel warrants that its Standard Refrigerated Air Dryers are free from defects in materials and workmanship for two years from the date of invoice. Warranty coverage for this time period will be parts and labor for the first year and parts only for the second. Custom engineered products, desiccant dryers, chillers and nitrogen generators are warranted to be free from defects in materials and workmanship for one year from date of invoice. Warranty coverage for this time period will be for parts and labor.

Aircel warranty excludes damages due to corrosion, lack of proper maintenance, incorrect installation, modification, or misapplication of equipment. Routine maintenance or adjustment required under normal operation as outlined in the Aircel operation and maintenance manuals are not covered under warranty.

Once Aircel has been given adequate opportunity to remedy any defects in material or workmanship in accordance with Aircel Warranty Policy and Procedures, Aircel retains the sole option to accept return of the goods, with freight paid by the purchaser, and to refund the purchase price for the goods

after confirming the goods are returned undamaged and in usable condition. Such a refund will be the full extent of Aircel liability. Aircel shall not be liable for any other costs, expenses or damages whether direct, indirect, special, incidental, consequential or otherwise. The terms of this warranty may be modified only by a special warranty document signed by a CEO, General Manager or Vice President of Aircel.

There exist no other representations, warranties or guarantees except as stated in this paragraph and all other warranties, including merchantability and fitness for a particular purpose whether express or implied, are hereby expressly excluded and disclaimed.



Parts & Service

For genuine Aircel replacement parts, call

800.767.4599

For faster service, please have your unit model and serial number, part number, or description.