

nano



User Guide

ABP Blower Purge Desiccant Dryer

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www.nano-purification.com

DRYER DATA SHEET

Model Number: _____Serial Number:_____

Dryer Type: _____Date of Manufacture:_____

Ship Date: _____Installation Date:_____

Customer Name: _____

Customer Address: _____

Customer City: _____State/Zip:_____

Accessories: _____

Other: _____

DRYER DATA SHEET

Dryer Inlet Air Flow Rate: _____

Dryer Inlet Temperature: _____

Dryer Ambient Temperature: _____

Dryer Voltage: _____

Dryer MCA Minimum Circuit Ampacity: _____

Dryer MOP Maximum Overcurrent Protection: _____

Dryer Operating Pressure: _____

Dryer Maximum Operating Pressure: _____

Dryer Vessel Pressure Relief Valve Setting: _____

Dryer Desiccant Type: _____

Dryer Desiccant Weight Total for System: _____

Dryer Outlet Dew Point: _____

Dryer Control Time Cycle: _____

Dryer EMS Dew Point Sensor Setting (for sensor outlet dew point): _____

High Dew Point Setting: _____

Demand Cycle Setting: _____

Outlet Dew Point Readout on Display: _____

Electrical Drawing Number: _____

Mechanical Drawing Number: _____

PLC Software Program Number: _____

Control Air Filter Element Number: _____

Inlet Pre-Filter Element Number (option): _____

Outlet After-Filter Element Number (option): _____

Inlet Valve: _____

Purge Exhaust Valve: _____

Vessel National Board Number (Left and Right Vessels): _____

Dryer System Weight: _____

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NOTICE

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.



WARNING!

GENERAL SAFETY PROCEDURES:

- Improper installation, operation, or maintenance may contribute to conditions in the work area or facility that could result in personal injury and product or property damage. Check that all equipment is properly selected and sized for the intended use.
- Consult and comply with national and local codes relating to fire or explosion and all other appropriate codes when determining the location and operation of this equipment.
- 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, NFPA No. 70-latest edition.
- A qualified installation and service agent must complete installation and service of this equipment.
- DO NOT weld on / to pressure vessel or modify it in any way.
- DO NOT remove, modify, or adjust protective or safety devices.
- Lock out power supply and depressurize system before performing maintenance or service work.
- DO NOT operate the equipment with the control panel door open.

Notice: For optimum performance, use only nano Aircel replacement parts.

Notice: For information and notes specific to custom designed and built dryers, reference the drawing package provided with the unit. See warranty on manual back cover for custom engineered products.

SAFETY INSTRUCTIONS

Safety Symbols Used in Manual



IMPORTANT INFORMATION: Readers of the manual must pay extra attention to instructions and information succeeding this symbol.



WARNING: This indicates that it is dangerous and could result in physical injury and death if the instructions are not followed correctly.



ELECTRICAL DANGER HIGH VOLTAGE: This means that there is a risk of electrical shock and only authorized personnel with proper gear must approach it.



HIGH NOISE AREA: All personnel are required to wear ear protectors before approaching the vicinity of the equipment.



HAZARDOUS FUMES & GASES: Personnel must wear protective gear to prevent inhaling of the gases and fumes.



SUSPENSION POINTS: Look for these symbols before making any attempt to move or relocate your equipment.



TIPS & SUGGESTIONS: Following these tips can make your work easier.



EXTREME CAUTION: This indicates that there might be possible risk of material damage and personnel are advised to exercise extra caution.

GENERAL SAFETY INSTRUCTIONS

What You Must Do



1. Certified/authorized electricians must perform electrical work.
2. Electrical work must conform to the specifications indicated by nano and any local or state laws that may apply.
3. Personnel must wear appropriate safety gear before working on any electrical or mechanical aspects of the machine.
4. Appropriate tools have to be used for all installation and maintenance work. If special tools are required and are not available to the installation crew, contact the factory or your nano Aircel representative.
5. A copy of the Operation Manual must be made available to all personnel involved with the installation, operation, and maintenance of the equipment.
6. Before performing any maintenance operations on the equipment, the unit must be shut down, isolated, electrical power removed, and completely depressurized.
7. To ensure compatibility and continued trouble free operation, only genuine Aircel parts must be used.

What You Must Not Do



1. Do not make any constructional changes to the unit. Only nano or its authorized representatives with the prior approval can perform any constructional work on the machine.
2. Do not use foreign parts.
3. Compressed air from the dryers is not to be used for breathing purposes - install a breathing air package to ensure conformance with OSHA regulations.
4. Do not disable or disengage any protective equipment used on the machine.

Safe Operating Procedures



1. 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.
2. 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.
3. Only use original fuses for the rated voltage and current.
4. Shut down the unit in the correct recommended procedure.
5. Before any work on system, always depressurize the unit and remove all electrical power.
6. After shut down, put up warning notice to prevent the unit from being switched "ON" accidentally.
7. 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.
8. Secure condensate drain lines. Unsecured, flexible drain lines may whip violently under pressure and may cause bodily harm.

nano Aircel air dryers do not remove carbon monoxide (CO) and are 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. nano disclaims any liability whatsoever for loss, injury, or damage.

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.

Desiccant First Aid Recommendations

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.

SKIN CONTACT

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

EYE CONTACT

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

SPILLS

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

Purpose and Intended Use

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.

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 unit 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.



WARNING!

- 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 hand cart, fork lift, or crane is recommended for unloading and installation.
- Lift unit by lifting lugs and frame only. Do not lift by piping.



WARNING!

- 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.



CAUTION!

- A copy of the Operation Manual must be made available to all personnel involved with the installation, operation, and maintenance of the equipment, to avoid injury to personnel or property damage.
- Appropriate tools must be used for all installation and maintenance work, to avoid injury to personnel or property damage.

DESIGN PARAMETERS

Type of dryer: Desiccant

Desiccant type: Premium Grade Activated Alumina

Power supply: 460 Volt / Three Phase / 60Hz

All Models			
Parameter Description	Air Pressure	Air Inlet Temperature	Ambient Temperature
Maximum	135 psig	120 (°F)	120 (°F)
Minimum	60 psig	40 (°F)	38 (°F)

DRYER DESCRIPTION

System

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.

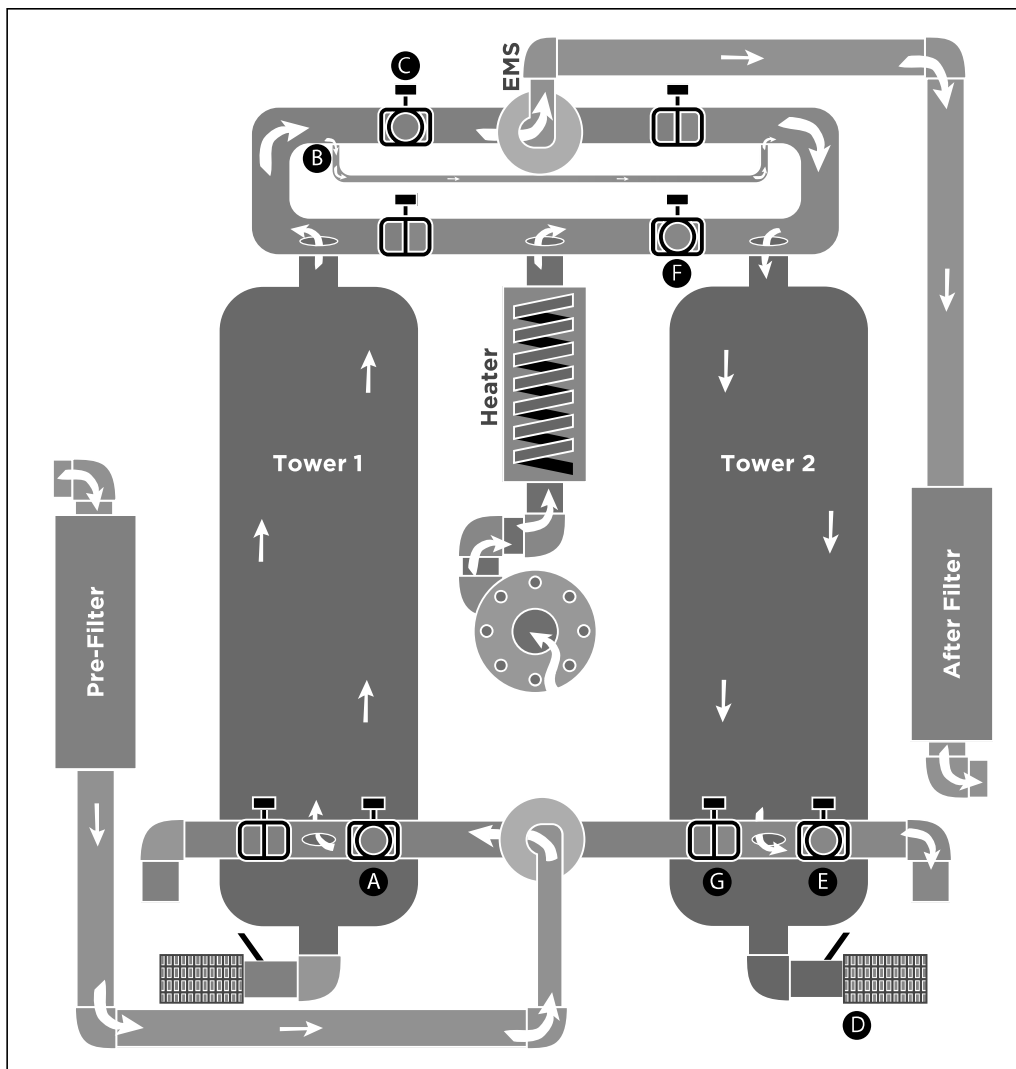
The self-contained heated regenerative desiccant dryer includes a control system, dryer, regeneration blower and heater, and silencers.

The heated blower purge regenerative desiccant dryer features high separation efficiency desiccant to ensure high water removal rates. Control system include the PLC electronic controller and the energy management system. Both offer consistent reliable control and tremendous energy savings. The standard EMS (Energy Management System) allows for either fixed time or energy saving demand modes of operation.

How It Works

1. Pre-filtered wet compressed air enters the bottom of the on-line vessel.
2. Compressed air passes upward through the desiccant bed; moisture is removed, lowering the dew point to -40o F.
3. Dry compressed air exits the top of the vessel and flows downstream to the after filter, monitored constantly via standard dew point sensor. This EMS feature extends the drying period until the target dew point occurs. This greatly reducing energy costs.
4. Prior to regeneration, saturated on line vessel goes off-line and depressurizes to ambient through an angle seat valve & muffler.
5. After the off-line vessel has depressurized, a blower draws in ambient air for regeneration.
6. The air passes through an immersion heater, check valve, and enters top of regenerating vessel.

7. As the hot ambient air passes downward through the desiccant bed, water molecules are released from the surface of the desiccant.
8. Hot regeneration air passes through a butterfly valve and exhausts to atmosphere. Heating phase may terminate early due to low load conditions; this energy savings is automatically passed onto the customer and allows for earlier cooling process to begin.
9. At the end of the heating phase of the cycle, the desiccant bed, although regenerated, remains hot. The temperature of the bed must be lowered to reduce dew point and temperature spikes in the process air when the bed goes back on-line. This is accomplished by allowing a slipstream of dry process air, controlled by an automatic valve, to flow from the on-line vessel into the off-line vessel. This slipstream is also used to re-pressurize the off line vessel after it has been cooled placing the unit into standby. The EMS control continues to save by extending the drying period through outlet dew point monitoring until the target dew point is reached.
10. Unique to the nanoAircel ABP is our parallel running period 10 minutes after vessel switchover. During this period, the incoming flow of wet compressed air is directed through both vessels. This step further reduces the dew point and temperature spikes associated with heated dryers. This parallel cooling mode requires no purge air.



TYPICAL SCHEMATIC FLOW DIAGRAM

INSTALLATION

Lifting Information



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 lifting lugs. Do not lift by piping.
4. Check the approximate weight provided on the specification control drawing to ensure adequate crane or 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.

Installation Codes and Procedures

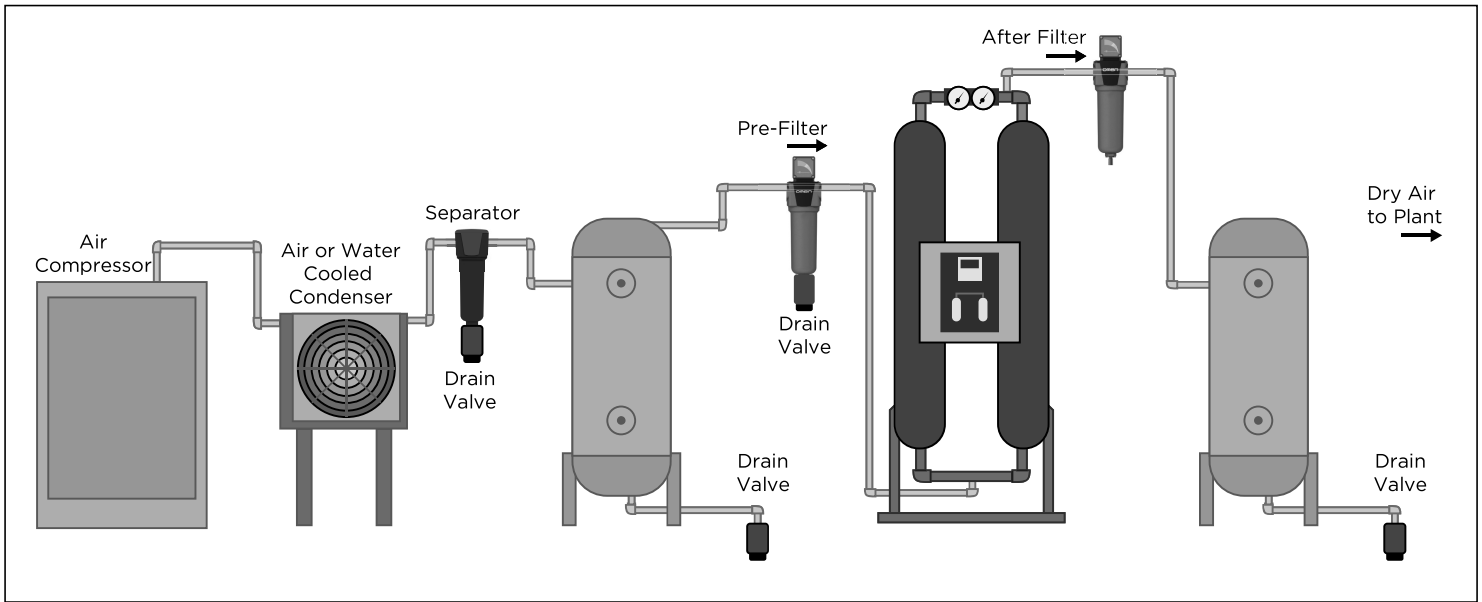
This product should be operated only from the type of power source specified. If unsure of the type of power supply for the desired outlet, consult a local power company. Failure to comply may result in personal injury and/or property damage.

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.

1. Safe and efficient operation of the unit depends on proper installation.
2. 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.
3. A qualified installation and service agent versed in all regulatory codes must complete installation of this unit.
4. All shipping materials, including shipping covers, must be removed from the unit prior to, or during unit installation.

INSTALLATION, CONT.



TYPICAL INSTALLATION DIAGRAM

Installation

1. Locate unit on a level foundation.
2. Install unit to provide adequate clearance for maintenance services.
3. The frame must be securely bolted to the foundation to prevent movement resulting from earth tremors and induced piping vibration.
4. Install unit using the correct pipe size and pressure rating. See drawing package provided with the unit.
5. Provide adequate power supply.
6. Do not place the dryer in service until both vessels are fully regenerated, the operating cycle in the PLC is verified, and the system is at the correct operating pressure.

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.
7. The regeneration air outlet should be piped away from all equipment and occupied spaces. The pressure loss through the regeneration air outlet piping should not exceed 2 inches of water column to prevent excessive back pressure on the blower. If regeneration outlet line is to be piped upwards, a manual drain valve must be installed at the lowest point to drain any liquid water.
8. The relief valves can cause an unwanted condition or hazard upon discharging. Pipe the outlets to a safe location. 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 that the vessels are subjected to heat, such as in a conflagration. They are set to relieve at the maximum design pressure of the desiccant vessels.
9. If there are any changes in the operating conditions of the system from those published in this manual, contact Technical Support for advice on necessary adjustments.

COMPONENT OPERATION

Adsorption

NOTICE: The heated regenerative desiccant dryer is not designed to remove bulk liquid, therefore a cyclone separator or a mist eliminator, not provided with the system, must be installed to remove bulk-liquid condensate from the air compressor's aftercooler.

The bulk-liquid free compressed air from the customer-supplied cyclone separator is delivered to the dryer through a coalescing pre-filter located upstream of the dryer. The pre-filter (optional with dryer) cleans by removing particles and liquid mist down to a residual oil content of 0.03 ppm, based on an inlet concentration of 3 ppm. The coalesced liquid is removed from the pre-filter housing by the zero air-loss drain valve.

The airflow continues through the inlet control butterfly valve into the bottom of the on-line desiccant chamber. A desiccant support and distribution screen at the chamber inlet distributes the flow evenly throughout the desiccant bed. The moist air flows upward through the desiccant bed where it is dried. The dried air exits the desiccant chamber through the upper flow distributor and retaining screen at the top of the vessel. Before leaving the system to enter the compressed air distribution system, the air is purified further by an after filter (optional with dryer) that removes fine dust and abraded desiccant.

Regeneration

While one desiccant chamber is on-line drying compressed air, the other chamber is off-line and depressurized for desiccant regeneration. The inlet valve to the off-line chamber closes and the vessel depressurizes through an exhaust valve and silencer to the atmosphere.

When the vessel low pressure switch indicates successful depressurization, an atmospheric pressure blower is started to provide regeneration air to the off-line desiccant bed. The ambient regeneration air, heated to 400° F by an electric resistance heater, is controlled by a manual valve installed at the blower discharge or a slide gate damper at blower intake.

The heated air is directed downward through the off-line wet desiccant bed and vented from the system through the regeneration air outlet valve in the lower piping manifold. When the desiccant bed is fully regenerated, 175 minutes maximum heating time, the electric heater is turned off. The blower is then turned off 6 minutes later, for heater cool-down, and isolated by check valves.

The regeneration air heater outlet temperature is monitored by a thermocouple and PLC control system. A thermocouple is also installed in the regeneration air outlet manifold. If preset temperature of 200°F is sensed at the regeneration air outlet prior to the end of the maximum heating time, the heater will be turned off early to save energy.

A heater sheath over-temperature switch is provided on each heater circuit to protect the heater elements in the event of a control fault or heating element failure.

After the desiccant is thermally regenerated, a portion of dry outlet air, controlled by the manual purge flow adjusting valve, is expanded to atmospheric pressure and passed through the off-line vessel to cool the desiccant. The airflow direction is downward through the off-line vessel during depressurization, heating and cooling which prevents fluidization of the desiccant and greatly reduces abrasion and attrition of the desiccant granules. The cooling phase continues for 45 minutes (maximum) or until the temperature switch in the lower manifold detects 120°F. The regeneration outlet valve is closed and the vessel is re-pressurized with dry air. When full line pressure is achieved in the regenerated vessel, which is verified by pressure sensors, the inlet valve is opened and the two chambers run in parallel mode for 10 minutes.

The two vessels are switched-over at the end of the drying period. The regenerated bed is placed on-stream and the water laden bed of desiccant is taken off-stream for regeneration.

The manual purge flow adjusting valve must be set at start-up to allow the dryer to re-pressurize in 4 minutes. This will ensure that the correct purge flow is being used for cooling and that full system pressure is achieved prior to change over.

VESSEL CHANGEOVER

Time Controlled

The PLC control system initiates the changeover procedure when the timed regeneration and re-pressurization phases for the off-line chamber are complete.

With the standard EMS (Energy Management Control System), the Time Controlled or Dew point Controlled drying mode can be selected at any time during the cycle.

Dew Point Controlled

The standard EMS (Energy Management control System) initiates the changeover procedure when the timed regeneration, re-pressurization, and the dew point drying extension phases for the off-line chamber are complete.

When the dryer is in the Dew point Controlled mode, the effluent dew point is continuously monitored to determine if the drying period can be extended or if vessel changeover is required. If a high dew point is sensed at dryer outlet, changeover at the end of the re-pressurization results; if a low dew point is sensed at dryer outlet, dew point extension drying results.

Dew point extension drying can occur for up to 6 hours on the on-line desiccant chamber. During this extended drying period, dew point at the dryer outlet is monitored and if the high value is sensed, an immediate vessel changeover occurs. If this value is not sensed, vessel changeover occurs at the end of the 6 hour drying extension period.

At each vessel changeover, the chamber that was in service is regenerated. Time Controlled operation can be selected at any time while in the Dew point Controlled mode.

PRELIMINARY START-UP CHECKLIST

During transport and storage of the equipment, the desiccant can become pre-loaded with atmospheric moisture. Regenerate both desiccant beds before placing the dryer in service. Installation must be complete and process air available to regenerate the desiccant beds.

1. Check that the inlet and outlet connections are the correct size and pressure rating, and tightened securely.
2. Check that the correct power supply is connected to the dryer with an adequate disconnect switch.
3. Check that all instrument service valves are OPEN and all vent valves are CLOSED.
4. Check that all liquid drain service valves are OPEN.
5. With the customer-supplied compressed air to the system, OPEN the inlet valve slowly 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.
6. Check the complete air system piping connections and dryer system connections for leaks at this time. Repair and retest all leaks.
7. Make certain control air pressure has pressure and is set at 100 psi.
8. Verify that all instrumentation (pressure gauge[s] and drain air tubing fittings) are tight.
9. With the electrical power ON, verify that the PLC is operational after turning on the dryer power off/on switch. After a few minutes, the regeneration process for the right vessel will begin. Determine the rotation of the blower motor by observing the shaft rotation at the back end of the motor. Compare the rotation arrow on blower housing or in the blower manual. If rotation is not correct, turn the dryer off and turn the disconnect switch off. Lock-out the electrical power to the unit. A qualified electrician can then open the electrical enclosure and exchange two of the three electrical leads on the motor starter. The unit should then be restarted and the correct rotation of the blower motor verified.

Observe the temperature of the regeneration air leaving the electric heater. Adjust the blower discharge manual valve or blower intake slide gate damper until the outlet temperature is 400°F. If the system has a blower discharge valve to ambient (typically used on the vortex blowers on Aircel models 800-2500) the valve should be initially closed for max flow. If the system can not maintain 400°F. temperature for regeneration then slightly open valve to ambient this will cause less flow to heater causing temperature to rise make changes gradually.

If the system has a blower intake slide gate damper (typically used on the centrifugal blowers on Aircel models 3000 and up the valve should be initially open for max flow). If the system can not maintain 400°F temperature for regeneration then slightly close valve to cause less flow to heater causing temperature to rise. Make changes gradually.

During the re-pressurization operation, full line pressure should be achieved in the freshly regenerated desiccant vessel in 4 minutes to assure the design cooling purge flow rate and complete pressurization in time for vessel switch over. Incrementally open the purge control valve to decrease the re-pressurization time. Close in on the valve to increase the re-pressurization time.

To further reduce dew point and heat spike at switchover the manual re-pressurization adjustment valve can be adjusted open slightly more when the tower is in the re-pressurizing mode to re-pressurize the tower within 1 to 1 1/2 minutes.

10. Observe all operations during one complete cycle on both chambers and verify PLC and valve operations.
11. Slowly open the system outlet valve to pressurize the downstream system to start drying air.
12. Make certain dew point sensor valves are adjusted properly. The valve upstream of the dew point sensor to be full open and the valve downstream of the sensor should be just slightly cracked open so just a slight amount of air is felt on the exhaust.
13. After start-up and approximately one month of service, check that all piping flanges and bolts are tight.

SHUT DOWN PROCEDURES



WARNING!

- 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.
- Regenerate both desiccant beds before unit shutdown. When the system is shutdown and power removed, open the dryer bypass valve and close the inlet valve to prevent the adsorption vessel from moisture overload.

Emergency Shutdown

The dryer can be shut down under emergency conditions under at any time by using the dryer power off/on switch or by turning the main disconnect switch OFF.

Short-Term Shutdown

For planned shut down, the regeneration process should be completed (heating and cooling) prior to stopping the dryer. This ensures that a fully regenerated bed will be available when the system is restarted. When the system is restarted, dryer operation resumes at the same point in the cycle as when it was shut down.

Long-Term Shutdown

1. Close the outlet valve to stop the process airflow.
2. Fully regenerate both vessels.
3. Leave the equipment depressurized with the system inlet and outlet valves closed and power removed.
4. The complete start-up procedure must be followed after a long-term shutdown.
5. Close both needle valves before and after the dew point sensor.

NORMAL OPERATION SETUP

Normal Dryer System Operation Setup

The following operational sequence should be followed for normal dryer system operation.

1. Make certain all gauge isolation valves, vent valves, instrument valves, pre-filter drain valves, etc. are in the correct positions.

2. Make certain the system has been pressurized to line pressure.

3. Ensure blower intake adjustment valve has been preset and locked down. Slight adjustment might be needed to maintain 400°F downstream of heater during the heat regeneration cycle.

4. Verify control air has pressure, set at 100 psi

5. Confirm the valve upstream of the dew point sensor is fully open, and valve downstream of the dew point sensor is slightly open - a slight air flow should be noticed at the end of the exhaust coil.

6. The Power On/Off switch is set to ON.

7. The System On/Off button must be turned On. This is accomplished by pressing the System On button on the control panel in the Main Menu screen. The color will be green for on and red for off.

8. Service Mode should not be active. Service Mode will not be visible or shown on the Running Sequence screens when not active. If Service Mode is shown, the service routine is active and needs to be place into normal operation. To deactivate Service Mode from the Running/ Step screens, press the Screen Unlock button until it starts blinking, then press the Main Menu button, displaying the Control/Main screen. Next, press the Service Menu button to activate the service screen. From here, press the Deactivate Service button. The Service Mode that was visible on each screen will disappear and the dryer will resume normal operation.

9. Check the temperature settings in the Control/Main menu by pressing the Temp Settings button and verify all settings are correct as needed.
10. Dew point Demand can be turned On or Off in the Control/Main menu. When On (Green in color), Dew point Demand is energy saving demand mode, extending the drying period if below outlet Dew point Demand setting in the Temp Settings screen. When the Dew point Demand button is Off (Red in color), the dryer is in fixed time mode, switching continuously on a standard time cycle.

11. Dry Cool Purge can be turned On or Off in the Control/ Main menu. When On (Green in color), a portion of the dry air outlet will help cool the regenerating bed and minimize the pressure dew point swing at switchover.

12. Blower Cool can be turned On or Off in the Control/ Main menu. When On (Green in color), the heater sheath cooling process will initiate for a total of 8 minutes prior to the Dry Cool Purge.

13. Typically, the Running Screens/Steps screens should be displayed on the system screen when in operation. Other screens (such as the Flow Diagram) can be displayed as the normal operation screen, if needed.

14. Verify no Common Shutdown alarms are active and require attention.

15. Make certain any filter, dryer, or user block and bypass valves are in the correct positions.

16. The system is ready to go on line and dry the process air.

Normal Settings	Heat Control	400
	Dew point Demand	- 50
	High Humidity	- 10

SERVICE INFORMATION

Maintenance

DAILY

With the dryer on line:

- Verify the operating pressure, temperature, and flow rate are correct and conform to those listed in the provided drawing.
- Verify that the optional pre-filter automatic drain is functioning by pressing its TEST button.
- Verify that chamber back pressure is not present during regeneration.
- Check the optional pre-filter and after filter for excessive pressure drop.

WEEKLY

- Verify the operating sequence with the Time Settings.
- Repeat all daily inspections and record data in the Maintenance Log in this manual.

MONTHLY

- Repeat all daily and weekly inspections.
- Verify the system is leak free.
- Verify the operation of all pressure gauges, temperature indicators, and dew point sensor.
- Verify the heater outlet temperature. Adjust the blower discharge valve or blower intake slide gate damper as needed. See startup section for adjustment. Check heat temperature settings in dryer system display.

QUARTERLY

- Repeat all monthly inspections.
- Check filter elements for dirt accumulation and seal leakage.
- Check the tightness of all flange bolts and all tube fittings.



WARNING!

- Prior to performing any maintenance on the system, disconnect power supply, properly lock out (tag out) electrical power supply, and depressurize the system to avoid personal injury and/or property damage.

YEARLY

- Check seats and seals on all switching valves, replace as needed.
- Replace the optional pre-filter and after filter elements.
- Dismantle, clean, and check the optional pre-filter drain valve. Inspect internal components for visual signs of wear and replace parts as necessary.
- Replace the regeneration silencers.
- Verify the current draw on the electrical immersion heater and the blower motor.
- Disassemble the valve actuators and inspect for wear and cleanliness.
- Check settings on temperature controls. Reference drawing provided with the unit.

MAINTENANCE LOG, WEEKLY INSPECTIONS

Desiccant Replacement

(For Models 2,500 scfm and Smaller)

Prior to performing service or maintenance work on the system, disconnect power supply, properly lock out (tag out) electrical power sources and depressurize the system to avoid personal injury and/or property damage.

1. Remove the covers or plugs from the desiccant drain ports. Reinstall the covers or plugs when vessels are empty.
2. To load the new desiccant, remove the covers or plugs on the fill ports located on the top head.
3. Install the amount and type of desiccant listed on the supplied drawing in each vessel.
4. Reinstall the covers or plugs on the desiccant fill ports.
5. Leak test all plugs and flanges removed in the change process. Repair and retest leak sites if necessary.

Desiccant Replacement

(For Models 3,000 scfm and Smaller)

Prior to performing service or maintenance work on the system, disconnect power supply, properly lock out (tag out) electrical power sources and depressurize the system to avoid personal injury and/or property damage.

All personnel must stand clear of the lifting device when it is in use, and no personnel may be allowed to stand under or pass under the drums or sacks of desiccant when they are raised by the lifting device. Failure to comply may result in personal injury and/or property damage.

First Desiccant Tower

1. Turn electrical power OFF and lock-out controller. Depressurize the compressed air dryer.
2. Equipment required:
 - Shop Vac, 6 hp or larger recommended
 - Two (2) hoses, 12 to 15 foot long, 2-in. diameter or larger recommended
3. Install one of the hoses on the suction side of the Shop Vac. This is the primary suction hose. The Shop Vac discharge will contain desiccant dust. If the dust is objectionable, install an additional hose to the outlet of

the Shop Vac and run the discharge hose outdoors.

4. Install a reducing flange on the Regeneration Air Outlet line to connect to the primary suction hose from the Shop Vac.
5. Connect the Shop Vac primary suction hose to the Regeneration Air Outlet line.
6. Remove the flange on the desiccant filling port on the upper head of the desiccant tower being filled. Install a reducing flange to connect to the secondary suction hose.
7. Immerse the secondary suction hose connected to the filling port into the desiccant drum or sack.
8. Place the drum or sack of desiccant on a Fork Lift. Carefully raise the desiccant to the level of the filling port.
9. Remove the Position Indicator on the Regeneration Air Outlet valve mounted on the desiccant tower to be filled. Turn the valve stem with a wrench by hand to open the Regeneration Air Outlet valve.
10. Inspect the installation to ensure the safety of the personnel.
11. Turn on the Shop Vac. Allow time to create a vacuum in the tower, and desiccant will be drawn into the vessel from the drum or sacks on the Fork Lift. The hose must remain submerged in the desiccant to provide continuous filling of the vessel.
12. Fill vessel to the start of the knuckle in the upper head of the vessel. The Shop Vac must be turned off and the flange on the filling port must be removed occasionally to determine the level of the desiccant in the vessel. A small rake with a long handle can be used to level the desiccant at these times.
13. After filling the first vessel, remove the reducing flange from the filling port and reinstall the original flange with the relief valve.
14. Turn the valve stem with a wrench by hand to close the Regeneration Air Outlet valve on the first vessel. Reinstall the Valve Position indicator.

Second Desiccant Tower

1. Remove the desiccant filling flange from the second vessel and install the reducing flange and secondary suction hose on this vessel.
2. Remove the Position Indicator on the Regeneration Air Outlet valve mounted on the second desiccant tower to be filled. Turn the valve stem with a wrench by hand to open the Regeneration Air Outlet valve.

WEEKLY INSPECTIONS, CONT.

3. With the Shop Vac secondary suction hose immersed in the desiccant drum or sack, turn on the Shop Vac and the desiccant will be drawn into the second vessel.
4. Fill vessel to the start of the knuckle in the upper head of the vessel. The Shop Vac must be turned off and the flange on the filling port must be removed occasionally to determine the level of the desiccant in the vessel. A small rake with a long handle can be used to level the desiccant at these times.
5. When the vessel is filled with desiccant to the proper level, remove the desiccant secondary suction hose and reducing flange and reinstall the original flange with its relief valve.
6. Turn the valve stem with a wrench by hand to close the Regeneration Air Outlet valve on the second vessel. Reinstall the Valve Position indicator.
7. Store the unused desiccant in a dry area for future use.
8. Replace the bucket or bin under the drain port and repeat the draining process until all of the desiccant is removed from the tower.
9. Replace the blind flange over the drain port and replace the bolts to secure the flange.
10. Repeat the unloading process on the second tower.

Desiccant Unloading

Prior to performing service or maintenance work on the system, disconnect power supply, properly lock out (tag out) electrical power sources and depressurize the system to avoid personal injury and/ or property damage.

Personnel must stand clear as the flange on the drain port is loosened and slid over. Personal injury can result from the desiccant discharge from the drain port.

1. Turn electrical power OFF and lock-out controller. Depressurize the compressed air dryer.
2. Place a bucket or a bin beneath the desiccant drain port located on the lower section of the desiccant tower.
3. Loosen the bolts on the blind flange covering the desiccant drain port.
4. Remove all of the bolts except for the upper bolt.
5. Slide the blind flange over about half way and monitor the desiccant filling of the bucket or bin.
6. When the bucket or bin is nearly full, slide the blind flange over the drain port to cease draining the desiccant.
7. Remove the filled bucket or bin and empty the spent desiccant in a waste barrel for proper disposal.

Filter Element Change

Reference the Filter Manual provided with the dryer.

Condensate Drain Maintenance

Reference the Condensate Drain manual provided with the dryer.

Butterfly Valve

Reference the Butterfly Valve manual provided with the dryer.

TROUBLESHOOTING TABLE

Problem	Probable Cause	Remedy
PLC Alarm Switch Activated	The PLC has discovered a fault in the dryer operation.	The system will display an alarm banner illustrating the active alarm and store the alarm into an alarm log that can be accessed from the display. Investigate the cause of the alarm and repair. Reset the "alarm" on the display screen. The dryer will resume operation at the same point in the cycle that it was in at the time of the fault detection.
High Humidity Alarm	The regeneration of the desiccant beds is insufficient.	Clear the "alarm" on the display. Verify the heating and cooling operations by observing regenerations. Check the operation of the regeneration blower. Check the heater outlet temperature during heating.
	The dew point probe service valves are closed	Make certain dew point sensor valves are adjusted properly, the valve upstream of the dew point sensor to be full open and the valve downstream of the sensor should be just slightly cracked open so just a slight amount of air is felt on the exhaust.
	The dew point probe is out of calibration.	Shut off the air to the humidity sensor. Remove the probe from the housing and return for recalibration.
Blower Overload Alarm	The motor overload has tripped.	Check the motor overload to see if it is defective. Check the operating conditions to see if the motor is operating overloaded as a result of a problem with the blower or motor bearings.
Low Operating Pressure During Drying	Compressor not running.	Check compressor for operation.
	System manual inlet isolation valve closed.	Open all manual valves upstream of the dryer.
Vessel 1 Depressurization Failure	The depressurization valve did not open.	Check the purge exhaust solenoid valves for correct operation. Check the valve actuator for correct operation.
	Vessel did not fully depressurize.	Check to determine if the depressurization muffler is plugged. If so, replace.
	Vessel depressurized, but alarm is on.	Check the pressure sensor for correct operation.

TROUBLESHOOTING TABLE

Problem	Probable Cause	Remedy
Vessel 2 Depressurization Failure	The depressurization valve did not open	Check the purge exhaust solenoid valves for correct operation. Check the valve actuator for correct operation.
	Vessel did not fully depressurize.	Check to determine if the depressurization muffler is plugged. If so, replace.
	Vessel depressurized, but alarm is on.	Check the pressure sensor for correct operation.
Vessel 1 Re-pressurization Failure (5 minute timer to alarm)	The re-pressurization valve did not open.	Check the re-pressurization solenoid valve for correct operation. Check the valve actuator for correct operation.
	Vessel re-pressurized, but the alarm is on.	Check pressure sensor for correct operation.
Vessel 2 Re-pressurization Failure (5 minute timer to alarm)	The re-pressurization valve did not open.	Check the re-pressurization solenoid valve for correct operation. Check the valve actuator for correct operation.
	Vessel re-pressurized, but the alarm is on.	Check pressure sensor for correct operation.
Regeneration Heater Sheath Over Temperature Failure	Defective or open circuit thermocouple.	Replace the thermocouple. RESET alarm.
	Low or no regeneration blower flow.	Check the manual valve on the blower. Check the blower, blower motor and overloads, and blower inlet filter. Replace as necessary. Press RESET to restart.
	Problem with PLC control system.	Replace as needed.
Failure of Regeneration Outlet Valves to Operate	Defective solenoid valve, loss of power or loss of pilot air.	Check the solenoid valve operation and verify the continuity of the solenoid coil. Replace as necessary. Check the pilot air system and verify that pilot air is present at the solenoid valves.
	Defective valve actuator.	Verify that the valve actuator can be rotated by hand with a wrench. If not, replace actuator.
	Butterfly valve defective.	Verify that the valve shaft can be rotated by hand with a wrench. If not, replace or rebuild valve.

TROUBLESHOOTING TABLE

Problem	Probable Cause	Remedy
Loss of Power	The system incoming power has been lost.	Check the incoming power and restore the supply.
	The circuit fuse has blown.	Check the fuse and replace as necessary.
	The PLC has failed or is in a "Fault" condition.	Check the PLC to verify if any outputs are "on" or if the PLC "fault" alarm LED is on. The PLC may require reprogramming or replacement. Consult the Aircel Sales Department for assistance.



WARNING!

- Prior to performing any maintenance on the system, disconnect power supply, properly lock out (tag out) electrical power supply, and depressurize the system to avoid personal injury and/or property damage.

APPENDIX

Desiccant Material Safety Data Sheet

**Safety data sheet**
F200Revision date : 2009/12/04
Version: 3.0Page: 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.

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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 (Al₂O₃),
hydrate

OSHA

ACGIH

PEL 5 mg/m³ Respirable fraction ; PEL 15 mg/m³ Total
dust ;
TWA value 1 mg/m³ Respirable fraction ;

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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)

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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

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Registration status:

TSCA, US

released / listed

OSHA hazard category:

ACGIH TLV established

SARA hazard categories (EPCRA 311/312): Acute**SARA 313:****CAS Number**

1333-84-2

Chemical nameAluminum oxide (Al₂O₃), hydrate**State regulations****State RTK****CAS Number**

1333-84-2

Chemical nameAluminum oxide (Al₂O₃), hydrate**State RTK**

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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SERVICE NOTES

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SERVICE NOTES

[illegible]



Experience. Customer. Service.



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