

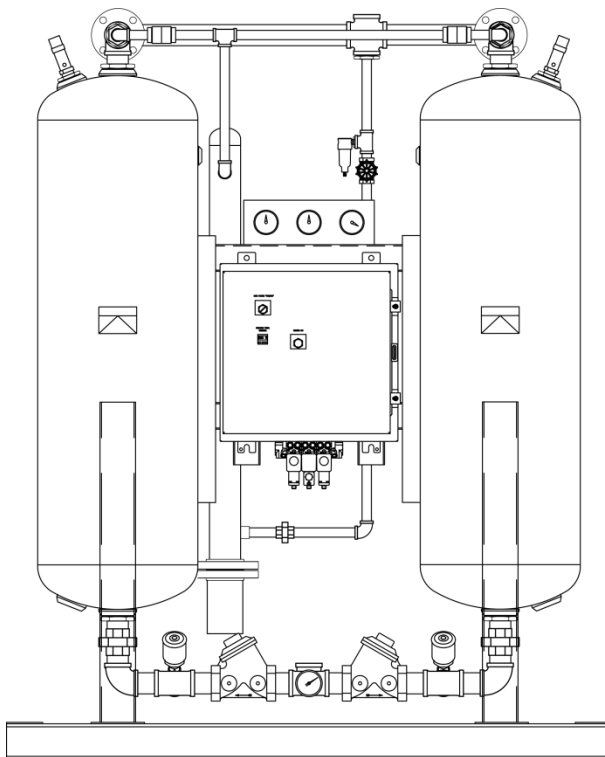


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**COMPRESSED AIR DRYER
 INSTRUCTION MANUAL**

**GEH-SERIES
 EXTERNAL HEATED
 REGENERATIVE
 DESICCANT DRYERS**

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INTRODUCTION



Before attempting any installation or maintenance on the dryer, please carefully read this entire manual.

Great Lakes Air Products genuine parts, manufactured to design tolerances, are developed for optimum dependability – specifically for Great Lakes Air Products dryer systems. Design and material innovations are the result of years of experience with hundreds of different compressor and dryer applications. Reliability in materials and quality assurance are incorporated in our genuine replacement parts.

Your authorized Great Lakes Air Products Dryer distributor offers all the backup and reassurance you'll need. Our network of authorized distributors provides the finest product support in the air compressor industry.

Your authorized distributor can support your Great Lakes Air Products Dryer with these services:

1. Trained parts specialists to assist you in selecting the correct replacement parts.
2. Repair and maintenance kits designed with the necessary parts to simplify servicing your dryer.
3. Authorized distributor service technicians are factory trained and skilled in compressor and dryer maintenance and repair. They are ready to respond and assist you by providing fast, expert maintenance and repair services.

To Contact Great Lakes Air Products or locate your local distributor:

Visit: www.glair.com or

Call: (734) 326-7080

Failure to install the compressed air dryer per this manual or any change to the dryer not previously authorized by the manufacturer will void the warranty.

The information and specifications in this manual are in accordance with the information in effect at the time of printing. The manufacturer reserves the right to make changes without notice or incurring obligation.

GENERAL SAFETY INFORMATION



General Warning

The associated text outlines conditions which could indicate a hazardous situation that has some probability of death or severe injury. It could also represent the possibility of damage to the associated equipment.



Electrical Hazard

The associated text outlines conditions which could indicate a hazardous situation that has some probability of death or severe injury.

Only qualified personnel can use and service electrically powered devices. Be sure that the voltage is disconnected before any work is performed.



Danger Hazard

Compressed air is a highly hazardous energy source. Depressurize the system prior to performing any work or maintenance on that system. Never work on equipment with parts under pressure.



Breathing Air

Air treated by this equipment may not be suitable for breathing without further purification. Refer to applicable standards and specifications for the requirements of breathing quality air.

PROPER USE OF DRYER

This dryer has been designed, manufactured, and tested to separate humidity normally contained in compressed air **only**. Any other unauthorized use will be considered improper. The manufacturer will void the warranty and not be held responsible for any problem arising from improper use. The correct use requires adherence to installation conditions specified in this manual.

RECEIVING EQUIPMENT

Immediately upon receipt of equipment, remove all crating and packaging around equipment. Examine machinery for any damages either external or internal that may have occurred in transit.

This dryer is supplied tested and assembled however some components on larger units have been removed and attached to the skid independently, to avoid any damage during shipping. On models GEH-350 and larger the desiccant material is shipped on a separate skid from the dryer for installation instructions see **DESICCANT LOADING PROCEDURES**

The only operation left to the user is the connection to the plant in compliance with the instructions given in the following chapters.

INSTALLATION LOCATION



Particular care is required in selecting the installation site, as an unsuitable location could jeopardize the proper operation of the dryer. Standard units are not suitable to be used in an explosive atmosphere, or where the risk of fire could be present.

The unit should be installed in an area that is clean and dry, allowing sufficient space on all sides for routine maintenance and service. It should be located on a level floor or shelf free from vibrations and sufficient to support the total weight of the machinery. Although the dryer package is a freestanding unit, it may be secured by bolting the base to the floor but is not required. **This standard dryer is designed for indoor installation.** Contact distributor if installing unit outdoors.

Installations at altitudes above 2500 feet (762 meters) may require adjustments to standard operating conditions. The unit has been factory adjusted to operate at or near sea level. If installation is above this altitude, contact your local distributor for corrected purge settings.

INLET CONDITIONS

A healthy, long-term, and trouble free compressed air supply design should be approached as a complete system, not individual components. The air compressor; intake location is vital to system health; it should supply clean fresh air that is free from possible contaminant (e.g. ammonia, chlorine or methane). Any contaminant entering the compressor intake will be concentrated by a factor of 8 due to the compression process in a typical compressed air system.

A properly sized and maintained compressed air aftercooler is vital to maintaining an acceptable system temperature range. GEH Series desiccant air dryers are designed to operate at rated flow with a maximum inlet temperature of 100°F (37.7°C). Units can be oversized to accommodate higher inlet temperatures up to 120°F (48.8°C). Inlet temperatures above 120°F (48.8°C) require custom designed dryer equipment. In most cases temperatures can be kept below maximum operating by correctly sizing or servicing the compressor aftercooler.

As dryer inlet temperatures rise above the design 100°F (37.7°C), the moisture holding capacity of the air rises dramatically. This table represents the additional moisture load at elevated temperatures.					
Inlet Temperatures	100°F (37.7°C)	105°F (40.5°C)	110°F (43.3°C)	115°F (46.1°C)	120°F (48.8°C)
Additional Load	0%	15%	32%	51%	75%

PRE-FILTRATION

As all regenerative desiccant dryers are designed to remove only water vapor, any possibility of liquid water carryover to the desiccant dryer must be avoided. Coalescing pre-filtration will eliminate the carryover of droplets, aerosols, and compressor lubricant liquids. Proper filtration will not only enhance the dew point suppression capability of the dryer, but will also add years of life to the desiccant by preventing fouling of the desiccant caused by compressor lubricants.

Coalescing pre-filtration of ISO Class-1(8573) with a max. oil carryover 0.008 PPM w/w is required under the equipment warranty.

CONDENSATE

A typical compressed air system has multiple points that require condensate removal: the compressor, the aftercooler, receiver tank and coalescing pre-filter. **It is urgent that each of these drains is not piped to a common header** that will allow condensate to be pumped from a high-pressure location to a low-pressure location. Some facilities have tried to install check valves to prevent backflow in a common header system. This concept seems reliable in theory; however a drain system failure will be imminent. The health of your compressed air dehydration system is contingent on a clean and properly designed condensate removal system.

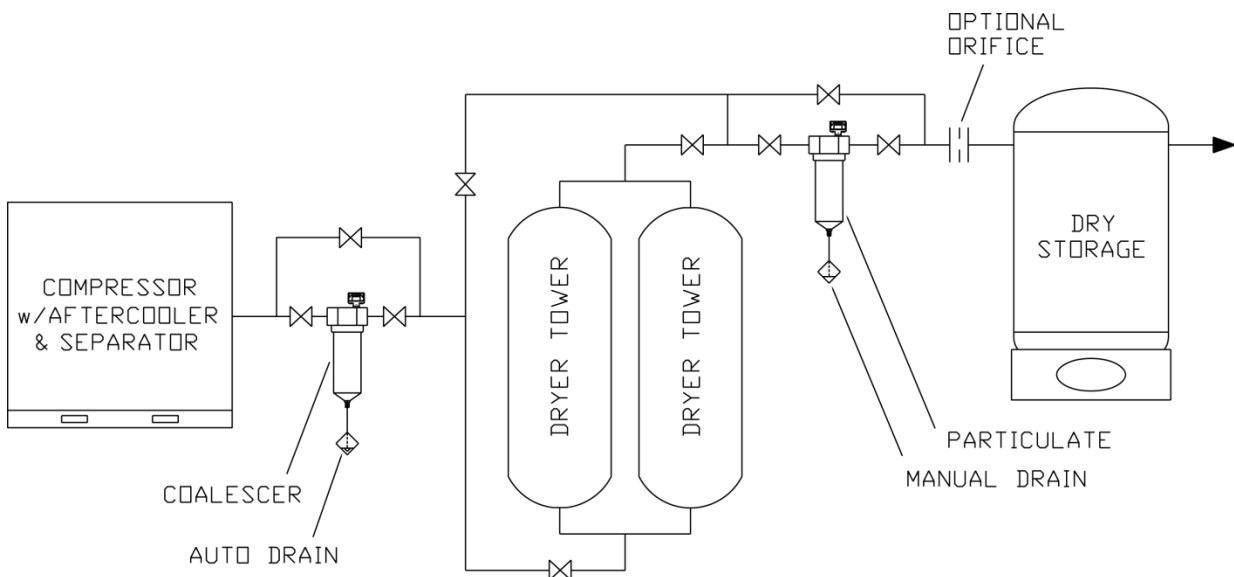
AFTER-FILTRATION

All regenerative desiccant dryers gradually produce hard and abrasive desiccant fines. These contaminants should be removed with a high quality particulate after-filter capable of removing 1.0 μm particles.

Particulate filters located downstream of Regenerative Air Dryers do not have automated drain systems. The material collected should be held in the bottom of the housing; no draining is necessary. Simply clean out the sump area as an element is replaced.

BLOCK & BYPASS

All compressed air dryer systems should have a bypass system to facilitate servicing the dryer and filters without interrupting compressed air flow. Valves should be bubble-tight to prevent water vapor migration around the system from the regions of high relative humidity to low relative humidity. The bypass system should be capable of bypassing each filter or the dryer and any combination thereof. Operation in this condition for extended periods of time is not recommended because of possible system contamination (i.e. desiccant dust downstream, moisture downstream, or oil in the desiccant).



OPTIONAL BACK PRESSURE REGULATOR

For regenerative dryer applications where sudden downstream demand for compressed air frequently occurs in such a manner to cause rapid pressure loss in the compressed air system, it is recommended that a back pressure regulator be installed downstream of the dryer. The backpressure regulator will maintain a constant pressure and reduce microburst velocity surges within the dryer. It will reduce the possibility of desiccant bed fluidization, which accompanies rapid pressure fluctuation. By eliminating fluidization and desiccant bed "bumping", the life of the desiccant charge will increase and after-filter elements will not become prematurely clogged with desiccant fines.

Coalescing filters are also affected by dramatic flow swings or pressure changes. This problem is identified by oil carryover through the element or even the destruction of the element.

PURGE EXHAUST PIPING

To eliminate noise pollution created by frequent tower depressurization or purge exhaust noise, the purge exhaust may be piped outdoors or to a more remote area. This may also eliminate any problem caused by indoor accumulation of condensed moisture from the purge exhaust. Extended purge exhaust piping must not restrict the passage of purge air near atmospheric pressure.

If the equivalent length of extended purge exhaust piping does not exceed 15 feet, use pipe one size larger than the dryer purge exhaust connection. If the equivalent length of extended purge exhaust piping does not exceed 30 feet, use pipe two sizes larger than the dryer purge exhaust connection. For remote purge piping in excess of 30 feet contact the factory for recommendations.

ELECTRICAL CONNECTION



The Nameplate/Data plate located on each unit identifies the power supply requirements and maximum fuse specification. Units supplied with electrical junctions require a suitable fused disconnect in compliance with the National and Local Electrical Code requirements. Maximum fuse specification can be located on the Nameplate/Data Plate.

Check unit voltage supply as specified on the equipment data plate. The power feed should meet the national electric code standard for amperage capacity of that unit. The feed voltage must be within 10% of the specified data plate requirement. Reduced supply voltages can cause a reset of the control card and elevated voltages can cause electronic components to fail. The (FLA) full load amps of any dryer can also be found on the data plate directly below the specified voltage. When required the standard control voltage of 120-1-60 is transformed from the main power feed and no separate control power feed is required.

DESICCANT LOADING PROCEDURES

Models GEH-350 and larger require field loading of the desiccant material. Desiccant is not shipped in the dryer vessels to avoid damage to the desiccant support screens and premature desiccant breakdown. The screens are designed to support the load of the desiccant under operating conditions; however, shipping conditions require the desiccant to be loaded on site.

THE PROCEDURE TO LOAD THE DESICCANT IS AS FOLLOWS:

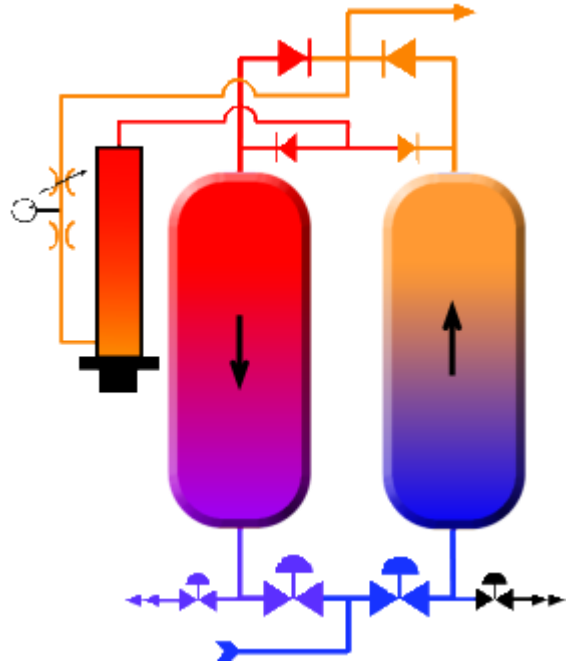
1. Remove the pressure relief valves from the top of each of the dryer vessels.
2. Load 50% of the shipped desiccant quantity into each of the dryer vessels. The final level of the desiccant will vary from unit to unit. If all of the desiccant will not fit in one or the other vessels, a slight tapping or vibration will settle freshly loaded desiccant.
3. Replace the pressure relief valves on top of the dryer vessels to a pressure seal condition.

OPERATION

The operation of a GEH dryer is fully automated with all sequencing and function controlled by an automatic timing module or a programmable controller.

An air compressor produces hot, wet, and dirty compressed air; the first stage of air treatment is the aftercooler, where the compressed air temperature is reduced to within 10-20°F of ambient temperature. The entrained water vapor is released as liquid, and then removed by a separator. The coalescing pre-filter then removes any liquid moisture or lubricant carryover present after the separator. The compressed air is still saturated at the reduced temperature, but does not contain any gross liquids prior to entering the regenerative dryer.

The saturated compressed air enters either the right or left tower of the dryer depending on the control sequence position. For ease of description, assume the saturated compressed air is entering the right tower giving up all of its water vapor to the activated alumina desiccant. This process will continue for 4 hours on a standard model, or until the vessel is saturated with the optional Demand Cycle Controller. For more information on that option refer to the **DEWPOINT DEMAND CONTROLLER** section in this manual.



While one tower is drying the process air stream, the other is in a regeneration sequence. A regulated portion of dry compressed air that has been expanded to near atmospheric pressure by an orifice flows over the wet desiccant bed. This expanded volume of dry air called purge then absorbs moisture from the saturated desiccant bed. The now saturated purge stream exits to atmosphere through the left tower purge exhaust valve and muffler. This process is maintained for 3 hours & 55 minutes. At the end of this time the purge valve closes and allows the purge stream to repressurize the regenerated tower, preparing it for the process stream when the inlet valves invert at the start of a new cycle.

DEWPOINT DEMAND CONTROLLER

The Dewpoint Demand Controller is an option designed to limit energy consumption to the minimum required for optimum dryer performance. The option works off the premise that not all compressed air conditions are stable and continuous. Each desiccant tower is designed to adsorb the moisture load of full rated flow and rated conditions for 4 hours. For example; if at the end of 4 hours your flow has fluctuated from 20 to 100% of rated load, the desiccant bed has an unused adsorption capacity of roughly 40%. At the end of the 4 hours the demand cycle control holds the freshly regenerated tower in a pressurized standby mode so the on-line tower can continue to adsorb moisture to the design limit. While the dryer is in this standby mode no energy is being expended and the overall average energy consumption is reduced. As the dew point meter (the heart of the Dewpoint Demand Control) signals that the proper moisture loading of the on-line tower is approaching, the standby tower starts a new cycle and begins the regeneration of the previously saturated tower.

STARTUP

Pressurize the system with the dryer bypass open and the dryer inlet and outlet closed. Then open the dryer outlet valve allowing it to pressurize the dryer from the outlet. By pressurizing the dryer backwards through the outlet, it allows the control air system to be energized first and properly seat the control and process valves.

S-L-O-W-L-Y pressurize the rest of the dryer by gradually opening the inlet valve upstream of the dryer. This will allow compressed air to enter and completely pressurize the dryer. When the tower pressure gauges indicate line pressure, close the bypass valve and allow compressed air to flow through the entire dryer package.

Pressurization of the dryer should never be initiated by suddenly pressurizing the dryer towers from the dryer inlet. The sudden rush of high velocity air in the desiccant bed would cause the desiccant bed to fluidize. Desiccant fluidization will create desiccant breakdown and or excessive desiccant fines.

This section refers to systems with the optional Dewpoint Demand Systems only

The final step prior to initiation of the dryer is to verify flow to the dewpoint probe in the sample flow cell. Open the isolation valve upstream of the sample cell filter. The sample cell is now pressurized. An orifice in the sample cell outlet lets a small flow of air over the probe. After the orifice there is a check valve that prevents atmospheric air from migrating into the sample cell when the compressed air system is depressurized. The coil of tubing on the outlet of the sample cell is to prevent atmospheric moisture from migrating into the sample cell during sampling.

Initiate the "power on" selector switch or push button. Almost immediately one tower will depressurize to atmospheric pressure through the purge exhaust valve and muffler. At this time verify that the purge flow indicator (pressure gauge in the purge loop piping) is reading the pressure indicated by the factory tag located on the piping behind the gauge (the pressure setting for the flow indicator should be between 45 & 55 PSIG). If the indicator does not match the tag, adjust the globe valve directly above the indicator until the setting matches. This pressure/flow can be set only during a purge cycle (air exiting the muffler). The setting will change during repressurization then return to the setting in the next purge cycle. From this point the system should cycle as outlined in the operation section of this manual. Once the purge flow is set it will fluctuate slightly during the day if the system operating pressure fluctuates. It is best to set the purge flow during a time when the system pressure is at a low point, so the dryer purge requirements are not starved during lower pressure operating periods.

SEQUENCE CONTROLLER

Time cycles are part of the equipment design that have been accurately set in the factory and should not be field adjusted. Timing changes are possible for custom applications but always consult the factory prior to changes. The following are the standard time cycles for your equipment.

Drying Each Tower	4 Hours (Indefinite period with the Demand Cycle Controller option)
Purging Each Tower	3 Hours / 55 Minutes
Heating Each Tower	2 Hours / 30 Minutes

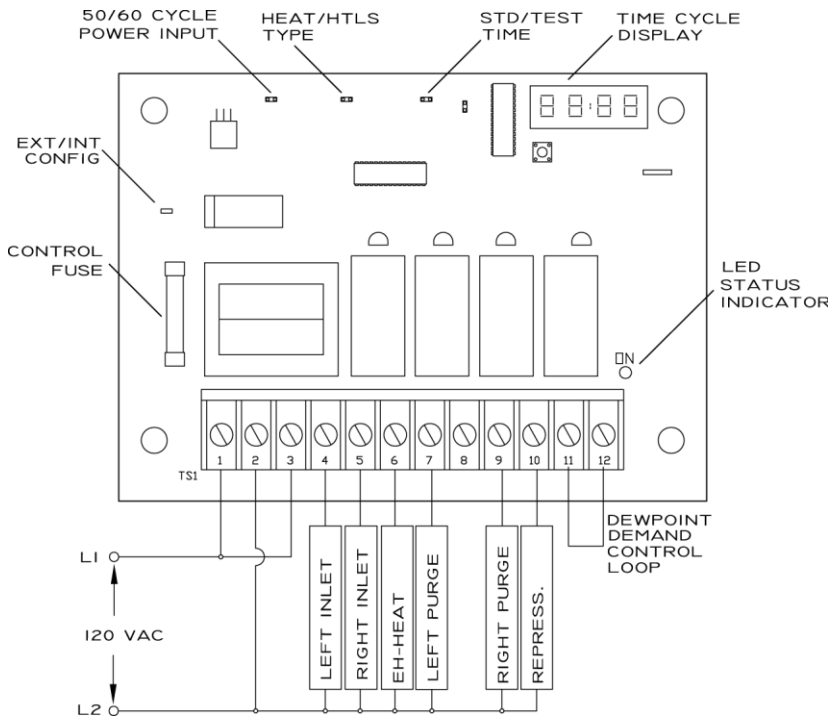
The standard heated regenerative air dryer is controlled by a CMOS logic system designed specifically for compressed air dryers. The controller is preset in its function with adjustments available by moving jumper pins.

EXT/INT Configuration	Selects external or internal configuration for heating when HEAT is selected on the HEAT/HTLS jumper pin.
50/60 CYCLE Power Input	Selects feed power frequency of 50 or 60 Hz.
HEAT/HTLS Type	Selects a basic design configuration of Heated or Heatless.
STD/TEST	Selects a standard operational timing sequence or a test sequence

The test cycles are for startup and troubleshooting do not operate in test for normal operation!

Type	Heated (HEAT)			Heatless (HTLS)		
	Standard	Test	Open	Standard	Test	Open
Main	240 Min.	48 Min.	30 Sec.	300 Sec.	150 Sec.	20 Sec.
Purge	235 Min.	47 Min.	20 Sec.	260 Sec.	130 Sec.	10 Sec.
Heat	150 Min.	30 Min.	10 Sec.	(none)	(none)	(none)

Notes: 1. Open signifies that the jumper is completely removed and connects no pins.
2. Time sequence vs jumper status (assumes power frequency correlation)



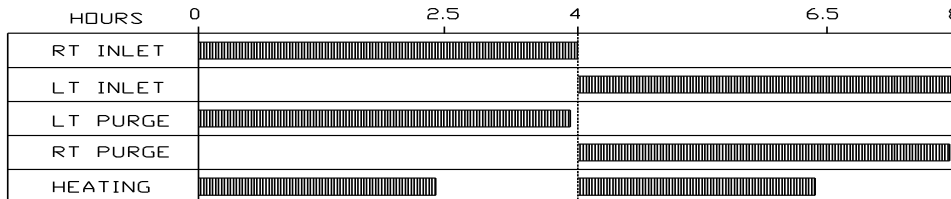
Time Cycle Display

00 03
Hours : Minutes

The Time Cycle Display shows the current online towers time of operation (Adsorption)

Led Status Indicator

If the green led status indicator is blinking it indicates the controller is in an active regeneration cycle. If the indicator is solid, it indicates that the controller is in a demand standby mode waiting for a signal from an external source to complete a circuit between terminal #11 & #12



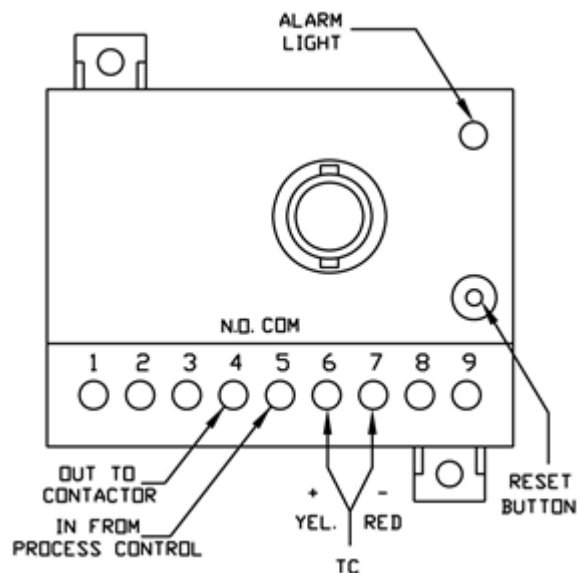
If an optional PLC controller is operating the dryer sequence, a program and manufacturer's warranty will be included with this manual. Consult factory prior to any changes to PLC programs.

PROCESS HEATER CONTROL

The process temperature controllers supplied with heated regenerative dryers are factory set for standard operation. The process temperature controller is a small microprocessor with the capacity to monitor and adjust its ramping functions to best suit the specific dryer application. The process controller is located on the door of the electrical enclosure with a digital readout of the current purge temperature. The required temperature setting of the process controller is between 325°F and 375°F. To identify the proper setting for your application the following steps are suggested: set the process controller at 325°F initially, and observe the operation of the unit over the following days. If the unit delivers a highly elevated downstream temperature for more than a couple of minutes after switch over, the temperature should be lowered in 15° increments with no more than 1 adjustment per day. If the unit is developing an insufficient Dewpoint with no elevated discharge temperature the unit will need to have the process temperature elevated. Elevate the temperature in 10° increments with no more than 1 adjustment per day. Once the temperature is set it should not need readjustments unless a dramatic change in operating conditions such as ambient temperature swings, compressed air load, pressure, or temperature occur.

HI-LIMIT HEATER CONTROL

The HI-Limit controller senses the surface temperature of the heating element bundle. In the case of a primary controller failure or the lack of purge flow that normally carries the heat away from the heater bundle; the high limit controller would trip, saving the heater from burning out. The high limit controller is a manual reset type temperature switch which prevents the system from cycling on the high limit system. Once the high limit is tripped it must be manually be reset by pressing the reset button on the front of the unit, or by cycling the control power resetting the switch. The high limit controller is located on the sub panel of the electrical enclosure. The standard factory setting for the high limit controller is 1000°F.



MAINTENANCE

Pre & After Filtration

The Pre & After-filter element should be replaced whenever the pressure drop becomes excessive. Differential pressure is the best method to gauge the need for element replacement. The recommended maximum element differential is 10 PSIG. The pressure at which you should change your elements should be determined by comparing the operational efficiency of your system (cost of pressure drop vs. cost of the elements). Many facilities put filter replacement on an annual or bi-annual schedule based on system contaminant load.

Control Air Filter

Frequent inspection of the control air filter is required so desiccant particulate does not restrict the control air required for pneumatic actuation of dryer valves. The control air filter is generally replaced when the particulate after-filter on the dryer is replaced.

Purge Muffler Maintenance

Purge mufflers prevent high noise levels from the cyclic depressurization of the desiccant towers. The desiccant fines generated from normal operation will cause the muffler elements to become clogged, which will restrict purge flow and cause insufficient regeneration. If the purge tower shows backpressure during operation replace the muffler element.

The desiccant loading procedure can cause a large amount of desiccant dust to accumulate prior to equipment startup. Most of this accumulation is blown out the purge exhaust valve during the first hours of operation. The high volume of desiccant fines from startup limits the life of the initial purge muffler element. It is recommended that the muffler element be replaced after the first 100 hours of operation. Subsequent element replacements should be every 6 months to a year or as dictated by regeneration tower backpressure.

Purge Rate Maintenance

An adequate supply of purge air is essential for proper regeneration of desiccant and good dewpoint suppression. If your system pressure varies throughout, the day set the purge pressure at a low period so in low-pressure periods the purge flow is not starved. Always consult the factory prior to changing operating conditions. The adjustable purge valve should be set to the following values for standard equipment operating at standard conditions.

Model	Purge Set Pressure	Model	Purge Set Pressure	Model	Purge Set Pressure
GEH-100	40	GEH-800	50	GEH-2250	40
GEH-125	50	GEH-1000	50	GEH-2500	45
GEH-175	40	GEH-1250	50	GEH-2750	45
GEH-250	50	GEH-1400	45	GEH-3000	50
GEH-350	45	GEH-1600	45	GEH-3500	45
GEH-500	50	GEH-1800	45	GEH-4000	45
GEH-650	50	GEH-2000	45		

Desiccant Maintenance & Replacement

Desiccant life is estimated at 3 to 5 years, however conditions differ with location. Contamination of desiccant is a leading cause of accelerated failure. Close preventative maintenance of the coalescing pre-filters will extend the life of the desiccant. Spent desiccant should be drained through the desiccant drain port in the bottom of each tank. Desiccant alone is not hazardous and can be disposed of as a general landfill product. Oil contaminated desiccant must be dealt with on the basis of the amount of oil contamination.

Fresh desiccant should be added through the desiccant fill port, which is where the pressure safety relief valves are located. Always leave adequate room above the desiccant bed to permit some bed motion and expansion during dryer operation.

Be certain to only install the approved activated alumina that your Great Lakes Air Products representative can provide; it excels with respect to dew point suppression capability and attrition resistance. Various brands can cause excessive attrition, and poor dew point suppression.

TROUBLESHOOTING GUIDE - QUICK REFERENCE



Please read the entire troubleshooting section of the manual before proceeding with any repairs or modifications. Several topics are addressed at several points in the manual and understanding them all before you proceed will give you a much better understanding of the entire process.

Because almost all problems with regenerative dryers will result in a bad Dewpoint it is assumed that the condition of bad Dewpoint applies to this entire table.

PROBLEM	POSSIBLE CAUSE	Proceed to	Page
No / Bad Regeneration	No / Low purge stream	Purge Rate Maintenance	10
	Regeneration back pressure	Purge Exhaust System	11
	Low regeneration temperature	PROCESS HEATER CONTROL	9
	No regeneration heat	Heater	13
	Contaminated Desiccant	Desiccant Testing or Replacement	13
Cycle / Sequence Failure	Low feed voltage	ELECTRICAL CONNECTION	5
	Process, Check, or Solenoid Valve failure	Valve Integrity	12
		OPERATION	6
		Intermittent Cycle Problems	13
	Timing card failure	SEQUENCE CONTROLLER	8
Dewpoint Demand Only Dewpoint meter not signaling	Dewpoint Demand Controller	14	
Excessive Inlet conditions	Liquid at dryer inlet	Filtration & Drains	11
	High inlet temperature	Ambient & Air Inlet	12
	High flow at dryer inlet	Ambient & Air Inlet	12
	Low pressure at dryer inlet	Ambient & Air Inlet	12
High discharge temperature	Excessive heat during cycle or saturated desiccant	PROCESS HEATER CONTROL	9
		No / Bad Regeneration	N/A

TROUBLESHOOTING TUTORIAL

Filtration & Drains

Identify the pre-filtration for the unit. It should be a high quality coalescing filter. Check that the drain system is working properly and is not hard piped into other system drains. Hard piped drain systems will inevitably pump liquid from one point of the system to the other because of operating differential pressures. Check valves are utilized to overcome this problem in many facilities, but are prone to failure from the usual debris in drain lines. If a system has a common piped drain system, water downstream of the filters and dryer is almost impossible to identify.

Regenerative dryers are designed to remove vapor not liquid. Adequate filtration must be employed to remove all liquid before entering the dryer.

If the dryer pre-filter has a differential pressure gauge, check to see that it reads at least 1 PSID. No visible pressure drop is usually an indication of a ruptured filter element. If the coalescing filter is showing large amounts of liquid being drained, it might be overloaded and bypassing liquid. Verify upstream drains are functioning properly.

Purge Exhaust System

When the system is purging, check the tower pressure gauge on the purging tank. It should be at 0 PSIG (2 PSIG maximum). Any backpressure in the regeneration purge system will impede purge flow and hinder the regeneration of the desiccant. If the system has mufflers, change the elements. This should be done annually. If the system has the purge exhaust piped away, locate the cause for the restriction and eliminate it. It is possible that a bad check valve or inlet valve is allowing process air into the regeneration system, and this will overload the muffler or piping system. The next section helps you identify a valve problem.

Ambient & Air Inlet

The capacity of a compressed air dryer is a combination of four operating conditions, flow, pressure, temperature, and saturation. These parameters are commonly specified as SCFM at 100 PSIG, 100°F, and 100% saturated. When a system deviates from these standard parameters, the load on the compressed air dryer changes. Elevated inlet temperature increases the moisture holding capacity of each cubic foot of air entering the dryer. Reduced inlet pressures increases actual volume and reduces the effectiveness of desiccant adsorption system. Changes in either of these conditions from the standard design results in changes to efficiency and capacity of the compressed air dryer. The following chart offers multipliers that can be applied to standard dryer ratings to achieve true capacity at actual field conditions.

		Dryer Inlet Temperature in °F						
		80	90	100	105	110	115	120
Dryer Inlet Pressure PSIG (minimum)	70	0.75	1.01	1.35	1.54	1.78	2.04	2.36
	80	0.67	0.90	1.21	1.38	1.60	1.83	2.12
	90	0.60	0.82	1.09	1.24	1.44	1.65	1.91
	95	0.58	0.79	1.05	1.20	1.39	1.59	1.84
	100	0.55	0.75	1	1.14	1.32	1.51	1.75
	110	0.51	0.69	0.92	1.05	1.21	1.39	1.61
	115	0.49	0.66	0.88	1.00	1.16	1.33	1.54
	120	0.47	0.64	0.85	0.97	1.12	1.28	1.49
	125	0.45	0.61	0.82	0.93	1.08	1.24	1.43
150	0.38	0.52	0.69	0.79	0.91	1.04	1.21	

Identify the compressed air inlet temperature to the dryer; if it is above 100°F and the system was not designed for high inlet temperatures, it is most likely overloaded. Be sure to carefully identify the air temperature, as 110°F can feel just warm through a steel pipe.

Identify the ambient operating conditions. If the unit is in ambient conditions above 110°F Dewpoint then operational efficiencies will suffer. Ambient temperatures at 120°F and higher will seriously impair the dryer's adsorption capacity.

Valve Integrity

Most of the valves on a regenerative dryer act to separate the high-pressure process-drying stream from the low/atmospheric pressure regeneration system. By performing the following diagnosis, it is possible to identify valve bypass and the severity of that bypass without even taking the unit out of service.

Identify which tower/muffler is purging. Turn the purge control valve (Located between the tanks in the purge piping) off completely. Check the muffler to see if the purge flow has stopped. If it has stopped, half of the valves on the dryer are in good shape. If a small amount of air can be felt, then a valve seat is leaking and needs to be repaired as soon as possible. If large amounts of air are present, a valve has failed and immediate attention is required. Return the purge valve to the original operating set points.

At this point, you have checked out half of the valves on the machine. In order to check the other half, you will need to wait for the unit to switch towers so the process can be repeated on the other side of the dryer. If you have a leak, it will be one of three points. They are listed in order of failure probability. The only way to specifically identify which valve is failing requires depressurizing the unit; removing the valves and inspecting them.

1. The front purge check valve above the opposite tank that is purging.
2. The back outlet check valve above the regeneration tank.
3. The inlet valve on the side of the tower that is regenerating. This valve is rarely the culprit. If it is, you will most likely find air leaking out of the valve casting at a vent point indicating the diaphragm has ruptured. The less likely option of a complete valve seizure is possible.

Intermittent Cycle Problems

There are three probable reasons that a system cycle will fail intermittently. The first possible reason is the timer control card. This fault is very easy to verify with the help of a voltmeter. Use the meter to match the control cycle to electrical outputs associated with the output diaphragm on page 9 of this manual.

The second possible reason is a solenoid valve fault. To check this possibility verify that control air is applied to the correct inlet and purge valves, by loosening the compression nuts ½ turn on the top of each valve one at a time. Control air pressure should be present on the inlet valve closest to the purge valve exhausting air. The inlet valve is normally open and the presence of control air closes it. The exhausting purge valve should have a control air signal because it is a normally closed valve and the control air signal opens it.

The opposite (online tank) inlet valve should not have control air and the opposite purge valve should not have control air because it is normally closed. If the control card is sending the correct electrical signal to the solenoid and the solenoid is not sending air to the correct process valve the solenoid is at fault.

If both the card and the solenoids check out and you have performed a valve check from Valve Integrity in this manual the problem must be check or inlet valve sticking. Replace the appropriate left or right check valves and rebuild the inlet valves with complete rebuild kits.

Heater



This unit can operate on high voltage. If troubleshooting with high voltage active take all OSHA required precautions for personal safety.

Verify power feed and main fuses as well as heater branch fuses.

The most common cause of a heater not functioning is the high limit heater control being tripped. Consult the **HIGH LIMIT HEATER CONTROL** section for reset information after the cause of the trip is identified and corrected.

The heater cycle function is controlled by a process temperature controller to maintain a specific temperature range. Verify the settings and function of this controller in the **PROCESS HEATER CONTROL** section of this manual.

For additional steps in troubleshooting heater operation contact your local distributor.

Desiccant Testing or Replacement

Desiccant in a regenerative dryer has an average life of 5 years, provided the coalescing filter upstream of the dryer is monitored and serviced regularly. Some types of system failures or lack of filtration maintenance can damage desiccant before that period. We recommend that you pull a desiccant sample and have it analyzed after approximately 3 years of service.



To pull a sample, de-energize and completely depressurize the dryer. Remove the lower desiccant drain plug and fill a zip-lock bag full of desiccant. A quart bag with 1 to 2 pounds of desiccant sample is required. Label the bag left or right tower with the serial number of the dryer.

Replacing the drain plug after it has been removed can be a messy and aggravating process without a simple little trick. Before removing the plug, have a piece of cardboard just slightly larger than the drain opening handy. Once the sample bag is full, cover the hole with your hand and work the cardboard in the drain hole to stop the desiccant flow. Remove any debris from the threads reapply thread sealant and replace the plug. The cardboard left in the tower will cause no problem to the dryer operation.

Dewpoint Demand Controller (Optional)

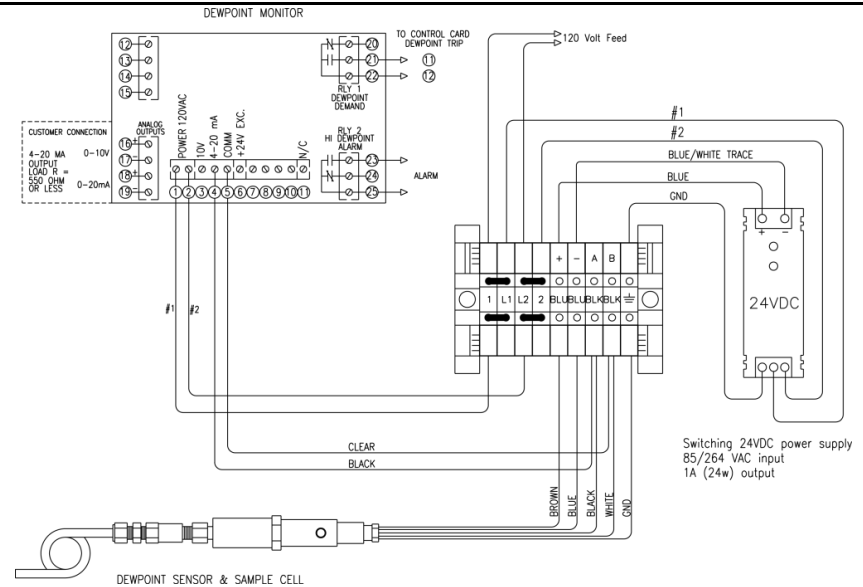
The dewpoint demand system consists of three components. First, a probe that reads system dewpoint and transmits a 4-20 ma signal to the second component, a digital display that interprets and displays it in °F pressure Dewpoint. The third component is the 24V DC power supply that supplies power to the probe for loop power signal and the probe's auto calibration routine. All must be working in concert to get an accurate dewpoint reading. Each dewpoint meter comes pre-programmed with manufacturers' settings, and should not require any field adjustments. Cases, in which adjustments must be made, refer to parameters instructions and the factory standard values chart below.

Press PAR to enter into PRO display, using the F1▲/F2▼ scroll to the program group that may need adjustments. Once found, press PAR to select the specific parameter that needs adjusting, followed by F1▲/F2▼ to change settings. Pressing PAR will finalize any action. Pressing DSP at any time will return the meter to the current dewpoint reading.



PAR		Initiates the Pro display, initiates settings and navigates the table to the right →													
F1▲	Pro														
Changes Settings and navigates the table up and down	1-INP	rANGE	deCpt	round	FILtr	BANd	PtS	StYLE	INP 1	dSP 1	INP 2	dSP 2			
	F1▲	0.02A	0.00	0.01	1.0	0.10	2	YEY	4.00	-112	20.00	68			
	2-FNC	USr-1	USr-1	USr-1	F1	F2	rSt	Sc-F1	Sc-F2						
	F1▲	no	no	no	no	no	no	no	no						
	3-LOC	HI	LO	tOt	SP-1	SP-2	SP-3	SP-4	Code						
	F1▲	loc	loc	loc	loc	loc	loc	loc	0						
	4-SEC	HI-t	LO-t	dSP-t	b-L1t										
	F1▲	0.0	0.0	2	off										
	5-tOt	dECPt	tBASE	SCFAC	Locut	P-UP									
	F1▲	0.0000	_in	1.000	-199.99	no									
	6-Spt	SPSEL		Act-1	SP-1	Src-1	HyS-1	tON-1	tOF-1	out-1	rSt-1	Stb-1	L1t-1		
		→	SP-1	AB-LO	-40.00	rel	0.02	0.0	0.0	nor	auto	no	nor		
				Act-2	SP-2	Src-2	HyS-2	tON-2	tOF-2	out-2	rSt-2	Stb-2	L1t-2		
	F1▲	→	SP-2	AB-HI	-20.00	Rel	0.02	0.0	0.0	nor	auto	no	nor		
	7-SrL	bAUd	dAtA	PAr	Addr	AbRu	OPT	INP	tat	HILO	SPnt				
F1▲	9600	7	Odd	0	yes	no	yes	yes	yes	no					
8-Out	tyPE	ASIN	AN-LO	AN-HI	udt										
F1▲	4-20	INP	-112	68	0.0										
9-FCS	d-LEu	Code													
F2▼	F1▲	3	50												

1. Verify there is flow over the sample cell. It should be fed by an unrestricted compressed air line. The flow restriction is created by a check valve and orifice on the outlet of the sample cell, just before the "pigtail" that prevents ambient moisture from backtracking to the sensor.
2. Verify that the data cable is securely connected to the probe.
3. Verify the 24V DC power supply is supplying the correct voltage.



WARRANTY

Any standard **GEH Series** Regenerative Air Dryer manufactured by Great Lakes Air Products is warranted free from defects in material and workmanship under normal use for a period of **2-Years** covering OEM replacement parts. Job site and or factory warranty labor is covered for the term of **1-Year**. The warranty applies to original purchaser effective at date of shipment from manufacturer's warehouse. The company's obligation under this warranty is limited to repairing or, at its sole option, replacing, during normal working hours at an authorized service facility of the company, any part which in its judgment proved to be not was warranted within the applicable warranty period.

This warranty applies to equipment installed, operated and maintained in accordance with the procedures and recommendations as outlined in the owner's manual.

Great Lakes Air Products will not be responsible for the following items; component failure due to improper or fluctuating voltage, maintenance items such as control air filter, muffler elements, dewpoint probes, external wear items such as insulation or the exterior finish, desiccant that has been contaminated, freight damages and or any parts not original to the dryer.

In all cases, seller must be given a reasonable opportunity to investigate and inspect any assumed defects. At seller's option, buyer must return any defective materials to seller's plant or authorized depot at buyer's expense. Freight charges for returned or replacement machines or parts are not the responsibility of Great Lakes Air Products. Seller's liability whether on warranty contract or otherwise shall be limited to repair or replacement of material found within such period to be defective. In no event shall the seller be liable for consequential or special damages.

Great Lakes Air Products shall not be responsible for any incidental or consequential damages or other costs resulting from the following; labor charges, delays, vandalism, negligence, fouling caused by foreign material, damage from adverse air conditions, chemicals, or any circumstances over which Great Lakes Air Products has no control.

The liability of Great Lakes Air Products for all loss or damage resulting from non-conforming goods or tender, including breach of any and all warranties, shall be limited to refund of the purchase price of the particular goods with respect to which the loss or damage occurred.

This warranty is in lieu of all other warranties oral or written, expressed or implied, including warranties of merchantability or fitness for a specific purpose are hereby excluded and disclaimed. **This warranty shall not apply to any equipment, which has been subjected to misuse, shipping damage, nonpayment, neglect or accident, nor shall it apply to any equipment that has been repaired or altered by persons not authorized for each incident with a Great Lakes Air Products authorization number.**