ZEH External Heat Regenerated Compressed Air Dryer

User Manual

For MODELS ZEH400 TO ZEH3500

This dryer configuration includes equipment options as selected (X) below:

- [x] EC OPTION
- [ ] LDP OPTION
- [ ] 3V OPTION

This manual is part number
Z103160 Rev. 05

FOREWORD

Reading this user manual will fully familiarize you with the Zander adsorption dryer. You will be better able to run this equipment in accordance with its intended use.

This manual contains important information for safe, proper and economic dryer installation, start-up, operation and maintenance. Always keep it within reach where the adsorption dryer is being used.

It is necessary to follow all instructions as written. Careful reading will avert danger, avoid unnecessary downtime, and minimize work for yourself and wear on the equipment.

In addition to carefully reading this technical manual in its entirety, you must understand your National, State and local rules and regulations regarding safety in the workplace, their necessary precautions and procedures.

Each person responsible for the set-up, start-up, operation, maintenance or repair of this adsorption dryer must have first read and understood this user manual – including all the safety tips.

NOTE: ***Zander recommends that installation, start-up and maintenance be carried out by its factory-trained technicians in a regularly scheduled, site-dedicated program. This will ensure the safety of personnel, the integrity of equipment and the surety of warranty coverage.***

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1. INTRODUCTION

1.1 GENERAL

This adsorption dryer includes the latest technology and safety features. Its use, however, can endanger life and limb and can lead to considerable damage to the equipment and other material assets if:

- it is operated by personnel not instructed in its use,
- it is improperly used,
- it is improperly maintained or serviced.

Furthermore, ignorance of its use and maintenance can result in the loss of any claim for damage.

This adsorption dryer is designed for neutral media (such as air or nitrogen) which is free of aggressive water, oil and solid elements. Zander accepts no liability for corrosion damage or malfunctions caused by aggressive media.

Applications other than those mentioned in this manual must be agreed to by Zander and confirmed in writing.

Zander reserves the right to make changes at any time as may be necessary for increasing safety or efficiency, or in the interests of further product development.

1.2 PRODUCT INFORMATION

The adsorption dryer is used for the purpose of drying compressed air and other gases according to its contracted design. Depending on certain conditions at the inlet, and with pre- and afterfilters properly installed, it provides pure, dry and oil-free compressed air or gases. The standard model of adsorption dryer is equipped with two desiccant vessels.

This specific model of dryer includes the Ecotronic Control (EC) energy management system to provide automatic monitoring and control of the dry/regenerate cycle to optimize equipment efficiency. This manual includes references to optionally available Low Dew Point (LDP) and 3-valve bypass (3V) systems/assemblies which may or may not be provided. Selected options included with this dryer are indicated on the cover page by an “X” printed in the box.

1.2.1 PRESSURE VESSEL REGULATIONS

The pressure vessels are designed and built to meet the American Society of Mechanical Engineers (ASME) standards. They fulfill the test of the certifying procedure and carry the ASME symbols **U** or **UM**.

RANGE OF APPLICATION

Design Pressure	Max: 150 psig
Design Temperature	Max: 500 °F (260 °C) Min: -20 °F (-29 °C)

1.2.2 LEAK TEST

Each Zander adsorption dryer is subjected to, and passes, a leak test prior to shipment.

1.3 SAFETY INSTRUCTIONS

This manual contains basic tips which must be followed during set-up, operation and servicing. It is most important that it be read by the assembly technician before installation and start-up as well as by the specialist/operator in charge. It must always be within reach at the place where the adsorption dryer is being used.

1.3.1 IDENTIFICATION OF SIGNS AND SYMBOLS IN THIS MANUAL

The safety tips contained in this manual, whose disregard could endanger people and equipment, are indicated by a general danger sign and the additional markings **Danger!** or **Attention!** or **Warning!**

Danger! / Attention!

Safety sign in accordance with DIN 4844 - W9

Warning – high voltage!

Safety sign in accordance with DIN 4844 - W8

Safety tips printed directly on the adsorption dryer must be heeded at all times and must be kept completely legible.

1.3.2 GENERAL SAFETY TIPS FOR ASSEMBLY, INSPECTION AND MAINTENANCE

The purchaser is to ensure that all assembly, maintenance and inspection work is carried out by personnel qualified to do it.

The personnel involved in assembly, operation, maintenance and inspection must have the corresponding qualifications to do this work. Areas of responsibility and supervision of the personnel must be clearly established by the purchaser. Should the personnel not possess the necessary knowledge, then they must be instructed. If need be, this training may be carried out by the manufacturer/supplier at the request of the purchaser. Further, the purchaser is to ensure that all personnel completely understand and follow the content of this manual.

Attention!

- Never make structural changes to the adsorption dryer
- Only use recommended spare parts as listed in section 5
- Never weld on a pressure vessel or change it in any way
- Carry out maintenance only when the adsorption dryer is OFF, depressurized and disconnected from the electric power supply.

Danger!

- Review the Material Safety Data Sheet (MSDS) provided with the desiccant when installing or disposing of it
- Wear protective clothing and goggles when working with the desiccant
- If desiccant comes into contact with the eyes, rinse eyes immediately with a lot of clear water
- If the desiccant is spilled, clean up without causing swirls of dust
- In case of fire, there is no restriction on the use of fire extinguishing material on the desiccant; the reaction with water and foam is defined as strong
- A mask must be worn whenever handling desiccant.

1.4 TECHNICAL DATA SHEET

1.4.1 MODELS ZEH400 TO ZEH820

Model	ZEH400	ZEH500	ZEH650	ZEH820
Rated flow @ 100 psig & 100°F inlet conditions	400 scfm	500 scfm	650 scfm	820 scfm
Chamber Outer Diameter	18 inches	18 inches	18 inches	20 inches
Desiccant Bed Composition & Pounds per Chamber	**Standard (no LDP option):** 100% Activated Alumina			
	272	350	433	660
	With LDP option – Layered: 33% Mol Sieve (bottom), 67% Activated Alumina (top).			
	1st MS: 90	1st MS: 115	1st MS: 143	1st MS: 218
	2nd AA: 182	2nd AA: 235	2nd AA: 290	2nd AA: 442
Inlet Connection	2-in NPT	2-in NPT	2-in NPT	3-in RF FLG
Outlet Connection	2-in NPT	2-in NPT	2-in NPT	3-in RF FLG
Standard Electric Rqmt	230 Vac/3-phase/60 Hz or 460 Vac/3-phase/60 Hz		460 Vac/3-phase/60 Hz	
Heater	6 kW	6 kW	8 kW	12 kW
Cycle Time	8-Hour Cycle – 4 Hours Drying / 4 Hours Regeneration			
Outlet Pressure Dewpoint	-40°F PDP (-100°F LDP)			
EC Control Setting	-40°F PDP (-100°F LDP)			
High Humidity Alarm	-35°F PDP (-95°F LDP)			
Pressure Switch Setpoints	PSL – 10 psig / PSH – 30 psig below line pressure			
Purge Pressure Setting	70 psig	65 psig	55 psig	55 psig
Low Purge Alarm Setpoint	60 psig	55 psig	45 psig	45 psig
Heater Outlet Setpoint	425°F			
End Heating Temperature	180°F			
End Cooling Temperature	120°F			
Heater Sheath Alarm	1000°F			
Flow Directions	Downward Drying – Upward Regeneration			

1.4.2 MODELS ZEH1000 TO ZEH1800

Model	ZEH1000	ZEH1225	ZEH1500	ZEH1800
Rated flow @ 100 psig & 100°F inlet conditions	1000 scfm	1225 scfm	1500 scfm	1800 scfm
Chamber Outer Diameter	24 inches	24 inches	28 inches	28 inches
Desiccant Bed Composition & Pounds per Chamber	**Standard (no LDP option):** 100% Activated Alumina			
	825	990	1055	1320
	With LDP option – Layered: 33% Mol Sieve (bottom), 67% Activated Alumina (top).			
	1st MS: 272	1st MS: 327	1st MS: 348	1st MS: 436
	2nd AA: 553	2nd AA: 663	2nd AA: 707	2nd AA: 884
Inlet Connection	3 in RF FLG	3 in RF FLG	3 in RF FLG	4 in RF FLG
Outlet Connection	3 in RF FLG	3 in RF FLG	3 in RF FLG	4 in RF FLG
Standard Electric Rqmt	460 Vac/3-phase/60 Hz			
Heater	17 kW	21 kW	25 kW	28 kW
Cycle Time	8 Hour Cycle – 4 Hours Drying / 4 Hours Regeneration			
Outlet Pressure Dewpoint	-40°F PDP (-100°F LDP)			
EC Control Setting	-40°F PDP (-100°F LDP)			
High Humidity Alarm	-35°F PDP (-95°F LDP)			
Pressure Switch Setpoints	PSL – 10 PSIG / PSH – 30 PSIG below line pressure			
Purge Pressure Setting	70 psig	60 psig	65 psig	70 psig
Low Purge Alarm Setpoint	60 psig	50 psig	55 psig	60 psig
Heater Outlet Set Point	425°F			
End Heating Temperature	180°F			
End Cooling Temperature	120°F			
Heater Sheath Alarm	1000°F			
Flow Directions	Downward Drying - Upward Regeneration			

1.4.3 MODELS ZEH2100 TO ZEH3500

Model	ZEH2100	ZEH2500	ZEH3000	ZEH3500
Rated flow @ 100 psig & 100°F inlet conditions	2100 scfm	2500 scfm	3000 scfm	3500 scfm
Chamber Outer Diameter	30 inches	36 inches	40 inches	40 inches
Desiccant Bed Composition & Pounds per Chamber	**Standard (no LDP option):** 100% Activated Alumina			
	1485	1722	2310	2805
	With LDP option – Layered: 33% Mol Sieve (bottom), 67% Activated Alumina (top).			
	1st MS: 490	1st MS: 568	1st MS: 762	1st MS: 926
	2nd AA: 995	2nd AA: 1154	2nd AA: 1548	2nd AA: 1879
Inlet Connection	4-in RF FLG	4-in RF FLG	6-in RF FLG	6-in RF FLG
Outlet Connection	4-in RF FLG	4-in RF FLG	6-in RF FLG	6-in RF FLG
Recommended Prefilter Recommended Afterfilter Pilot Air Filter	SWH-2100 SWF-2100 SWF-20	SWH-2750 SWF-2750 SWF-20	SWH-4100 SWF-4100 SWF-20	SWH-4100 SWF-4100 SWF-20
Standard Voltage	460 Vac/3-phase/60 Hz			
Heater	30 kW	36 kW	43 kW	50 kW
Cycle Time	8-Hour Cycle – 4 Hours Drying / 4 Hours Regeneration			
Outlet Pressure Dewpoint	-40°F PDP (-100°F LDP)			
EC Control Setting	-40°F PDP (-100°F LDP)			
High Humidity Alarm	-35°F PDP (-95°F LDP)			
Pressure Switch Set Points	PSL – 10 psig / PSH – 30 PSIG below line pressure			
Purge Pressure Setting	60 psig	70 psig	65 psig	60 psig
Low Purge Alarm Set Point	50 psig	60 psig	55 psig	50 psig
Heater Outlet Set Point	425°F			
End Heating Temperature	180°F			
End Cooling Temperature	120°F			
Heater Sheath Alarm	1000°F			
Flow Directions	Downward Drying – Upward Regeneration			

1.4.4 DRYER FLOW CAPACITIES

The specific size/model of your dryer was selected to meet performance requirements based on an analysis of air supply and demand capacities. The model selection chart provided following should confirm that this dryer remains suitable for its intended use.

The table following is based on -40°F PDP, 8-hour cycle, activated alumina and average inlet air flow for non-LDP-equipped dryers with EC. Consult our factory for rated air flows on LDP-equipped dryers.

MODEL	Design Inlet Air Pressure (psig)	Rated inlet air flow (scfm) at given pressures (psig) (Based upon 100°F inlet air temperature)								
		60	70	80	90	100	110	120	130	140
ZEH400	150	220	265	310	355	400	440	480	520	550
ZEH500	150	305	355	400	460	500	550	590	645	680
ZEH650	150	360	435	505	580	650	705	790	850	905
ZEH820	150	460	550	640	735	820	905	990	1070	1150
ZEH1000	150	615	715	805	920	1000	1140	1255	1325	1420
ZEH1225	150	690	825	955	1100	1225	1360	1490	1610	1735
ZEH1500	150	785	960	1150	1275	1500	1600	1730	1875	2010
ZEH1800	150	1010	1210	1405	1610	1800	1995	2190	2375	2535
ZEH2100	150	1095	1345	1600	1835	2100	2275	2500	2700	2890
ZEH2500	150	1480	1735	1985	2270	2500	2820	3100	3355	3585
ZEH3000	150	1685	2015	2340	2680	3000	3330	3645	3960	4235
ZEH3500	150	1900	2300	2700	3095	3500	3845	4195	4570	4890

Higher pressures are optionally available. Consult factory.

To correct for an inlet temperature other than 100°F, multiply dryer capacity by the temperature correction factor listed below.

CORRECTION FACTOR FOR INLET TEMPERATURE

TEMPERATURE DEGREES F	80	90	100	105	110	115	120
Correction Factor	1.1	1.1	1.0	0.85	0.69	0.565	0.455

***Example*: To size for an inlet flow of 950 SCFM @ 105 F and 110 psig.**

1. Select model that produce at least 950 SCFM at 110 psig. This case would be the ZEH1000 which can dry 1140 SCFM.
2. Multiply pressure corrected flow by the temperature correction factor to obtain the flow of the dryer corrected for pressure and temperature:
   1140 X (0.85) = 969 SCFM
3. Confirm model selection. Model ZEH1000 can flow 969 SCFM at the inlet conditions specified; requirements of 950 SCFM are less: ZEH1000 is correct.

NOTE: Settings for EC: ***Standard Dryers: EC Control -40°F (-40°C)***
High Humidity -32°F (-35°C)

LDP Dryers: EC Control -100°F (-74°C)
High Humidity -95°F (-69°C).

1.5 OVERLOADING

Attention! Protect the adsorption dryer from overloading!
The adsorption dryer can become overloaded if:

- The flow volume of the medium to be dried increases
- The temperature of the air at entry and, correspondingly, its humidity increases
- The minimum operating pressure decreases
- The prefiltration and separation of impurities are not sufficient or the filter drain fails
- Introduction of oil into the air stream.

1.6 TRANSPORT

Immediately upon delivery of the adsorption dryer, it must be checked for any damage that may have occurred during transport. If necessary, the damage must be recorded on the shipping waybill/receipt. Liability for such damage usually rests with the shipper. Contact Zander to arrange for any required service or replacement parts.

Attention!

For transport within your company site, only the skids of the adsorption dryer may be used. Lifting at any other points on the equipment will void the warranty and damage the equipment.

1.7 STORAGE

If the adsorption dryer is to be stored for a long period of time, its place of storage must be dry and free of dust. The ambient temperature cannot go below 33°F (+1°C).

1.8 USE OF A PREFILTER AND AFTERFILTER

In order to prevent droplets of condensate, oil and dirt from getting into the desiccant, a Zander prefilter must be installed upstream of the adsorption dryer. Otherwise, an oil film on the desiccant would reduce the drying capacity. In order to prevent breakdown in downstream consumers caused by material that has been abraded from the desiccant bed, a Zander afterfilter must be mounted downstream of the adsorption dryer. Since no condensate should accumulate in the afterfilter, no automatic drain is required. Both filters are equipped with an incident monitor (i.e., differential pressure indicator) to advise of blockage in the filter elements.

2. INSTALLATION

2.1 GENERAL

Ensure that the installation site is free of dust, dirt and litter. The site floor must be level and strong enough to support the equipment. The site itself must be an heated environment (minimum 50°F) to ensure proper operation and warranty protection.

Ensure that the Zander adsorption dryer is carried only by its skid base frame. The adsorption dryer must be positioned so that the side from which it is to be operated is easily accessible. The upstream piping is to be connected at a slightly downward slope toward the prefilter. Install isolation valves on the inlet to the prefilter and outlet of the afterfilter. Also, a bypass pipe with an additional isolation valve should be mounted around the adsorption dryer to allow for an uninterrupted supply of compressed air when the adsorption dryer requires maintenance or repair. The bypass assembly may not be provided (see paragraph 1.2): it is optionally available or can be customer furnished. If vibration occurs at the installation site, the adsorption dryer skid frame must be placed onto vibration dampers to avoid desiccant abrasion and degradation.

2.2 MECHANICAL ASSEMBLY

- The equipment should be located in an area with adequate clearances for service. An overhead clearance of not less than two feet above each desiccant tower is required for loading of the desiccant.
- Remove all protective shipping crates, flange covers, etc.
- Using the mounting holes provided on the skid, anchor the dryer to a solid, level foundation designed to support the equipment.
- Do not hydrostatically test the pressure vessels. All ZEH dryer pressure vessels and welded piping are hydrostatically tested at 1.5 times the design pressure after fabrication and before assembly.
- Desiccant for models ZEH820 and up is shipped loose and must be installed on site. Refer now to paragraph 4.3 for instructions on installing the desiccant.
- If the equipment is installed in a high traffic area, protective barriers may be required to prevent possible damage of equipment and to prevent contact with hot surfaces.
- Due to vibration during shipping, some tube fittings may have loosened. Therefore, inspect all connections and tighten if required.
- Ensure that the inlet and outlet connections to and from the dryer are made using the correctly rated fittings and piping to meet the design conditions.

NOTE: System isolation and bypass valves should be installed. If not supplied by Zander as part of the equipment package (i.e., 3V option – see paragraph 1.2), they should be supplied and installed by others. Ensure that this bypass facility is installed so that future servicing of the dryer system off-line may take place.

- Full flow relief valves to protect the system from over-pressure must be customer-provided in accordance with local regulations.

- The purge exhaust on the ZEH650 and smaller dryers is equipped with an exhaust muffler/silencer. If required, the silencer can be removed and purge exhaust can be connected to a vent header. Follow recommendations for pipe sizing listed below.

- The purge exhaust connection on the ZEH820 and larger dryers must be connected to a vent header. To ensure satisfactory regeneration of the desiccant chambers, the purge exhaust piping should be sized as follows to prevent back-pressure build up.

EXTENDED LENGTH	PIPE SIZE REQUIRED
TO 10 FEET	SAME SIZE AS DRYER EXHAUST
TO 25 FEET	1 SIZE LARGER THAN DRYER EXHAUST
TO 50 FEET	2 SIZES LARGER THAN DRYER EXHAUST
TO 100 FEET	3 SIZES LARGER THAN DRYER EXHAUST

Caution!

The noise at the outlet of the exhaust header may exceed 100 dBa, and the flow velocity will be high. Exhaust must be piped to an area where these flow velocities and noise levels can be safely tolerated.

2.3 FILTER INSTALLATION

Pre- and afterfilters for the ZEH dryer must be purchased separately. These filters are available loose, or as part of a separate bypass skid with the 3V Option (i.e., 3-valve bypass assembly with mounted filters).

2.3.1 PREFILTER INSTALLATION (SHIPPED LOOSE)

- Mount prefilter in such a way as to allow clearance for the element installation and removal.

- Locate the prefilter as close to the dryer inlet connection as possible.

- The filter must be piped so that the correct flow direction indicated on the filter is followed.

- Ensure that all piping and valves are equivalent or larger in size to the dryer inlet connection.
- Connect drain port to a condensate collector. Use an easily visible collector to aid in operational inspection.

2.3.2 AFTERFILTER INSTALLATION (SHIPPED LOOSE)

- Mount afterfilter in such a way as to allow clearance for the element installation and removal.
- The filter must be piped so that the correct flow direction indicated on the filter is followed.
- Ensure that all piping and valves are equivalent or larger in size to the dryer inlet connection.

2.3.3 FILTER SKID WITH 3 VALVE BYPASS (IF DRYER INCLUDES 3V OPTION)

- Filters skid should be located as close to dryer as possible. Use the skid bolt holes to secure the assembly.
- Ensure that the skid is located such that the 3-valve bypass will bypass the dryer and filters when in use.
- Check the flow direction of each filter to ensure the prefilter is connected to the inlet pipe of the dryer and afterfilter is connected to the outlet pipe of the dryer.
- Connect the filter skid piping and dryer skid piping using materials and fabrication procedures that are suitable for compressed air pressure piping. All flanges are ANSI B16.5 Class 150 raised face flanges.

2.4 ELECTRICAL CONNECTION

Warning – high voltage!

Be sure that power is removed from the line feed before making connection between the site drop and the equipment.

- Connect the dryer to a correctly sized power supply. Refer to the dryer nameplate or the electrical drawing (see section 7) for the supply voltage and amperage requirement to properly size the electrical service. Only one electrical connection is required. All internal wiring was done at the factory.

NOTE: A disconnect switch is not provided with the dryer and must be supplied by the customer in accordance with the local electrical codes.

- Ground the frame of the dryer in accordance with the local electrical codes.
- It is recommended that the common alarm relay, located in the dryer control panel, be connected to the control room or operator station so that an immediate response to a dryer alarm may be given when required.
- Before energizing the electrical circuit, the electrical heater assembly should be inspected to determine that no moisture has accumulated in the heater enclosure or terminations. A 1000V meg-ohmmeter should be used to determine the phase-to-ground insulation resistance for each phase. A minimum value of 500 kohms should exist.

2.5 EC CONTROL CONNECTION

- A probe sample line must be run from downstream of the afterfilter.
- A 10-ft length of 1/8-in stainless steel tubing and necessary compression fittings are provided.
- Tube fittings are to be installed downstream of the afterfilter at the incident monitor/differential pressure indicator (DPI) port T-fitting on the afterfilter outlet nozzle
- Remove the hexagonal plug from the DPI T-fitting.
- Insert 1/8-in tubing into compression fitting and tighten.
- Run the tubing back to the hygrometer housing. Cut to necessary length and connect to the upper connection fitting. Tubing is semi-flexible so care must be taken when bending to ensure the tubing does not kink.
- If the sample port is installed at a distance longer than the tubing supplied, contact your Zander distributor for assistance.

3. EQUIPMENT OPERATION

3.1 GENERAL OPERATING PRINCIPLES

This dryer model has two parallel adsorption chambers filled with desiccant. While the medium is being dried flowing top-down in one chamber, regeneration takes place from the bottom up in the other chamber. The changeover from one chamber to the other is controlled by programmable logic control (PLC) and the Dewpoint Dependent Switching system that monitors desiccant performance by measuring the outlet air dew point. The dryer operates continuously and is fully automatic.

The standard dryer with EC has a cycle time of eight hours. Half the cycle time is dedicated to air drying and the other half to desiccant regeneration, with one chamber working to dry the air while the other regenerates. The dryer is configured at the factory.

Wet air enters the working desiccant chamber (it can be either the left or right) at the inlet switching valves (top) and is dried as it flows downward through the desiccant bed. Dry air exits the dryer through the outlet check valve.

The regeneration of the off-line chamber begins with a heating cycle. After having depressurized the off-line chamber, the purge orifice allows a portion of the dry outlet air to flow across the regeneration heater. The heated regeneration air then passes upward through the desiccant bed where it picks up previously adsorbed moisture from the desiccant and is then evacuated to atmosphere through the purge exhaust valve.

At the completion of the regeneration heating cycle, the cooling cycle begins. The regeneration heater is de-energized. The purge orifice allows a portion of the dry outlet air to flow through the off-line tower. It is then evacuated to atmosphere through the purge exhaust valve. When the cooling cycle is completed, the purge exhaust valve is closed and the off-line tower is repressurized. Once at line pressure, the dryer is ready to switch drying from one chamber to the other. Dryer models ZEH3000 and 3500 have purge control valves which close once at line pressure and prior to switching from one chamber to the other.

The purge air is controlled by a purge adjusting valve and purge orifice located in the purge line. Purge pressure is indicated on the purge pressure gauge.

Zander high-efficiency prefilters and reverse-flow afterfilters are designed to remove solids, oil and water condensate from compressed air and other neutral, compressed gases. These filters provide high flows and low differential pressures.

Solids are filtered out by impact or by the effect of inertia, whereas oil particles and drops of moisture are filtered out by the effect of coalescence. By the force of gravity, the contaminants collect in the lower filter vessel and are drained automatically or manually.

3.1.1 DRYER PROGRAM STEPS

This automatic dryer is equipped with a PLC which retains last-position data in the event of a power failure or fast shutdown. The dryer will restart at the last position or can be manually cycled on the operator interface to reset at step 1.

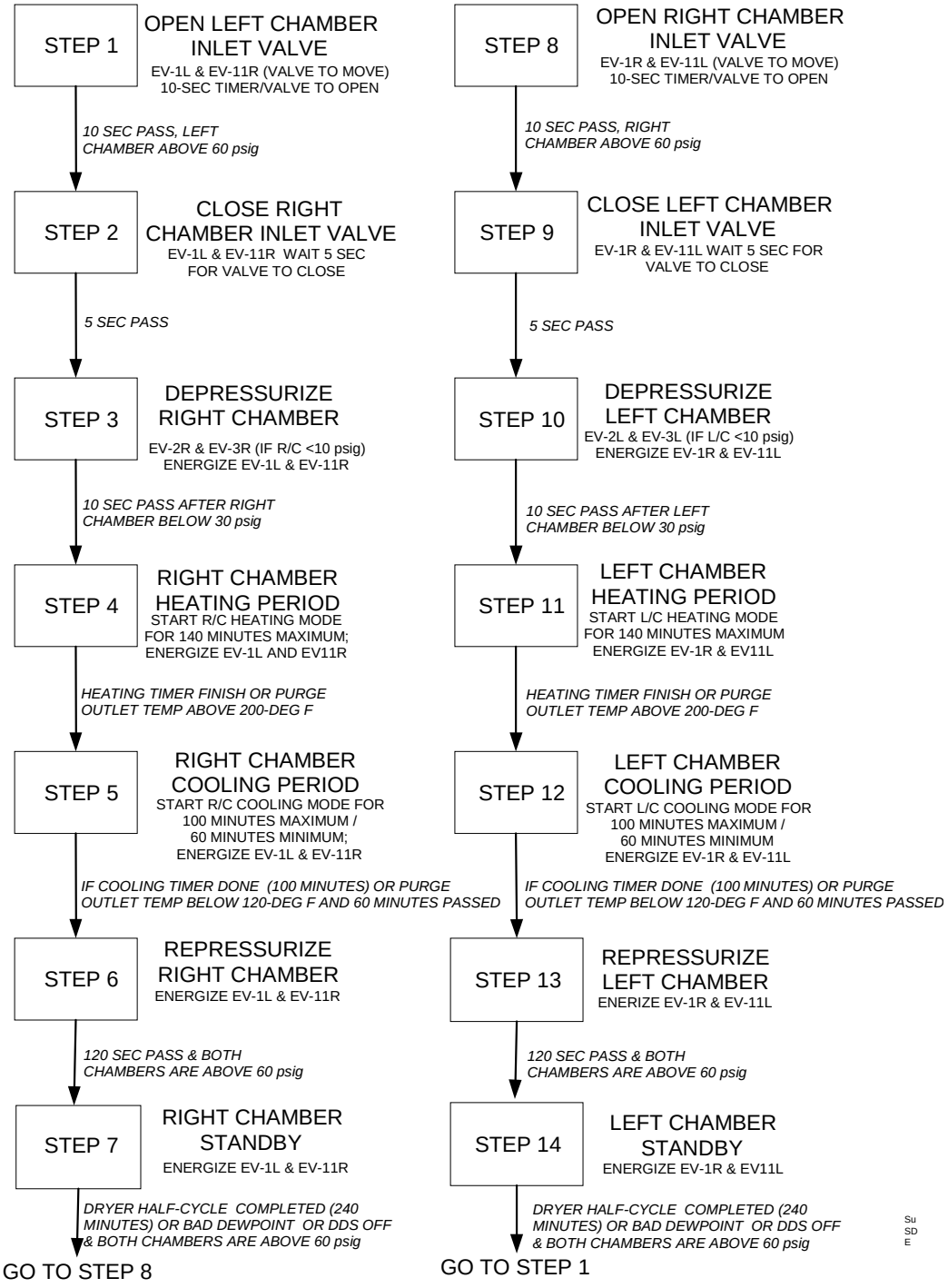
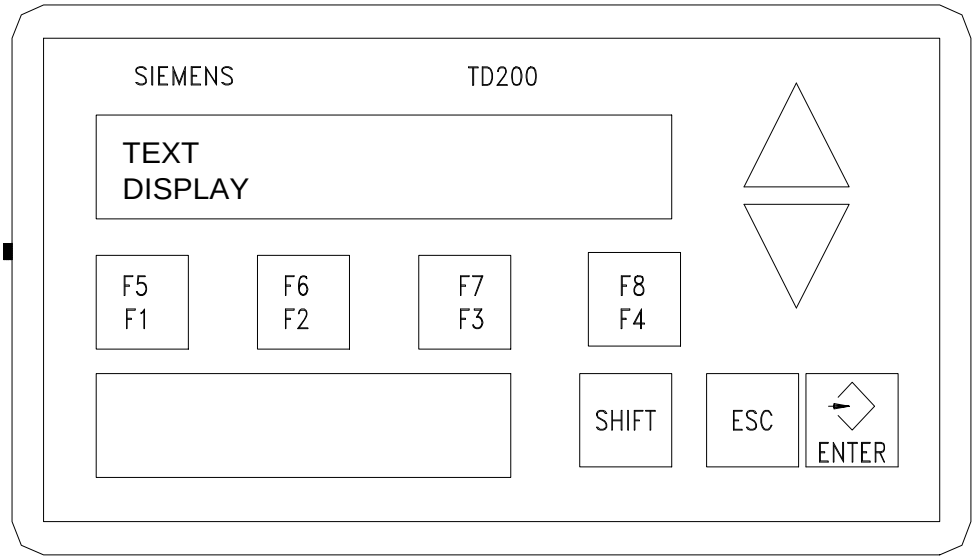


FIGURE 1 – DRYER PROGRAMMED STEPS

3.2 OPERATOR CONTROLS / LOW-VOLTAGE CONTROL PANEL

The operator status display and control interface (i.e., monitor) is detailed in Figure 2. It is provided to allow the operator to manually cycle through the programmed steps, and to indicate system status. The system operating setpoints cannot be changed at this panel.



F1 – DRYER STATUS
F2 – MANUAL STEP AHEAD (MANUAL MODE ONLY)
F3 – DRYER ALARM STATUS
F4 – ALARM RESET

SHIFT – In order to choose one of the next four options, the SHIFT button must be pressed first. An "s" in the lower right corner indicates the upper row is now active.

F5 – DRYER OPERATING MODE MENU
F6 – HEATER SHEATH TEMPERATURE AND SETPOINT
F7 – HEATER OUTLET TEMPERATURE AND SETPOINTS
F8 – REGENERATION OUTLET TEMPERATURE AND SETPOINTS

▲
▼ Arrows allow user to scroll up or down within the display. A flashing arrow on the right side of the screen indicates that more information is available in the direction of the arrow and can be accessed by using the scroll arrows.

ESC – ACCESSES THE MENU MODE (ACCESS IS NOT REQUIRED).
ENTER – NO FUNCTIONALITY FOR THIS BUTTON.

FIGURE 2 – OPERATOR MONITOR

3.2.1 DRYER STATUS

The **F1** key is pressed to display the present status of the dryer. This allows you to see which step of the program cycle is currently engaged. A message can appear below the dryer status at any time when in manual mode. A blinking arrow on the right side of the display will indicate this. To access the messages, press the green arrow on the right side of the interface.

MESSAGE IDENTIFICATION	MESSAGE DESCRIPTION
SELECT LEFT CHAMBER DRYING	Opening the left chamber (L/C) inlet valve. Closing the right chamber (R/C) inlet valve.
LEFT CHAMBER DRYING R/C IN DEPRESS MODE	Depressurizing the right chamber.
LEFT CHAMBER DRYING R/C IN HEATING MODE	Heating the right chamber for regeneration.
LEFT CHAMBER DRYING R/C IN COOLING MODE	Cooling the right chamber.
LEFT CHAMBER DRYING R/C IN REPRESS MODE	Pressurizing the right chamber.
LEFT CHAMBER DRYING R/C IN STANDBY MODE	Right chamber in standby until the end of the half cycle.
LEFT CHAMBER IN EC MODE R/C IN STANDBY MODE	The dryer is in EC mode on the left chamber. This will extend the half cycle for a maximum of 12 hours or until the outlet dewpoint goes higher than -40°F.
SELECT RIGHT CHAMBER DRYING	Opening the right chamber inlet valve. Closing the left chamber inlet valve.
RIGHT CHAMBER DRYING L/C IN DEPRESS MODE	Depressurizing the left chamber.
RIGHT CHAMBER DRYING L/C IN HEATING MODE	Heating the left chamber for regeneration.
RIGHT CHAMBER DRYING L/C IN COOLING MODE	Cooling the left chamber.
RIGHT CHAMBER DRYING L/C IN REPRESS MODE	Pressurizing the left chamber.
RIGHT CHAMBER DRYING L/C IN STANDBY MODE	Left chamber in standby until the end of the half cycle.
RIGHT CHAMBER IN EC MODE L/C IN STANDBY MODE	The dryer is in EC mode on the right chamber. This will extend the half cycle for a maximum of 12 hours or until the outlet dewpoint goes higher than -40°F.

3.2.2 ALARM INFORMATION

The **F3** button is pressed to display the status of the dryer alarms. If there is no alarm, a **NO ALARM** message will appear. If more than one alarm is active, a flashing arrow will appear on the right side of the display. To access the messages, press the green arrow on the right side of the panel. In order to reset non-active alarms, press the **F4** key. When all the alarm conditions have been cleared, the **NO ALARM** message will appear.

MESSAGE IDENTIFICATION	MESSAGE DESCRIPTION
HEATER OUTLET OVER TEMPERATURE	Heater outlet temperature is above the setpoint.
THERMOCOUPLE MODULE IN ERROR	Indicates the thermocouple module has lost it's 24Vdc supply.
THERMOCOUPLE OUT OF RANGE	Indicates a thermocouple connected to the module is defective or open.
HEATER FAILURE ALARM FAIL REACH SETPOINT	The heater has failed to reach the setpoint temperature within 15 minutes.
OVERSHEATH ALARM SHEATH TEMPERATURE TOO HIGH	The heater sheath temperature is above the setting.
DEPRESS FAILURE ON LEFT CHAMBER	The left chamber did not reach the low setting of the pressure switch within time limit.
DEPRESS FAILURE ON RIGHT CHAMBER	The right chamber did not reach the low setting of the pressure switch within time limit.
REPRESS FAILURE ON LEFT CHAMBER	The left chamber did not reach the high setting of the pressure switch within time limit.
REPRESS FAILURE ON RIGHT CHAMBER	The right chamber did not reach the high setting of the pressure switch within time limit.
HIGH HUMIDITY ALARM	Indicates the outlet dewpoint is above alarm setpoint.
NO ALARM	Indicates no alarm is active.

3.2.3 DRYER OPERATION MODES

The **F5** button is pressed to display the dryer mode of operation. The actual mode will be displayed whether it is in automatic or manual mode. To change the actual mode of the dryer, press **F2** when in the dryer mode screen. The actual mode will change from one to the other each time the **F2** button is pressed. If the dryer mode screen is left unattended for thirty seconds, it will automatically switch to the dryer status screen. In manual mode, the **READY TO STEP AHEAD PRESS F2 TO CONTINUE** message will be shown when the dryer is ready to perform the next step. In order to go to the next step in manual mode you must not be in the dryer operation mode screen. Failure to do so will simply change the operating mode of the dryer.

MESSAGE IDENTIFICATION	MESSAGE DESCRIPTION
DRYER IN AUTO MODE	The dryer is in automatic mode. The dryer will perform its cycle without any external intervention except in case of alarm.
DRYER IN MANUAL MODE	The dryer is in manual mode. The dryer will need external intervention in order to do to the following step. If no external intervention is provided the dryer will stay in that step.
READY TO STEP AHEAD PRESS F2 TO CONTINUE	The dryer is ready to go to the next step when in manual mode. The user must wait for this signal in order to press **F2** for making the dryer step ahead in its cycle.

3.2.4 HEATER SHEATH INFORMATION

The **F6** button accesses heater sheath information. On this screen the actual sheath temperature in degrees Fahrenheit is displayed and so is the temperature setpoint for the sheath over-temperature alarm. The setpoint cannot be changed from the panel.

MESSAGE IDENTIFICATION	MESSAGE DESCRIPTION
HEATER SHEATH XXXX F ALARM SETPOINT YYYY F	Displays temperature of the heater sheath (XXXX) and also at which temperature the dryer will turn in alarm (YYYY). Both temperatures are in degrees Fahrenheit.

3.2.5 HEATER OUTLET INFORMATION

The **F7** button accesses the heater outlet information. On this screen the actual temperature in degrees Fahrenheit is displayed and so is the temperature setpoint for the heater outlet over-temperature and heating failure alarm. The setpoint cannot be changed at the panel.

MESSAGE IDENTIFICATION	MESSAGE DESCRIPTION
HEATER OUTLET XXXX F HEAT CONTROL YYYY F	Displays the heater outlet temperature (XXXX) and the regulation temperature setting (YYYY) of the heater. Both temperatures are in degrees F.
HEATER OUTLET XXXX F HEAT FAIL AT ZZZZ F	Displays the actual heater outlet temperature (XXXX) and the heating failure alarm temperature setting (ZZZZ). Both temperatures are in degrees F.
HEATER OUTLET XXXX F HEAT OVERTEMP VVVV F	Displays the actual heater outlet temperature (XXXX) and the high outlet temperature alarm setting (VVVV). Both temperatures are in degrees F.

3.2.6 REGENERATION OUTLET INFORMATION

The **F8** button accesses regeneration outlet information. On this screen the actual temperature in degrees Fahrenheit is displayed and so are the control setpoints for end of heating and end of cooling. The setpoints cannot be changed at the panel.

MESSAGE IDENTIFICATION	MESSAGE DESCRIPTION
REGEN OUTLET XXXX F HEAT SETPOINT YYYY F	Displays the actual regeneration outlet temperature (XXXX) and the end of heating mode temperature setting (YYYY). Both temperatures are in degrees F.
REGEN OUTLET XXXX F COOL SETPOINT ZZZZ F	Displays the actual regeneration outlet temperature (XXXX) and the end of cooling mode temperature setting (ZZZZ). Both temperatures are in degrees F.

3.2.7 DRYER OFF, DRYER ON, EC ON – 3-POSITION SWITCH

This 3-position switch provides for manual selection of dryer basic functions. Ensure that the switch is set at DRYER OFF before beginning the initial startup procedure.

3.2.8 STATUS LAMPS

A green light announces that there is **POWER** at the control panel when lit. A red light announces that there is an **ALARM** condition when lit. Refer to the operator monitor to determine the cause.

3.2.9 PRESSURE GAUGES

Three gauges are mounted in a row above the low-voltage control panel. The two outside read the pressure within each each chamber (left side for left chamber, right for right) and the middle gauge shows the purge pressure.

3.3 INITIAL START-UP

Attention!

All pipes and wire connections must be tightened!

Furthermore, before start-up:

- The pipes must be cleaned of scale**,** abraded material from the threading, or other similar impurities.
- All isolation valves upstream of the prefilter and downstream of the afterfilter should be closed. The bypass valve, if installed, should be open.
- The ambient temperature must not be less than 33°F.

NOTE: Failure resulting from faulty installation or start-up does not qualify under the Zander warranty obligation. Start-up by factory-trained personnel is recommended.

3.3.1 PRESSURIZING DRYER

Prior to pressurizing the dryer system, verify the following:

- DRYER OFF/DRYER ON/EC ON switch is in the DRYER OFF position
- System outlet block valve is closed
- Prefilter, afterfilter and pilot air filter vent valves are closed
- Desiccant chamber vent valve is closed
- Pilot air isolation valve is open
- Hygrometer adjustment/isolation valves are closed.

Slightly open the inlet isolation valve to slowly admit compressed air to the system. When full system operating pressure has been reached, all connections should be soap bubble tested for leaks. Any leaks should be repaired and retested prior to placing the equipment in service. If some gas other than the process air will be used for leak testing, consult Zander for its compatibility with system components before proceeding.

Fully open the inlet isolation valve.

When the system is filled with process air and leak tight, *slowly* open the system outlet valve to pressurize the downstream piping. During this procedure, ensure that the dryer system pressure does not fall beyond 95% of its reading prior to opening the system outlet valve. This will protect the equipment internal components (i.e., filter elements, desiccant) from gas velocities above design conditions.

When pressurizing is complete, then fully open the system outlet valve to place the equipment in service.

Verify that the system inlet pressure and temperature are at the design operating levels (see paragraph 1.4)

Ensure that the pilot pressure regulator is set between 80 and 100 psig.

3.3.2 ENERGIZING DRYER CONTROLS

Turn 3-position switch to the DRYER ON position.

The operator monitor controls the dryer cycle. This should be used as a reference guide to ensure dryer is cycling. A manual mode is included in the dryer program to allow for fast cycling to verify to operation of the dryer.

Review the operational program of the dryer (paragraph 3.1.1) and the wiring schematic (see section 7) before operating the dryer.

NOTE: The hygrometer will signal an open circuit (the ALARM light will illuminate) until probe cable is connected to hygrometer probe. This connection is described in paragraph 3.3.4 – leave it as is for now.

While dryer is in purge mode for either chamber, the regeneration pressure setting should be checked.

Warning!

Failure to correctly set the purge pressure can lead to improper regeneration of the desiccant bed, resulting in a dewpoint failure when the chamber is returned to service.

3.3.3 PRESSURE SWITCH ADJUSTMENT

On the ZEH dryer there are four pressure switches: PSH-1, PSL-1, PSH-2 and PSL-2.

The PSH pressure switches are set at 30 psig below the operating pressure of the dryer, and use the normally open contact. When the adjustment is done, the contact between **C** and **NC** should close when increasing to the desired pressure.

The PSL switches are set at 10 psig regardless of the operating pressure and use the normally closed contact. When the adjustment is done, the contact between **C** and **NC** should close when decreasing to the desired pressure.

To increase the pressure, screw the knob toward the pressure switch diaphragm (see figure 3). To decrease the pressure, turn away from the pressure switch diaphram.

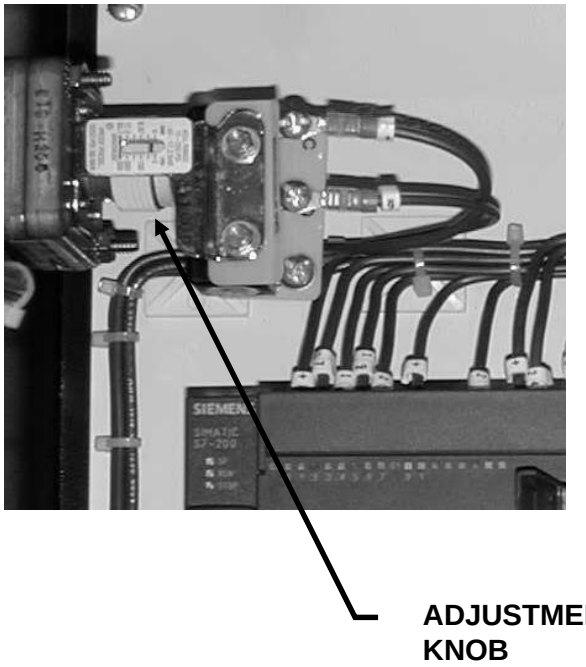


FIGURE 3 – PRESSURE SWITCH ADJUSTMENT

3.3.4 EC START UP

Refer to the general assembly drawing provided in section 7, and to figure 4.

The EC hygrometer probe has been shipped inside of its own sealed package to ensure that the probe does not become saturated with ambient air during storage and transport. Do not remove probe from the package until dryer system has been started and probe is to be inserted into the sample cell.

- Check that the sample line is connected from the dryer outlet to the inlet valve on the humidity probe sample cell.
- Check that the humidity probe is installed into the sample cell.
- Connect the cable to the humidity probe.

- Fully open the inlet valve to the sample cell.
- Partially open the discharge valve of the sample cell to vent off a small amount of sample air. Do not fully open discharge valve.
- Perform a soap bubble test to check for leaks on all parts of the sample line connections and the humidity sample cell.
- The digital display will now read the dewpoint of the dryer system. It will take a short period of time for a humidity probe to be purged of humidity.

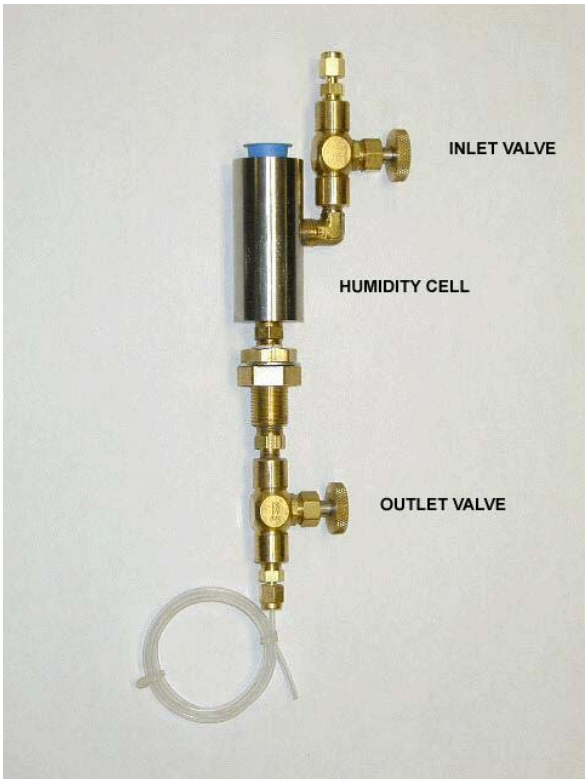


FIGURE 4 – HYGROMETER PROBE ASSEMBLY

NOTE: ***The dryer should be operated in the* DRYER ON *position at the time of initial start-up and at all times when the hygrometer or humidity probe are removed for service.***

3.4 SHORT-TERM SHUTDOWN

Follow this sequence when switching off the adsorption dryer:

- First close all the isolation valves up- and downstream of dryer
- Then immediately switch DRYER OFF.

Danger!

Dryer will remain pressurized.

3.5 SHUTDOWN IN CASE OF A FAULT OR FOR MAINTENANCE

Follow this sequence when switching off the adsorption dryer:

- First switch DRYER OFF. Make certain dryer is not in heating or cooling mode. The dryer electrical panel will still have power. The dryer disconnect must be turned off before opening electrical panel.
- Close all the isolation valves upstream and downstream of the adsorption dryer.
- Depressurize the dryer by using the manual vent valve at the bottom of the desiccant chamber.
- Depressurize the filters by opening vent valves at the bottom of each filter vessel.

Danger!

Before any kind of maintenance or repair work is done, the dryer must be depressurized and disconnected from the power source.

3.6 RESTARTING

- Close the manual vent valve mounted at the bottom of the afterfilter and at the bottom of each desiccant chamber
- Slowly open the inlet isolation valve and pressurize the dryer up to the regular operating pressure by keeping the isolation valve mounted behind the afterfilter closed.
- Switch DRYER ON.

NOTE: If the dryer is restarted after a long standstill, proceed as for an initial start-up (see paragraph 3.3).

4. MAINTENANCE

4.1 CHECKLIST

These checks are to be carried out by the operator during the routine operations cycle.

4.1.1 DAILY CHECK

- Operate prefilter drain ball valve as required to prevent excess accumulation. This may require frequent exercise depending on line moisture content. If the drain is automatic, check for functionality and blow down daily to remove accumulated fluids.
- Check the filter DPI/incident monitors. A reading in the red indicates a dirty filter element and it should be replaced. Filter elements should last between 6 to 12 months under normal use. The must be replaced annually regardless of the incident monitor reading.
- Check correct purge pressure.
- Ensure dryer is cycling without alarms.

4.1.2 WEEKLY CHECK

- Check all mufflers for backpressure at the pressure gauge on a regenerating chamber. It should not exceed 1 psig. Replace muffler if clogged or dirty.
- Verify heater operation.

4.1.3 QUARTERLY CHECK (EVERY THREE MONTHS)

- Check operating conditions, purge rate, line pressure, inlet flow.
- Check dryer operating cycle for proper operation of valve operators, solenoid valves, dump valves, heaters, pressure switches and temperature controller.
- Check the outlet dewpoint.
- Blow down relief valves.
- Check heater outlet temperature is between 400°F and 425°F.
- Verify pressure switch operation.
- Inspect pilot air filter element. If element seems clogged, dirty or damaged, replace it.

4.1.4 ANNUAL CHECK

- Disassemble, clean and inspect the inlet switching, purge exhaust and depressurizaton valves/actuators. Replace all worn or damaged parts.
- Disassemble, clean and inspect the outlet and purge check valves. Replace all worn or damage parts.
- Inspect the desiccant through the chamber fill port. Replace desiccant if degraded or if oil is present (see paragraph 4.3).
- Replace prefilter, afterfilter and pilot air filter elements at least once a year.
- Contact Zander to recalibrate the dewpoint sensor humidity probe.

NOTE: Should the need for spare parts or service arise during work on the adsorption dryer, the dryer model and serial number must be conveyed to Zander. This information is given on the nameplate mounted on the control cabinet. Telephone Zander to arrange for maintenance support.

4.2 CHANGING THE FILTER ELEMENT

- The filter element within the filter housing must be replaced when the incident monitor reads in the red or after one year of operation
- Depressurize the dryer and switch DRYER OFF

Danger!

Change filter elements only when the housing is fully depressurized

- Separate the lower part of the housing from the upper part
- Loosen and remove the element by hand
- Install the new filter element and replace the O-ring/gasket, making sure that the element seats perfectly
- Refit the filter housing.

NOTE: Zander filter elements cannot be cleaned or reused.

Attention!

Filters elements may contain pollutants as appropriate to their function. Dispose of used filter elements in accordance with your local, state and federal regulations.

4.3 REPLACEMENT OF THE DESICCANT

Desiccant life is determined by the care with which it is handled, the quality of filtered inlet air provided and by its time in use. Be careful to not abrade (i.e., wear down) the desiccant when installing it. Proper filtering of inlet air, and constant pressure and temperature, will also extend its life. In order to ensure trouble-free operation, we recommend replacing the desiccant every 10,000 operating hours, or every 3 years.

The following considerations determine the life expectancy of desiccant:

- Care in installation
- Quality of input gas (e.g., air)
- Constancy of flow and temperature
- Whether full-service cycling or low-demand usage
- Time in service.

The following clues will suggest that you examine the desiccant and consider its replacement:

- Discolorization of desiccant (e.g., oil residue, other contaminants): a brown or yellow tinge indicates that the adsorbancy capacity of the desiccant has been diminished
- Frequent afterfilter replacement due to desiccant dust accumulation
- Performance dew point rises.

Refer to paragraph 1.4 to determine the desiccant quantity required for your model of dryer.

- Close dryer inlet/outlet isolation valves
- Depressurize and switch DRYER OFF

Danger!

- **Wear protective equipment and clothing when handling desiccant.**

- For each chamber, remove the desiccant drain port plug and empty the old desiccant into a container

4.3 REPLACEMENT OF THE DESICCANT (CONTINUED)

Danger!

- **Desiccant may contain pollutants.**
- **Desiccant is to be disposed of in accordance with local, state and federal regulations.**

- Screw the plug back in and fill with new desiccant from above (one-half total quantity in each of the two chambers)

- Start up the adsorption dryer in accordance with paragraph 3.3 for initial start-up.

5. PARTS LIST

5.1 PARTS FOR ZEH400 to ZEH650

Description	ZEH400		ZEH500		ZEH650	
	Part #	Qty	Part #	Qty	Part #	Qty
Consumables						
Prefilter (Element Only)	2050XP	1	3050XP	1	3050XP	1
Afterfilter (Element Only)	2050ZP	1	3050ZP	1	3050ZP	1
Muffler	F006-015	2	F006-015	2	F006-015	2
Activated Alumina – Pounds	M001-019	544	M001-019	700	M001-019	866
Probe Recalibration	J006-052X	1	J006-052X	1	J006-052X	1
LDP Option						
Activated Alumina – Pounds	M001-019	364	M001-019	470	M001-019	580
Molecular Sieve 4A – Pounds	M001-011	182	M001-011	230	M001-011	286
Inlet Valve						
Inlet Valve Kit/	V002-532K1	2	V002-532K1	2	V002-532K1	2
Inlet Valve	V002-532	2	V002-532	2	V002-532	2
Solenoid Block	V005-200	1	V005-200	1	V005-200	1
Gasket	RGASK02002	4	RGASK02002	4	RGASK02002	4
Outlet Valve						
Valve Kit	V004-036VK1-1	1	V004-036VK1-1	1	V004-036VK1-1	1
Check Valve	V004-036V	2	V004-036V	2	V004-036V	2
Gasket	RGASK02002	4	RGASK02002	4	RGASK02002	4
Purge						
Purge Exhaust Valve Kit	V002-535K1	2	V002-535K1	2	V002-535K1	2
Purge Valve	V004-090	1	V004-090	1	V004-090	1
Purge Exhaust Valve	V002-537	2	V002-537	2	V002-537	2
3V Bypass Option						
Ball Valve	V001-086	3	V001-086	3	V001-086	3
EC						
Digital Panel Meter	J006-071	1	02250148-225	1	02250148-225	1
Probe	J006-052	1	02250149-692	1	02250149-692	1
Replacement Parts						
Pressure Gauge	B002-025	3	B002-025	3	B002-025	3
PLC	C020-019	1	C020-019	1	C020-019	1
Power Supply	C020-008		C020-008		C020-008	
Text Display	C020-010	1	C020-010	1	C020-010	1
Thermocouple	C020-017	1	C020-017	1	C020-017	1
Relief Valve	V006-010	2	V006-010	2	V006-010	2
Temperature Indicator	B001-006	2	B001-006	2	B001-006	2
Heater	H001-144	1	H001-144	1	H001-143	1
Pressure Regulator	B007-027	1	B007-027	1	B007-027	1
Pressure Switch	C002-011	5	C002-011	5	C002-011	5
Light Bulb	E004-058-24	2	E004-058-24	2	E004-058-24	2
Transformer Primary Fuse	E009-058	2	E009-058	2	E009-058	2
Transformer Secondary Fuse	E009-136	1	E009-136	1	E009-136	1
Heater Fuses	E009-436	3	E009-436	3	E009-436	3
Control Fuses	E009-051	1	E009-051	1	E009-051	1

Description	ZEH400		ZEH500		ZEH650	
Control Relay	E009-320RO	2	E009-320RO	2	E009-320RO	2
Heater Contactor	E002-140	1	E002-140	1	E002-140	1

5.2 PARTS FOR ZEH820 TO ZEH1225

Description	ZEH820		ZEH1000		ZEH1225	
	Part #	Qty	Part #	Qty	Part #	Qty
Consumables						
Prefilter (Element Only)	3075XP	1	5075XP	1	5075XP	1
Afterfilter (Element Only)	3075ZP	1	5075ZP	1	5075ZP	1
Muffler	F006-015	2	F006-015	2	F006-015	2
Activated Alumina – Pounds	M001-019	1320	M001-019	1650	M001-019	1980
Pilot Air Filter Element	K009AO	1	K009AO	1	K009AO	1
Probe Recalibration	J006-052X	1	J006-052X	1	J006-052X	1
LDP Option						
Activated Alumina – Pounds	M001-019	882	M001-019	1106	M001-019	1326
Molecular Sieve 4A – Pounds	M001-011	436	M001-011	544	M001-011	654
Inlet Valve						
Inlet Valve Kit	V012-200K1	2	V012-200K1	2	V012-200K1	2
Inlet Valve	V012-200	2	V012-200	2	V012-200	2
Solenoid Block	V005-204	1	V005-204	1	V005-204	1
Gasket	RGASK03002	4	RGASK03002	4	RGASK03002	4
Outlet Valve						
Valve Kit	V004-024K1	1	V004-024K1	1	V004-024K1	1
Check Valve	V004-024V	2	V004-024V	2	V004-024V	2
Gasket	RGASK03002	4	RGASK03002	4	RGASK03002	4
Purge						
Purge Valve	V004-036V	2	V004-036V	2	V004-036V	2
Purge Valve Gasket	RGASK03002	4	RGASK03002	4	RGASK03002	4
Exhaust Valve	V002-535	2	V002-535	2	V002-535	2
Exhaust Valve Kit	V002-535K1	2	V002-535K1	2	V002-535K1	2
3V Bypass Option						
Manual Butterfly Valve Kit	V012-130K1	3	V012-130K1	3	V012-130K1	3
Gasket, 3-inch	RGASK03002	4	RGASK03002	4	RGASK03002	4
Bypass Valve	V012-130	3	V012-130	3	V012-130	3
EC						
Digital Panel Meter	J006-071	1	J006-071	1	J006-071	1
Probe	J006-052	1	J006-052	1	J006-052	1
Replacement Parts						
Pressure Gauge	B002-025	3	B002-025	3	B002-025	3
PLC	C020-019	1	C020-019	1	C020-019	1
Power Supply	C020-008	1	C020-008	1	C020-008	1
Text Display	C020-010	1	C020-010	1	C020-010	1
Thermocouple	C020-017	1	C020-017	1	C020-017	1
Relief Valve	V006-010	2	V006-010	2	V006-010	2
Temperature Indicator	B001-009	2	B001-009	2	B001-009	2
Heater	H001-137	1	H001-134	1	H001-139	1
Pressure Regulator	B007-027	1	B007-027	1	B007-027	1

	ZEH820		ZEH1000		ZEH1225	
Pressure Switch	C002-011	5	C002-011	5	C002-011	5
Light Bulb	E004-058-24	2	E004-058-24	2	E004-058-24	2
Transformer Primary Fuse	E009-058	2	E009-058	2	E009-058	2
Transformer Secondary Fuse	E009-136	1	E009-136	1	E009-136	1
Heater Fuses	E009-065	3	E009-067	3	E009-150	3
Control Fuses	E009-051	1	E009-051	1	E009-051	1
Control Relay	E009-320RO	1	E009-320RO	1	E009-320RO	1
Heater Contactor	E002-140	1	E002-140	1	E002-140	1

5.3 PARTS FOR ZEH1500 TO ZEH2100

Description	ZEH1500		ZEH1800		ZEH2100	
	Part #	Qty	Part #	Qty	Part #	Qty
Consumables						
Prefilter (Element Only)	5075XP	1	3075XP	2	3075XP	3
Afterfilter (Element Only)	5075ZP	1	3075ZP	2	3075ZP	3
Muffler	F006-015	2	F006-016	2	F006-016	2
Activated Alumina – Pounds	M001-019	2110	M001-019	2640	M001-019	2970
Pilot Air Filter Element	K009AO	1	K009AO	1	K009AO	1
Probe Recalibration	J006-052X	1	J006-052X	1	J006-052X	1
LDP Option						
Activated Alumina – Pounds	M001-019	1414	M001-019	1768	M001-019	1990
Molecular Sieve 4A – Pounds	M001-011	696	M001-011	872	M001-011	980
Inlet Valve						
Inlet Valve Kit	V012-200K1	2	V012-201K1	2	V012-201K1	2
Inlet Valve	V012-200	2	V012-201	2	V012-201	2
Solenoid Block	V005-203	1	V005-203	1	V005-203	1
Outlet Valve						
Valve Kit	V004-024K1	1	V004-025K1	1	V004-025K1	1
Check Valve	V004-024V	2	V004-025V	2	V004-025V	2
Gasket	RGASK03002	4	RGASK04004	4	RGASK04004	4
Purge						
Check Valve Kit	V004-024K1	1	V004-024K1	1	V004-024K1	1
Purge Valve	V004-024M	2	V004-024M	2	V004-024M	2
Purge Valve Gasket	RGASK03002	4	RGASK03002	4	RGASK03002	4
Exhaust Valve	V012-200	2	V012-200	2	V012-200	2
Exhaust Valve Kit	V012-200K1	2	V012-200K1	2	V012-200K1	2
3V Bypass Option						
Manual Butterfly Valve Kit	V012-130K1	3	V012-131K1	3	V012-131K1	3
Gasket	RGASK03002	6	RGASK04004	6	RGASK04004	6
Bypass Valve	V012-130	3	V012-131	3	V012-131	3
EC						
Digital Panel Meter	J006-071	1	J006-071	1	J006-071	1
Probe	J006-052	1	J006-052	1	J006-052	1
Replacement Parts						
Pressure Gauge	B002-025	3	B002-025	3	B002-025	3
PLC	C020-019	1	C020-019	1	C020-019	1

	ZEH1500		ZEH1800		ZEH2100	
Power Supply	C020-008	1	C020-008		C020-008	
Text Display	C020-010	1	C020-010	1	C020-010	1
Thermocouple	C020-017	1	C020-017	1	C020-017	1
Relief Valve	V006-012	2	V006-012	2	V006-012	2
Temperature Indicator	B001-009	2	B001-009	2	B001-009	2
Heater	H001-142	1	H001-122	1	H001-127	1
Pressure Regulator	B007-027	1	B007-027	1	B007-027	1
Pressure Switch	C002-011	5	C002-011	5	C002-011	5
Light Bulb	E004-058-24	2	E004-058-24	2	E004-058-24	2
Transformer Primary Fuse	E009-058	2	E009-058	2	E009-058	2
Transformer Secondary Fuse	E009-136	1	E009-136	1	E009-136	1
Heater Fuses	E009-064	3	E009-064	3	E009-064	3
Control Fuses	E009-051	1	E009-051	1	E009-051	1
Control Relay	E009-320RO	1	E009-320RO	1	E009-320RO	1
Heater Contactor	E002-143	1	E002-148	1	E002-148	1

5.4 PARTS FOR ZEH2500 TO ZEH3500

Description	ZEH2500		ZEH3000		ZEH3500	
	Part #	Qty	Part #	Qty	Part #	Qty
Consumables						
Prefilter (Element Only)	3075XP	3	350AA	4	350AA	4
Afterfilter (Element Only)	3075ZP	3	350AR	4	350AR	4
Muffler	F006-016	2	F006-016	2	F006-016	2
Activated Alumina – Pounds	M001-019	3444	M001-019	4620	M001-019	5610
Pilot Air Filter Element	K009AO	1	K009AO	1	K009AO	1
Probe Recalibration	J006-052X	1	J006-052X	1	J006-052X	1
LDP Option						
Activated Alumina – Pounds	M001-019	2308	M001-019	3096	M001-019	3758
Molecular Sieve 4A – Pounds	M001-011	1136	M001-011	1524	M001-011	1852
Inlet Valve						
Inlet Valve Kit	V012-201K1	2	V012-202K1	2	V012-202K1	2
Inlet Valve	V012-201	2	V012-202	2	V012-202	2
Solenoid Block	V005-203	1	V005-207	1	V005-207	1
Outlet Valve						
Valve Kit	V004-025K1	1	V004-026K1	1	V004-026K1	1
Check Valve	V004-025V	2	V004-026V	2	V004-026V	2
Gasket	RGASK04004	4	RGASK06007	4	RGASK06007	4
Purge						
Check Valve Kit	V004-024K1	1	V004-025K1	1	V004-025K1	1
Purge Valve	V004-024M	2	V004-025M	2	V004-025M	2
Purge Valve Gasket	RGASK03002	4	RGASK04004	4	RGASK04004	4
Exhaust Valve	V012-200	2	V012-201	2	V012-201	2
Exhaust Valve Kit	V012-200K1	2	V012-201K1	2	V012-201K1	2
3V Bypass Option						
Manual Butterfly Valve Kit	V012-131K1	3	V012-132K1	3	V012-132K1	3
Gasket	RGASK04004	6	RGASK06007	6	RGASK06007	6

	ZEH2500		ZEH3000		ZEH3500	
Bypass Valve	V012-131	3	V012-132	3	V012-132	3
EC						
Digital Panel Meter	J006-071	1	J006-071	1	J006-071	1
Probe	J006-052	1	J006-052	1	J006-052	1
Replacement Parts						
Pressure Gauge	B002-025	3	B002-025	3	B002-025	3
PLC	C020-019	1	C020-019	1	C020-019	1
Power Supply	C020-008	1	C020-008		C020-008	
Text Display	C020-010	1	C020-010	1	C020-010	1
Thermocouple	C020-017	1	C020-017	1	C020-017	1
Relief Valve	V006-012	2	V006-012	2	V006-012	2
Temperature Indicator	B001-009	2	B001-009	2	B001-009	2
Heater	H001-138	1	H001-122	1	H001-122	1
Pressure Regulator	B007-027	1	H001-165	1	H001-165	1
Pressure Switch	C002-011	5	C002-011	5	C002-011	5
Light Bulb	E004-058-24	2	E004-058-24	2	E004-058-24	2
Transformer Primary Fuse	E009-058	2	E009-058	2	E009-058	2
Transformer Secondary Fuse	E009-136	1	E009-136	1	E009-136	1
Heater Fuses	E009-126	3	E009-069	3	E009-069	3
Control Fuses	E009-051	1	E009-051	1	E009-051	1
Control Relay	E009-320RO	1	E009-320RO	1	E009-320RO	1
Heater Contactor	E002-144	1	E002-146	1	E002-146	1

6. FAULTS AND TROUBLESHOOTING

6.1 DEWPOINT HAS DETERIORATED

POSSIBLE CAUSE	REMEDY
Incoming air temperature above design condition.	Check compressor after cooler and cooling system. Adjust as necessary to reduce the inlet temperature to dryer specification.
Incoming air flow too high	Problem external to dryer. Verify inlet flow rate and reduce as necessary to dryer specification.
Inlet pressure below design pressure.	Check compressed air system. Correct if necessary
Liquid water entering dryer	Check prefilter elements and seals for damage. Replace if necessary. Check operation of drain trap. Ensure proper drainage. Repair or replace drain if necessary.
Desiccant degraded or coated with oil.	Replace desiccant. Inspect prefilter if desiccant is coated with oil.
Insufficient regeneration due to: 1. Heater failure 2. Heater contactor failure 3. Incorrect purge flow 4. Temperature setting incorrect	1. Inspect and replace as necessary. 2. Inspect and replace as necessary. 3. Check purge flow setting. 4. Check setpoints of heater and purge exhaust.
Leaks at piping/tubing connections downstream of the dryer.	Soap bubble test dryer and repair all leaks

6.2 HIGH HUMIDITY ALARM OR SENSOR FAILURE

POSSIBLE CAUSE	REMEDY
Hygrometer probe out of calibration	Replace hygrometer probe.
Open circuit on probe electrical connection.	Inspect and repair.
Incorrect flow across sensor	Refer to EC start-up (paragraph 3.3.4).
Excessive moisture on sensor.	Check sensor tubing and probe filter for buildup of moisture. Allow tubing to dry and replace filter element.

6.3 PRESSURE DROP TOO HIGH

POSSIBLE CAUSE	REMEDY
Broken or fouled desiccant	Inspect desiccant and replace if required.
Inlet flow exceeding design flow rate	Reduce inlet flow as necessary
Pre or after filter element dirty or clogged	Depressurize filters and inspect elements. Replace if dirty or clogged.

6.4 SWITCHING FAILURE ALARM

If a switching failure alarm occurs, refer to paragraph 3.2.1 in order to determine where in the dryer cycle the alarm occurred. Also refer to the program step functions (paragraph 3.1.1) to assist in finding which component led to the switching failure.

POSSIBLE CAUSE	REMEDY
Pilot air insufficient	Close pilot air isolation valve, depressurize pilot air filter and inspect element. If clogged or dirty, replace.
	Check that pilot air isolation valve is fully open.
	Check that pilot air regulator is set at 100 psig.
	Inspect pilot air tubing for kinks or breaks. Repair if necessary.
Inlet air pressure below setpoint of pressure switches	Correct the low pressure problem to the dryer.

6.4 SWITCHING FAILURE ALARM (CONTINUED)

POSSIBLE CAUSE	REMEDY
Solenoid valve not energizing	Check operation of solenoid. Replace if not functioning.
	Check wiring from panel to the solenoid for an open or short circuit. Repair if necessary.
Inlet or purge exhaust valves leaking	Shut down and depressurize dryer. Inspect valve seats and seals for damage or wear. Repair or replace if necessary.
	While valve is disassembled, check the actuator stops to ensure that valve is fully closing (butterfly valves only).
Check valve internals are worn or damaged	Shut down and depressurize dryer. Repair or replace valves.
Switching failure on depressurization.	Inspect purge and depressurization mufflers and replace if necessary.
	Off-line desiccant chamber inlet valve or outlet check valve leaking. Inspect as described above
	Regenerating chamber depress/exhaust valve failed to open. Check associated solenoid valve operation as described above.
	Online chamber outlet check valve leaking. Inspect and repair as described above.
	Excessive purge flow. Check the purge pressure setting.
Switching failure on repressurization.	Exhaust or depressurization valves not closing or are leaking. Check solenoid operation as listed above. Check valve failure as listed above.
	Insufficient purge flow. Check purge pressure settings. Check automatic purge isolation valve for correct operation.
	Check the setpoint of the pressure switches. Readjust if necessary.
Pressure switch malfunction.	Check the operation of the pressure switches. Replace if needed.

7. DRAWINGS

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