

Regenerative Heatless Desiccant Dryer

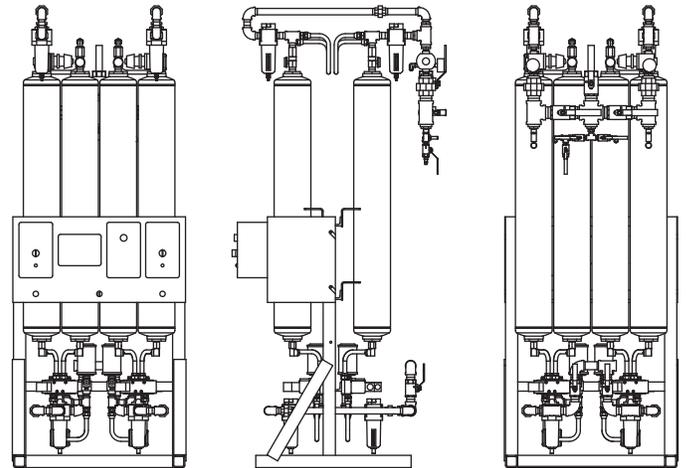
Please read and save these instructions. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.

Description

The desiccant dryer utilizes the process of adsorption in which molecules accumulate on the surface of an adsorbent, isolating the molecules from its compound. In the case of the dryer, water molecules accumulate on desiccant bead adsorbent, removing them and other harmful contaminants from the airstream. It utilizes a twin-tower design to dry the air coming from the compressor in one tower while the other tower is being regenerated for future use.

Regeneration is achieved by a process known as purging in which a portion of the dried air from the pressurized tower is directed back over the desiccant beads in the depressurized tower. A heatless desiccant dryer uses no heating elements to regenerate the adsorbent. The dry air used to purge the desiccant beads of moisture is considered "wasted" air since it isn't recoverable for application use and is for that reason engineered to a minimum.

An additional purge saving mode of operation ensures that the dryer is operating most efficiently yet providing a dependable dew point even under continuous load. The dryer is capable of achieving pressure dew points as low as -100°F depending on the operating conditions it encounters.



Safety Guidelines

This manual contains information that is very important to know and understand. This information is provided for SAFETY and to PREVENT EQUIPMENT PROBLEMS. To help recognize this information, observe the following symbols.

⚠ DANGER

Danger indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

Warning indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

Caution indicates a potentially hazardous situation which, if not avoided, MAY result in minor or moderate injury.

NOTICE

Notice indicates important information, that if not followed, may cause damage to equipment.

Specifications

Product	Regenerative Heatless Desiccant Dryer, PMD Series and PLD Series	
Dew Point Capability	PMD: +20° F Pressure Dew Point at 100 psig PLD: -40° F Pressure Dew Point at 100 psig	
Operating Pressure	60 psig - 125 psig (4,14 bar - 8,62 bar g) at inlet	
Operating Temperature	34° F - 120° F (1° C - 49° C) at inlet	
Overpressure Protection (PMD)	ASME Safety Valve Factory Set and Sealed	
Outlet Air Connections	PMD71: 1 inch NPT PMD111: 1 - 1/2 inch NPT PLD60: 1 inch NPT PLD90 - PLD110: 1 - 1/2 inch NPT	
Flow Capability	PMD71: 70 CFM PMD111: 110 CFM	PLD60: 57.3 CFM PLD90: 86 CFM PLD110: 105 CFM
California Ordinance 462 (L) (2)	Meets Requirements of this Ordinance	
Control Enclosure	Polycarbonate NEMA-4X electrical box	
Power Requirements	110 V - 120 V AC ± 10%, 60 Hz	
Fuse	Type FNM 1.25-amp (1 per enclosure)	
Power	80 VA (40 VA per enclosure)	
Desiccant	Activated Alumina	

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Safety Information

CALIFORNIA PROPOSITION 65

⚠ WARNING

This product contains chemicals, including lead, known to the State of California to cause birth defects and other reproductive harm. Wash hands after handling.

GENERAL

⚠ WARNING

Failure to comply with these instructions can lead to personal injury and/or property damage.

⚠ WARNING

Always notify the appropriate medical facility staff before commencing any work on the compressed air system; air level and quality may be affected during maintenance.

⚠ WARNING

Dryer under pressure. Isolate and depressurize the dryer and its components before commencing any work to remove or disassemble them.



⚠ WARNING

Electrical shock hazard exists. Different parts of the dryer carry electrical current. Any potential must be properly de-energized before commencing any electrical maintenance.



⚠ WARNING

The dryer's desiccant towers are spring loaded. Extreme caution should be taken if/when disassembling. Please contact the manufacturer for assistance.

⚠ WARNING

Hazard from sudden air ejection. Normal operation of the dryer consists of sudden vessel depressurization. Ear and eye risks are present. Always wear proper protection equipment when around the dryer.



1. Read all manuals included with this product carefully. Be thoroughly familiar with the controls and the proper use of the equipment.
2. Follow all local electrical and safety codes as well as in the United States, the National Electrical Codes (NEC) and Occupational Safety and Health Act (OSHA).
3. Only persons well acquainted with these rules of safe operation should be allowed to use the unit.
4. Before each use, inspect compressed air system and electrical components for signs of damage, deterioration, weakness or leakage. Repair or replace defective items before using.
5. Check all fasteners at frequent intervals for proper tightness.



⚠ DANGER

Breathable Air Warning

This unit is not equipped and should not be used "as is" to supply breathing quality air. For any application of air for human consumption, you must fit the compressed air source with suitable in-line safety and alarm equipment. This additional equipment is necessary to properly filter and purify the air to meet minimal specifications for Grade D breathing as described in Compressed Gas Association Commodity Specification G 7.1 - 1966, OSHA 29 CFR 1910. 134, and/or Canadian Standards Associations (CSA).

DISCLAIMER OF WARRANTIES

IN THE EVENT THE UNIT IS USED FOR THE PURPOSE OF BREATHING AIR APPLICATION AND PROPER IN-LINE SAFETY AND ALARM EQUIPMENT IS NOT SIMULTANEOUSLY USED, EXISTING WARRANTIES ARE VOIDED, AND POWEREX DISCLAIMS ANY LIABILITY WHATSOEVER FOR ANY LOSS, PERSONAL INJURY OR DAMAGE.

6. Only persons experienced and properly trained in compressed air systems or licensed electricians should service or repair this dryer.
7. The dryer is intended for drying compressed air. **Under no circumstances should it be used to dry any other gases.**
8. Do not operate the dryer if a leak is detected.
9. Do not operate the dryer at pressures and/or temperatures above the marked maximum allowable.
10. Do not operate the dryer if any signs of damage are detected or if the dryer isn't operating as described in this manual.
11. No conversions or modifications must be made to the dryer without prior approval by the manufacturer.

Terms and Definitions

DUPLEX DRYER SYSTEM (PMD)

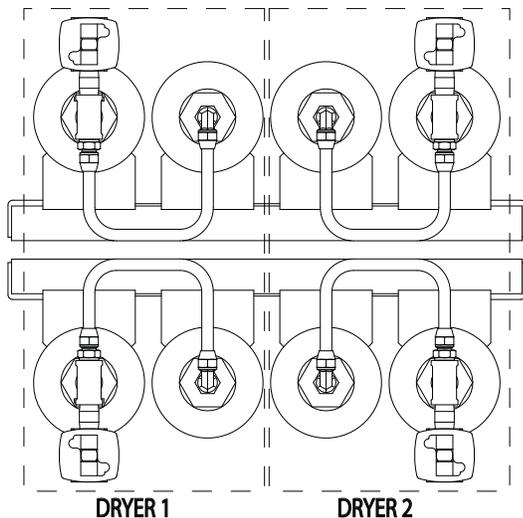
Per the NFPA 99 Standard for Healthcare Facilities, the dryer system is completely redundant, having one dryer capable of peak demand in reserve at all times. Each dryer consists of four spring loaded desiccant towers, two pre-filters, two after-filters, regulator, safety relief valve, and a dew point dependent control system within a four valve bypass. A regulator is factory set at 55 PSIG and protected with safety relief valves rated for 75 PSIG. The system includes a pre-rippled and pre-wired dew point monitor, carbon monoxide monitor, and certifier's test port.

NOTICE

Only one dryer should be in service at any given time,

unless a dryer switchover procedure is being performed.

CLOSE THE ISOLATION VALVES FOR THE DRYER NOT IN SERVICE.



DUPLEX DRYER SYSTEM (PLD SERIES)

PLD Series models do not include the outlet safety valve, and may be adjusted to provide a variety of system outlet pressures. The CO monitor is optional.

DRYER

The dryer is a regenerative heatless desiccant dryer. It employs a pressure swing adsorption cycle and purge saving control system. The dryer's four towers work simultaneously in sets of two. Tower cycling formula set is driven using a four-way pneumatic directional control valve with ceramic plate design. The near diamond hard plates wipe themselves clean of any desiccant dust or debris every time they actuate and are warranted for the life of the valve. Valve actuation is assured with the use of conditioned pilot air.

The pre-filters equipped with a separator and 5 micron element prevent any liquids and particulates from entering

the dryer. They come with automatic condensate drain valves and filter element change indicators. The after-filters equipped with a 0.5 micron elements stop any desiccant dust from leaving the dryer. They also come with an indicator as to when the element needs to be replaced.

PRESSURE SWING ADSORPTION CYCLE

The dryer uses a fully automatic pressure swing adsorption cycle in which two towers are online in a drying phase while the other two are offline either preparing or waiting for their next drying phase. The towers rotate between phases based on either time or dew point status, depending on the mode of operation. The two phases are described below:

a. **Drying Phase:** A tower in a drying phase receives humid air through the pre-filter and then flows upward through the desiccant bed. At full system pressure the desiccant dehumidifies the air by means of adsorption. The air is then distributed out the top of the tower for different uses.

b. **Regeneration Phase:** Parallel to the tower in a drying phase the opposing tower is in one of four stages of the regeneration phase.

- 1. Expansion:** The expansion stage takes place immediately after a tower switches from the drying phase to the regeneration phase. During this stage the tower pressure is expanded to ambient through the purge muffler over the course of a couple seconds, accompanied by a sudden blast.
- 2. Purge:** A portion of the dry air from the opposing tower in the drying phase is bled through an orifice and directed through the top of the regenerating tower now at ambient pressure. The moisture stored in the desiccant bed is picked up by this dry air and expelled out the purge muffler.
- 3. Pressurize:** After the tower is purged, the orifice continues to bleed dry air into the regenerated tower, building it up to system pressure. This prevents the dryer's pre-filter and desiccant bed from being shocked with a blast of air upon tower switchover. Shocking a desiccant bed not only puts a strain on the effectiveness of the filtration and drying systems but can cause the desiccant material to dust. That dust will clog the after-filter and decreases the dryer's capacity to dry the air passing through it.
- 4. Standby:** When the dryer is switched into the variable mode of operation, the regenerating phase is capable of a fourth stage in which the regenerated tower is standing by, fully pressurized, ready for the next drying phase. The control system will switch to this tower as soon as the measured dew point has reached the set point for switchover.

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TOWER SWITCHOVER

When the dryer control system calls for a tower switchover, either by reaching a certain time or dew point, the towers switch the function each is performing and the process starts over again.

Installation

INSTALLATION SITE

1. The dryer must be located in a clean, well lit and well ventilated area.
2. The installation site must be protected against the weather. The area should be free of excessive dust, toxic or flammable gases, moisture, water, and direct sunlight.
3. Never install the dryer where the ambient temperature will drop below +34°F or rise above +104°F or where humidity is high.
4. The installation area must be level, firm, and capable of holding the weight of the dryer.
5. The site should provide sufficient spacing around the unit in order to be able to carry out routine maintenance on the dryer. At least three feet is recommended from the front and sides of the dryer.
6. Never install the dryer outside.

MOVING AND SECURING

If it is necessary to move a freestanding dryer, proper technique is extremely important. The dryer should only be lifted from its structural points such as the frame or tank brackets, never from its piping. Caution should be taken when lifting a dryer due to its slight top heaviness. Once the dryer is in position, use suitable anchoring fasteners in all four holes provided to secure the dryer frame to the mounting location. Suitable vibration dampening devices should be used if that is a potential condition at the installation site.

POWER CONNECTION

Each dryer control box requires a stable 120VAC \pm 10% to be field furnished to the main system control panel. The individual dryer control boxes are pre-wired to that main panel. No other installation procedures to power the dryer are necessary.

WIRING

All electrical connections to the main system control panel must be performed by a qualified electrician. Installations must be in accordance with local and national electrical codes.

DEW POINT MONITOR CONNECTION

The dew point monitor's relay output contacts are wired to a relay in the main system control panel. The individual dryer control boxes are pre-wired to that main panel. No other installation procedures to run the dryer in a dew point dependent mode are necessary.

PLUMBING CONNECTION

The dryer inlet and outlet are equipped with female NPT ports which differ in size depending on the dryer model. The specification section of this manual specifies what size NPT ports are equipped with each dryer model. Ensure before plumbing in and out of the dryer that all compressed air lines are clean, undamaged, and won't subject any stress to the dryer's piping.

1. Make sure the piping is lined up without being strained or twisted when assembling the piping for the dryer.
2. Appropriate expansion loops or bends should be installed at the dryer to avoid stresses caused by changes in hot and cold conditions.
3. Piping supports should be anchored separately from the dryer to reduce noise and vibration.
4. Never use any piping smaller than the dryer connection.
5. Use flexible hose to connect the outlet of the dryer to the piping so that the vibration of the dryer does not transfer to the piping.

VALVES

Each dryer is equipped with a solenoid-operated directional control valve. The valve utilizes a pair of sliding ceramic plates, externally piloted from the dry side of the dryer to ensure the highest reliability. The near-diamond hard plates wipe themselves clean of any ingested particulates every time the valve switches, forming a nearly indestructible seal. There is no gap between the plates for dirt, oil, dust, or water to accumulate, which are common problems in spool and sleeve valves. The unique wiping action and absence of a gap between the plates prevent wear even without line lubrication.

Operation

BEFORE START UP

1. Make sure all safety warnings, labels and instructions have been read and understood before continuing.
2. Remove any shipping materials.
3. Confirm that the electric power source and ground have been firmly connected.
4. Be sure all pressure connections are tight.
5. Check to be certain all safety relief valves, etc., are correctly installed.
6. Securely mount all panels and guards.
7. Check that all fuses, circuit breakers, etc., are the proper size.
8. Make sure the inlet and after filters are properly installed.

TURNING THE DRYER ON

The dryer is supplied power through a three position switch on the main system control panel labeled **Dryer 1 - BOTH - Dryer 2**. After the appropriate dryer is selected, that dryer's control box has electric potential. The dryer can now be turned on by a three position switch on the dryer's control box labeled **Fixed - Off - Variable**. The switch will light up when turned into either the fixed or variable positions, signifying the dryer is on. The Powerex medical dryer should be operated in the variable mode of operation unless start-up or maintenance instructions call for the fixed cycle mode to be selected temporarily.

START UP

- Ensure that all isolation valves (dryer, monitor, and source) are closed.
 - Ensure the electrical connections are in safe contact and in good condition.
 - Ensure the compressed air system upstream of the dryer is pressurized.
1. At the main system control panel there will be a switch labeled **Dryer 1 - BOTH - Dryer 2**. Place this switch to the **Dryer 1** position. This will apply power to the dryer control box for **Dryer 1**.
 2. SLOWLY open the inlet isolation valve to **Dryer 1**. Avoid sudden pressure build-up in every circumstance as it can cause damage to the dryer.
 3. Rotate the dryer cycle switch on **Dryer 1's** control box to the Fixed position. **Dryer 1** will now begin cycling between its four desiccant towers.
 4. Check for airflow from **Dryer 1's** purge mufflers.
 5. SLOWLY open the dryer outlet isolation valve, making sure the source valve is still closed.
 6. SLOWLY open the monitor isolation valve(s) allowing air to flow to the CO and dew point monitors' sensors.
 7. Check for airflow from the dew point sensor's orifice tube.
 8. Allow the dryer to cycle in this state for at least 15 minutes. During this time, test all joints for any leaks using a leak detector spray or suitable alternative. Repair any detected leaks as they will cause degraded performance of the dryer.

9. Rotate the dryer cycle switch on **Dryer 1's** control box to the Variable position. The dryer is now capable of switching into the economy mode.
10. SLIGHTLY open the source valve and allow the compressed air system downstream of the dryer to pressurize, preventing the dryer from being overloaded.
11. SLOWLY open the source valve to its fully open position. **Dryer 1** is now in service and fully operational.

MODES OF OPERATION

Fixed Cycle Mode

When the dryer is operated in the fixed cycle mode, the drying and regenerating phases are strictly based on an elapse of time, repeating over and over no matter what the dew point. In this mode, the purge airflow is the same whether the demand on the dryer is high or low.

- The fixed cycle time totals 4 minutes, 2 minutes per desiccant tower
 - While TowerA is in the drying phase for 2 minutes, TowerB regenerates for 2 minutes (Expansion then purge for 1:45; Pressurize for 0:15)
 - Then TowerB is in the drying phase for 2 minutes, while TowerA regenerates, completing the 4 minute cycle

Variable Cycle Mode

When the dryer is operated in the variable cycle mode, the drying and regenerating phases are based on an elapse of time as well as dew point. If the dew point is -10°F or above, the control system operates the dryer in the same time increments as the fixed cycle mode. In the case that the demand on the dryer is low and the dew point is below -15°F (PMD) or -45°F (PLD), the dryer will switch into an economy mode in which the purge flow is eliminated and the drying phase time is increased up to 60 minutes.

- The variable cycle either operates the dryer in the 4 minute fixed cycle format or in the three steps of the economy mode format described here:
 - TowerA is in drying phase for 20 minutes while TowerB purges for 3 minutes, then pressurizes and goes into standby for the remaining 17 minutes. The towers switch phases, completing a 40 minute cycle.
 - TowerA is in drying phase for 40 minutes while TowerB purges for 3 minutes, then pressurizes and goes into standby for the remaining 37 minutes. The towers switch phases, completing an 80 minute cycle.
 - TowerA is in drying phase for 60 minutes while TowerB purges for 3 minutes, then pressurizes and goes into standby for the remaining 57 minutes. The towers switch phases, completing a 120 minute cycle.

Tower Phase	Fixed Cycle Mode	Variable Cycle Economy Mode
Drying	2 minutes	20 / 40 / 60 minutes
Regenerating	2 minutes	3 minutes, 15 seconds
Expansion & Purge	1 minute, 45 seconds	3 minutes
Pressurize	15 seconds	15 seconds
Standby	N/A	up to 57 minutes

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Maintenance

PREVENTATIVE MAINTENANCE SCHEDULE

To ensure reliable, uninterrupted dryer operation, follow the recommended preventative maintenance schedule. If done so, the dryer system should provide years of dependable service.

Maintenance Item	Service Interval			
	1 Month	6 Months	2 Years	8 Years
Switch online & offline dryers	☐			
Check that the drying and regeneration cycles are functioning normally and that all valves are operating as expected	☐			
Check the differential pressure gauge (element change indicator) on top of both the prefilter and afterfilter while pressurized. If the gauge is colored red instead of green, service is required	☐			
Monitor the backpressure on the purging tower. If the tower gauge reads anything above 0 PSIG while the tower is purging, check the purge muffler for blockage	☐			
Clean the auto drain valve in the prefilter bowl		☐		
Replace all filter elements			☐	
Replace purge muffler			☐	
Replace auto drain valve in the prefilter bowl			☐	
Replace desiccant towers				☐
Replace check valves				☐
Replace purge solenoid valve				☐

MONTHLY SWITCHOVER PROCEDURE

In order to maintain proper and unified performance from the desiccant air dryer system, it is recommended that the units be alternated on a regular schedule (once every month). The following procedure explains alternating two systems, where **Dryer 1** is the online dryer and **Dryer 2** is the offline dryer.

1. At the main system control panel there will be a switch labeled **Dryer 1 - BOTH - Dryer 2**. Place this switch to the **BOTH** position. This will apply power to both dryers' control boxes.
2. SLOWLY open the inlet isolation valve to **Dryer 2**. Avoid sudden pressure build-up in every circumstance as it can cause damage to the dryer.
3. Rotate the dryer cycle switch on **Dryer 2's** control box to the Fixed position. **Dryer 2** will now begin cycling between its four desiccant towers.
4. Check for airflow from **Dryer 2's** purge mufflers.
5. Allow both dryers to run for a period of 15 minutes to ready **Dryer 2**. At this point **Dryer 2's** outlet isolation valve is still closed, and **Dryer 1** remains the online dryer. During this time, test all plumbing joints on **Dryer 2** for leaks with a leak detector spray or suitable alternative. Repair any detected leaks as they will cause degraded performance of the dryer.
6. Rotate the dryer cycle switch on **Dryer 2's** control box to the Variable position.
7. SLOWLY open **Dryer 2's** outlet isolation valve.
8. Close **Dryer 1's** outlet isolation valve.
9. Rotate the dryer cycle switch on **Dryer 1's** control box to the **Off** position.
10. Wait 15 seconds for **Dryer 1** to fully pressurize and close **Dryer 1's** inlet isolation valve.
11. At the main system control panel rotate the dryer selector switch labeled **Dryer 1 - BOTH - Dryer 2** to the **Dryer 2** position. **Dryer 1** is now dormant. **Dryer 2** is in service and fully operational.

MAINTENANCE SHUT DOWN

All of the maintenance items that take place at 6 month intervals or more require that the dryer be shut down in order for them to take place. The following procedure explains how to shut down a dryer that needs maintenance labor.

1. Bring the reserve dryer online by following steps 1 through 7 of the Monthly Switchover Procedure.
2. Close the outlet isolation valve of the dryer that needs maintenance.
3. Close the inlet isolation valve of the same dryer.
4. Rotate the dryer cycle switch on the control box to the **Fixed** position and allow the dryer to continue cycling until the purge exhaust has fully depressurized all towers. Check all towers' pressure gauge to confirm that the system is depressurized.
5. Rotate the dryer cycle switch on the control box to the **Off** position.

Maintenance (Continued)

6. At the main system control panel rotate the dryer selector switch labeled **Dryer 1 - BOTH - Dryer 2** from the **BOTH** position to whichever dryer is now online.
7. Isolate and disconnect the electrical power to the dryer. Follow all Lock out/Tag out procedures while maintenance is being carried out.

CLEANING OR REPLACING THE PRE-FILTER'S AUTO DRAIN VALVE

The auto drain valve is a float mechanism condensate trap. It automatically opens and drains the collected condensate as soon as the level of fluid rises to lift the float. If the valve is suspected to be malfunctioning it should be cleaned or replaced. A typical characteristic of valve malfunction is a permanent flow noise from the drain outlet signifying the float mechanism is stuck open. If the sight gauge on the side of the filter's bowl is showing a significant amount of condensate, the float mechanism could be stuck in the closed position, preventing it from draining. In either case, the valve needs to be removed for cleaning or replacement. To do this:

1. First perform a maintenance shut down, making sure the dryer needing maintenance is fully depressurized and isolated from all electric potential.
2. Remove the drain hose from the auto drain outlet.
3. Remove the filter bowl by pushing it up into the body and twisting counter-clockwise.
4. Loosen and remove the retaining nut at the bottom of the filter bowl.
5. The auto drain valve can now be pushed out the top of the bowl to be cleaned or replaced.
6. Place the clean or new auto drain valve in the bowl and tighten the retaining nut
7. Return the filter bowl to the body and the drain hose to the auto drain outlet.

REPLACING THE FILTER ELEMENTS

The filter elements will eventually become clogged with particulates and contaminants and should be replaced at regular intervals. A clogged filter element creates too large of a pressure drop across the filter and can hurt the dryer's performance. The differential pressure indicators on top of the filters will change from green to red when the pressure drop across the filter is too high, usually signaling an element that needs to be replaced.

1. First perform a maintenance shut down, making sure the dryer needing maintenance is fully depressurized and isolated from all electric potential.
2. Remove the filter bowl by pushing it up into the body and twisting counter-clockwise.
3. Unscrew the filter element from the body and properly discard it.
4. Screw in the new element and replace the filter bowl.
5. Dispose of the old filter element in an environmentally safe way, in accordance with all current statutory regulations.

REPLACING THE PURGE MUFFLER

The purge muffler is a critical component of the dryer. If it becomes clogged, dryer performance will degrade quickly due to the restraints on the purge stage of the regeneration phase. A characteristic of a clogged muffler is a tower pressure gauge reading anything but zero while that tower is purging.

1. First perform a maintenance shut down, making sure the dryer needing maintenance is fully depressurized and isolated from all electric potential.
2. Remove the purge muffler by unscrewing it from the purge solenoid valve.
3. Plumb the new muffler into place, using thread tape on its pipe threads.

REPLACING THE DESICCANT TOWERS AND CHECK VALVES

The desiccant in the dryer's towers can over time degrade in capacity to absorb moisture from the compressed air. In order to keep the dryer operating most efficiently, the desiccant towers should be replaced at regular intervals. The Powerex Medical Dryer has completely exchangeable desiccant towers, meaning the entire tank is replaced with a new pre-filled one.

1. First perform a maintenance shut down, making sure the dryer needing maintenance is fully depressurized and isolated from all electric potential.
2. Loosen flare nuts and remove the copper tube assembly and flare fitting located at the bottom of the tower.
3. Loosen flare nuts and remove the copper tubing linking the tops of the towers.
4. Remove the check valves and all subsequent plumbing up to the union joint.
5. Remove hex fasteners from each tank bracket and remove the tank from the support frame.
6. Place the replacement desiccant tower in the vacant location and fasten to the support frame with the hex fasteners.
7. Remove the plug from the top of the new tower and plumb in the replacement check valve, making sure the direction arrow is facing upward and the gauge oriented into a viewable position.
8. Return all of the subsequent plumbing and copper tube assembly at the top of the tower and tighten the union joint.
9. Remove the plug from the bottom of the new tower and return the flare fitting and copper tube assembly.

WARNING

The dryer's desiccant towers are spring loaded. Extreme caution should be taken if disassembling. Contact the manufacturer for information if disassembling is necessary.

10. Dispose of the old tower and used drying agent in an environmentally safe way, in accordance with all current statutory regulations.

Maintenance (Continued)

REPLACING THE PURGE SOLENOID VALVE

The purge solenoid valve will wear over time. It should be replaced at regular intervals to prevent catastrophic dryer failure.

1. First perform a maintenance shut down, making sure the dryer needing maintenance is fully depressurized and isolated from all electric potential.
2. Remove the purge muffler by unscrewing it from the purge solenoid valve.
3. Unplug the DIN connector powering the purge valve's solenoid.
4. Remove the purge solenoid valve.
5. Plumb the new valve into the same location, making sure to orient the direction of flow such that the valve's outlet leads into the purge muffler.
6. Plug the DIN connector into the new valve's solenoid and tighten the center screw, locking the connector in place.
7. Return the purge muffler to the valve outlet, using thread tape on its pipe threads.

Troubleshooting Guide

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
Directional control valve not cycling	1. Pilot air blockage	1. Check pilot air pressure lines for blockages or leaks. If clear, remove directional control valve, check for correct gasket orientation and clear passageways.
	2. Conductor connection	2. Check and verify conductor connection; see drawing.
	3. Controller in stop mode	3. If the controller has either a red light on the front or it is displaying the text "STOP" then the controller is in stop mode. Contact an authorized distributor.
	4. Controller program failure	4. If the controller has either a green light on the front or it is displaying the text "RUN" then the controller is as it should be, in run mode. Contact an authorized distributor.
Dew point degradation	1. Clogged orifice in check valve poppet	1. The check valve poppet contains an orifice which controls the amount of purge air used during regeneration. If it clogs, it results in less than intended purge flow and the dew point will degrade. Contact an authorized distributor for a replacement.
	2. Pre-filter auto drain jammed	2. A jammed pre-filter auto drain will allow liquid condensate to enter the desiccant tower. Check the auto drain to confirm that it is operating correctly.
	3. Air receiver auto drain malfunctioning	3. An air receiver with a malfunctioning auto drain will send more than intended amounts of moisture towards the dryer, possibly resulting in a degradation of dew point. Confirm the auto drain is working properly in regular intervals.
	4. Leakage	4. All plumbing joints and filter valves should be checked for leaks. Any small leak can degrade the dew point and result in a shortened lifespan.
	5. Too much back pressure during regeneration phase	5. Too much back pressure on a regenerating tower hinders its ability to purge itself of moisture in preparation for the next drying phase. The causes listed below should be investigated.

Troubleshooting Guide (Continued)

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
Back pressure on a desiccant tower during the regeneration phase	<ol style="list-style-type: none"> 1. Clogged purge muffler 2. Purge solenoid valve is malfunctioning 3. Check valve leaking 	<ol style="list-style-type: none"> 1. Contact an authorized distributor for a replacement purge muffler. 2. The purge solenoid valve should be removed and inspected for repair or replacement. 3. Remove, inspect, and clean the check valve; replace if necessary.
Dryer not switching out of economy cycle when dew point is above -10°F (-45°F for PLD)	Wrong connection with dew point monitor	Check the dew point monitor wiring diagram and confirm that the proper controller outputs are relaying to the dryer.
Dryer not switching into the economy cycle	<ol style="list-style-type: none"> 1. Dryer cycle switch in fixed position 2. Wrong connection with dew point monitor 3. Dew point degradation 	<ol style="list-style-type: none"> 1. The dryer can only switch into the economy cycle if the cycle switch on the control box is in the variable position. 2. Check the dew point monitor wiring diagram and confirm that the proper controller outputs are relaying to the dryer. 3. Check the possible causes from the list above.
No pressure build up before tower switchover; Dryer is continuously purging	Purge solenoid valve is not closing	The purge solenoid valve should be removed and inspected for repair or replacement.
No expansion in tower during regeneration phase	Purge solenoid valve is not opening	The purge solenoid valve should be removed and inspected for repair or replacement.
Excessive compressed air consumption	<ol style="list-style-type: none"> 1. Dryer cycle switch in fixed position 2. Dew point monitor not receiving power 3. Leakage 	<ol style="list-style-type: none"> 1. Under normal conditions, the dryer should be operated in the variable mode, allowing the dryer to switch in and out of the economy cycle. 2. Check that the dew point monitor is powered and in normal operation. It sends the signal to the dryer controller to switch in and out of the economy cycle. 3. Check the auto drain valve of the dryer pre-filter to confirm that it's not stuck open. Clean or replace if necessary.
No dryer cycle switch light	<ol style="list-style-type: none"> 1. Power supply interrupted 2. Blown fuse in control box 3. LED lamp burnt out 4. Conductor connection 	<ol style="list-style-type: none"> 1. Check and verify that the correct dryer is receiving power from the main panel dryer selector switch. 2. Replace fuse. 3. Contact an authorized distributor for replacement. 4. Check and verify conductor connection; see drawing.
No economy cycle light	<ol style="list-style-type: none"> 1. LED lamp burnt out 2. Conductor connection 	<ol style="list-style-type: none"> 1. Contact an authorized distributor for replacement. 2. Check and verify conductor connection; see drawing.

Regenerative Heatless Desiccant Dryer

Electrical Diagram

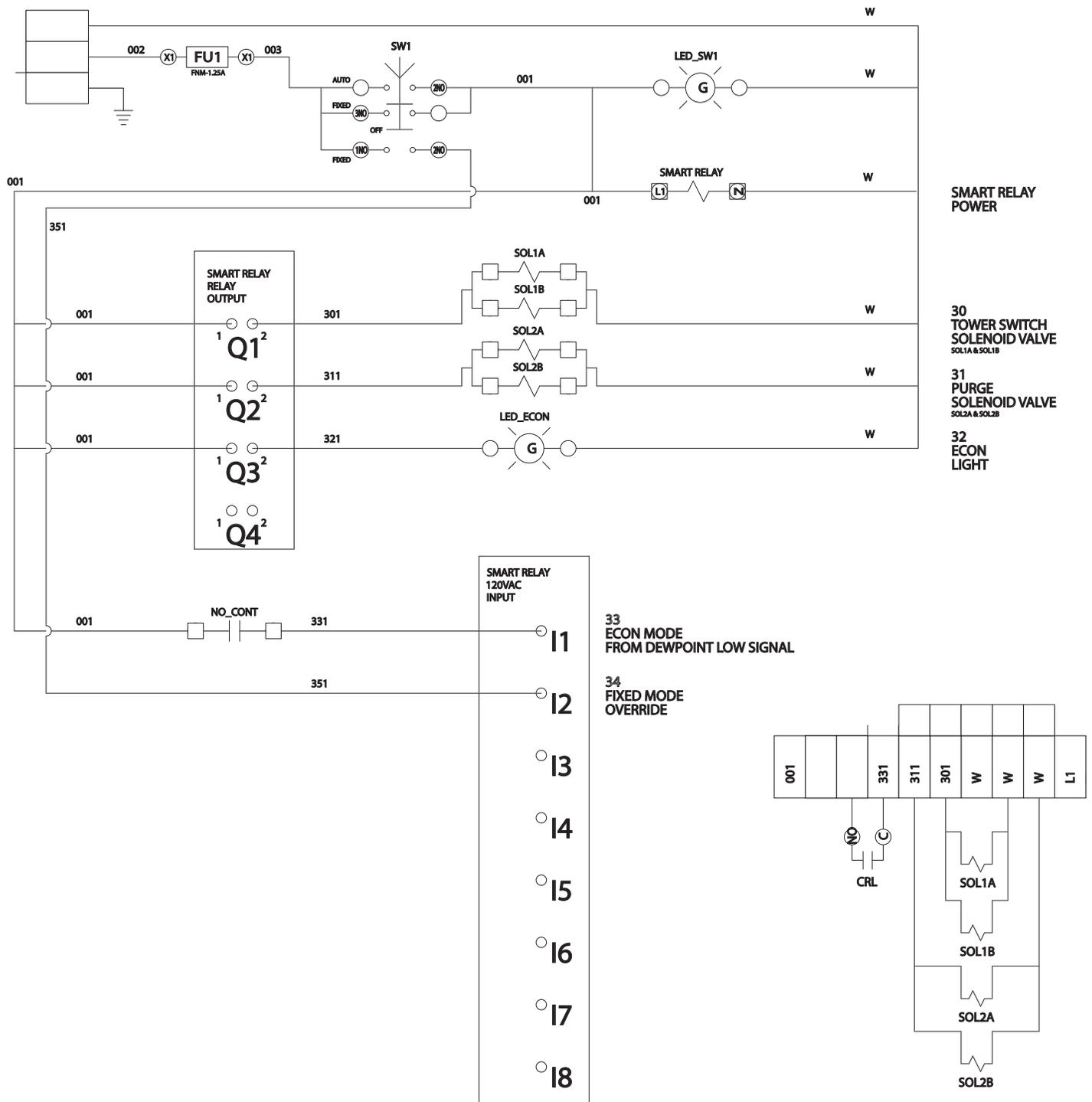


Figure 1

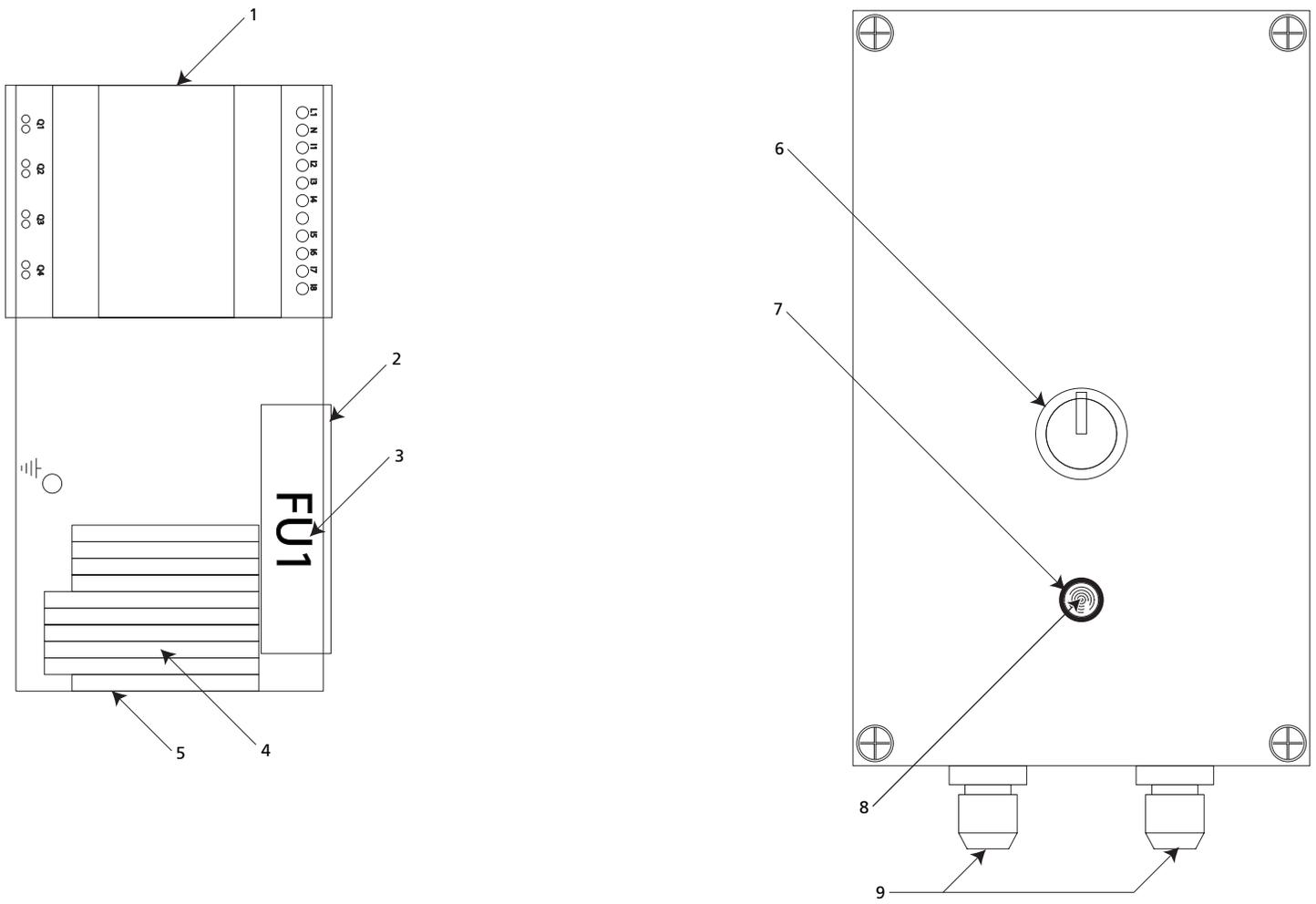


Figure 2

Controller Replacement Parts

Reference Number	Description	Part Number	Quantity
1	Dryer Controller	PE000414AV	1
2	Fuse Block	JP007802AV	1
3	Fuse	JP007711AV	1
4	Terminal Block	PE000617AV	5
	Terminal Block	PE000633AV	5
5	Terminal Block End Plate	PE000618AV	1
	Terminal Block End Plate	PE000634AV	1
6	Lighted 3-Position Switch	PE000556AV	1
7	LED Transformer	PE000551AV	1
8	Green LED Light	PE000550AV	1
9	Cord Grip	PE000635AV	6

Regenerative Heatless Desiccant Dryer

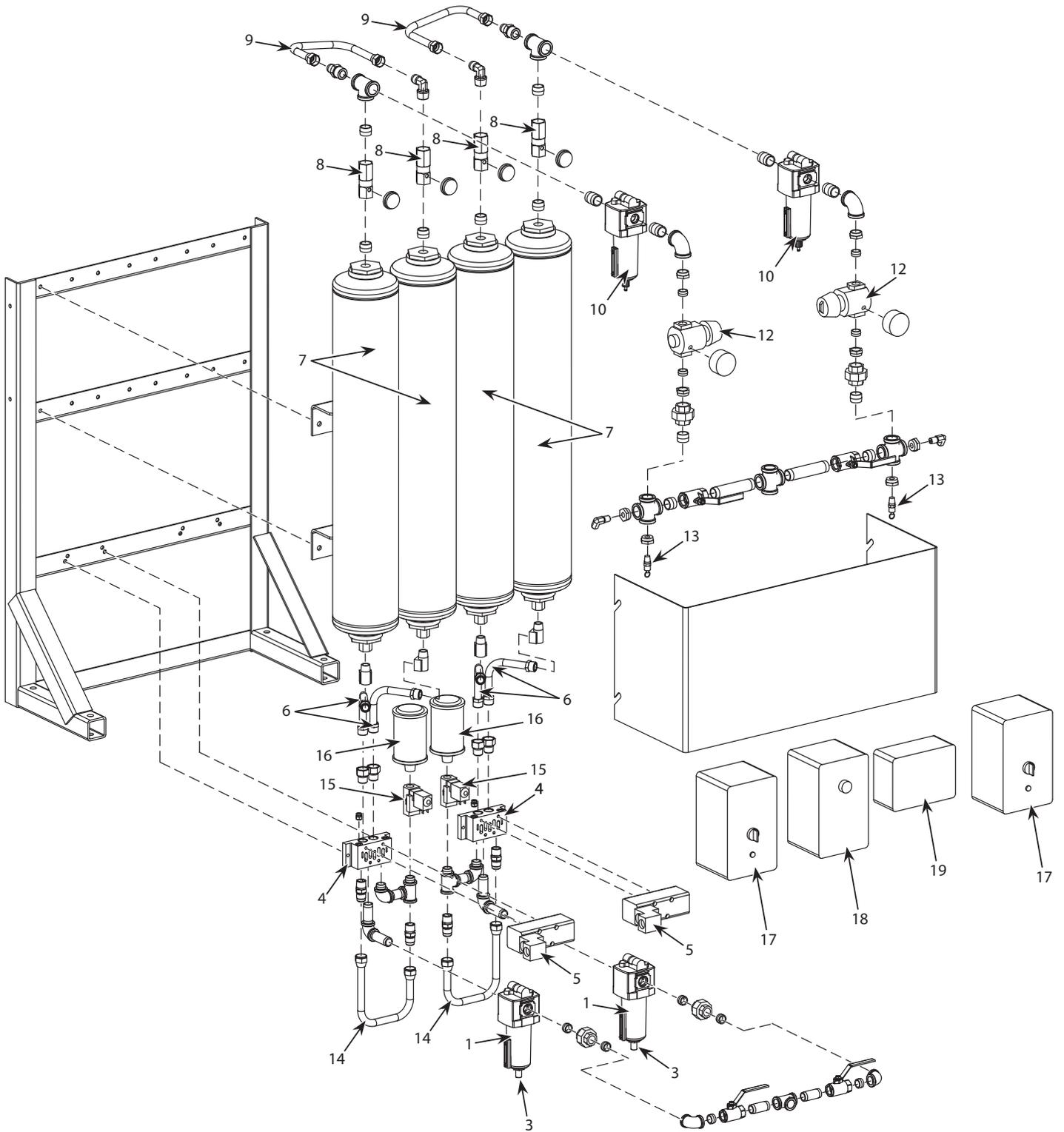


Figure 3 (Front half of dryer shown)

Replacement Parts

Ref. No.	Description	Part Number per Model				Qty
		PMD71	PLD110 PMD111	PLD 60	PLD90	
1	Pre-filter assembly	ST178158AV	ST178158AV	ST178158AV	ST178158AV	4
2	Pre-filter element (not shown)	ST178169AV	ST178169AV	ST178169AV	ST178169AV	4
3	Pre-filter auto drain valve	ST178103AV	ST178103AV	ST178103AV	ST178103AV	4
4	Control valve sub base	ST196602AV	ST196602AV	ST196602AV	ST196602AV	4
5	Directional control solenoid valve	ST196502AV	ST196502AV	ST196502AV	ST196502AV	4
6	90° valve to tower tube assembly	JP018801AJ	JP018801AJ	JP018801AJ	JP018801AJ	8
7	Desiccant tower	SK108500AJ	SK108300AJ	SK108800AJ	SK108300AJ	8
8	Check valve (with internal orifice)	CV309301AV	CV309303AV	CV309300AV	CV309302AV	8
9	180° tower to tower tube assembly	SK108800AJ	SK108800AJ	SK108800AJ	SK108800AJ	2
10	After-filter assembly	ST178163AV	ST178163AV	ST178163AV	ST178163AV	4
11	After-filter element (not shown)	ST178104AV	ST178104AV	ST178104AV	ST178104AV	4
12	Regulator	ST178409AV	ST178409AV	ST178408AV	ST178408AV	2
13	Safety relief valve (PMD only)	V-206409AV	V-206410AV	--	--	2
14	180° valve to valve tube assembly	JP018800AJ	JP018800AJ	JP018800AJ	JP018800AJ	4
15	Purge solenoid valve	ST197201AV	ST197201AV	ST197201AV	ST197201AV	4
16	Muffler	ST198301AV	ST198301AV	ST198301AV	ST198301AV	4
17	Controller	PDM11002AJ	PDM11002AJ	PDM11002AJ	PDM11002AJ	2
18	Dew point monitor	PDPM1001AJ	PDPM1001AJ	PDPM1001AJ	PDPM1001AJ	1
19	CO monitor	ACO600105	ACO600105	ACO600105	ACO600105	1

Powerex Limited Warranty – Applicable to Non-OEM Customers in the U.S. & Canada Only

Warranty and Remedies.

(a) General. Powerex warrants each Compressor System, Vacuum System, Vacuum Pump, Compressor Air-End, or Powerex branded Accessory (collectively “Products”, individually each a “Product”) to be free from defects in material and workmanship (“Defects”) at the date of shipment. This warranty shall apply only to Products that are purchased and used in the United States of America and in Canada. EXCEPT AS SET FORTH BELOW, NO OTHER WARRANTY, WHETHER EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, SHALL EXIST IN CONNECTION WITH THE SALE OR USE OF SUCH PRODUCTS. TO THE EXTENT PERMITTED BY LAW, ANY AND ALL IMPLIED WARRANTIES ARE EXCLUDED. All warranty claims must be made in writing and delivered to Powerex in accordance with the procedures set forth on its website (www.powerexinc.com), or such claim shall be barred. Upon timely receipt of a warranty claim, Powerex shall inspect the Product claimed to have a Defect, and Powerex shall repair, or, at its option, replace, free of charge, any Product which it determines to have had a Defect; provided, however, that if circumstances are such as to preclude the remedying of Defect by repair or replacement, Powerex shall, upon return of the Product, refund to buyer any part of the purchase price of such Products paid to Powerex. Freight for returning Products to Powerex for inspection shall be paid by buyer. The warranties and remedies herein are the sole and exclusive remedy for any breach of warranty or for any other claim based on any Defect, or non-performance of the Products, whether based upon contract, warranty or negligence.

(b) (i) Standard Period of Warranty – Parts and Labor - The purchase of any system includes our standard warranty. Powerex warrants and represents all Products shall be free from Defects for the first eighteen (18) months from the date of shipment by Powerex, or twelve (12) months from the documented date of startup, or five thousand (5,000) hours of use, whichever occurs first. During such warranty period, Powerex shall be fully liable for all Defects in the Products (the “Product Defects”), i.e., all costs of repair or replacement, which may include “in and out” charges, so long as the Products are located in the United States or Canada, and the Products are reasonably located and accessible by service personnel for removal. “In and out” charges include the costs of removing a Product from buyer’s equipment for repair or replacement.

(ii) Premium Period of Warranty – Parts and Labor - In order to be eligible for premium warranty coverage, a premium warranty for each system must be purchased when order is placed. Powerex warrants and represents all Products shall be free from Defects for the first thirty (30) months from the date of shipment by Powerex, or twenty-four (24) months from the documented date of startup, or seven thousand five hundred (7,500) hours of use, whichever occurs first. During such warranty period, Powerex shall be fully liable for all Defects in the Products (the “Product Defects”), i.e., all costs of repair or replacement, which may include “in and out” charges, so long as the Products are located in the United States or Canada, and the Products are reasonably located and accessible by service personnel for removal. “In and out” charges include the costs of removing a Product from buyer’s equipment for repair or replacement.

(c) Additional Period of Warranty – Parts Only (No Labor). In addition to the above, Powerex warrants each Powerex branded Compressor Air- End and Vacuum Pump shall be free of Defects for a period of forty-two (42) months from the date of shipment by Powerex, or thirty-six (36) months from the documented date of startup, or ten thousand (10,000) hours of use, whichever occurs first. Supplier’s repair or replacement of any Product shall not extend the period of any warranty of any Product. This warranty applies to the exchange of part(s) found to be defective by an Authorized Powerex Service Representative only.

(d) Replacement Pumps – Parts Only (No Labor). For any replacement Air-End or Vacuum Pumps installed on a Powerex manufactured system or unit after any initial warranty period has expired or where another warranty does not apply for any reason, Powerex warrants that the Air-End or Vacuum Pumps shall be free of Defects for a period of thirty-six (36) months from the date of shipment by Powerex or ten thousand (10,000) hours of use, whichever comes first. For any replacement Air-End or Vacuum Pumps installed on a system that was not manufactured by Powerex after any initial warranty period has expired or where another warranty does not apply for any reason, Powerex warrants that the Air-End or Vacuum Pumps shall be free of Defects for the first twelve (12) months from the date of shipment by Powerex. Supplier’s repair or replacement of any Product shall not extend the period of any warranty of any Product. This warranty applies to the exchange of part(s) found to be defective by an Authorized Powerex Service Representative only.

(e) Replacement Motors – Parts Only (No Labor). For any replacement motor installed on a Powerex manufactured system or unit after any initial warranty period has expired or where another warranty does not apply for any reason, Powerex warrants that the replacement motor shall be free of Defects for the first twelve (12) months from the date of shipment by Powerex. For any replacement motor installed on a system or unit that was not manufactured by Powerex after any initial warranty period has expired or where another warranty does not apply for any reason, Powerex warrants that the replacement motor shall be free of Defects for the first ninety (90) days from the date of shipment by Powerex. Supplier’s repair or replacement of any Product shall not extend the period of any warranty of any Product. This warranty applies to the exchange of part(s) found to be defective by an Authorized Powerex Service Representative only.

(f) Replacement Parts – Parts Only (No Labor). For other replacement parts besides motors, Air-End or Vacuum Pumps installed on a Powerex manufactured system or unit after any initial warranty period has expired or where another warranty does not apply for any reason, Powerex warrants that such replacement parts will be free from Defects for the first twelve (12) months from the date of shipment by Powerex. For other replacement parts besides motors, Air-End or Vacuum Pumps installed on a system or unit that was not manufactured by Powerex after any initial warranty period has expired or where another warranty does not apply for any reason, Powerex makes no warranties. Supplier’s repair or replacement of any Product shall not extend the period of any warranty of any Product. This warranty applies to the exchange of part(s) found to be defective by an Authorized Powerex Service Representative only.

(g) Coverage. The warranty provided herein applies to Powerex manufactured units or systems only.

(h) Exceptions. Notwithstanding anything to the contrary herein, Powerex shall have no warranty obligations with respect to Products:

- (i) that have not been installed in accordance with Powerex’s written specifications and instructions;
- (ii) that have not been maintained in accordance with Powerex’s written instructions;
- (iii) that have been materially modified without the prior written approval of Powerex; or
- (iv) that experience failures resulting from operation, either intentional or otherwise, in excess of rated capacities or in an otherwise improper manner.

Regenerative Heatless Desiccant Dryer

(i) The warranty provided herein shall not apply to:

- (i) any defects arising from corrosion, abrasion, use of insoluble lubricants, or negligent attendance to or faulty operation of the Products;
- (ii) ordinary wear and tear of the Products;
- (iii) defects arising from abnormal conditions of temperature, dirt or corrosive matter; or
- (iv) any OEM component which is shipped by Powerex with the original manufacturer's warranty, which shall be the sole applicable warranty for such component.

Limitation of Liability. NOTWITHSTANDING ANYTHING TO THE CONTRARY HEREIN, TO THE EXTENT ALLOWABLE UNDER APPLICABLE LAW, UNDER NO CIRCUMSTANCES SHALL POWEREX BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL, PUNITIVE, SPECULATIVE OR INDIRECT LOSSES OR DAMAGES WHATSOEVER ARISING OUT OF OR IN ANY WAY RELATED TO ANY OF THE PRODUCTS OR GOODS SOLD OR AGREED TO BE SOLD BY POWEREX TO BUYER. TO THE EXTENT ALLOWABLE UNDER APPLICABLE LAW, POWEREX'S LIABILITY IN ALL EVENTS IS LIMITED TO, AND SHALL NOT EXCEED, THE PURCHASE PRICE PAID.

Warranty Disclaimer. Powerex has made a diligent effort to illustrate and describe the Products in its literature, including its Price Book, accurately; however, such illustrations and descriptions are for the sole purpose of identification, and do not express or imply a warranty that the Products are merchantable, or fit for a particular purpose, or that the Products will necessarily conform to the illustrations or descriptions.

Product Suitability. Many jurisdictions have codes and regulations governing sales, construction, installation, and/or use of Products for certain purposes, which may vary from those in neighboring areas. While Powerex attempts to assure that its Products comply with such codes, it cannot guarantee compliance, and cannot be responsible for how the product is installed or used. Before purchase and use of a Product, please review the Product applications, and national and local codes and regulations, and be sure that the Product, installation, and use will comply with them.

Claims. Any non-warranty claims pertaining to the Products must be filed with Powerex within 6 months of the invoice date, or they will not be honored. Prices, discounts, and terms are subject to change without notice or as stipulated in specific Product quotations. Powerex shall not be liable for any delay or failure arising out of acts of the public enemy, fire, flood, or any disaster, labor trouble, riot or disorder, delay in the supply of materials or any other cause, whether similar or dissimilar, beyond the control of Company. All shipments are carefully inspected and counted before leaving the factory. Please inspect carefully any receipt of Products noting any discrepancy or damage on the carrier's freight bill at the time of delivery. Discrepancies or damage which obviously occurred in transit are the carrier's responsibility and related claims should be made promptly directly to the carrier. Returned Products will not be accepted without prior written authorization by Powerex and deductions from invoices for shortage or damage claims will not be allowed. **UNLESS OTHERWISE AGREED TO IN WRITING, THE TERMS AND CONDITIONS CONTAINED IN THIS LIMITED WARRANTY WILL CONTROL IN ANY TRANSACTION WITH POWEREX.** Any different or conflicting terms as may appear on any order form now or later submitted by the buyer will not control. All orders are subject to acceptance by Powerex.