

# INSTRUCTION MANUAL FOR WILKERSON MODELS DE3, DE4 AND DE5 COMPACT HEATLESS AIR DRYERS

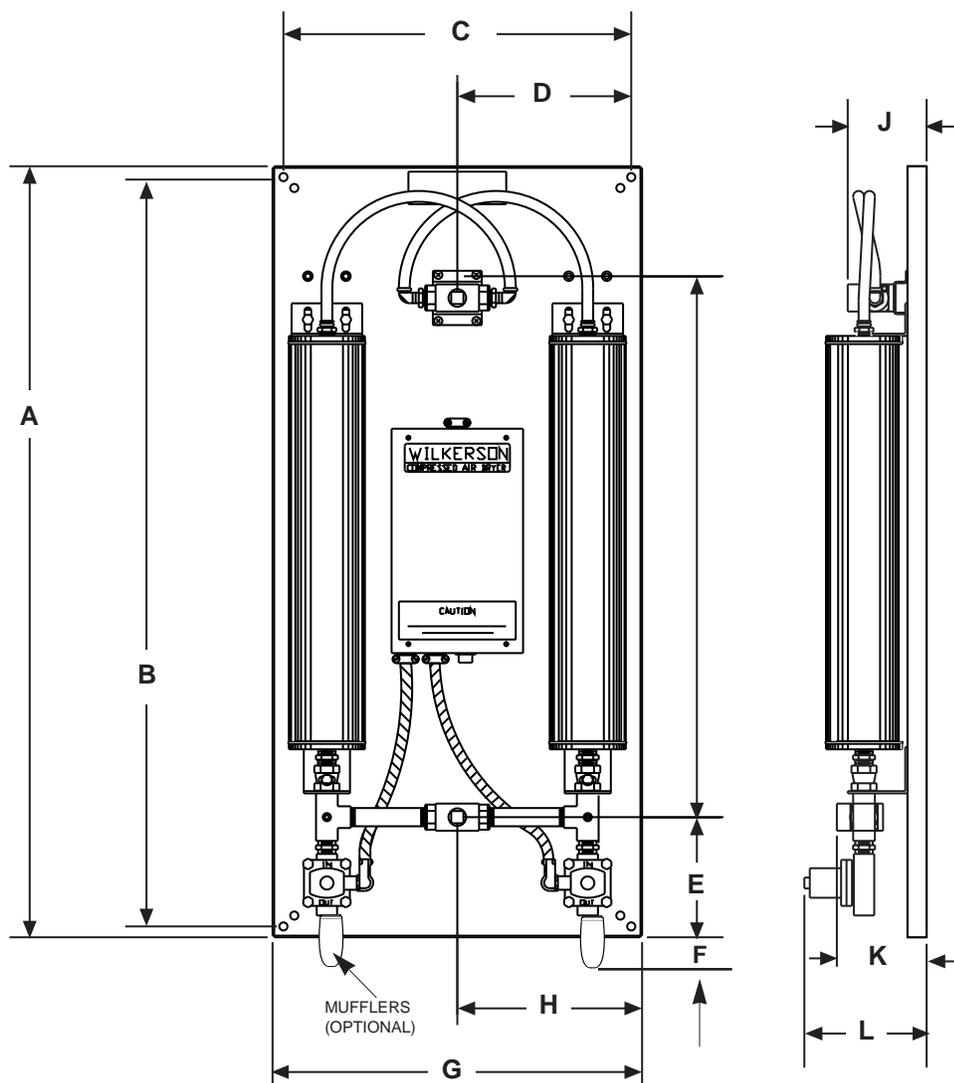
DE3 - DE5



**WILKERSON**<sup>®</sup>  
OPERATIONS

## GENERAL

This instruction manual covers the installation, operation, maintenance and troubleshooting guide for the Wilkerson compact heatless air dryers, models DE3, DE4 and DE5. These dryers are designed to be installed into a compressed air system, providing ultra-dry compressed air to moisture sensitive applications.



**Outline Dimensions**  
Figure 1

Model Number	A	B	C	D	E	F	G	H	J	K	L
DE3	35.50	34.50	16.00	8.00	6.50	1.50	17.00	8.50	3.63	4.13	5.63
DE4	35.50	34.50	16.00	8.00	6.50	1.50	17.00	8.50	3.63	4.13	5.63
DE5	41.00	39.50	18.62	9.31	6.50	1.50	20.13	10.06	6.75	4.75	6.38

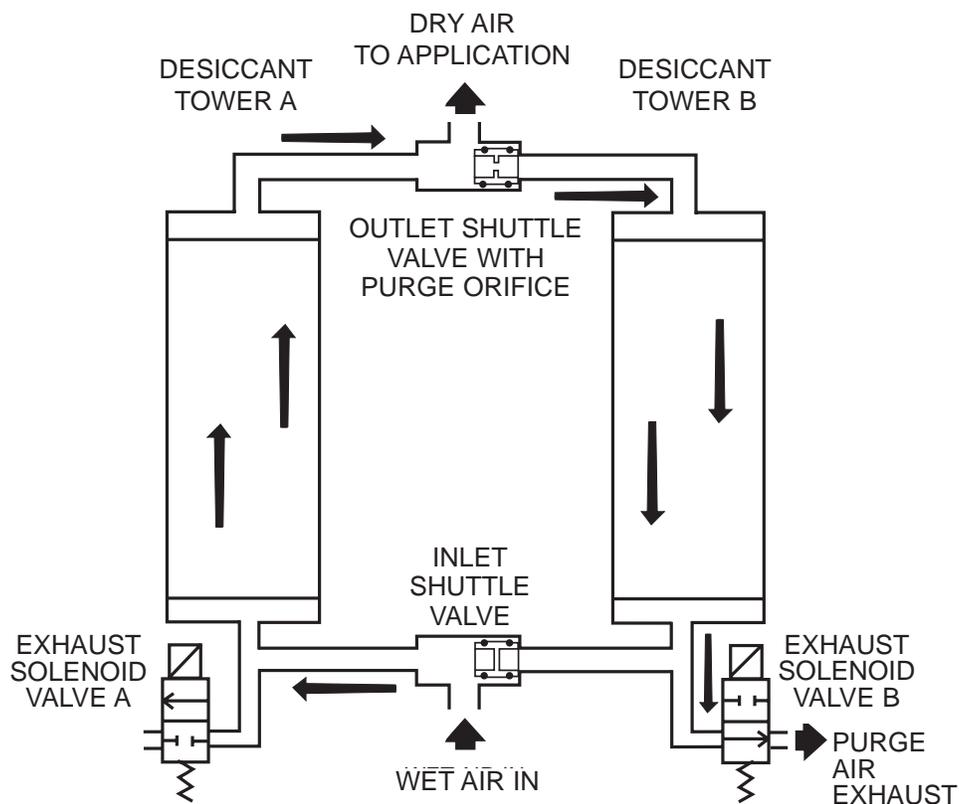
## DESCRIPTION OF OPERATION

Wilkerson DE series compact heatless air dryers employ the principles of pressure swing adsorption (PSA). The operation is fully automatic and relatively little maintenance is required.

The dryers utilize two identical desiccant towers, a metering orifice, two shuttle valves, and two 2-way AC operated solenoid valves controlled by a solid state electronic timer. Wet air at line pressure enters and flows through one of the towers where nearly all the water vapor is adsorbed while the other tower is being regenerated. A repressurization period follows the regeneration period. Every 60 seconds, the process is reversed, providing a continuous flow of dry air.

In the flow schematic shown below, Valve A (closed, de-energized) and Valve B (open, energized) allow the inlet shuttle valve to direct the inlet air to flow into Tower A (drying). A portion of the dry outlet air is allowed to flow through the outlet shuttle valve purge orifice into Tower B. This dry purge air expands to nearly atmospheric pressure, sweeping the water out of the desiccant as it flows through Tower B (regenerating) and out of the Valve B (energized) exhaust port. The timer controls the cycling of normally closed solenoid valves.

The orifices are fixed and are sized by the factory based on flow, pressure and dew point required.



DE3, DE4 and DE5

**Flow Schematic**  
Figure 2

## INSTALLATION AND OPERATION

**NOTE:**

Wilkerson DE series compact heatless dryers have been thoroughly inspected and tested at the factory and are in proper working condition.

- A. Initial Inspection** – Remove the air dryer from the shipping carton. Inspect the exterior and remove the electrical cover and inspect the interior components for any shipping damage.

**NOTE:**

Any damage noticed at this time must be brought to the immediate attention of the carrier and a freight claim must be filed.

- B. Warranty** – Please read this instruction manual carefully before installing the air dryer. Failure to follow proper instructions could result in damage to the equipment and may void the product warranty.



**CAUTION:**



EXCEPT as otherwise specified by the manufacturer, this product is specifically designed for compressed air service and use with any other gas or liquid is a misapplication. Use with or injection of certain hazardous liquids or gases in the system (i.e., alcohol or liquid petroleum gas) could be harmful to the unit and result in a combustible condition or cause hazardous external leakage. Manufacturers' warranties are void in the event of a misapplication and manufacturer assumes NO RESPONSIBILITY for any resulting loss. Before using equipment with fluids or gases other than air, or for non-industrial applications, consult Wilkerson Corporation for written approval.

- C. Installation/Mounting** – Four mounting holes are provided for wall mounting of Models DE3, DE4 and DE5. All dryers require a clean ambient environment for proper operation. Normally, most locations where ambient temperatures range between 40°F and 125°F are suitable for installation since drying efficiency is more dependent on the temperature of the compressed air flowing through the unit. Operating a unit at temperatures which could result in freezing may cause damage to the dryer. Do not operate at temperatures so low that freezing is a possibility.
1. Install dryer where ambient temperatures are between 40°F (4.4°C) and 125°F (52°C).
  2. Mount dryer in a vertical position.
  3. Piping connections: For maximum flow, INLET and OUTLET piping should be schedule 40 pipe or equivalent I.D. tubing. DE3, DE4 and DE5 inlet and outlet ports are 1/2" female, NPT, purge porting is 1/2" female, NPT.

**NOTE**

If purge air is required to be piped to a remote location, it is necessary to use oversized tubing to prevent back-pressure. Restricting the purge flow can cause the dryer to malfunction.

4. Use Teflon tape or pipe sealant on threads. Check all air connections for leakage, using soap solution prior to putting dryer into permanent service.
5. It is recommended that a bypass line with shut-off valves be installed to provide constant air flow to the system, should the dryer require servicing.
6. Always install a 5-micron particulate prefilter and a coalescing filter upstream to remove entrained particulates, moisture and oil. A 0.5-micron afterfilter should be installed downstream to remove any desiccant dust that may migrate from the desiccant towers.

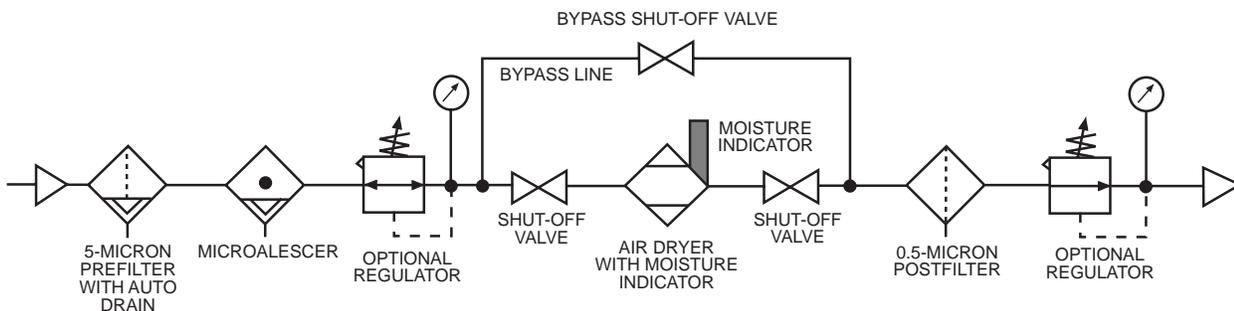
**Factory Recommended Dryer Installation**

Figure 3

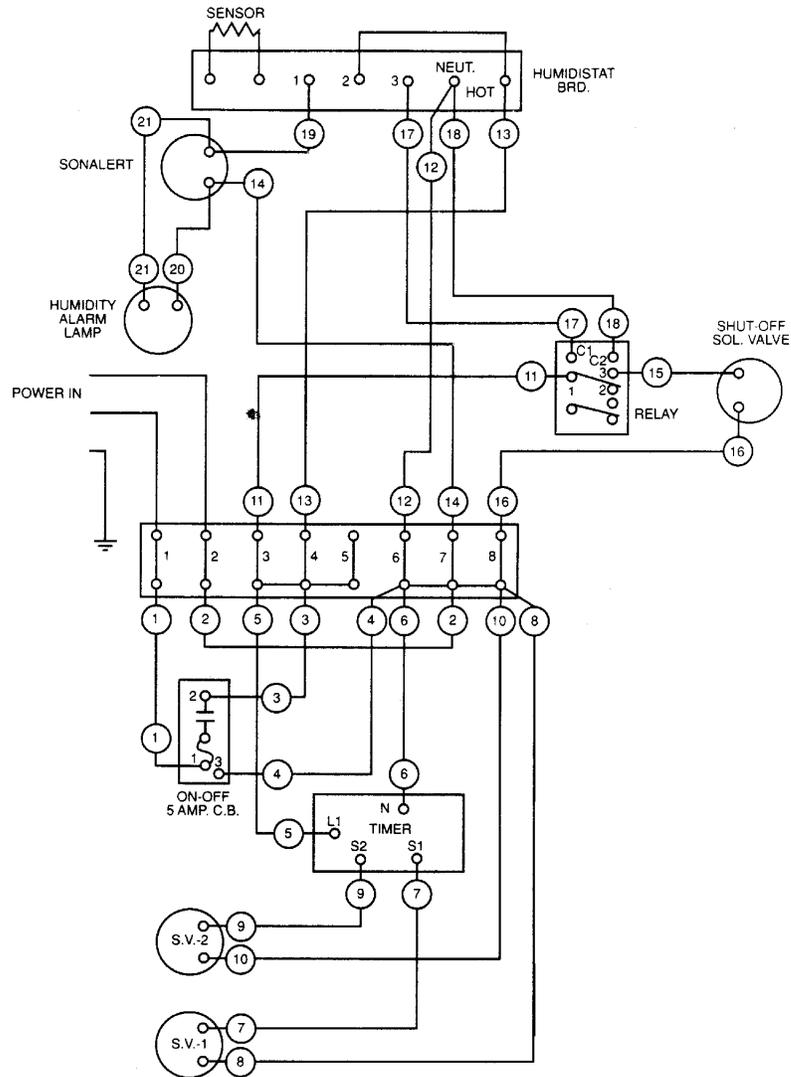
D. **Operating Specifications** – The DE3, DE4 and DE5 series compact heatless dryers can be sized to operate from 40 to 150 PSIG (2,7 to 10,3 bar).

1. The dryers must be operated in accordance with the factory sizing charts and original customer requirements in order to achieve desired dewpoints. Inlet pressure, inlet temperature, and outlet flow conditions are always specified when purchased.
2. Maximum inlet air temperature is 125°F (52°C).
3. Do not operate dryers in temperatures so low that freezing is a possibility.

E. **Electrical Connections** – Before wiring, check the dryer nameplate for electrical characteristics. Standard electrical characteristics are 115 Volt, 50/60Hz operation. Models operating on 230 Volt, 50/60Hz operation are available.

1.  **IMPORTANT!** No overload protection is provided in the dryer and unit should be wired into a protected circuit. A knockout hole with romex connector is provided for electrical connection.

F. **Solid State Timers** – The solid state timer used in the DE3, DE4 and DE5 dryers control the switching of the solenoid valves during a two minute total time cycle. The timers are equipped with a one hour memory capability. If power is interrupted, the dryer will resume operation at the same point in the cycle when power is restored.



**Wiring Diagram**  
Figure 4

## MAINTENANCE INSTRUCTIONS

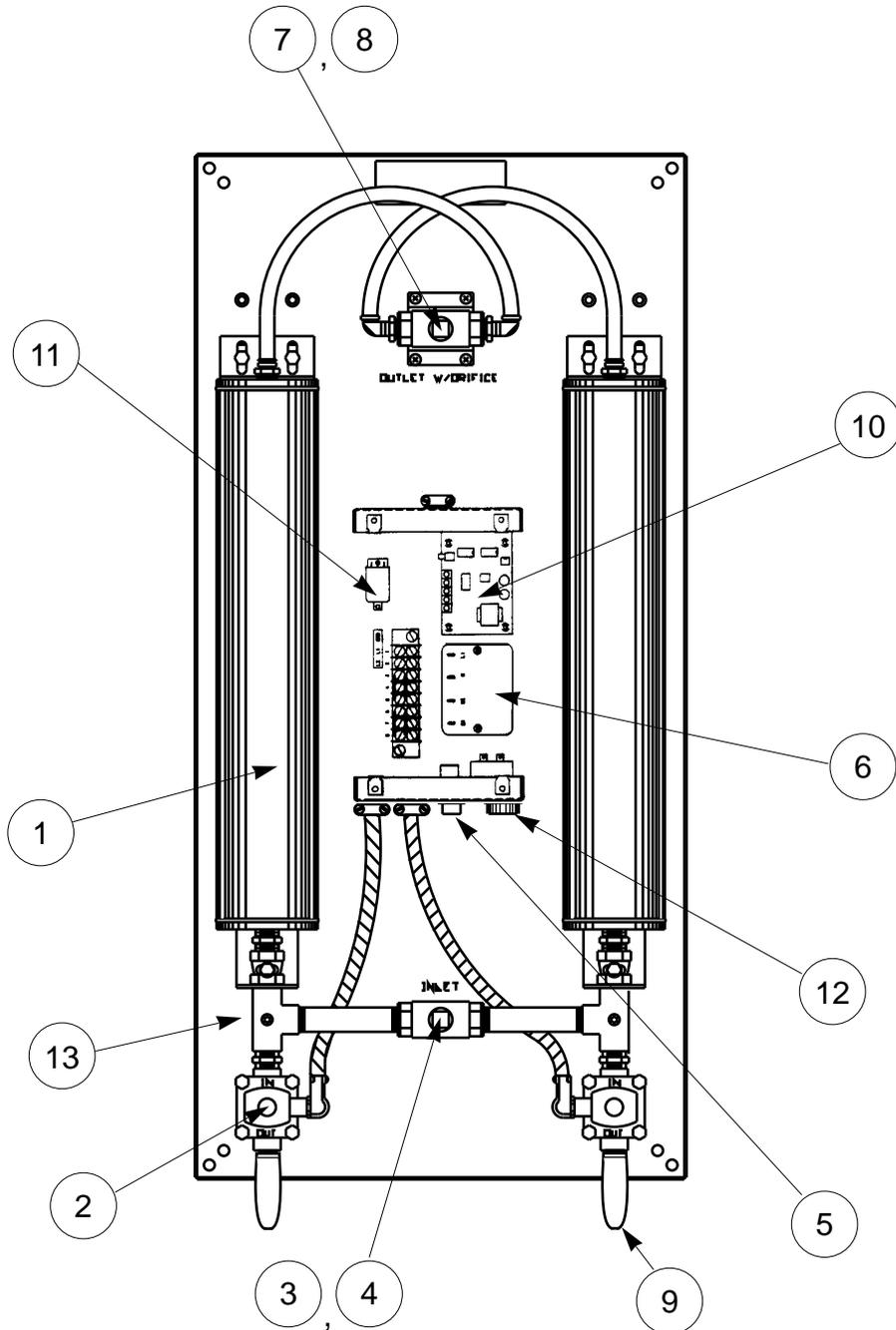
- A. **Field Adjustments** – Following proper installation of the Wilkerson DE heatless air dryer, no field adjustments are necessary. No lubrication is required on the dryer.
- B. **Six-Month Check** – It is recommended that every 6 months of operation, unit be thoroughly inspected. Inspection should include audible inspection of the towers switching and purge flow. Visual inspection should include checking for excessive dirt or oil fouling and for desiccant attrition at the outlet and purge exhaust area. Remove mufflers, if installed, and check for excessive pressure drop by blowing through the muffler. If large resistance is felt, mufflers should be replaced.
- C. **Purge Orifice** – If the operating conditions change from the label specifications (eg. inlet pressure, outlet flow), it is necessary to replace the purge orifice. There is one orifice in the DE3, DE4 and DE5 air dryers. The orifice is an extremely critical part in determining the performance of the dryer and no attempt should be made to enlarge or reduce the hole size. An orifice of the proper size must be obtained from your local Wilkerson distributor. The label on the dryer should also be changed, noting the present operating conditions. The purge orifice is precision drilled in the outlet shuttle spool. To change the orifice, remove the three screws on one side of the outlet shuttle valve. Remove and replace the orifice. Reassemble shuttle valve.
- D. **Cycle Timer** – The solid state cycle timer requires no maintenance and can be replaced in field.
- E. **Desiccant Towers** – Desiccant towers are an all-welded design and are not repackable. Replacement chambers should be obtained from your local Wilkerson distributor.
- F. **Operating Air Dryer Improperly** – Following improper dryer operation, i.e., low inlet pressure, high air temperature or high outlet flow, shut off the outlet flow from the air dryer for several hours to allow the dryer to operate, purging the desiccant towers of excessive moisture. If this does not restore dryer to proper working order, consult the troubleshooting guide.
- G. **Oil Contamination** – Oil contamination of the desiccant towers will cause complete loss of drying capability. If oil is detected in the desiccant towers or any other components, it will be necessary to install replacement towers in order to restore dryer to normal operation. For this reason, proper maintenance of the prefilters is essential.
- H. **Replacement Parts** – Contact your local authorized Wilkerson distributor for dryers or replacement parts.

## ***IMPORTANT INFORMATION***

**The installation of parts not supplied by Wilkerson will void the warranty of our air dryers.**

For replacement part information, contact Wilkerson Applications Engineering, toll free at 1-888-223-5126.

### DE3, DE4 and DE5 Parts Identification



#### Parts Identification

Figure 5

<b>PARTS DESCRIPTION – DE3, DE4 AND DE5 HEATLESS DRYERS</b>				
<b>ITEM NO.</b>	<b>PART NUMBER</b>	<b>QTY. PER DRYER</b>	<b>PART DESCRIPTION</b>	<b>INCLUDES ITEMS</b>
1	DRP-94-301	2	Desiccant Tower, New, DE3	
	DRP-94-302	2	Desiccant Tower, New, DE4	
	DRP-94-303	2	Desiccant Tower, New, DE5	
2	DRP-94-399	2	Purge Solenoid Valve, 115V.	
	DRP-94-400	2	Purge Solenoid Valve, 230V.	
	DRP-94-321-2	2	Solenoid Coil Only, 115V.	
	DRP-94-322-2	2	Solenoid Coil Only, 230V.	
	DRP-94-311	2	Valve Maintenance Kit	
3	DRP-94-393	1	Inlet Shuttle Valve	4
4	DRP-94-600	1	Inlet Shuttle Spool Only	
5	DRP-94-374	1	Power On/Off Switch	
6	DRP-94-335	1	Solid State Timer, 115V.	
	DRP-94-336	1	Solid State Timer, 230V.	
7	DRP-94-394	1	Outlet Shuttle Valve (Specify Orifice No.)	8
8*	DRP-94-6XX	1	Purge Orifice (Specify Orifice No.)	
<b>PARTS FOR OPTIONS</b>				<b>For Dryers with Option Codes</b>
9	DRP-94-371	2	Purge Muffler, 1/2", DE3/DE4	M
	DRP-94-372	2	Purge Muffler, 3/4", DE5	M
10	DRP-94-375	1	Humidistat Board W/ Sensor Cord	E, H
not shown	DRP-94-376	1	Moisture Sensor	E, H
11	DRP-94-377	1	Relay, Shut-off Valve	E, H
12	DRP-94-378	1	Sonalert	E, H
not shown	DRP-94-379	1	Lamp, Humidity Alarm	E, H
13	DRP-94-380	2	Tower Pressure Gauge	E, H, P
not shown	DRP-94-399	1	Shut-off Solenoid Valve, 115V.	E
not shown	DRP-94-400	1	Shut-off Solenoid Valve, 230V.	E
<p>When ordering parts, always state the dryer Model Number and Serial Number. *Orifice number must be specified. This can be obtained from nameplate data.</p>				

<b>MODELS DE3, DE4 AND DE5 TROUBLESHOOTING GUIDE</b>			
<b>A</b>	<b>PROBLEM: AIR DRYER DELIVERS WET AIR</b>		
	<b>POSSIBLE CAUSE</b>	<b>CHECK</b>	<b>CORRECTIVE ACTION</b>
A1	No power to unit.	On/off switch or power supply.	Correct power problem.
A2	High inlet air temperature.	Inlet air temperature should not exceed sizing criteria stated at purchase (usually 70°F or 100°F).	Reduce inlet air temperature.
A3	Air demand in excess of rated capacity of air dryer.	Check downstream flow demand with flowmeter.	Reduce air usage downstream.
A4	Low inlet pressure.	Verify actual inlet pressure vs. nameplate operating pressure.	Increase inlet pressure or call factory to resize dryer for inlet conditions.
A5	Dirty or obstructed inlet air filter.	Check filter element.	Replace.
A6	Purge orifice plugged.	Remove and inspect purge orifice.	Clean hole of debris. Use air gun to clean.
A7	Solenoid coil burned out.	Check magnetic field from coil operation. Place iron or steel material (screwdriver or nail) top of coil to feel the magnetic effect, indicating proper operation. (Note: each coil should be energized for 40 seconds every other minute).	Replace.
A8	Oil contamination of desiccant beds.	Verify particle/coalescing inlet filtration is adequate and functioning properly.	Towers must be replaced if contamination is suspected.
A9	Timer not operating properly.	Verify correct timing cycle. 1. With terminals pulled back slightly from lugs on timer, place voltmeter across N and S1. There should be a 115 volt AC signal for 40 seconds and 0 volts for 80 seconds. 2. Check across N and S2 for same timing.	At no time should there be simultaneous signals at S1 and S2.  Replace timer if defective.
A10	Purge flow restricted.	Check mufflers for excessive back pressure.	Replace mufflers. If purge air is piped away from unit, oversized piping should be used and length of run should be as short as possible.

<b>MODELS DE3, DE4 AND DE5 TROUBLESHOOTING GUIDE</b>			
<b>B</b>	<b>PROBLEM: RESTRICTED FLOW THROUGH UNIT</b>		
	<b>POSSIBLE CAUSE</b>	<b>CHECK</b>	<b>CORRECTIVE ACTION</b>
B1	Improper operating conditions.	See A2, A3, A4 above.	
B2	Dirty or obstructed inlet air filter.	See A5 above.	
B3	Plugged air passages.	Check inlet and outlet air passages and piping for blockages.	Clear restrictions.

<b>MODELS DE3, DE4 AND DE5 TROUBLESHOOTING GUIDE</b>			
<b>C PROBLEM: EXCESSIVE PURGE / BLOWDOWN</b>			
	<b>POSSIBLE CAUSE</b>	<b>CHECK</b>	<b>CORRECTIVE ACTION</b>
C1	Inlet or outlet shuttle not shifting.	Verify nameplate specifications vs. actual operating parameters.	Line pressure too low at inlet: Increase line pressure or call factory to resize purge orifice for new conditions.
C2	Inlet or outlet shuttle not shifting.	Verify nameplate specifications vs. actual operating parameters.	Turn off downstream air usage. If blowdown events stop occurring, this indicates the air flow was too much for the compressor capacity or airline diameter causing excessive pressure drop.
C3	Inlet or outlet shuttle not shifting.	Check for damage or contamination of inlet and outlet shuttles.	Clean or replace as necessary.
C4	Inlet or outlet shuttle not shifting.	Dirty or obstructed inlet air filter.	Check filter element. Replace.
C5	Purge orifice plugged.	Remove and inspect purge orifice.	Clean hole of debris. Use air gun to clean.
C6	Timer not operating properly.	Switth connections to S1 and S2 on the solid state timer. If symptoms appear on opposite purge port, the timer is defective.	Replace timer.
C7	Timer not operating properly.	Incoming power is not "clean." Fluctuations in voltage can occur in power circuits shared by inductive devices such as electric motors.	Supply line voltage from another source.
C8	Timer not operating properly.	Verify correct timing cycle. 1. With terminals pulled back slightly from lugs on timer, place voltmeter across N and S1. There should be a 115 volt AC signal for 40 seconds and 0 volts for 80 seconds. 2. Check across N and S2 for same timing.	At no time should there be simultaneous signals at S1 and S2.
C9	Leakage.	With dryer pressurized, remove power form dryer. Check purge ports for large leaks. Check all joints on dryer and air system for large leaks.	Repair as necessary.

<b>MODELS DE3, DE4 AND DE5 TROUBLESHOOTING GUIDE</b>			
<b>D PROBLEM: ALARM WILL NOT CLEAR</b>			
	<b>POSSIBLE CAUSE</b>	<b>CHECK</b>	<b>CORRECTIVE ACTION</b>
D1	Wet air condition not corrected.	See Section "A" of Troubleshooting Guide.	
D2	Sensor not dried out.	Allow several minutes for sensor to dry out after correcting dryer problem. Alarm should clear.	To speed up alarm clearing, bleed some air through tire valve at bottom of sensor housing. Alarm should clear in less than than 60 seconds.
D3	Bad humidistat board.	Disconnect humidity cable from sensor. Alarm should clear.	Replace humidistat board.

<b>MODELS DE3, DE4 AND DE5 TROUBLESHOOTING GUIDE</b>			
<b>E PROBLEM: NO ALARM DURING WET AIR CONDITION</b>			
	<b>POSSIBLE CAUSE</b>	<b>CHECK</b>	<b>CORRECTIVE ACTION</b>
E1	No power to humidistat board.	With voltmeter, check for line voltage at "Hot" and "Neutral" terminals on humidistat board. Also check for line voltage at "Common" and "Neutral".	Make sure there is power to dryer. Check wiring diagram for correct wiring. Check continuity of wires.
E2	Sensor cable connection.	Check cable connections at sensor and at humidistat board.	Reconnect
E3	Bad sensor.	Remove air pressure from dryer. With sensor cable connected and power on, unscrew brass hex nut at bottom of sensor housing. Blow gently on sensor. The moist air from your breath should cause the alarm to sound.	Replace sensor.
E4	Bad humidistat board.	Press red "Push to Test" button on humidistat board. Alarm should sound.	Replace humidistat board.

<b>MODELS DE3, DE4 AND DE5 TROUBLESHOOTING GUIDE</b>		
<b>F PROBLEM: SHUTTLE VAL VE NOT FUNCTIONING PROPERLY</b>		
<b>POSSIBLE CAUSE</b>	<b>CHECK</b>	<b>CORRECTIVE ACTION</b>
F1 No power to shutoff solenoid valve.	With power on, disconnect humidity alarm sensor cable from sensor. This will make sure unit is not in alarm and shutoff valve should be energized. With voltmeter, check for line voltage at shutoff solenoid valve, wires #15 and #16. If not reading line voltage, check wires #17 and #18, then wires #11 and #18.	If voltage at #17 and #18, and voltage at #11 and #15, and no voltage at #15 and #16, relay is bad. Replace relay.
F2 Coil burned out.	With power on, disconnect humidity sensor cable from sensor. This will make sure unit is not in alarm and shutoff valve should be energized. Check magnetic field from coil operation. Hold iron or steel material (screwdriver end or nail) at top of coil to feel the magnetic effect, indicating proper operation.	If no magnetic effect can be felt, replace coil.
F3 Valve needs maintenance kit.	If valve leaks with power off or if causes F1 and F2 are eliminated, you may need to install a valve maintenance kit.	Install valve maintenance kit.

