

Desiccant Air Dryer (Heatless Type) Operating Manual



- Please read this manual before using this equipment must.
- Learn all the safety precautions before using this equipment, please keep.

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■ Preliminary

The usability and the life cycle of the heatless regenerative air-dryer (referred to below as PHL-dryers) as well as the avoidance of premature repairs depends on proper operation, care and competent repair under consideration of these operating instructions.

■ Product Information

Due to our position as suppliers of components we do not always know the final usage and total range of products' applications. We constantly improve our products to the latest state of science and technology and therefore, we assume that our products are free from defects in the sense of product liability. However, it cannot be excluded that during faulty operation in critical areas of application especially at danger to life and limb of persons involved, additionally safety measures may be necessary.

Therefore, we request the user of our components / units, to ensure in his own interest, to inform us about the application of our products in order to initiate additional safety measures, if necessary.

■ General Notes

The Company does not accept responsibility if these safety measures are not met during handling, operation, maintenance and repair, even though this is not strictly stated in these operating instructions.

We recommend receipt and notice of these operating instructions verified by the operating personnel in writing (personnel file).

We request strict observation of these notes as otherwise we do not accept any liability in respect of this machine (plant).



Caution!

The operator has to observe the national working-, operating- and safety regulations. Also existing internal factory regulations must be met.

Maintenance and repair work must only be carried out by specially trained personnel and, if necessary, under supervision of a person qualified for this work.

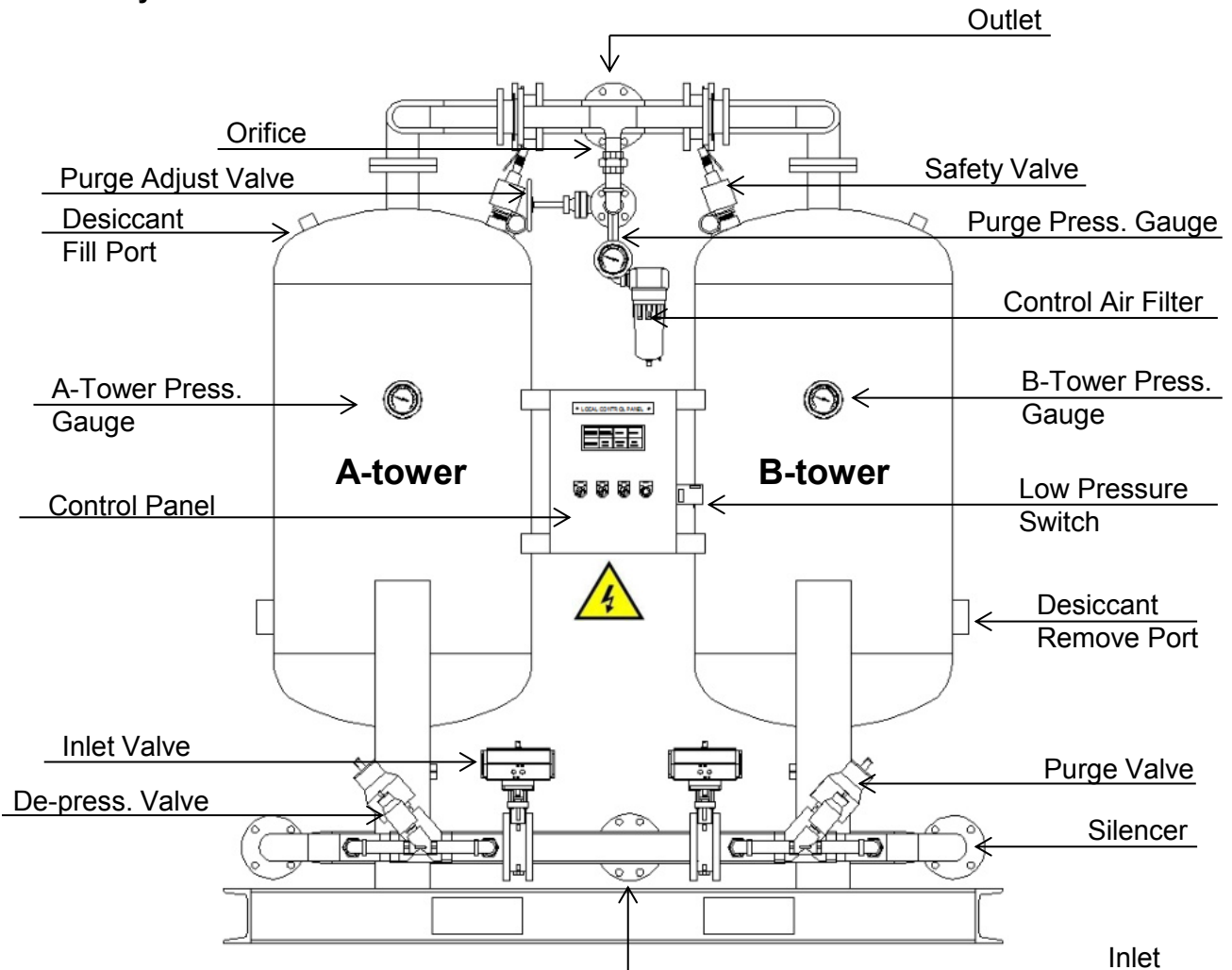
■ Safety Regulations

- Protective or safety devices must not be removed, modified or readjusted.
- During operation of the dryer none of the protective or safety devices must be removed, modified or readjusted temporarily or permanently.
- Use proper tools for maintenance and repair work only.
- Use original spare parts only.
- All maintenance works must be performed at stopped machine, disconnected power supply and pulled mains plug only. Ensure that the dryer cannot be switched on by mistake.
- Prior to dismantling a part under pressure disconnect the dryer from all pressure sources or depressurize the complete system respectively.
- Never weld the pressure vessel or modify it in any way.
- Ensure that no tools, loose parts or similar are left in the system.
- Wear eye protection and protective gloves during the change of desiccant.

■ First Aid

- Take victim immediately into the fresh air or into a very well ventilated room.
- If the victim does not breathe, perform a mouth-to-mouth resuscitation or use a respirator until the doctor's arrival.
- Never leave the victim unattended.

■ Safety Mark & Parts Location



Caution!

If the dryer is not disconnected, the risk of electric shock exists at control box.

■ Light

Dryer is not provide with a local lighting since it is designed for indoor use only. The sufficient illumination of the working area must be fulfilled by the factory in accordance with the appropriate code of practice and factory regulations.

■ Sound Pressure Level

If the sound pressure level is larger, proper safety method is needed to the operator such as ear protections and warning signs.

■ Purpose

Compressed air will be dehumidified by the dryer.

■ Composition

1. Control box
2. Electronic timing sequence module.
3. Sequence lights display
 - Drying Time
 - Repressurization Time
4. Tower safety relief valves
5. ASME coded vessels (100 over model : option)
6. Tower pressure gauge
7. Purge pressure gauge
8. Pneumatic valves
9. Tower exhaust mufflers

■ Principle of Operation

The Desiccant air dryer is specifically designed to remove moisture in vapor form. The dryer's Electronic Sequence Module is fully automatic, alternately cycling gas flow through the dryer's twin desiccant towers. Cycling between the two towers accomplishes the adsorption and regeneration processes and provides a continuous flow of air.

The desiccant air dryer is charged activated alumina, composed of desiccant tower, pneumatic valve, check valve, solenoid valve, and control panel.

The compressed air with moisture vapor enters a tower and flows upward through the desiccant bed. The desiccant has great affinity for moisture vapor, therefore it adsorbs or removes moisture from the air process is an exothermic process meaning heat is produced as moisture is adsorbed on the desiccant surface.

At the end of the drying cycle, the desiccant in the tower is regenerated the moisture that the desiccant adsorbed is removed by dry air.

A small portion of the dry gas is expanded to near atmospheric pressure by passing through an orifice specifically designed for the regeneration(Purge) stream to strip the previously adsorbed moisture vapor. The exothermic reaction from the previous drying cycle contributes to the regeneration of the desiccant bed. The heat is picked up by the regeneration stream which in turn increases the moisture adsorption capacity of the regeneration stream.

■ Operation

Assume the dryer has completed re-pressurization and the left tower has begun drying. The inlet compressed air/gas enters the dryer and is diverted to the left tower to begin the five minute drying cycle. Approximately five seconds later the right tower purge (regeneration) exhaust valve will open depressurizing the off-line tower. The purge flow will continue for a period of three minutes and fifty-five seconds. When regeneration of the off-line tower is complete, the purge exhaust valve will close, initiating the sixty second re-pressurization phase. After re-pressurization is complete, the inlet selector valve will switch inlet valves and the inlet air/gas stream will divert from the left tower to the right tower. After five seconds the left tower purge exhaust valve will continuously cycle through the sequence described above until power is removed from the dryer.

(See Appendix Sequence Chart)

The complete standard operating (NEMA) cycle is ten minutes. Under normal conditions and during normal operation, the dryer should provide an outlet pressure dew point (ADP) of -40°C or below.

■ Repressurizing Solenoid Valve

Repressurizing solenoid valve is installed Large capacity model to prevent break of activated alumina gel.

■ Fault Alarm

Pressure switch will transmit an outlet low pressure signal to DCS or local control panel. Then Purge solenoid valve is closed by control unit (in local control panel)

■ Receiving & inspection

Carefully inspect the packaging and dryer for external and internal damage. If you suspect damage has occurred during shipment, notify the transportation agency at once. This is the customer's responsibility.

Check the name plate for correct power supply requirements.

Inspect all piping and tubing. Vibration during shipment may have loosened the connections.

Desiccant air dryers are tested and operated before leaving the factory. They are ready to operate after connecting to proper services.



Caution!

Must install a suitable earth leakage circuit breaker.

■ Location

Locate your Desiccant Air Dryer on a level floor free from vibrations and in clean surroundings. Although the dryer is a free standing package, it may be secured by bolting the dryer base to the floor. Allow approximately three feet on each side of the dryer for ease of connecting and maintaining the dryer.

The ambient temperature in the dryer's location should range from 2°C to 40°C. The dryer will function in warmer ambient, but as a result, the degree of dew point suppression will decrease. Operation of the dryer in ambient approaching freezing could cause freezing of separated liquids in the pre-filter sump or in the dryer itself. For dryer operation at temperatures below freezing, Pioneer recommends heat tracing the pre-filter sump, drain trap and inlet manifold. For more information on heat tracing, contact your distributor or the factory.

Protective barriers are recommended for the prevention of accidental damage that may occur due to vehicular or personnel traffic, particularly for dryers located in open areas.

■ Connecting service

1. Connect inlet piping, including a shut off valve.
2. Connect outlet piping, including a shut off valve.
3. Install pre-filter(s) and after(s) if not factory installed.
4. If desired, install bypass piping using bubble tight valves.
 - Bypass piping is recommended for ease of maintenance, troubleshooting and service.
5. Connect electrical supply to the control box. This should be performed by a qualified electrician according to local and national codes. (See Appendix Control Panel)
6. Install access ports upstream and down-stream of the dryer for dew point and temperature.

■ Filtration

All regenerative desiccant dryers are designed to remove water in the vapor phase. The possibility of liquid carry over to the desiccant dryer must be avoided. A coalescing pre-filter will eliminate the carry over of droplets and aerosol-sized mists of both liquid water and compressor lubricant. The use of a coalescing filter will enhance the dew point depression capability of the dryer. It will also extend the life of the desiccant by preventing compressor lubricant fouling of the desiccant bed.

After filtration is also a very important step. All regenerative desiccant dryers gradually produce hard and abrasive desiccant fines. These contaminants should be removed with a particulate filter. The elimination of desiccant fine carry over will protect your plant air systems and reduce future system malfunctions.

When installing filters, make connections according to the arrow directions marked on the filter head.

■ Back pressure regulator

In dryer applications where sudden down-stream demand for dry air frequently occurs, a rapid pressure loss in the compressed air system is possible. To prevent this, it is recommended that a back pressure regulator be installed down-stream from the dryer.

The back pressure regulator will maintain a constant pressure within the dryer. This will eliminate any chance of saturating the desiccant bed by sudden flow surges which accompany rapid pressure loss. By eliminating saturation and desiccant bed “bumping,” the life the desiccant charge will increase, and the after filter elements will not become prematurely clogged with desiccant fines.

■ Purge exhaust piping

To eliminate noise created by frequent tower release of purge exhaust, the dryer’s exhaust may be piped to an outside or more remote location. This will also eliminate any possible problems caused by indoor accumulation of condensed moisture from the purge exhaust. If extending the exhaust pipe, install it horizontal or downward to avoid accumulation of condensate at low points. If the purge exhaust is required to run upward, install a valve at the low point. If extending the exhaust pipe farther than 5 meter, consult the factory for recommendations.

**Caution!**

Do not operate the air dryer before purge air exhaust.
Damage caused by this is not covered by the product warranty.

■ Start-Up

After all installation procedures are performed, drain water from the system prior to dryer start up. This will prevent saturation of the desiccant bed and improve performance of the dryer.

1. The inlet shutoff valve open, the outlet shutoff valve & bypass valve close.
2. Before to turning the dryer control panel switch ON, pressurize the dryer by slowly opening the Inlet shutoff of the dryer.
3. When both tower pressure gauges indicate line pressure, open the outlet shutoff valve. Compressed air now flows through the pre-filter, the dryer and the after filter.
4. Switch the control panel power switch ON. Five seconds after activating the dryer control circuit, one tower will depressurize to atmospheric pressure. Regenerating purge air will then flow through the regenerating tower.
5. Set the purge adjustment valve to 45 psig (3.1 barg). The purge pressure can be properly set only the purge exhaust valve is open and the regenerating tower is at atmospheric pressure.
(See Appendix Purge Air Calibration Chart)

**Caution!**

Sudden pressurization of the dryer will cause a rush of high velocity air into the desiccant bed. This will hasten the need for after filter element and desiccant replacement and may cause premature failure of valves due to desiccant fines. Must keep the purge pressure : 3.0~3.5barg.

■ Stop

To stop the dryer, place the switch in off.

During maintenance of dryer, disconnect main electrical source.



Caution!

Before servicing any component, be certain the component is depressurized and valves are closed. Otherwise, equipment damage, severe injury or death could result.

■ **Pre-Filter**

Under normal operating conditions, the pressure drop across the filter indicates when the element needs changing typically 6 psig or greater. However, inspect the filter element at least every three months for proper seating and condition of the element. If the element has collapsed or can not be properly seated, replace the element.

■ **After Filter**

Under normal operating conditions, the pressure drop across the filter indicates when the element needs changing typically 6 psig or greater. However, inspect the filter element at least every three months for proper seating and condition of the element. If the element has collapsed or can not be properly seated, replace the element.

Replacement of the element will enhance system operation and prevent inflow of desiccant powder to load side.



Caution!

The life cycle of filter element depends of the quality of compressed air. Periodic attention must be paid to proper performance.

■ **Control air filter**

The control air filter should be inspected periodically and replaced when dirty. Periodic replacement of the element will ensure clean control air for operation of the valves.

■ **Purge flow rate adjustment**

The purge flow rate should be checked periodically for proper adjustment. The purge pressure for full load operation should be set at 45 psig(3.1barg). The purge calibration graph(Appendix) may be used for purge adjustment when the load is less than capacity.

**Caution!**

Do not operate the dryer with no purge flow. It may damage the dryer and will void the warranty.

■ Solenoid valve

Inspect solenoid valves periodically for proper operation. The inspection should include monitoring the tower pressure gauge on each tower during the cycle. The back pressure on a regenerating tower should not be greater than 5 psig. Higher pressure indicates either a malfunctioning valve or a clogged muffler.

Frequent monitoring of the tower pressure gauges in conjunction with the control will give a good indication of proper operation and can assist with troubleshooting should a problem occur.

Failure of a solenoid valve may result from:

- Faulty control circuit. Check the electrical system to verify that the solenoid coil is receiving electrical input.
- A burned out coil. Replace the coil.
- Clogged solenoid valve. Disassemble and clean.
- Damaged valve seat. Disassemble and clean.

■ Desiccant replacement

Remove contaminated desiccant from each vessel through the desiccant “drain port” located near the bottom of each vessel. Pour new desiccant into the indicated “fill port” located near the top of each vessel. Allow adequate space above the desiccant bed to permit bed motion and expansion during drying. Change the desiccant periodically for optimum dryer performance. Store any unused desiccant in an airtight container.

**Caution!**

Use only activated alumina in your Desiccant Air Dryer.

■ Maintenance schedule

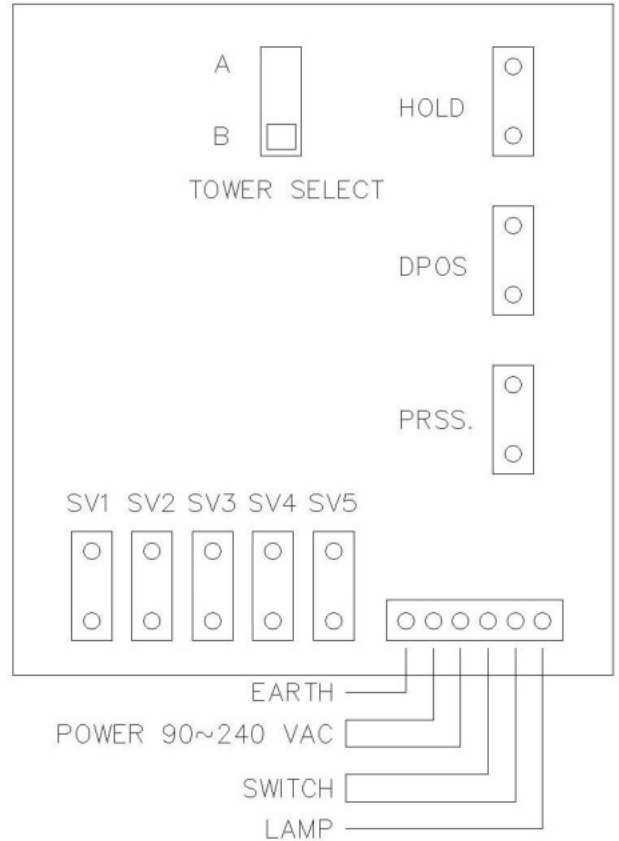
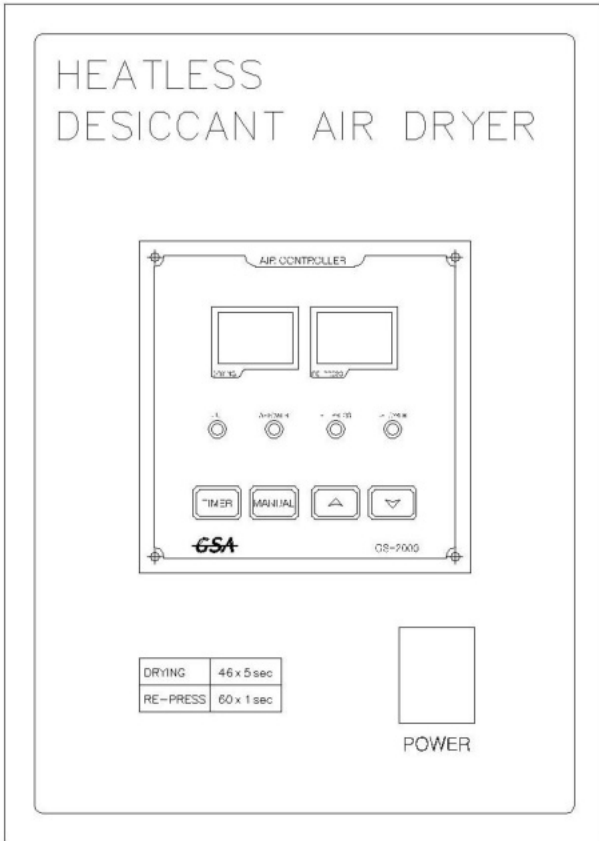
Maintenance intervals highly depend on the mode of operation and the ambient conditions on site, the intervals below air only to be understood as general recommendation.

Period	Check point	Method
Start up	Pressure indication	All pressure gauges - Drying tower pressure : same line pressure - purge pressure : 3.0~3.5 barg - Regeneration tower pressure : below 0.5barg
	Solenoid & pneumatic valve	Operation check
	Back pressure on regeneration tower	Max. 0.5 bar. If needed clean the silencer.
Every 3~4 months	Pre-filters and after-filters	Inspect pre-filter and after filter for dirt, oil and other contaminants. Replace if contaminated.
	Control air filter	Inspect filter element or regulator. if needed clean the filter & regulator.
Every 6 months	Calibrate dew point meter (if installed)	Refer to dew point meter owner's manual.
	Inspect the silencer	Replace exhaust silencer if back pressure on regeneration exceed 0.5 barg.
	Inspect solenoid valves	While dryer is operating, inspect solenoid valves. If leak or malfunction persists, replace valves.
Yearly	Replace filter elements	Replace pre-filters & after-filters.
	Inspect & replace pneumatic valves	Inspect valve seating and valve internals. If needed, clean or replace the valve.
	Inspect pressure gauge	Replace if readings are incorrect.
Every 2~3 year	Replace desiccant (recommendation)	Replace if contaminated oil moisture and other contaminants inhibit the performance of the desiccant.

■ Troubleshooting

Problem	Probable Cause	Remedy
Excessive backpressure in regeneration tower (above 0.5barg)	Silencer is clogged	Clean or replace silencer.
	Pressure gauge malfunction	Check or replace pressure gauge.
Depressurization fail	De-press. valve & purge valve doesn't open	Check de-press. & purge valve. And check its solenoid valve.
	Silencer is clogged	Clean or replace silencer.
	Low pressure	Check control air pressure(above 5 barg)
Re-press. fail	De-press & purge valve doesn't close	Check de-press. & purge valve. And check its solenoid valve.
Excessive press. drop	Excessive flow rate	Check working pressure.
	Low Inlet pressure	Check line pressure.
Tower change failure	No control air Low control press.	Check control air line & control filter.
	Controller failure	Check the PLC or PCB controller.
	Insufficient purge air	Check purge pressure.(nor. 30.~3.5 barg)
Elevated dew point	Silencer is clogged	Clean or replace silencer.
	Low pressure	Check pressure sauce.
	High inlet temp.	Reduce inlet temp. Check after-cooler or ref. dryer.
	Desiccant contaminated by oil.	Install suitable pre-filter. And replace desiccant.
	Water entering	Check after-cooler or ref. dryer. If necessary replace desiccant.

■ Control Panel



SV1 – [B-Tower] Right Tower On-Line

SV2 – [B-Tower] Right Tower Purge

SV3 – [A-Tower] Left Tower On-Line

SV4 – [A-Tower] Left Tower Purge

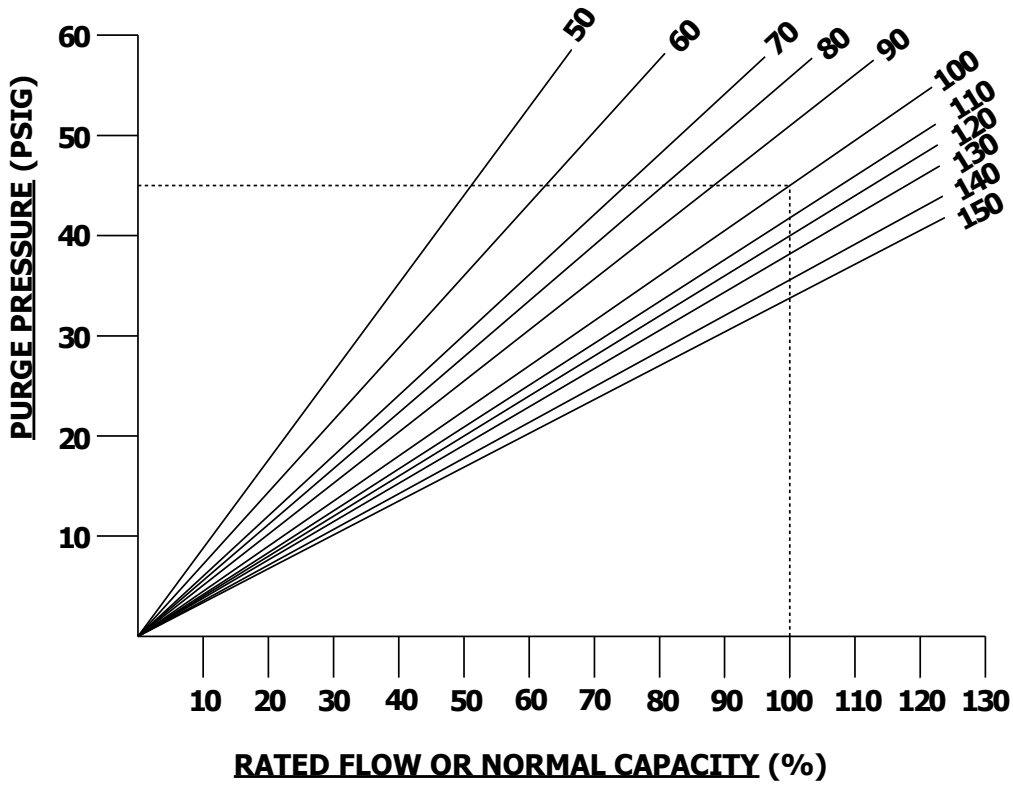
SV5 – Re-Pressure

Tower Select – A or B Tower Select

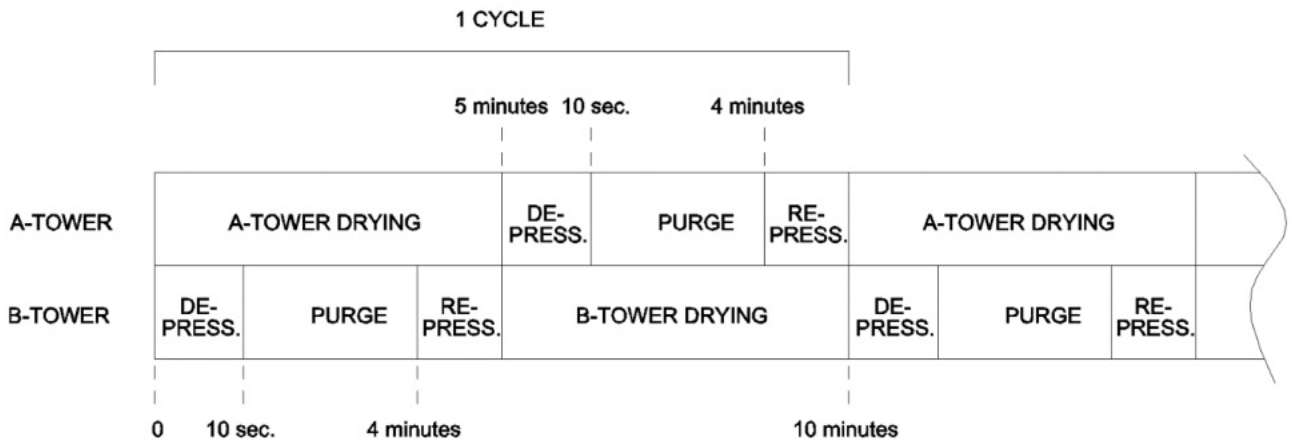
DPOS – Dew Point Operating System

PRSS. – Repressurize

■ Purge Air Flow Calibration Chart



■ Sequence chart(5 minutes drying cycle)





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