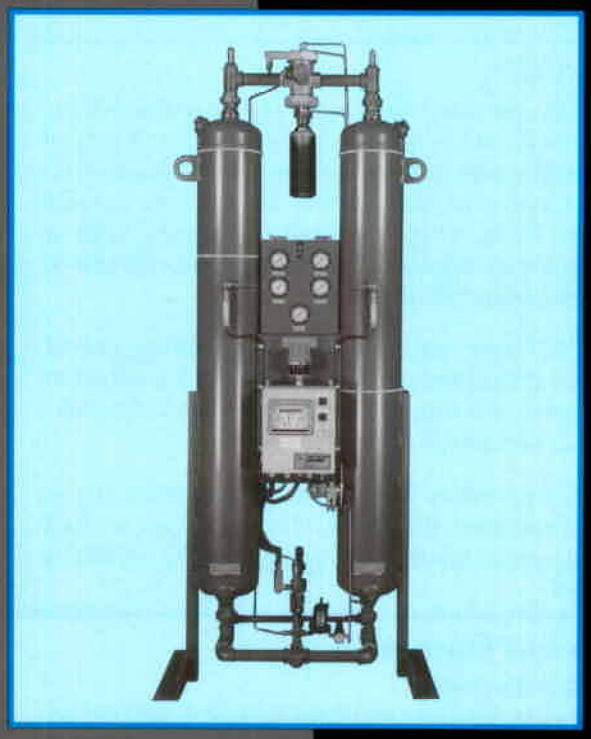


PSM AND PSL HEATERLESS DRYERS

GENERAL AIR
Making the world's air dryer

GENERAL AIR TYPE PSM and PSL HEATERLESS DRYER SYSTEMS

Introduction

The **PSM** (medium flow) and **PSL** (large flow) Heaterless Dryers are units which operate on the "Pressure Swing" principle. Pressure swing dryers regenerate desiccant by expanding a portion[1] of the dried air to atmospheric pressure. This swing in pressure results in very dry purge air which, when passed through the desiccant, picks up and removes the adsorbed moisture.

PSM/PSL Dryers are reliable and economical, providing low initial capital and operating costs. With a minimum of moving parts, the dryers provide exceptional dewpoint performance, with minimal maintenance.

Designed primarily for general plant instrument air service, the standard **PSM/PSL** Dryers deliver a -40°F pressure dewpoint for flows ranging from 75 SCFM to 10,000 SCFM.

A -40°F or better pressure dewpoint is produced with a 10-minute NEMA cycle (5 minutes drying and 5 minutes regenerating). The pressure dewpoint on PSM Dryers can be lowered to -100°F or better by switching to a 4-minute NEMA cycle (2 minutes drying and 2 minutes regenerating) and increasing the purge rate.

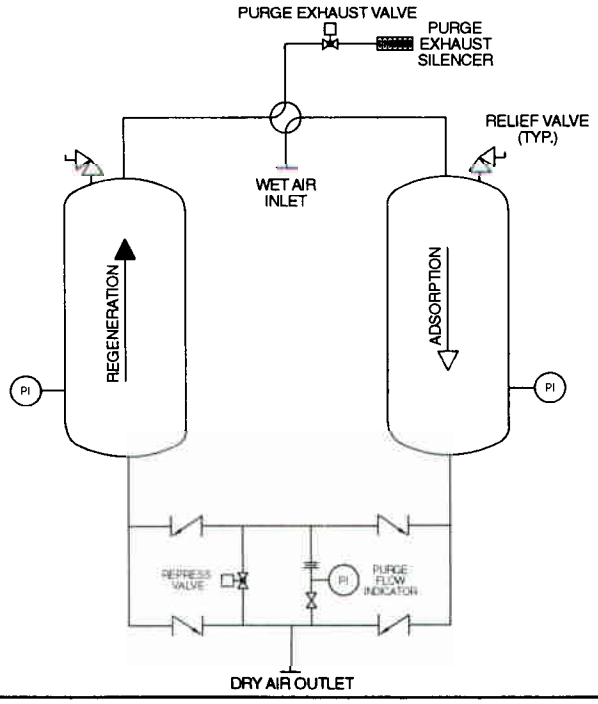
Heaterless regeneration ensures that the outlet air temperature is constant. This makes the **PSM/PSL** Dryers an ideal choice where it is critical to have a constant outlet temperature (i.e., no temperature spike).

[1] Purge flow is 15% of inlet flow when operating at 100 psig.

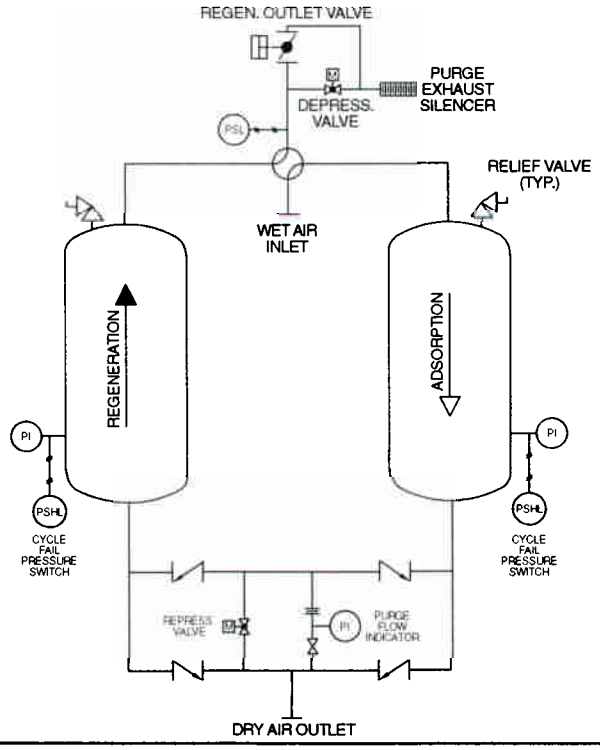
Principles of Operation

- **Adsorption (Drying)**
  Wet air enters the dryer and flows down through the on-stream tower, allowing the activated alumina desiccant to adsorb water vapor from the air. Adsorption is a heat-releasing (exothermic) process; this heat is stored in the desiccant bed for the regeneration cycle.

- **Regeneration**
  While the on-stream tower is drying wet air, the off-stream tower is depressurized from operating pressure to atmospheric pressure. A portion of dry outlet air is passed up through the off-stream tower's desiccant bed. The combination of dry purge air and the heat of adsorption from the drying cycle removes the moisture from the desiccant.



PSM Flow Diagram 75-1,000 SCFM



PSL Flow Diagram 1,250-10,000 SCFM

Features and Benefits

Standard

- **Non-lubricated 4-way Switching Valve** – PSM Models 75 thru 1000 utilize a slide valve with an integral actuator controlled by the pilot air solenoid. The valve contains floating Teflon seals which can be replaced without disconnecting piping.

  PSL Models 1250 thru 10,000 utilize a rotor valve with an external actuator controlled by the pilot air solenoid. Teflon leaf seals form an integral surface which is self-cleaning, self-lubricating and long-lasting.

- **Solid-State Controller** – Extremely reliable electronic timer control eliminates obsolete cam timer designs.

- **Activated Alumina Desiccant** – A reliable desiccant that removes moisture from saturated compressed air.

- **Tower Repressurization** – Employs a solenoid, pilot valve and orifice to ensure full repressurization prior to tower switchover. This prevents a sudden rush of air fluidizing the desiccant bed which can reduce desiccant life.

- **Adjustable Purge** – Utilizes a regulating device to monitor purge flow rate. Adjustability permits flow rate to be individualized to customer conditions, thereby minimizing purge loss and reducing energy costs.

Other Standard Features:

- **Standard -40°F Pressure Dewpoint**
- **ASME Code-Stamped Carbon Steel Vessels**
- **150 PSIG MWP Stainless Steel Support Screens**
- **Desiccant Fill and Removal Ports**
- **Initial Fill of Activated Alumina**
- **NEMA-1 Electricals – PSM**
- **NEMA-4 Electricals – PSL**
- **115/1/50-60 Electricals**
- **Power Switch and Indicator Light**
- **Pressure Gauge for Each Vessel**
- **Relief Valve for Each Vessel**
- **Purge Exhaust Silencer**
- **Preset Purge Flow Control**
- **Remote Alarm Contact – PSL**
- **Tower On-Stream Lights – PSL**
- **Copper Alloy Tubing and Fittings**

Optional

- **Accu-Purge II Energy Management System** – Automated sensing and control system designed to enhance the efficiency of the dryer by using only the amount of purge air necessary to maintain the required output dewpoint. This results in significant energy savings (paybacks of only a few months are quite common). See page 4 of bulletin.

- **Visual Moisture Indicator** – Utilizes silica beads which are blue when dry and pink when wet.

- **High Humidity Indicator** – Utilizes a lithium chloride type humidity sensor which activates an indicating light if the dryer experiences high dewpoint. Remote alarm dry contacts are provided for customer hookup.

- **Cycle Failure Indicator** – Utilizes pressure sensitive switches which activate an indicating light if the dryer experiences cyclic malfunction. Remote alarm dry contacts are provided for customer hookup; standard on PSL.

- **Tower Regenerating Lights** – Indicate the tower being regenerated.

- **Filter Bypass Assemblies** – Three-valve, seven-valve, or nine-valve, manually operated system consisting of a coalescing prefilter with automatic drain and a particulate afterfilter. Valving provides ease of service without interruption of air supply. Coalescing filter protects the desiccant from oil and/or free water contamination in the incoming air stream. Particulate filter protects downstream instrumentation/equipment from desiccant dust (fines) inherent in all regenerative desiccant dryers. Inlet and outlet pressure gauges on the filter bypass piping are optional. A ΔP indicator is also optional.

Other Optional Features:

- **NEMA 4, 7 and NEMA 4-Purged Enclosures**
- **UL Listed (Panel Only) Electricals**
- **Temperature Gauges**
- **Stainless Steel Pilot Tubing and Fittings**
- **All Pneumatic Controls**
- **-100°F Outlet Dewpoints (PSM Only)**
- **300 PSIG Operating Pressure (PSM Only) – Higher Pressures Available as Custom Application**

For custom applications, materials, options or design criteria, contact GAD.

(Optional) ACCU-PURGE II
Energy Management System For PSM and PSL Heaterless Dryers

Dryers are sized for maximum design flow rate and maximum design moisture load (based on pressure and temperature). In other words, dryers are sized for "worst case" operating conditions. The dryer is rarely operated at this set of conditions. Operating the dryer on a fixed cycle, therefore, wastes energy since the actual moisture load is less than design.

The GAD Energy Management Systems are designed to enhance the overall operating efficiency of each type of dryer by consuming only as much energy as is necessary to maintain the required outlet dewpoint throughout the entire operating range of the dryers.

Features/Benefits

Lower Maintenance and Cost Savings:

- **Energy Conservation** – Depressurization losses and purge are limited to the minimum amount needed to remove the actual moisture in the dryer.
- **Longer Desiccant Life** – Desiccant attrition is reduced as a result of fewer tower depressurizations.
- **Extended Valve Life** – Valve wear and tear is reduced since the drying cycles less frequently.

Reliable Design and Quality Construction:

- **Probe Construction** – The probes are designed to measure both capacitance and impedance, ensuring more accurate control even during upset conditions.
- **Alphanumeric Display** – This 16-character display provides operators with detailed operational information and troubleshooting self-diagnostics.
- **Alarms** – Cycle Failure and Probe Failure alarms are standard. A High Humidity alarm is optional.
- **Self-Diagnostics** – Dryer malfunctions are analyzed by the microprocessor and troubleshooting messages are displayed to aid field diagnosis.
- **Probe Location** – For more accurate moisture sensing, the probes are located within each desiccant bed.
- **Fail-Safe Operation** – In an alarm situation, the control system automatically reverts to fixed cycle operation. This ensures the rated dewpoint is maintained. Fixed cycle operation continues until operators reset the alarm. Dry contacts provide a signal for remote alarm capability.

Operation

Unique capacitance/impedance moisture sensors (probes) are the heart of the GAD **Accu-Purge II** Energy Management System. One is located in the desiccant bed of each tower. Capacitance accurately measures a narrow range of very dry conditions. Impedance accurately measures a wide band of wetter conditions. Normally, probe location is *critical* because most probes can accurately measure only a narrow range of moisture levels. The GAD **Accu-Purge II** probe does not have this limitation. Utilizing both capacitance and impedance gives accurate measurements across a wide range of conditions. This ensures accurate dryer control during upset conditions.

Another unique feature of the GAD **Accu-Purge II** Energy Management System is that it extends the drying cycle of the on-stream tower when the moisture level is lower than the design conditions. This saves energy and reduces the number of cycles, thereby extending valve life. The off-stream tower goes into standby once a standard regeneration cycle is completed.

Energy Savings From Accu-Purge II

Energy Savings Calculation

$$\%\ \text{Loading} = \frac{\text{SCFM (actual)}}{\text{SCFM (design)}} \times \frac{T_F\ \text{(actual)}}{T_F\ \text{(design)}} \times \frac{P_F\ \text{(actual)}}{P_F\ \text{(design)}}$$

% Savings = 1 - % Loading

T_F = Temperature Factor

Temp (°F)	60	70	80	90	100	110	120
T_F	.6	.7	.8	.9	1.0	1.1	1.2

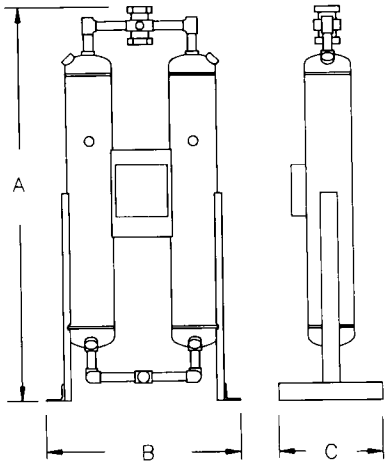
P_F = Pressure Factor

Pressure (PSIG)	60	70	80	90	100	110	120
P_F	1.55	1.35	1.2	1.1	1.0	.9	.85

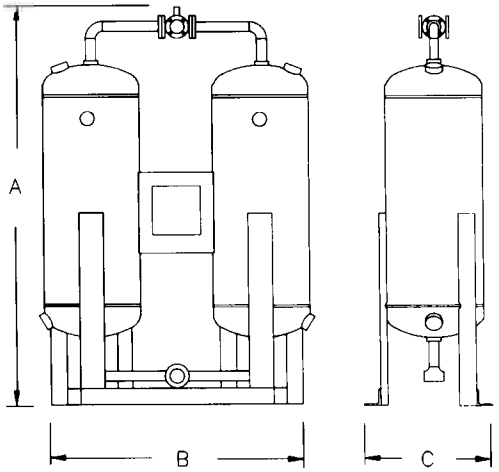
The energy savings can be estimated using the above calculations. The "actual" factor represents the anticipated *average* flow. If flow is not continuous, the average should be estimated.

See brochure number 305-SBG.

PSM/PSL TECHNICAL DATA SHEET

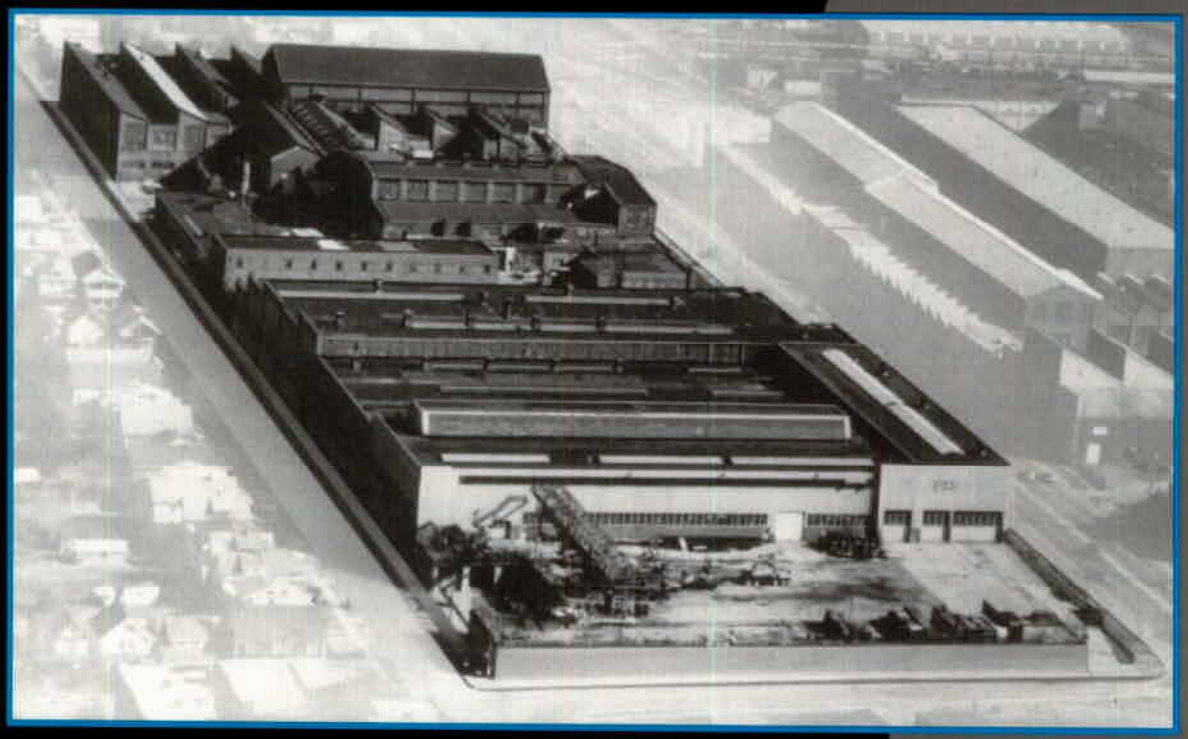


PSM Models 75 thru 350



PSM Models 500 thru 1000; PSL Models 1250 thru 10,000

Model Number	Inlet Capacity SCFM @ 100 PSIG 100°F	Dimensions			In/Out Connection	Weight Unit Only w/Desiccant (lbs.)	Approx. Shipping Weight (lbs.)	Applicable Filter Series		
		A	B	C				Coalescing	Particulate	Odorguard
PSM-75	75	88	37	24	1" NPT	460	600	C30	P30	O30
PSM-100	100	107	37	24	1" NPT	535	700	C30	P30	O30
PSM-125	125	86	39	24	1" NPT	590	735	C30	P30	O30
PSM-150	150	97	39	24	1" NPT	655	800	C30	P30	O30
PSM-175	175	108	39	24	1½" NPT	705	870	C30	P30	O30
PSM-200	200	93	45	24	1½" NPT	905	1,100	C30	P30	O30
PSM-250	250	107	45	24	1½" NPT	1,040	1,250	C30	P30	O30
PSM-350	350	107	47	24	1½" NPT	1,330	1,550	CX100	P30	OX100
PSM-500	500	111	57	25	2" Flg.	2,060	2,300	CX100	PX100	OX100
PSM-750	750	121	59	27	2" Flg.	2,770	3,100	CX160	PX160	OX160
PSM-1000	1,000	106	63	32	2" Flg.	3,390	3,700	CX200	PX200	OX200
PSL-1250	1,250	121	56	32	3" Flg.	4,900	Contact Factory			
PSL-2000	2,000	134	73	37	3" Flg.	6,300				
PSL-3000	3,000	132	78	42	4" Flg.	7,800				
PSL-4000	4,000	142	94	48	4" Flg.	12,300				
PSL-5000	5,000	157	116	52	6" Flg.	16,500				
PSL-7500	7,500	Contact Factory								
PSL-10,000	10,000									



Manufacturers of quality products since 1945

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Making the world's air dryer

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