The most Economical & Reliable Dryer on the Market Today for the Production of Instrument Quality Compressed Air and Process Gases.

PNEUMATIC PRODUCTS

The Energy Saver DEA Internally Heated Desiccant Dryer 100 - 4900 scfm

DESCRIPTION

PPC's downflow, internally heat-reactivated, demand cycle controlled DEA incorporates state-of-the-art design features unequalled in the industry to date.

Using less than 3% process gas for purge, the DEA is the most energy efficient dryer on the market today. The key to the DEA's energy efficiency is the unique arrangement of evenly spaced heaters within the desiccant bed, insuring complete, even heating.

Energy costs are typically 80% less than heatless units and 70%-80% less than other internally heat reactivated dryers.

Coupled with our field proven poppet-style switching valves, factory tested for over 500,000 cycles; the patented in-the-bed capacitance probes for desiccant charge moisture load sampling; and unsurpassed diagnostics - the DEA dryer is the unit of choice for today's cost and reliability conscious consumer.

APPLICATIONS

The Signature Series Energy Saver DEA serves instrument, fluidpower and process air applications. Designed for continuous or intermittent service, it is also utilized in specialty gas drying such as carbon dioxide in breweries, nitrogen for chemical padding, and hydrogen drying.

Low purge requirements make the DEA the ideal dryer for installations where compressed air/gas is not expendable for regeneration. Coupled with PPC's AMLOC® energy management system, air/gas used for purge can be reduced to a fraction of a percent.

When used with PPC's coalescing pre-filter, the DEA may be suitable for use in corrosive environments or downstream of lubricated compressors.

Signature Series design allows the end user to customize the unit to suit his particular needs, i.e., controllers suitable for use in a Class 1, Div. 2, Group C or D location; stainless steel instrumentation and hardware for corrosive environments, and many other engineered options.

DEA DRYER

ADC Control System with AMLOC® Moisture Load Control

CONTROLS - MONITORS - DIAGNOSTICS

The synoptic display and information center work together to provide automatic operation of the dryer, monitoring of all dryer functions and diagnosis of system faults.

Features

- LED status display 30 times brighter than standard industrial type
- Backlit LCD display for visual clarity in a variety of ambient lighting conditions

Operator Information - Menu (1)

STATUS

- Dryer Operation Normal
- LC/RC-Depressurizing
- LC/RC-Repressurizing
- LC/RC-Sweep
- LC/RC-Stand-by (HOLD)
- LC/RC-Heating

ALARMS/WARNINGS

- LC/RC-Depress Failure - Alarm
- LC/RC-Repress Failure - Alarm
- LC/RC-On-line Press Failure - Alarm
- LC/RC-Heater Overtemp - Alarm
- LC/RC-Thermocouple Failure - Alarm
- LC/RC-AMLOC® Failure - Warning
- LC/RC-High Humidity - Warning

HISTORY OF DRYER OPERATION

History - Menu (2)

Dryer operational history stores up to 20 alarms providing operators and service personnel key diagnostics for rapid repair and maximum uptime.

- 20 Alarms (History)
- AMLOC® Savings
- Cumulative Run/Off Time
- Current Cycle Status
- Last Cycle Status - LC/RC (Dry/Sweep/Heat/Hold)
- Alarm History Clear

System Schematic of the desiccant dryer to reference system functions

Warning & Alarm Lights supported by communications from the information center

Information Center Four Lines of Liquid crystal text to reference 4 menu options - 80 character display

DEA CONTROLS

Touch Sensitive Interactive Key Pad Controls for PPC's Thermal Regenerative Adsorption Systems

- Menu Select Key ① (4 Options)
  — Dryer Status
  — Dryer History
  — Dryer Service
  — Dryer Configuration

SERVICE INFORMATION

Service requirements for PPC air dryers are minimal due to the long service life engineered and designed into componentry. However, routine preventive maintenance is recommended to promote extended, trouble free performance.

Information and Functions -Menu (3)

- Program Version/Catalog#
- Filter Usage: X of X weeks
- Valve Usage: X of X weeks
- Desiccant Usage: X of X weeks
- Lamptest

CONFIGURATION/COMMUNICATION

This menu provides additional flexibility in allowing field configuration to accommodate unusual field conditions. Also provided, is a serial communication port to allow monitoring by most PLC families, computer systems and modems.

CONFIGURATION/COMMUNICATION - MENU (4)

- Temperature - Degrees C or F
- Press Switch - On/Off
- Communications - Baud Rate
- Heat Set Point
- Maximum Sweep Time
- NEMA Cycle

The Need For Energy Management And PPC's Patented AMLOC® SYSTEM

WHY THE NEED FOR ENERGY MANAGEMENT

Design operating conditions and actual field operating conditions are seldom the same. Experience has shown that field conditions are typically less than 50% of design load.

To minimize energy consumption, the dryer control system must be able to determine moisture load and then adjust operation to take full advantage of the adsorptive medium before initiating a regeneration cycle.

CRITERIA FOR COMPONENT SELECTION

The moisture sensing device must be rugged enough to survive a harsh industrial environment and easy to use. PPC has accomplished this feat by offering a moisture probe with a life time warranty with no calibration requirements for the life of the equipment.

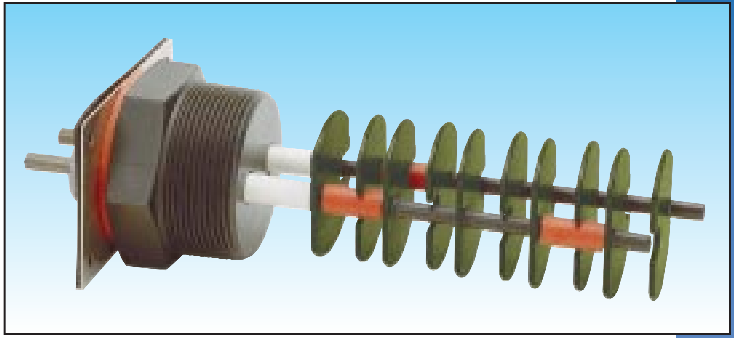
PPC's Automatic Moisture Load Control (AMLOC®) energy management system, developed nearly two decades ago, is unrivaled by any other demand cycle control in the industry. It has been field proven in over 25,000 applications.

By sensing actual desiccant bed condition, unlike devices which utilize air sampling, the AMLOC® control is able to interpret and adjust for an aging or fouled bed. Probes located in the bed provide early warning of air quality degradation and allows the controller to maximize performance capabilities in upset conditions.

HOW AMLOC® WORKS

Each chamber utilizes a ceramic plated, stainless steel capacitance probe imbedded directly in the desiccant. As the desiccant becomes moisture laden, its dielectric strength is weakened, and the strategically positioned plates of the capacitance probe allow an electrical signal to pass to the controller. Regeneration is initiated only after a preset frequency level has been reached. When actual moisture load is less than design conditions, the on-line chamber continues to dry until saturation is reached. The off-line chamber is regenerated and maintained in stand-by status for the extended drying period. Since the moisture content is sensed directly by the probe, without the requirement of filters, recalibration or other devices, the customer is assured of accurate readings, time after time.

Coupled with the energy savings realized by the reduction in heater on-time and purge air consumption, is the economic advantages of less cycling. Fewer flow reversals and minimal thermal stress yields longer desiccant and valve life.



AMLOC® PROBE proven in over 25,000 applications with a Life Time Warranty and no calibration requirements.

HOW MUCH DOES AMLOC® REALLY SAVE?

Conservatively, looking at a system where the annual average flow is 75% of design and average inlet temperature is 80 degrees F we can determine...

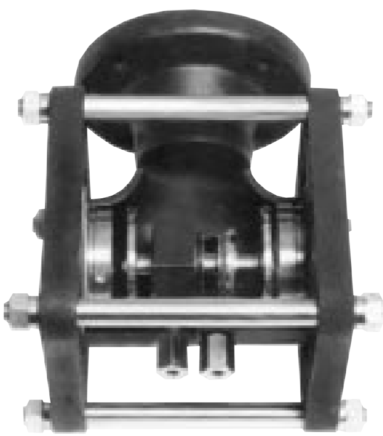
Example of Annual Moisture Load Factor (M.L.F.) and Potential Energy Savings

	Design Conditions	Annual Average	M.L.F.
FLOW:	1500 SCFM	1125 SCFM	75%
TEMP:	100 Deg. F	80 Deg. F	54%
PRESS:	100 PSIG	100 PSIG	100%
R.H.:	100%	100%	100%
			40% M.L.F.

Result 40% Annual average moisture load results in **60% savings in energy consumption!**

DEA Patented Poppet Style Valves

STANDARD FEATURES	YOUR BENEFITS
Fully ported, poppet type	Resists clogging, scoring and friction wear; long life and low maintenance
Elastomeric hi-temp seals	Bubble-tight seal, no cross leakage to degrade dewpoint performance, no lubrication or frequent maintenance required
Fluorocarbon treated internals	Fluidity in movement; no lubrication required
Factory tested for over 500,000 cycles without failure	Reliability, durability
Stainless steel internals and coated carbon steel externals	Resists corrosion and erosion; provides freedom from valve stiction
Stainless steel exhaust valve bonnet cylinders	Extra corrosion protection where you need it most
Air-operated inlet/purge exhaust valves	Positive actuation; high reliability; offering fail-safe operation
Designed and manufactured by PPC specifically for dryer application	Ensures highest quality and reliability; valving designed with abrasive, industrial environment in mind; readily available spare parts
Low differential pressure	Reduced operating costs and more working pressure available downstream
Self-cleaning via a rod scraper	No scoring or accelerated wear by abrasive contaminants
Easy access to purge adjusting valve	Allows field adjustment of purge flow rate
No piping to remove or special tools required to service	Easiest to maintain and service



The ideal valves for desiccant dryer service are air piloted, full ported, poppet style with a friction-free coating. They are corrosion resistant and can withstand elevated temperatures, clogging and erosion caused by abrasive desiccant dust.

HOW IT WORKS

Wet incoming gas, after first being pre-filtered, enters the drying chamber through valve (A). Vaporous contaminants are removed from the gas stream in the adsorption process and adhere to the desiccant. Dry gas exits the drying chamber through check valve (G) and is then directed to point-of-use after first having any particulate contamination removed in the afterfilter.

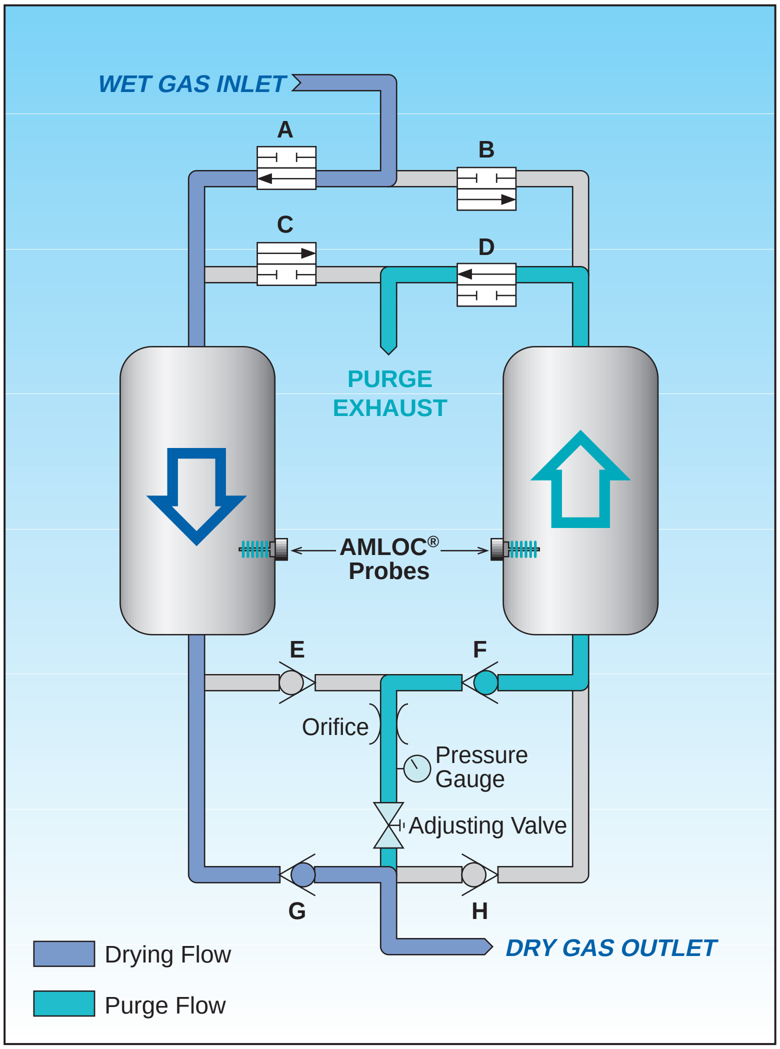
While in the drying cycle, the offstream chamber is depressurized to atmospheric pressure through exhaust valve (D).

A portion of the dried gas, about 2%, is directed through a purge adjusting valve and orifice, expanded, and directed through the offstream chamber via purge check valve (F). A series of evenly spaced heater tubes insures even heating of the wet desiccant bed which liberates previously adsorbed water molecules. The moisture is then removed by the extremely dry purge gas and carried up and out of the bed via purge exhaust valve (D).

Heating is terminated after 3 hours and the dry purge gas continues to sweep and cool the bed. After regeneration is complete, the chamber is repressurized to line pressure by closing exhaust valve (D) in preparation for switchover.

The AMLOC® Automatic Moisture Load Control uses capacitance probes to monitor moisture load in the drying chamber. In low moisture load conditions the drying cycle is extended to maximize the loading capacity of the desiccant and minimize heating and purge requirements.

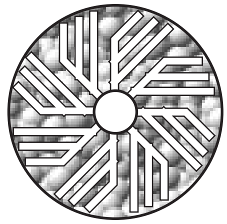
Once the adsorptive capacity of the desiccant has been reached, switchover occurs automatically and the drying cycle is repeated in the newly regenerated chamber. The cycle repeats as necessary, based on moisture load.



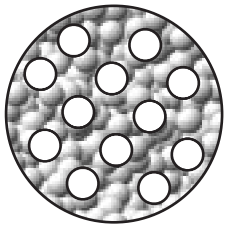
The Evolution Of The Signature Series DEA

WHY INTERNALLY HEAT REACTIVATED?

The quality of the purge gas is critical to the performance of ***any*** regenerative dryer. The relative humidity of the purge gas must be significantly lower than that of the bed to be regenerated. This can be accomplished by (1) reducing the pressure of the dried process gas (pressure swing) or (2) by heating ambient air (i.e., wet air) and conveying it to the bed (atmospheric blower-convection) or (3) a combination of the two wherein heat is produced directly in the desiccant bed and dry purge gas is directed through the bed to remove liberated moisture (conduction-internally heated).



Cross Section of Central Heat Tube-Fin Type Design



Cross Section of Multiple Heater Tube Design

Provided heat is distributed evenly and purge gas quantity is maintained, the energy costs associated with method (3) can be 70-80% less than pressure swing and/or convection heated dryers. By introducing heat directly in the bed, heat is concentrated where it's needed. This reduces costly purge requirements.

EARLY DESIGN CHARACTERISTICS

The First Generation

Type "AA" - This unit incorporated a central heat tube which housed a high-watt density heating element. Silica gel was the adsorptive medium. Dry gas purge (approximately **10-12%** of the process flow) entered the offline chamber for regeneration. Drying took place in an upflow direction and purge was countercurrent.

The Second Generation

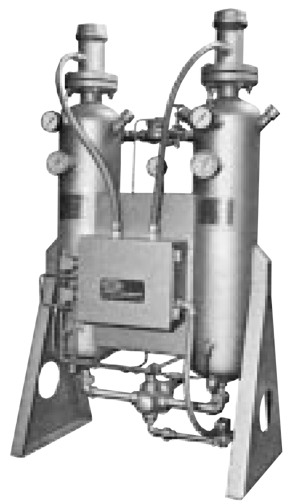
Type "AE" - To encourage more even distribution of heat, central heat tube was modified to incorporate "fins" to help radiate heat throughout the desiccant bed. A dedicated dry gas purge circuit was added including modulating hardware to allow adjustment for varying inlet conditions. Heat was distributed throughout the desiccant bed via the central heater/fin-tube assembly, thus reducing dry gas purge requirements to approximately **5-7%**, offering significant energy savings. Drying was upflow and purge countercurrent to the drying flow.

The Motivation for Evolutionary Changes...

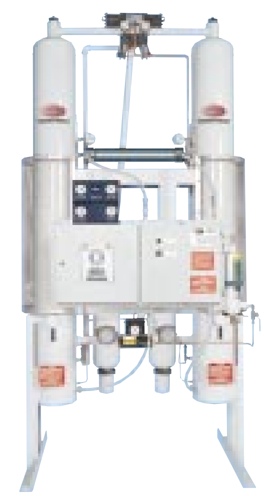
- Central heater tube - carbon steel - subject to corrosion in moisture laden, thermally stressed environment
- Leaks in central heater tube allowed purge gas bypass developing hot spots in desiccant; online drying efficiency was thus compromised
- Life of high-watt density heaters frequently threatened due to operator errors
- Lubricated plug valves attracted abrasive contaminants; required routine lubrication; suffered cross-port leakage sacrificing dewpoint integrity
- Check valves - commercially available; could not withstand the high temperature, abrasive environment
- Purge flow had to be increased in low pressure or high temperature applications
- Insufficient heating of adsorptive medium
- 4'-7' overhead clearance required to remove heaters
- Heater burn-out required removing unit from service until replaced (typically 4 week lead)
- Tube-to-fin welds limited heat transfer ability
- Connecting fin surface area -1/4" to 3/16" insufficient surface area to promote good heat transfer ability
- High-watt density; continuous heater cycling encouraged short heater life
- No energy management capabilities

Today's Revolutionary Design - The DEA

- Multiple heater SST heater tubes - even heat distribution; corrosion resistant
- Nominal **2%** process gas required for purge
- Low watt density heating elements; long life
- Flexible construction; bottom insertion; no overhead clearance required
- Poppet-style switching valves; SST internals; no lubrication required; hi-temp seals
- Heater burn-out; although effluent air minimally compromised, does not necessitate flow interruption
- AMLOC® energy management system
- Silica gel/molecular sieve desiccant bed provides more capacity in smaller vessels
- Can economically maintain emergency heater stock
- Downflow drying minimizes bed fluidization in upset (overflow) conditions



Early 'AE' Style Internally Heat Reactivated Dryer Incorporating Central Finned Heater Tube



Today's 'DEA' Style Internally Heat Reactivated Dryer Incorporating Multiple Low Watt Density Heaters

DEA SIGNATURE SERIES
Models 100 - 4900DEA

SELECT A "SYSTEM"

SIZE	DEA	SP/HP	TABLE 2	TABLE 3	TABLE 4 —	TABLE 5 —	TABLE 6 —	TABLE 6 —	TABLE 6
TABLE 1							OPTIONS		

TABLE 1 - BASE UNIT		
	SP	HP
SIZE	150#	300#
100		
175		
300		
400		
500		
600		
800		
1000		
1300		
1500		
1800		
2000		
2500		
3600		
4900		

TABLE 1 - BASE UNIT FEATURES

VESSELS
- 300# Design
- Mfg'd by PPC
- Inlet Screens-Cleanable/SST
- Downflow drying
- Repress Circuit
- Silica Gel/Mole Sieve Charge
- Exposed Steel Shot Blast to SP6
- Zinc Chromate Primer
- 2-Part High Solids Epoxy Finish
- -40°F Design

VALVES
- CS Bodies
- SST Internals
- Permanent Dry Lube
- Poppet Style
- Fail Safe
- Hi-Temp Viton Seals
- Simple Removal/ Rebuild
- 500,000 Cycle Tested
- Air Operated
- Self-Cleaning
- Bubble Tight
- Fully Ported
- High Press. Svc.

TABLE 5 - DRAIN VALVES	
CODE	DESCRIPTION
P1	PDV-100 ELEC.
P4	PDV-400 ELEC.
T1	T-7A C.I. TRAP
T17	T-17 SST TRAP
D1	DDV-2000 PNEU.

TABLE 2 - CONTROLS	
CODE	DESCRIPTION
A4	AMLOC® NEMA 4
A7	AMLOC® NEMA 7

TABLE 2 - CONTROLS A4 - STANDARD

- ADC+ Controller
- Backlit LCD Status Display
- Synoptic Operating Display
- Warning/Alarm Lights
- EMS Minder
- Capacitance Probes
- Self-Checking
- Maintenance Reminder
- RS-232 Capable
- Interactive Keypad
- Alarm Storage
- Diagnostics:
  - Normal Operation
  - RC/LC Depress
  - RC/LC Repress
  - RC/LC Heating
  - RC/LC Sweep
  - Switching Failure
  - High-Humidity
  - EMS Failure

TABLE 6 - OPTIONS	
CODE	DESCRIPTION
	ALUMINUM ΔP GAUGES
A1	Qty 1 - ΔP System
A2	Qty 2 - ΔP F01/F11
A3	Qty 3 - ΔP F01/F11/System
A4	Qty 4 - ΔP F21
A5	Qty 5 - ΔP F21/System
	STAINLESS ΔP GAUGES
S1	Qty 1 - ΔP System
S2	Qty 2 - ΔP F01/F11
S3	Qty 3 - ΔP F01/F11/System
S4	Qty 4 - ΔP F21
S5	Qty 5 - ΔP F21/System
BB	Qty 5 Brs Blk/Bld Valves
BS	Qty 5 SST Blk/Bld Valves
T	Transformer (575V/60H/3PH)
H	Heater Burnout
R	Spot Radiography
PP	Personnel Protection
B	B31.3 Dryer Piping

TABLE 3 - INSTRUMENTS	
CODE	DESCRIPTION
B1	150# BRASS
B3	300# BRASS
S1	150# STAINLESS
S3	300# STAINLESS

TABLE 3 - INSTRUMENTS 150# BRASS - STANDARD

- 2.5" Dual Scale Inl/Outl/Chamber Pressure Gauges
- Panel Mounted
- 2.5" Dual Scale Purge Prs Gauge
- Relief Valves
- Copper Tubing
- Aquadex Moisture Indicator
- Purge Adj. Valve
- Pilot Air Filter
- 3" Chamber Temp Gauges

TABLE 4 - HOUSINGS		
SCFM	MODEL NUMBER	PRS./CONN.
100	MCD1001G16	150# - 1" NPT
200	PCS12001G16	150# - 1" NPT
340	PCS13401G24	150# - 1.5" NPT
500	PCS15001G24	150# - 1.5" NPT
600	PCS16001G32	150# - 2" NPT
800	PCS18001G32	150# - 2" NPT
1200	PCC112001G49	150# - 3" FLG
1200-1800	PCC118003G65	150# - 4" FLG
2000-2400	PCC124004G65	150# - 4" FLG
2500-3600	PCC136003G97	150# - 6" FLG
3700-4800	PCC148004G97	150# - 6" FLG
220	PCS31001G16	300# - 1" NPT
460	PCS32001G16	300# - 1" NPT
785	PCS33401G24	300# - 1.5" NPT
1150	PCS35001G24C	300# - 1.5" NPT

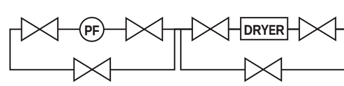
TABLE 4 - FILTER PACKAGES FEATURES

- SST 100-800 scfm with Epoxy finish
- CS 1/16" C.A.>800 scfm
  - -Zinc Chromate Primer
  - -Hi-Temp; 2-Part Epoxy Finish (Internal/External)
- Low Operating Delta-P
- Lowest Oil Penetration (0.0014 ppmw)
- 0.9 Micron Absolute
- Y-Strainer & Isolation Valving for Drain Valve Mounting

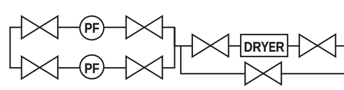
BYPASS OPTIONS

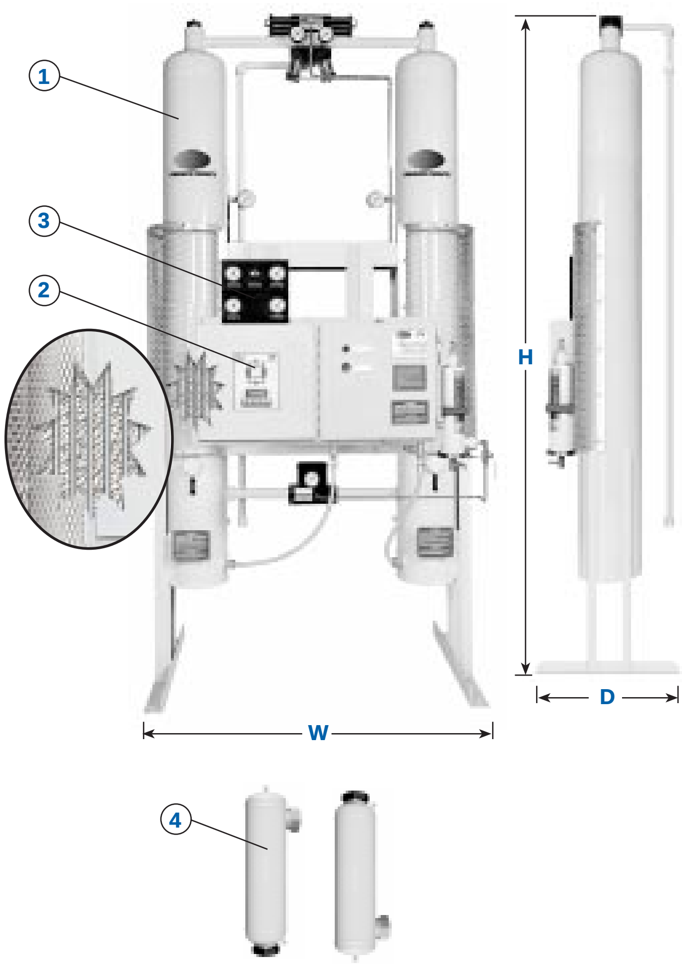
F01 - Mounted Prefilter; Afterfilter
- No Block Valves

F11 - Mounted Prefilter; Afterfilter
3-Valve Block & Bypass
around Dryer and Filters

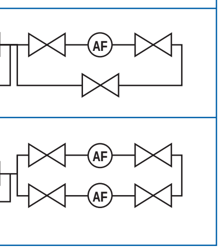


F21 - Dual Prefilter; Dual Afterfilter;
2-Valve Isolation for Prefilter &
Afterfilter; 3-Valve Block & Bypass
for Dryer





PIPING OPTIONS			CARTRIDGES		FACTORY INSTALLED
F01	F11	F21	CS	SST	
					DEA100
					DEA175
					DEA300
					DEA400/500
					DEA600
					DEA800
					DEA1000
					DEA1300-1800
					DEA2000
					DEA2500-3600
					DEA4900
					DEA100/175
					DEA300/400
					DEA500/600
					DEA800/1000



TECHNICAL INFORMATION

MODEL	PURGE SCFM	CONN	HEATER QTY PER CHAMBER	DESICCANT #'S CHAMBER SILICA GEL	DESICCANT #'S CHAMBER MOLE SIEVE	KW PER CHAMBER	APPROX WEIGHT	W	D	H	AVG KW/ DAY
100	2.2	1" NPT	3	43	9	2.5	950	3'	2'	9'	32
175	3.8	1" NPT	6	73	15	5.0	1150	3'	2'	9'	65
300	6.2	1.5" NPT	6	120	25	5.0	1350	3'	2'	10'	65
400	8.8	2" FLG	9	170	35	7.4	1625	3'	2'	10'	97
500	10.3	2" FLG	12	201	41	10.0	1950	4'	3'	10'	130
600	13.7	2" FLG	15	266	55	12.4	2275	4.5'	3'	10'	162
800	17.5	3" FLG	18	341	70	14.9	2425	4.5'	3'	10'	195
1000	21.8	3" FLG	21	424	88	17.3	2950	5'	4'	11'	227
1300	26.5	3" FLG	24	518	107	19.8	3650	5'	4'	11'	345
1500	31.6	3" FLG	30	614	127	24.75	4675	6'	4'	12'	476
1800	38.0	4" FLG	33	729	151	27.23	4675	6'	4'	12'	476
2000	43.6	4" FLG	39	847	175	32.18	5175	7'	5'	13'	563
2500	50.1	4" FLG	45	975	201	37.13	5725	7'	5'	13'	648
3600	90.0	4" FLG	51	1630	308	42.08	9300	9'	5'	13'	737
4900	112.0	6" FLG	54	2158	420	44.60	11900	11'	5'	13'	781