

KEMP
kemp-spa.com



► **HEATLESS DESICCANT AIR DRYERS**

KHE SERIES, KHL SERIES AND KHS SERIES



KHE SERIES, KHL SERIES AND KHS SERIES HEATLESS DESICCANT DRYERS

For decades, compressed air users have relied on Kemp to deliver technology that reduces the cost of operation and improves the reliability of air driven processes. The KHE Series, KHL Series and KHS Series are engineered to deliver ISO 8573.1 Air Quality with dew point performance guaranteed from 40 to 5,400 scfm.



THE KEMP GUARANTEE

Kemp guarantees that KHP Series dryers will produce the design dew point while operating continuously at maximum rated flow (100% duty cycle) at CAGI ADF 200 inlet standards of 100° F inlet temperature and 100% relative humidity at 100 psig.

CONSISTENT OUTLET PRESSURE DEW POINTS Industry-leading Desiccant Beds

- Industrial grade activated alumina desiccant beads offer enhanced surface area and high crush strength which prolongs bed life
- Large desiccant beds ensure 4.8 seconds of contact time...allows wet, saturated air at the dryer inlet to be dried to the required dew point
- Industrial grade desiccant ensures top performance over expected 3 to 5 years of desiccant bed life
- Large flow diffusers ensure even flow distribution through the bed and eliminate channeling
- Towers are sized so that air velocity through the bed won't fluidize the desiccant which prevents bed movement and desiccant dusting
- Up-flow drying allows water and heavy contaminants to drop out of the air stream as they enter a tower which protects the bed from contamination. This makes it simple to discharge the contaminants when the tower depressurizes.
- Cleanable stainless steel flow diffusers/support screens and separate fill and drain ports for ease of desiccant replacement

SAFETY BUILT TO CODE

- Pressure vessels are CRN and ASME Certified
- Heavy-duty mufflers for quiet operation-dryers are shipped with an extra set of mufflers
- NEMA 4 electrical construction is standard
- Pressure relief valves are standard



FOUR DEW POINT OPTIONS PER ISO 8573.1 AIR QUALITY STANDARDS

Specifying a pressure dew point is not simple work for an engineer. KHL and KHS Series dryer designs are optimized to match up to four pressure dew point classes of the ISO 8573.1 Air Quality Standard.

ISO 8573.1 Class	Dew Point	Remaining Moisture		KHS Series	KHL Series	KHE Series
		ppmw	mg/m ³			
1	-100°F -73°C	0.12	0.15	4 min. fixed	4 min. fixed	–
2	-40°F -40°C	10	12	Demand or 10 min. fixed	10 min. fixed	10 min. fixed
3	-4°F -20°C	81	97	Demand or 16 min. fixed	16 min. fixed	–
4	+38°F +3°C	610	730	Demand or 24 min. fixed	24 min. fixed	–

ACCUSHIFT™ SWITCHING VALVES – DURABILITY FOR DECADES

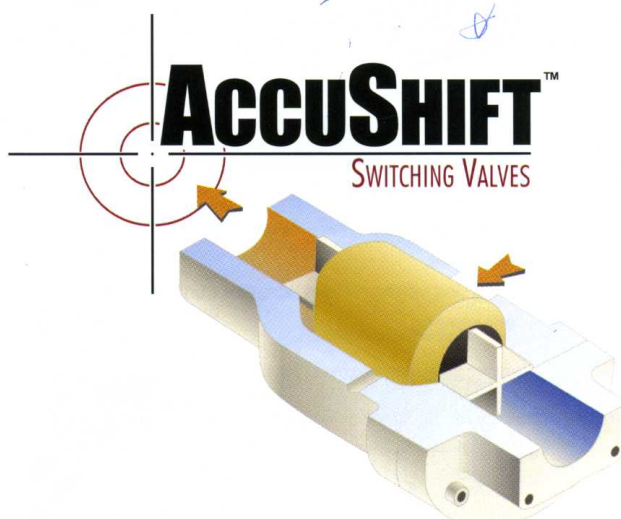
Flow direction components, such as switching valves and check valves, are typically the weakest link in any heatless desiccant dryer design. Valve diaphragms tear, check valves break and valve stems leak. Wet air and unplanned maintenance results when you can least afford the downtime, too. That is what led Kemp to create a better solution. Simplicity and durability define AccuShift™ Switching Valves.

AccuShift™ Switching Valve cores are precision molded out of virgin nylon for quiet, resilient operation. Durable cast valve bodies provide broad flow paths to reduce pressure drop and eliminate localized abrasion. Internally powered with 1 moving part, this robust design encases the valve core and replaces common switching valves and check valves. Long life AccuShift™ valves target the weakest link to improve your uptime.

ACCURATE AND DURABLE PROCESS VALVES




- AccuShift™ Inlet and Outlet Switching Valves automatically shift to the low pressure side of the circuit to control process flow
- AccuShift™ valve life tested to over 500,000 cycles
- AccuShift™ position memory ensures drying continues, even with the loss of electrical power to the dryer
- 5 year AccuShift™ valve replacement warranty*
- Purge/repressurization valves are normally closed, pneumatic piston actuated, Y-angle poppet valves or premium quality butterfly valves
- Three-way pilot operated solenoid valves manage the pilot air flow to direct the purge/repressurization valves
- Purge pressure adjustment valve

* Parts and labor covered through first year of warranty, parts only in second through fifth years.



THREE APPLICATION SPECIFIC DRYER DESIGNS

Empower yourself with 3 select designs to choose from. Each is engineered to balance economy and performance. Why three? Many applications operate with a large swing in air demands due to variations in production scheduling or shifts of operation. Some applications operate at a fraction of the flow of the compressor due to air system efficiency improvements. Some applications operate continuously at-or-near full capacity. The following table serves as a guide to help determine which design is best suited for your critical application.

Air Demand Profile	Flow Range	Kemp Solution
 Fluctuating Demands (1 to 3 shifts)	40 - 5,400	KHS Series
 Reduced Demands (1 to 3 shifts)	40 - 5,400	KHS Series or KHL Series
 Peak Demands (1 to 3 shifts)	40 - 5,400	KHS Series, KHL Series or KHE Series

STANDARD INSTRUMENTATION

- Left and right tower pressure gauges
- Purge pressure gauge
- Moisture indicator – alerts operator of elevated dew point
- Throttling valve provides accurate purge pressure adjustment

KHS SERIES

Automatic Energy Savings with EMS-Energy Management System

KHS Series with the EMS-Energy Management System automatically computes purge air requirements to deliver maximum energy savings in proportion to the demand on the system. The energy savings go right to your bottom line. The EMS Controller features vacuum fluorescent text display that communicates energy savings, operating mode and service reminders. Select from one of four ISO 8573.1 pressure dew point settings for seasonal efficiencies.

KHL SERIES

Load Selectable Savings

KHL Series provides load selectable energy savings with Purge Economizer. Tailor the drying cycles to match reduced peak air demands. This advanced controller offers 8 capacity settings, in 10 percent increments and 4 pressure dew point settings to further tune your savings and adapt to climatic changes in your environment.

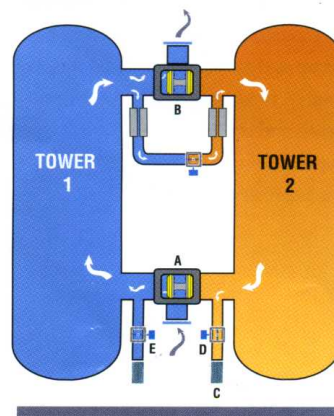
KHE SERIES

-40°F Dew Point Performance - Pure and Simple

KHE Series presents traditional heatless drying technology. A simple timer based controller delivers precise operation to deliver maximum value to applications that operate at-or-near full capacity. Automatic time controlled bed regeneration cycles offer consistent performance and economy of purchase.

HOW THEY WORK

Moist, filtered compressed air enters the pressurized on-line desiccant-filled drying Tower 1 through AccuShift™ valve (A). Up-flow drying enables the desiccant to strip the air stream of moisture. Clean, dry compressed air exits through AccuShift™ valve (B) to feed the air system. Tower 2 (when in regeneration mode) depressurizes to atmosphere through muffler (C) when valve (D) opens. A portion of dry compressed air (purge air) is diverted before exiting (B) and passes through off-line Tower 2 and exits at valve (D) to desorb the moisture from the desiccant. Once desorbed, valve (D) closes and Tower 2 is repressurized. At tower shift-over, valve (E) will open, causing AccuShift™ valves (A & B) to shift. Tower 2 will be placed on-line to dry the bed. Operations will switch and Tower 1 will be regenerated.





KHS SERIES – EMS DELIVERS ENERGY SAVINGS

Kemp's EMS-Energy Management System mirrors plant air demands to deliver calculated energy savings.

EMS-Energy Management System detects the rise in desiccant bed temperatures (heat of adsorption) that result during the drying phase. Temperature escalation and dry time provide an indirect measure of extracted water vapor. Advanced microprocessor based controls continuously re-calculate available drying time to manage how long a tower stays active. During the regeneration phase, the stored heat of adsorption is released to improve energy efficiency and prepare the inactive tower for the next cycle. After regeneration, the off-line tower is re-pressurized and purge air consumption ceases in anticipation of the next drying cycle.

ADVANTAGES:

1. The system is based on saving the heat of adsorption - towers switch before heat is lost...maximizing purge air efficiency and minimizing the amount of purge air required.
2. Temperature transducers (thermistors) are used as sensing devices - they are simpler, more reliable and more rugged than the humidity, pressure and flow transducers used by others.
3. Sensors used on the system require no calibration.

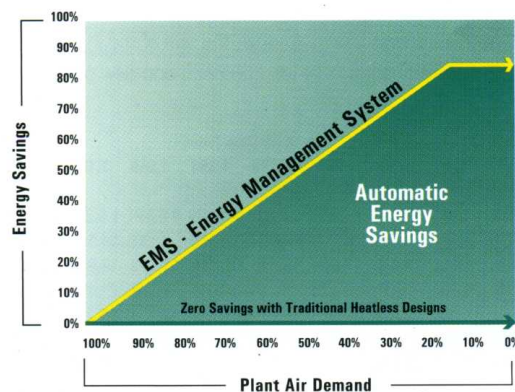
KHS SERIES CONTROLLER FEATURES:

- Choice of four operating modes
- EMS-Energy Management System Demand mode or fixed cycle mode
- Switches for On/Off, Alarm and Service reminder reset
- Operational LED lights for power-on, tower status, valve status, and tower pressure
- Service reminder LED lights for filters and drains, valves, and desiccant
- Alarm LED for tower switching failure, filter monitor signals, electronic demand drain alarms
- Vacuum fluorescent text display shows energy savings, operating mode and service reminders
- RS-232 communications port is standard

KHS SERIES AUTOMATIC ENERGY SAVINGS*

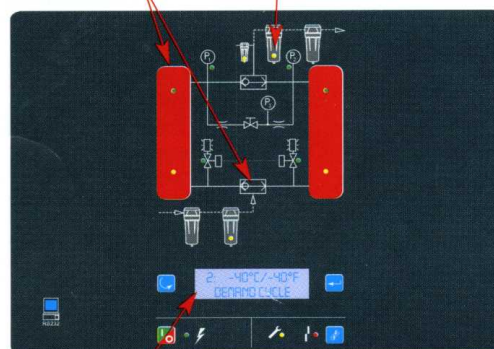
Load	Dryer Flow Rates						
	590	750	930	1,130	1,350	1,550	2,100
100%							
95%	\$ 741	\$ 941	\$ 1,167	\$ 1,418	\$ 1,694	\$ 1,945	\$ 2,636
90%	1,481	1,883	2,335	2,837	3,389	3,891	5,271
85%	2,222	2,824	3,502	4,255	5,083	5,836	7,907
80%	2,962	3,765	4,669	5,673	6,778	7,782	10,543
75%	3,703	4,707	5,836	7,091	8,472	9,727	13,179
70%	4,443	5,648	7,004	8,510	10,166	11,873	15,814
55%	6,665	8,472	10,505	12,764	15,250	17,509	23,722
40%	8,886	11,296	14,007	17,019	20,333	23,345	31,629
25%	11,108	14,120	17,509	21,274	25,416	29,181	39,536

* Based upon 100 psig, 0.10\$/kwh, cost of compressed air at 0.33166\$/1,000 scf, 8,760 hrs/yr.



Full complement of Function Indicator LEDs

Filter Service Indicator LEDs



Controller displays energy savings, cycle modes, dew point selection, service reminders and alarm conditions.

KHL SERIES – LOAD SELECTABLE ENERGY SAVINGS

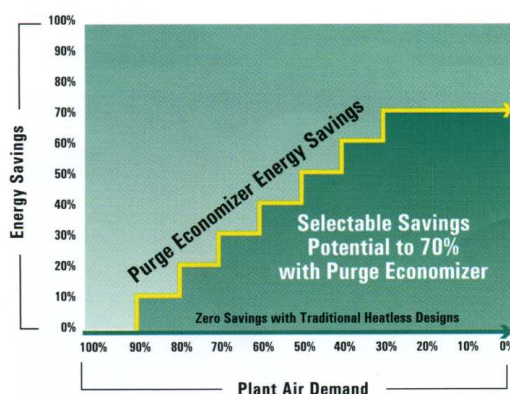
Eight energy saving selections, in 10% increments, deliver up to 70% in purge air energy savings to help facilities adapt to reduced plant air demands. Ideal for facilities that are candidates for energy saving air system audits, end users can reduce dryer purge requirements to match reduced plant air loads on the dryer. Each Purge Economizer energy saving setting has an LED that illuminates to confirm the percentage of purge air energy being saved.

ADVANTAGES:

1. Lower initial capital cost, with the ability to upgrade to full KHS capabilities in the future.
2. Manual energy saving through the use of the Purge Economizer selectable load demand and dew point.

Load	Dryer Flow Rates							
	590	750	930	1,130	1,350	1,550	2,100	3,000
100%								
90%	\$ 1,481	\$ 1,883	\$ 2,335	\$ 2,837	\$ 3,389	\$ 3,891	\$ 5,271	\$ 7,531
80%	2,962	3,765	4,669	5,673	6,778	7,782	10,543	15,061
70%	4,443	5,648	7,004	8,510	10,166	11,673	15,814	22,592
60%	5,924	7,531	9,338	11,346	13,555	15,563	21,086	30,123
50%	7,405	9,413	11,673	14,183	16,944	19,454	26,357	37,653
40%	8,886	11,296	14,007	17,019	20,333	23,345	31,629	45,184
30%	10,367	13,179	16,342	19,856	23,722	27,236	36,900	52,715

* Based upon 100 psig, 0.10\$/kwh, cost of compressed air at 0.33166\$/1,000 scf, 8,760 hrs/yr.



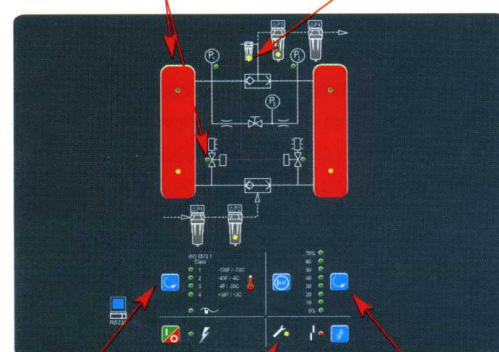
Purge Economizer lets you align your purge costs with your air demands to optimize your return-on-investment. Tailor KHL Series dryers to take full advantage of air system efficiency improvements driven by air audit strategies.

KHL CONTROLLER FEATURES:

- Choice of four fixed cycle operating modes corresponding to ISO 8573.1 Air Quality Classes (see page 3 for ISO dew point classes and cycle times)
- Choice of eight Purge Economizer Energy Savings settings with an energy saving selector switch
- Switches for ISO Class dew point, On/Off, Alarm and Service reminder reset
- Operational LED lights for power-on, tower status, valve status, and tower pressure
- Service reminder LED lights for filters and drains, valves, and desiccant. The user selects between a Normal and a Severe service interval
- Alarm LED for valve switching failure
- RS-232 communications port is standard

Full complement of Function Indicator LEDs

Filter Service Indicator LEDs



Dew Point Selector ISO 8573.1 Class 1, 2, 3 & 4

Maintenance/ Service Reminder LED

Purge Economizer Energy Savings

Advanced energy saving capabilities and iconic circuit communications make the KHL Series the better alternative.



► KHE SERIES -40 °F DEW POINT, PURE AND SIMPLE

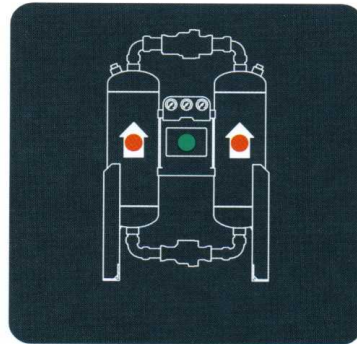
Engineered to address the need for raw performance and value. Traditional design uses a simple timer to alternate flow between the two towers filled with industrial grade desiccant. While the on-line tower is drying the air stream, the off-line tower purges a fixed amount of compressed air to dry the bed and prepare it for the next work cycle.

ADVANTAGES:

1. Lowest initial capital cost, with the ability to upgrade to KHL or full KHS capabilities in the future.
2. Simple, uncomplicated controls allow for "Set it and forget it" operation.

KHE CONTROLLER FEATURES:

- Control Panel overlay with LED's indicating:
 - Power On
 - Left Tower Drying
 - Right Tower Drying



Designed for durability in uncompromising applications, simple visual tower drying indicators make the KHE Series the right choice for those who want reliability without sacrificing pure performance.

► KHS, KHL, KHE SERIES ENGINEERED-TO-ORDER SYSTEMS

If your application needs fall outside of our three preconfigured models, Kemp can custom engineer a system to meet your specific application.

TYPICAL MODIFICATIONS INCLUDE:

1. NEMA-7 electrical enclosure for more demanding environmental requirements
2. Pneumatic control package where power or environment dictate the need
3. Dew point monitor with digital display and 4-20mA output
4. System and/or filter bypass options
5. Special epoxy paint systems
6. Stainless steel filter packages
7. No loss filter drains
8. Higher operating pressures

KHS, KHL, KHE SERIES FEATURES AND SPECIFICATIONS

PRODUCT FEATURES

Model	Pressure Dew Point		Energy Savings Mode		Power Recovery	Dry Contacts				
Dryer Series	ISO Class 2 -40°F (-40°C)	User Selectable at Control Pane	Automatic EMS Energy Savings	Manual	Automatic	Remote Indication of Alarm	Power On	Tower Status (drying switchover, etc)	Alarm Indicator	Fluorescent Text display
KHE	✓	—	—	—	✓	—	✓	✓	—	—
KHL	✓	✓	—	✓	✓	✓	✓	✓	✓	—
KHS	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

✓ - included

PRODUCT SPECIFICATIONS

Model	Inlet Flow ¹ @ 100 psig (7 bar)	Dimensions			Inlet / Outlet Connections ³	Weight lbs.
	scfm	H	W	D		
KHS/KHL/KHE		Inches				
40	40	46	32	32	¾" NPT	365
60	60	61	32	32	¾" NPT	445
90	90	78	32	32	1" NPT	575
115	115	54	44	38	1" NPT	685
165	165	54	44	38	1½" NPT	685
260	260	72	48	38	1½" NPT	1,010
370	370	63	55	38	2" NPT	1,215
450	450	71	55	38	2½" NPT	1,350
590	590	101	52	48	2½" NPT	1,473
750	750	104	54	48	2½" NPT	2,134
930	930	109	59	56	3" NPT	2,414
1130	1,130	112	63	56	3" NPT	2,875
1350	1,350	117	65	56	3" ANSI FLG	3,722
1550	1,550	115	71	56	4" ANSI FLG	4,167
2100	2,100	116	79	56	4" ANSI FLG	4,417
3000	3,000	122	78	65	6" ANSI FLG	9,010
4100 ²	4,100	122	93	85	6" ANSI FLG	9,900
5400 ²	5,400	122	102	86	6" ANSI FLG	12,000

¹ Performance data per CAGI Standard ADF 200 for Dual-Stage Regenerative Desiccant Compressed Air Dryer. Rating conditions are 100°F (37.8°C) inlet temperature, 100 psig (6.9 bar) inlet pressure, 100% relative humidity, 100°F (37.8°C) ambient temperature, and 5 psi (0.35 bar) pressure drop.

² Supplied with Premium Quality Butterfly Switching Valves

³ BSP and DIN flanges available

* Consult factory for larger models.

INLET FLOW

Inlet flow capacities shown in the Engineering Data table have been established at an inlet pressure of 100 psig (7 kgf/cm²) and a saturated inlet temperature of 100°F (38°C). To determine maximum inlet flow at other conditions, multiply the inlet flow from the Engineering Data table by the multipliers from the Inlet Pressure and Inlet Temperature correction factors that correspond to your operating conditions.

DEW POINT

Outlet pressure dew point at rated inlet conditions of 100 psig (7 kgf/cm²) and 100°F (38°C) saturated. Dew point varies slightly at other conditions. Consult the factory to determine exact outlet pressure dew point at your operating conditions.

REGENERATION FLOW RATE

The amount of air used during the regeneration phase consists of the amount used while the purge/repressurization valve is open (purge air) plus the volume of air used to repressurize the tower after the purge/repressurization valve closes. Typically the rate shown is averaged over the cycle time. At 100 psig (7 bar), average air use is 14.4% of the inlet flow capacity (13.7% for purge +0.7% for repressurization) for dryers operating on a 10 minute cycle; 15.5% (13.7% for purge +1.8% for repressurization) for dryers operating on a 4 minute cycle. Instantaneous flow rate (air flowing while the purge/repressurization valve is open) varies with cycle selection, Energy Savings setting and inlet pressure.

INLET TEMPERATURE CORRECTION FACTORS

Inlet Temp.	°F	105	110	115	120	125	130	135	140
Temp.	°C	41	43	46	49	52	54	57	60
Multiplier		0.98	0.96	0.93	0.89	0.85	0.81	0.76	0.7

INLET PRESSURE CORRECTION FACTORS

Inlet Pressure	psig	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250
Pressure	kgf/cm ²	4.2	4.9	5.6	6.3	7	7.7	8.4	9.1	9.8	10.5	11.2	12	12.7	13.4	14.1	14.8	15.5	16.2	16.9	17.6
Multiplier		0.65	0.74	0.83	0.91	1	1.04	1.08	1.12	1.16	1.2	1.23	1.27	1.3	1.34	1.37	1.4	1.43	1.46	1.49	1.52

SPX KEMP

SPX Dehydration & Process Filtration

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