

KEMP
kemp-afx.com



► **EXTERNALLY HEATED DESICCANT
COMPRESSED AIR DRYERS**

KHP SERIES

KHP SERIES DRYERS REDUCE PURGE AIR ENERGY COSTS

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 KHP Series is engineered to deliver ISO 8573.1 Air Quality and reduce purge air consumption. In combination with our advanced Ambient Air Amplification (A³) Purge Technology™, we offer externally heated purge desiccant dryers with dew point performance guaranteed from 300 to 3,200 scfm.



KHP SERIES DRYERS: -4 °F to -40 °F PRESSURE DEW POINTS

Designed for applications that were previously forced to accept a -40 °F pressure dew point when simple protection against seasonal freezing is the issue. The standard design delivers ISO 8573.1 dew points between Class 2 and Class 3 automatically. Class 2 (-40 °F) dew points protect against freezing during low ambient conditions and Class 3 (-4 °F) dew points keep your air system bone dry during the heat of summer. Applications that require Class 2 (-40 °F) dew points year round simply need to select the Jet Blower option package.

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.

ISO 8573.1 AIR QUALITY STANDARDS

| Class | Solid Particles, (d mm) | | | Pressure Dew Point | | Oil, Aerosol, Liquid Vapor | |
|-------|-------------------------|---------------|---------------|-------------------------------|-----|----------------------------|---------|
| | 0.10 < d ≤ 0.5 | 0.5 < d ≤ 1.0 | 1.0 < d ≤ 5.0 | °C | °F | mg/m ³ | ppm w/w |
| 0 | As Specified | | | As Specified | | As Specified | |
| 1 | 100 | 1 | 0 | ≤ -70 | -94 | ≤ 0.01 | 0.008 |
| 2 | 100,000 | 1,000 | 10 | ≤ -40 | -40 | ≤ 0.1 | 0.08 |
| 3 | - | 10,000 | 500 | ≤ -20 | -4 | ≤ 1 | 0.8 |
| 4 | - | - | 1,000 | ≤ +3 | 38 | ≤ 5 | 4 |
| 5 | - | - | 20,000 | ≤ +7 | 45 | > 5 | > 4 |
| 6 | | | | ≤ +10 | 50 | | |
| | | | | Liquid Water g/m ³ | | | |
| 7 | | | | Cw ≤ 0.5 | | | |
| 8 | | | | 0.5 < C ≤ 0.5 | | | |
| 9 | | | | 5 < Cw ≤ 10 | | | |

Per ISO 8573-1: 2001(E)

▶ **ADVANCED TECHNOLOGY**



Soft-seated check valves for tight shutoff and durability

Towers filled with extra, high-grade activated alumina to deliver superior performance

High-quality pressure gauges display left tower, right tower and purge pressure

Low-watt density heater saves energy and prevents premature desiccant aging

Function indicator LEDs for easy monitoring

Heavy-duty air intake filter

Easy-view vacuum fluorescent text display is visible under any condition

Energy Management System advanced microprocessor-based control

Optional EMS controlled Jet Blower uses A³ Purge Technology™ to reduce purge costs

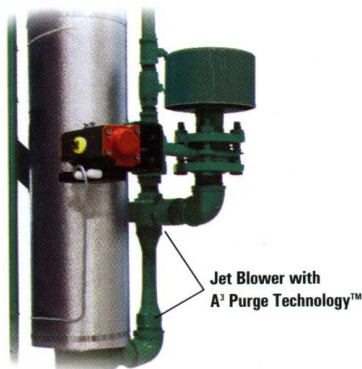
Premium quality inlet switching/purge exhaust butterfly valves for long life on 3" and larger (Quality pneumatic angle-seated valves for smaller sizes)

NEMA 4 construction



OPTIONAL JET BLOWER ENERGY MANAGEMENT SYSTEM

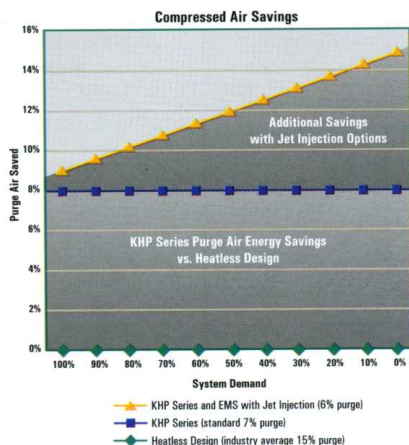
The EMS uses rugged temperature- & humidity-sensing technology that does not require calibration. Constant desiccant bed monitoring ensures stable dew point control. Algorithm-based A³ Purge Technology™ controls precisely engage the Jet Blower when needed to manage the bed regeneration cycles and boost the airflow through the tower. Compressed purge air volume is reduced, further optimizing energy conservation.



MAXIMUM SAVINGS AND -40 ° F PRESSURE DEW POINT

Select a Jet Blower (option A or B) option package to realize fast returns-on investment. The A³ Purge Technology™ is controlled by the engagement cycles of the Jet Blower. Energy consumption to regenerate the desiccant bed mirrors your plant air demands. This process is governed by algorithmic logic embedded into the EMS Controller. Consistent -40 ° F pressure dew points are delivered while saving at least 9% on compressed purge air costs.

In many applications, the Jet Blower's compressed purge air requirements (6% or less) afford the selection of a smaller air compressor. System efficiencies become linear to the energy-saving potential of the dryer. Once the off-line desiccant bed has been regenerated, zero compressed purge air is required. This represents compressed air savings of up to 15% as compared to typical heatless designs.



ANNUAL SAVINGS VS. HEATLESS DESIGN (1050 scfm System Profile Comparison)

| Air Capacity | | Air Demand | | Time (per year) | | KHP Series Savings | | |
|----------------|------------|------------|--------------|-----------------|------------------------|---------------------|--|--|
| Percent | (scfm) | Percent | Hours | Standard Design | Includes Option A or B | Savings with A or B | | |
| 100 | 1050 | 40 | 3,504 | \$4,391 | \$4,940 | \$549 | | |
| 90 | 945 | 5 | 438 | \$549 | \$659 | \$110 | | |
| 75 | 788 | 15 | 1,314 | \$1,647 | \$2,162 | \$515 | | |
| 50 | 525 | 15 | 1,314 | \$1,647 | \$2,470 | \$823 | | |
| 35 | 368 | 20 | 1,752 | \$2,196 | \$3,541 | \$1,345 | | |
| 20 | 210 | 5 | 438 | \$549 | \$947 | \$398 | | |
| Average | 555 | 100 | 8,760 | \$10,979 | \$14,719 | \$3,740 | | |

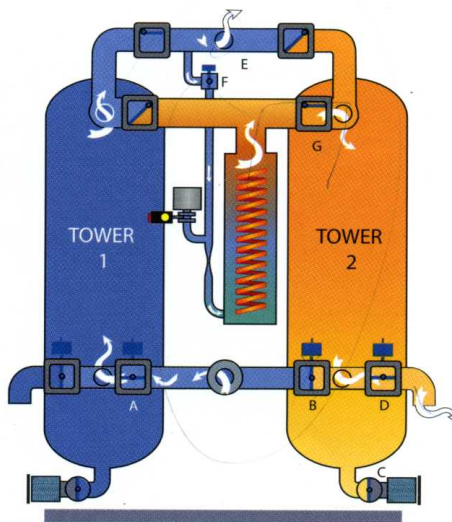
Annual Savings (optional EMS with Jet Blower vs. standard KHP)\$3,740
 EMS option A- payback within 8.2 months



HOW IT WORKS

STANDARD DESIGN:

Moist, filtered compressed air enters the pressurized on-line desiccant-filled drying Tower 1 through valve (A). Up-flow drying enables the desiccant to strip the air stream of moisture. Clean, dry compressed air exits through valve (E) to feed the air system. Tower 2 (when in regeneration mode) closes valve (B), then depressurizes to atmosphere through muffler (C). Valves (D & G) open and the heater turns on. A portion of dry compressed air (purge air) is diverted before exiting (E) and passes through the heater. Hot, dry purge air desorbs the moisture from the desiccant as it flows down through Tower 2 to exit at valve (D). Once desorbed, the heater turns off and cool, dry purge air continues to pass until the desiccant bed is cooled. Finally, valve (D) closes and Tower 2 is repressurized. At a fixed time interval, valve (B) will open and Tower 2 will be placed on-line to dry the bed and valves (A & D) will close. Operations will switch and Tower 1 will be regenerated.



Shown with optional Jet Blower

JET BLOWER OPTION PACKAGE

Whereas the standard design operates on a fixed time interval basis, Jet Blower versions manage the drying and regeneration cycles with precision for systems with variable air demands. The on-line Tower will continue to dry the air stream until the "moisture front" is detected. Only then will the switchover sequence begin. In regeneration mode, the Jet Blower is engaged and a portion of dry purge air exits valve (F) to be injected into the V-axis of the Jet Blower. A³ Purge Technology™ draws ambient air into the X-axis to desorb the desiccant at better than 1:1 amplification. Sensors detect the retreat of the moisture front, disengages the Jet Blower, eliminates the purge air usage and initiates the repressurization cycle. The dry, pressurized off-line Tower will remain ready and isolated until sensors detect that the on-line drying Tower is saturated. Then, the switchover will occur and the process will repeat.

PURGE AIR OPERATING COST COMPARISON

Annual Cost of Compressed Purge Air
(constant operation at average air demand)

| Average Air Demand | Regeneration Cost by Technology ¹ | | |
|--------------------|--|----------------------------|--|
| | Heatless Design (Std. 15% Purge) | KHP Series (Std. 7% Purge) | KHP Series (w/ Optional Jet Blower 6% purge) |
| Percent | scfm | | |
| 100% | 1050 | \$20,585 | \$8,234 |
| 90% | 945 | \$20,585 | \$7,411 |
| 75% | 788 | \$20,585 | \$6,176 |
| 50% | 525 | \$20,585 | \$4,117 |
| 35% | 368 | \$20,585 | \$2,882 |
| 20% | 210 | \$20,585 | \$8,234 |

¹ Assumes 8760 hours, 10 cents per kWh, 5 scfm per HP

DEW POINT PERFORMANCE TABLE

| Controller | Pressure Dew Point | | EMS Energy Savings Automatic |
|-------------------|--------------------|------|------------------------------|
| | -40°F | -4°F | |
| Standard | S | G | |
| Jet Blower Option | G | | ✓ |

S - seasonal G - guaranteed ✓ - included

KHP SERIES FEATURES AND SPECIFICATIONS

KHP SERIES PRODUCT FEATURES

| Controller | Pressure Dew Point | | Jet Blower | EMS Control | Vacuum Fluorescent Text | | Languages | Power Recovery | Dry Contacts | Overlay with Circuit Graphics and LED Indicators - Alarm LEDs with Text Display | | | | | | |
|------------|--------------------|-------------|-------------|----------------|--------------------------|------------------------------|---|------------------------|--------------|---|----------|-----------|--|--|--|------------------|
| | per ISO 8573.1 | ISO Class 3 | ISO Class 2 | Venturi Blower | Automatic Energy Savings | Digital Dew Point Monitoring | 2 Line, 16 Characters (high-visibility in darkness or sunlight) | English Spanish French | Automatic | Remote Indication of Alarm | Power On | Heater On | Tower Status (drying, switchover heat, cool, etc.) | Tower Swivch, Switchover temp/high heater temp.) | Sensor Over-range & Under-range, temp humidity, dew point) | Service Reminder |
| Model | per ISO 8573.1 | ISO Class 3 | ISO Class 2 | Venturi Blower | Automatic Energy Savings | Digital Dew Point Monitoring | 2 Line, 16 Characters (high-visibility in darkness or sunlight) | English Spanish French | Automatic | Remote Indication of Alarm | Power On | Heater On | Tower Status (drying, switchover heat, cool, etc.) | Tower Swivch, Switchover temp/high heater temp.) | Sensor Over-range & Under-range, temp humidity, dew point) | Service Reminder |
| Standard | G | S | - | - | - | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Option A | - | G | ✓ | ✓ | - | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Option B | - | G | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

S - seasonal G - Guaranteed ✓ - included

KHP SERIES PRODUCT SPECIFICATIONS

| Model | Inlet Flow ¹ | | Heater | Average | Dimensions | | | Approximate | Inlet/Outlet Connections |
|---------|-------------------------|-------|--------------|---------|------------|--------|------|-------------|--------------------------|
| | @ 100 psig | 100°F | Rated Output | | H | W | D | Weight | |
| | scfm | 100°F | kW | kW | inches | inches | lbs. | inches | |
| 300KHP | 300 | 300 | 4.5 | 2.00 | 98 | 48 | 59 | 1400 | 1½" NPT |
| 400KHP | 400 | 400 | 6.0 | 2.67 | 105 | 53 | 67 | 1800 | 1½" NPT |
| 500KHP | 500 | 500 | 6.0 | 3.34 | 105 | 53 | 70 | 1800 | 2" NPT |
| 600KHP | 600 | 600 | 8.0 | 4.01 | 108 | 55 | 71 | 2000 | 2" NPT |
| 750KHP | 750 | 750 | 10.0 | 5.01 | 114 | 60 | 87 | 2400 | 3" FLG |
| 900KHP | 900 | 900 | 12.0 | 6.01 | 114 | 60 | 87 | 2400 | 3" FLG |
| 1050KHP | 1050 | 1050 | 14.0 | 7.01 | 113 | 64 | 84 | 2900 | 3" FLG |
| 1300KHP | 1300 | 1300 | 16.0 | 8.68 | 118 | 66 | 85 | 3400 | 3" FLG |
| 1500KHP | 1500 | 1500 | 19.0 | 10.0 | 116 | 88 | 97 | 5100 | 3" FLG |
| 1800KHP | 1800 | 1800 | 23.0 | 12.0 | 116 | 88 | 97 | 5100 | 3" FLG |
| 2200KHP | 2200 | 2200 | 27.5 | 14.7 | 124 | 85 | 110 | 7800 | 4" FLG |
| 2600KHP | 2600 | 2600 | 32.0 | 17.4 | 124 | 85 | 110 | 7800 | 4" FLG |
| 3200KHP | 3200 | 3200 | 39.0 | 21.4 | 121 | 97 | 126 | 9000 | 6" FLG |

INLET FLOW - Inlet Flow capacities shown in the Specifications Table have been established at an inlet pressure of 100 psig (7kgf/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 Specifications Table by the multiplier from Table 1 that corresponds to your operating conditions.

DEW POINT - Outlet pressure dew point at rated inlet conditions of 100 psig (7kgf/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.

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. Consult factory for larger models.

TABLE 1

| Pressure psig (fgf/cm ²) | Inlet Temperature °F (°C) | | | | | | |
|--|---------------------------|--------------|--------------|--------------|---------------|---------------|---------------|
| | 60 (15.6) | 70 (21.1) | 80 (26.7) | 90 (32.2) | 100 (37.8) | 110 (43.3) | 120 (48.9) |
| 60 (4.2) | 1.03 | 1.01 | 0.99 | 0.80 | 0.58 | 0.43 | 0.32 |
| 70 (4.9) | 1.10 | 1.08 | 1.07 | 0.94 | 0.68 | 0.50 | 0.37 |
| 80 (5.6) | 1.17 | 1.15 | 1.14 | 1.08 | 0.79 | 0.58 | 0.43 |
| 90 (6.3) | 1.24 | 1.22 | 1.20 | 1.18 | 0.89 | 0.66 | 0.49 |
| 100 (7.0) | 1.30 | 1.28 | 1.26 | 1.24 | 1.00 | 0.74 | 0.55 |
| 110 (7.7) | 1.36 | 1.34 | 1.32 | 1.30 | 1.11 | 0.82 | 0.61 |
| 120 (8.4) | 1.42 | 1.40 | 1.38 | 1.36 | 1.22 | 0.90 | 0.67 |
| 130 (9.1) | 1.48 | 1.46 | 1.44 | 1.42 | 1.33 | 0.99 | 0.74 |
| 140 (9.8) | 1.53 | 1.51 | 1.49 | 1.47 | 1.44 | 1.07 | 0.80 |
| 150 (10.6) | 1.58 | 1.56 | 1.54 | 1.52 | 1.50 | 1.16 | 0.87 |

OPERATING CONDITIONS

| KHP Models | Max. working pressure | Min. operating pressure | Max. inlet air temp. | Min. inlet air temp. | Max. ambient temp. | Min. ambient temp. |
|------------|-----------------------|-------------------------|----------------------|----------------------|--------------------|--------------------|
| | 150 psig | 60 psig | 120°F | 40°F | 120°F | 40°F |



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