Regenerative Desiccant Dryers

KAD, KED, KBD, and Hybritec Series

kaeser.com
Desiccant Air Dryers

The right dryer for you
Most compressed air applications can achieve the required air quality by using a refrigerated dryer in combination with proper filtration. However, in cases where compressed air is exposed to freezing temperatures or where the product, process, or equipment is highly sensitive to moisture, Kaeser offers a complete line of desiccant dryers specifically designed to meet low dew points and deliver energy savings.

Innovation you can trust
With a cutting edge research and development team committed to building industry-leading products, Kaeser continues to deliver better solutions to meet our customers’ compressed air needs. Kaeser’s expertise and world-wide reputation for superior reliability and efficiency offer great performance and peace of mind.

Quality in every detail
Desiccant dryer performance and reliability are driven by component quality. Kaeser’s valves and actuators are designed for consistent dew point performance and low pressure drop. Additionally, desiccant bed symmetry is selected to ensure uniform flow distribution and maximize contact time, while the spherical activated alumina desiccant allows for long service life and minimizes dusting. It also has a high surface-to-volume ratio and great affinity for water vapor for superior adsorption.

Savings with proper application
Proper planning with the help of Kaeser’s system design engineers can save you money on capital and energy costs. Desiccant dryers have a higher purchase price and overall operating costs than refrigerated dryers and should be applied to the portions of a system requiring dew points below that of a refrigerated dryer. Kaeser can design a system that will efficiently deliver air quality suitable for your application.

Desiccant dryer basic operation
Kaeser desiccant dryers use the principles of adsorption and desorption and alternately cycle the compressed air through twin desiccant towers. As the vapor-laden air flows through one tower, the moisture is adsorbed onto the desiccant. Meanwhile, in the other tower, “purge air” flows through, evaporates the water on the desiccant, and carries it out of the tower as vapor.

The Benefits of Counterflow Regeneration
Kaeser’s upflow drying and downflow regeneration extends desiccant service life and ensures consistent outlet dew points.

Upflow drying also controls the accumulation of liquid water in the desiccant beds. Regardless of design, liquid water will accumulate in the piping between the prefilters and the dryer inlet. Eventually, the air stream will carry a “slug” of water into the desiccant bed.

Counterflow design ensures that the driest portion of the desiccant bed is nearest the dryer outlet at switchover, and allows purge air to be evenly distributed throughout the desiccant bed, providing more effective regeneration.
Heatless Desiccant Dryer (KAD)

KADs produce pressure dew points as low as -100°F at rated conditions (see Dew Point Options on page 5).

Sizes: 40 – 5400 scfm

**Controls and instrumentation**
- Tower pressure gauges
- Tower status lights
- Switching failure alarm*
- Purge flow indicator
- NEMA 4 electrical enclosure
- RS232 comm port*

*Not available on KAD E

**Inlet and outlet shuttle valves**
- Nylon shuttle
- Tested to over 500,000 cycles
- Corrosion resistant aluminum housing
- Single moving part has very long life
- No maintenance
- No check valves

**Standard moisture indicator**
- Color change indicates elevated outlet dew point

**Standard stainless steel support screens and air diffusers**
- Located internally at top and bottom of each vessel
- Easy to remove and clean
- Efficiently filters out large contaminants and protects outlet shuttle valve
- Effectively prevents channeling

**ASME stamped pressure vessels**
- Fabricated per Section VIII of the boiler and pressure vessel code
- ASME pressure relief valve

**Separate top fill and bottom drain ports**
- Easy desiccant replacement and removal

**Structural steel frame complete with floor stand for easy installation**
- Lifting lugs for easy handling
- Optional factory mounting of pre- and after-filters
Heatless Desiccant Dryer (KAD) (Table 1)

<table>
<thead>
<tr>
<th>All Models (E and PS)</th>
<th>Inlet Flow @ 100 psig (scfm)</th>
<th>Purge Rate @ 100 psig (scfm)</th>
<th>Outlet Air Flow Rate (scfm)</th>
<th>Power Supply</th>
<th>Dimensions* W x D x H (inches)</th>
<th>Inlet and Outlet Connection*</th>
<th>Weight (lb.)</th>
<th>Filter Package Capacity (scfm)</th>
<th>Total Replacement Desiccant (lb.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>KAD 40</td>
<td>60</td>
<td>8.6</td>
<td>10.5</td>
<td>51.4</td>
<td>49.5</td>
<td>1 NPT</td>
<td>365</td>
<td>60</td>
<td>52</td>
</tr>
<tr>
<td>KAD 60</td>
<td>60</td>
<td>8.6</td>
<td>10.5</td>
<td>51.4</td>
<td>49.5</td>
<td>1 NPT</td>
<td>445</td>
<td>60</td>
<td>80</td>
</tr>
<tr>
<td>KAD 90</td>
<td>90</td>
<td>13</td>
<td>15.8</td>
<td>77.0</td>
<td>74.2</td>
<td>2 NPT</td>
<td>575</td>
<td>100</td>
<td>110</td>
</tr>
<tr>
<td>KAD 115</td>
<td>115</td>
<td>16.6</td>
<td>20.1</td>
<td>98.4</td>
<td>94.9</td>
<td>3 FLG</td>
<td>680</td>
<td>170</td>
<td>210</td>
</tr>
<tr>
<td>KAD 165</td>
<td>165</td>
<td>23.8</td>
<td>28.9</td>
<td>141</td>
<td>136</td>
<td>4 FLG</td>
<td>685</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KAD 260</td>
<td>260</td>
<td>37.4</td>
<td>45.5</td>
<td>223</td>
<td>215</td>
<td>5 FLG</td>
<td>1010</td>
<td>375</td>
<td>318</td>
</tr>
<tr>
<td>KAD 370</td>
<td>370</td>
<td>53.3</td>
<td>64.8</td>
<td>317</td>
<td>305</td>
<td>6 FLG</td>
<td>1215</td>
<td>375</td>
<td>458</td>
</tr>
<tr>
<td>KAD 450</td>
<td>450</td>
<td>64.8</td>
<td>78.8</td>
<td>385</td>
<td>371</td>
<td>7 FLG</td>
<td>1350</td>
<td>485</td>
<td>542</td>
</tr>
<tr>
<td>KAD 590</td>
<td>590</td>
<td>85</td>
<td>103</td>
<td>505</td>
<td>487</td>
<td>8 FLG</td>
<td>1473</td>
<td>625</td>
<td>708</td>
</tr>
<tr>
<td>KAD 750</td>
<td>750</td>
<td>108</td>
<td>131</td>
<td>642</td>
<td>619</td>
<td>9 FLG</td>
<td>2134</td>
<td>780</td>
<td>906</td>
</tr>
<tr>
<td>KAD 930</td>
<td>930</td>
<td>134</td>
<td>163</td>
<td>796</td>
<td>767</td>
<td>10 FLG</td>
<td>2414</td>
<td>1000</td>
<td>1180</td>
</tr>
<tr>
<td>KAD 1130</td>
<td>1130</td>
<td>163</td>
<td>198</td>
<td>967</td>
<td>932</td>
<td>11 FLG</td>
<td>2875</td>
<td>1250</td>
<td>1420</td>
</tr>
<tr>
<td>KAD 1350</td>
<td>1350</td>
<td>194</td>
<td>236</td>
<td>1156</td>
<td>1114</td>
<td>12 FLG</td>
<td>3722</td>
<td>1875</td>
<td>1846</td>
</tr>
<tr>
<td>KAD 1550</td>
<td>1550</td>
<td>223</td>
<td>271</td>
<td>1327</td>
<td>1279</td>
<td>13 FLG</td>
<td>4167</td>
<td>1875</td>
<td>2064</td>
</tr>
<tr>
<td>KAD 2100</td>
<td>2100</td>
<td>302</td>
<td>368</td>
<td>1798</td>
<td>1732</td>
<td>14 FLG</td>
<td>4417</td>
<td>2500</td>
<td>2520</td>
</tr>
<tr>
<td>KAD 3000</td>
<td>3000</td>
<td>432</td>
<td>525</td>
<td>2568</td>
<td>2475</td>
<td>15 FLG</td>
<td>9010</td>
<td>3125</td>
<td>3734</td>
</tr>
<tr>
<td>KAD 4100</td>
<td>4100</td>
<td>590</td>
<td>718</td>
<td>3510</td>
<td>3383</td>
<td>16 FLG</td>
<td>9900</td>
<td>5000</td>
<td>5398</td>
</tr>
<tr>
<td>KAD 5400</td>
<td>5400</td>
<td>778</td>
<td>945</td>
<td>4622</td>
<td>4455</td>
<td>17 FLG</td>
<td>12,000</td>
<td>6875</td>
<td>7200</td>
</tr>
</tbody>
</table>

Note 1: KAD dryer inlet flow capacities are established in accordance with CAGI (Compressed Air and Gas Institute) Standard ADF-200: Inlet air pressure 100 psig, inlet air temperature 100°F, saturated.

Note 2: The purge flow rate of any pressure swing (heatless) desiccant dryer is not constant throughout the purge cycle. The purge cycle consists of a maximum purge flow period when the purge valve is open and a reduced flow period during repressurization. The total air consumption during the purge cycle is the average purge flow and is based on a 10 minute cycle time (-40°F PDP).

Note 3: Maximum working pressure: 150 psig standard; 250 psig optional. Maximum working pressure to 500 psig available for most models. Consult factory.

*Dryer only. May vary with filter package.

Flow Capacities

Maximum inlet flow capacities at various pressures:
To determine a dryer’s inlet flow capacity at inlet pressures other than 100 psig, multiply the dryer’s rated inlet flow (found in Table 1) by the multiplier from Table 2 that corresponds to the system pressure at the dryer inlet.

Outlet flow capacities:
For dryers operating at less than maximum flow and using the Purge Economist feature and/or operating at pressures other than 100 psig, contact factory for correct purge flow.

Specifications are subject to change without notice.

KAD Inlet Pressure Correction Factor (Table 2)

<table>
<thead>
<tr>
<th>Inlet Pressure (psig)</th>
<th>Multiplier</th>
<th>Inlet Pressure (psig)</th>
<th>Multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>60*</td>
<td>0.65</td>
<td>125</td>
<td>1.10</td>
</tr>
<tr>
<td>70</td>
<td>0.74</td>
<td>130</td>
<td>1.12</td>
</tr>
<tr>
<td>80</td>
<td>0.83</td>
<td>140</td>
<td>1.16</td>
</tr>
<tr>
<td>90</td>
<td>0.91</td>
<td>150</td>
<td>1.20</td>
</tr>
<tr>
<td>100</td>
<td>1.00</td>
<td>175</td>
<td>1.29</td>
</tr>
<tr>
<td>110</td>
<td>1.04</td>
<td>200</td>
<td>1.37</td>
</tr>
<tr>
<td>115</td>
<td>1.06</td>
<td>225</td>
<td>1.45</td>
</tr>
<tr>
<td>120</td>
<td>1.08</td>
<td>250</td>
<td>1.52</td>
</tr>
</tbody>
</table>

*For operation at pressures lower than 60 psig, please contact factory.

KAD Dew Point Options Meet ISO 8573.1 Air Quality Standards (Table 3)

<table>
<thead>
<tr>
<th>ISO 8573.1 Class</th>
<th>Dew Point</th>
<th>Cycle Time and Mode with Optional Purge Saver**</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-100°F (-73°C) *</td>
<td>4 min. fixed</td>
</tr>
<tr>
<td>2</td>
<td>-40°F (-40°C)</td>
<td>10 min. fixed</td>
</tr>
<tr>
<td>3</td>
<td>-4°F (-20°C)</td>
<td>16 min. fixed</td>
</tr>
<tr>
<td>4</td>
<td>+38°F (+3°C)</td>
<td>24 min. fixed</td>
</tr>
</tbody>
</table>

* This performance exceeds Quality Class 1 set at -94°F (-70°C)
** The Purge Saver controller also offers fixed cycle settings
Heated Desiccant Dryers (KED & KBD)

Kaeser Heated Purge Dryers (KED) are heated regenerative dryers that use only 7% of compressed air for purging. They heat the dry purge air to increase its capacity to hold moisture and to regenerate. KED’s provide lower operating costs by reducing the amount of expensive purge air used to regenerate. Standard design outlet pressure dew point at rated conditions: -4°F (-40°F with the optional purge booster).

Sizes: 300 – 3200 scfm

Kaeser Blower Purge Dryers (KBD) use little or no purge air by introducing atmospheric air and heating it. The heated air has a higher capacity for absorbing water and provides effective regeneration. KBD’s provide the greatest energy savings by eliminating the need to use costly compressed air for purging. Standard design outlet pressure dew point at rated conditions: -40°F.

Sizes: 500 – 4300 scfm standard. Up to 10,000 scfm available, consult factory.
Inlet Flow

Inlet Flow capacities shown in the Specifications Table have been established at an inlet pressure of 100 psig (7 bar) 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 6 that corresponds to your operating conditions.

### KED/KBD Inlet Conditions Correction Factors (Table 6)

<table>
<thead>
<tr>
<th>Inlet Pressure (psig)</th>
<th>Inlet Temperature °F (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 (15.6)</td>
<td>70 (21.1)</td>
</tr>
<tr>
<td>80 (26.7)</td>
<td>90 (32.2)</td>
</tr>
<tr>
<td>100 (37.8)</td>
<td>110 (43.3)</td>
</tr>
<tr>
<td>120 (48.9)</td>
<td></td>
</tr>
<tr>
<td>60 (15.6)</td>
<td>1.03</td>
</tr>
<tr>
<td>70 (21.1)</td>
<td>1.10</td>
</tr>
<tr>
<td>80 (26.7)</td>
<td>1.17</td>
</tr>
<tr>
<td>90 (32.2)</td>
<td>1.24</td>
</tr>
<tr>
<td>100 (37.8)</td>
<td>1.30</td>
</tr>
<tr>
<td>110 (43.3)</td>
<td>1.36</td>
</tr>
<tr>
<td>120 (48.9)</td>
<td>1.42</td>
</tr>
<tr>
<td>130</td>
<td>1.49</td>
</tr>
<tr>
<td>140</td>
<td>1.53</td>
</tr>
<tr>
<td>150</td>
<td>1.58</td>
</tr>
</tbody>
</table>

Important:

For inlet temperatures above 100°F, we strongly recommend installing a trim cooler. Please note that for every 20°F inlet temperature increase, moisture load/dryer size approximately doubles.
Heatless Desiccant Dryers

**Standard Control** (KAD)

The standard controller, with process flow schematic and LED’s, makes status checks of control sequence, valves, and filters simple and allows the user to program reminders for routine maintenance intervals. A diagnostic mode steps through the dryer’s operational sequence to verify proper function and performance. The display clearly notifies the user if a malfunction occurs.

This controller has four fixed cycle operating modes corresponding to four of the ISO 8573.1 air quality classes for moisture content. In addition, the standard controller includes a manually selectable purge saving feature. The Purge Economizer Switches allow the user to reduce purge consumption in increments of 10% of full purge requirement and down to 30% of dryer capacity, to closely match a constant, fixed load.

**Purge Saver Control** (KAD PS)

To precisely and automatically match purge air consumption to a changing load, Kaeser offers the Purge Saver Control. Having the same features as the Standard Control (except the Purge Economizer Switches), the Purge Saver monitors temperature changes within the desiccant bed when the dryer is operating at less than its full capacity and keeps the towers on-line until the full drying capacity is reached. This reduces the number of purge cycles and ensures that only the necessary volume of purge air is consumed.

In the event of a malfunction with the Purge Saver Control, standard fixed cycle operation is automatically initiated. Dryer operating status is displayed on a two-line vacuum fluorescent text display with choice of three languages: English, Spanish, or French.

**Basic Timer Control** (KAD E)

The Basic Timer Control is a reliable fixed cycle timer with LED’s indicating which tower is drying. This controller maintains a fixed 10-minute cycle delivering an ISO Class 2 pressure dew point (-40°F). Choose this controller when air demand is uniform and closely matches dryer capacity.
Externally Heated Desiccant Dryers

Energy Management Control (KED and KBD)

The Energy Management Control for heated dryers monitors the moisture level in the desiccant bed and keeps a tower on-line drying compressed air until the desiccant's adsorptive capacity has been fully utilized. Regeneration is then initiated and completed in the following four hours. The regenerated tower repressurizes then sits idle until the Energy Management Control detects full use of the adsorptive capacity of the drying tower and brings the regenerated tower back on-line. For operation at less than full capacity, the Energy Management Control will match power requirement to demand by reducing the frequency of regeneration. Heater operation is terminated when temperature sensors detect that desiccant bed heating is complete. The standard controller’s process flow schematic and LED’s make status checks of control sequence, valves, and filters simple and allow the user to program reminders for routine maintenance intervals. A diagnostic mode steps through the dryer’s operational sequence to verify proper function and performance. The display clearly notifies the user if a malfunction occurs. Dryer operating status is displayed on a two-line vacuum fluorescent text display with choice of three languages: English, Spanish, or French.

Standard Control (KED and KBD)

The standard controller for heated dryers operates the dryer on a fixed eight-hour cycle. A tower is on-line (drying compressed air) for four hours and then taken off-line to be regenerated during the remaining four hours. Heater operation is terminated when temperature sensors detect that desiccant bed heating is complete. The standard controller’s process flow schematic and LED’s make status checks of control sequence, valves, and filters simple and allow the user to program reminders for routine maintenance intervals. A diagnostic mode steps through the dryer’s operational sequence to verify proper function and performance. The display clearly notifies the user if a malfunction occurs. Dryer operating status is displayed on a two-line vacuum fluorescent text display with choice of three languages: English, Spanish, or French.

Optional Controls

Heated Purge (KED)

**Purge Booster**

Without increasing the use of compressed air, purge flow can be increased from 7% to 12% with the optional Purge Booster. This device reduces compressed air consumption from 7% to 6% and draws in an equal volume of ambient air mixing it with the purge air. The increased purge airflow produces lower outlet dew points and minimizes dew point spikes.

Heated Purge and Blower (KED and KBD)

**Energy Saver**

The Energy Saver Option integrates moisture and temperature sensors to monitor the humidity level near the outlet end of the desiccant beds. During periods of reduced flow, the Energy/Saver extends the drying cycle thereby reducing the number of regeneration cycles, saving energy. For KED models, the Energy Saver Option also includes the Purge Booster.

**Energy Management**

The Energy Management Option includes the Energy Saver Option above and a digital dew point monitor. This feature displays the dryer’s outlet dew point and allows the user to prevent tower changeover until a user specified outlet dew point has been achieved, or lets the Energy Management determine the length of the drying period. For KED models, the Energy Management Option also includes the Purge Booster.
Hybritec Combination Dryer

This innovative drying solution combines the energy savings of a refrigerated dryer with the low dew points of a desiccant dryer. Hybritec units operate on a simple premise: air is first treated by a refrigerated dryer to remove most of the air’s water vapor. Then a blower purge desiccant dryer further reduces the dew point. Finally, the air is returned to the refrigerated dryer to be reheated before use.

The advantages over other dryer types are a more consistent outlet dew point and greatly reduced operating costs. Hybritec dryers produce both refrigerated dew points of +38°F and desiccant dew points of -40°F. For larger applications, high energy cost areas, or if your need for low dew points is seasonal, the Hybritec is a superior solution that will pay back quickly. See our separate brochure (USHYBRITEC) for details and contact us for an operating cost comparison.

Sizes from 700 to 5300 scfm

Superior drying performance

The Hybritec dryer produces a consistent outlet dew point and air temperature. There are no spikes at any time during the drying or regeneration cycle. The hybrid system achieves the following ISO 8573.1 classes:

- Class 2 for moisture
- Class 2 for solids/particulate
- Class 2 for oil

Higher tolerance to high temperatures

Hybritec dryers significantly outperform other heated desiccant dryers, especially when inlet temperatures are above rated conditions. For example, increasing inlet air temperature just 5°F from 100°F to 105°F results in a 13% decrease in capacity of other heated desiccant dryers. With a 10°F rise, other dryers lose 26% of their rated capacity. The Hybritec’s refrigerated dryer greatly reduces the impact of inlet temperature on capacity.

Energy cost advantages:

At rated conditions and producing a -40°F dew point for seven months per year and a 38°F dew point for the remaining five months, a Hybritec system consumes:

- 48% less power than a blower purge dryer.
- 54% less power than a heated purge dryer.
- 64% less power than a heatless dryer.

Total cost of purchase, operation, and maintenance of desiccant dryers

For 2400 cfm, Hybritec’s total costs, including purchase are lower than other types of desiccant dryers after only 2 years. For 5300 cfm, Hybritec breaks even with other dryers in less than a year. Based on 8760 hours of operation at $0.10/kWh running desiccant dryer 7 months.
Options

**Insulation for heated desiccant air dryers (KED and KBD)**

Insulation with protective jacket for heater and heater discharge piping is standard; however, insulation for the desiccant vessels is optional. Vessel insulation offers protection for personnel and reduces operating costs. Vessel insulation is flexible open-cell melamine foam having a permanently bonded PVC film laminated polyester fabric jacket. This insulating system absorbs impact and returns to its original shape, thus maintaining its insulating qualities.

**Wall-mounted heatless desiccant air dryers (KADW)**

Compact and convenient, these wall-mounted dryers are available in seven models from 7 to 50 scfm all with factory supplied filter packages. Four minute fixed cycle timer produces standard -40°F pressure dew point at rated flow conditions. Lower pressure dew points, to -100°F, are achieved by reducing air flow rate.

**Other options**

- High humidity alarm
- Dew point monitor
- Stainless steel or copper pilot and instrument air tubing and fittings
- NEMA 4 low ambient protection packages
- NEMA 7 Explosion-proof electrical packages (KAD only)
- Parallel piped pre-filters and after-filters

---

**Filtration**

All desiccant dryers require proper filtration. Coalescing pre-filters prevent contamination of desiccant beds by hydrophobic aerosols. Particulate after-filters collect traces of desiccant dust that may exit the dryer. Maintaining these filters extends service intervals and provides excellent air quality. All Kaeser desiccant dryers offer optional filter packages with or without block and bypass valves.
As one of the world's largest compressed air systems providers and compressor manufacturers, Kaeser Compressors is represented throughout the world by a comprehensive network of branches, subsidiary companies and factory trained partners.

With innovative products and services, Kaeser Compressors’ experienced consultants and engineers help customers to enhance their competitive edge by working in close partnership to develop progressive system concepts that continuously push the boundaries of performance and compressed air efficiency. Every Kaeser customer benefits from the decades of knowledge and experience gained from hundreds of thousands of installations worldwide and over ten thousand formal compressed air system audits.

These advantages, coupled with Kaeser’s worldwide service organization, ensure that our compressed air products and systems deliver superior performance with maximum uptime.