

# Compressed Air Dryer



## Hybritec Combination Dryer

Flow rate 706 to 5295 scfm



## Low dew points with low costs

If you need very low pressure dew points (such as  $-40^{\circ}\text{F}$ ), you are going to have a desiccant dryer. Whether it's to prevent cold weather freezing in outdoor air lines or to protect sensitive equipment or processes, some form of desiccant dryer is your only option.

Desiccant dryers produce very dry air but have high energy and maintenance costs, and may have dew point swings. What if there were a dryer that cost much less to operate and did not sacrifice performance? In fact, what if it actually were more reliable?

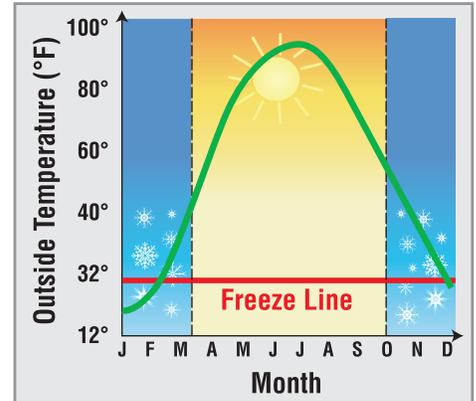
The new Hybritec dryer from Kaeser is just that. It maintains a low dew point even in varying conditions while greatly reducing energy and maintenance costs.

The Hybritec dryer does this by combining the functions of both refrigerated and blower purge desiccant dryers. The refrigerated dryer component does approximately 85% of the work to reach a  $-40^{\circ}\text{F}$  dew point, so the desiccant dryer can be smaller. Since refrigeration is a much less expensive method for dehydrating compressed air, the cost to produce a  $-40^{\circ}\text{F}$  dew point is significantly reduced.

In many cases, the need for very low dew point is actually seasonal. A refrigerated dryer will meet typical air quality needs most of the year. In these cases, the Hybritec offers even greater savings since the desiccant dryer portion of the system can be taken off line and shut down when not required or automatically with "temperature sensing".

Hybritec dryer systems quickly return the additional investment costs and go on to provide years of significant operation and maintenance savings, with the additional benefit of more consistent dew points in a wider range of operating conditions.

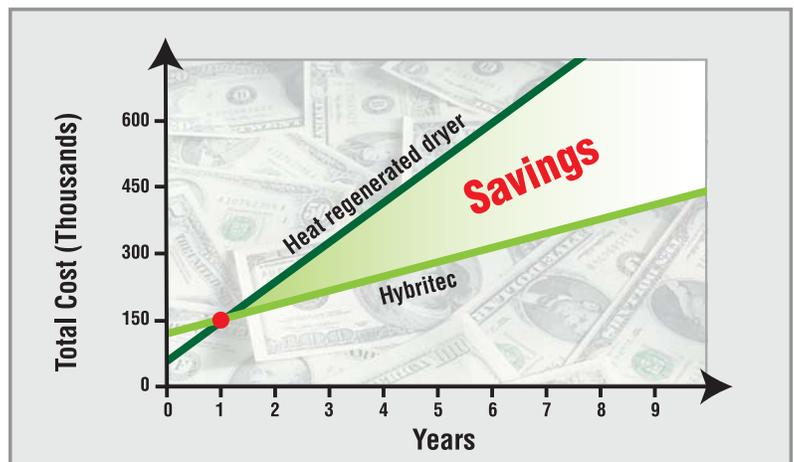
## Year round savings



If your need to provide cold weather protection for your air system is seasonal, Hybritec's energy advantages are clear. With an assumed frost period of 4 months per year, for example, it is possible to reduce energy costs as much as 2/3. Even if you need a  $-40^{\circ}\text{F}$  dew point year round, Hybritec still offers nearly 50% energy savings and more consistent dew points.

## System comparison

No conventional desiccant system comes close to Hybritec dryers' low life cycle costs. This is mainly due to Hybritec's lower energy consumption and the fact that these versatile dryers become even more cost-effective as energy prices increase. Hybritec dryers also require less maintenance — further reducing their carbon footprint.



Graph shows a 3000 scfm system running the desiccant dryer for 7 months of the year, 8760 operating hours per year at  $\$0.10/\text{kWh}$

# Hybritec



## Superior drying performance

The Hybritec dryer produces a consistent outlet dew point and air temperature. There are no spikes at anytime during the drying or regeneration cycle. In fact, it will deliver outlet dew points exceeding the -40°F design when ambient conditions are less taxing than design conditions. The hybrid system achieves the following ISO 8573.1 classes:

- Class 2 for moisture
- Class 1 for solids/particulate\*
- Class 2 for hydrocarbon aerosols\*

\*exceeds class standards

## Higher tolerance to high temperatures

Hybritec dryers significantly outperform desiccant dryers when inlet temperatures are above rated conditions. Increasing inlet air temperature just 5° from 100°F to 105°F results in a 13% decrease in capacity of other heated desiccant dryers. With a 10°F rise, heated dryers lose 26% of their rated capacity, and at 20°F above the rated inlet air temperature the capacity loss is 45% (a 1000 scfm dryer becomes a 550 scfm dryer). The Hybritec's refrigerated dryer greatly reduces the impact of inlet temperature on capacity.

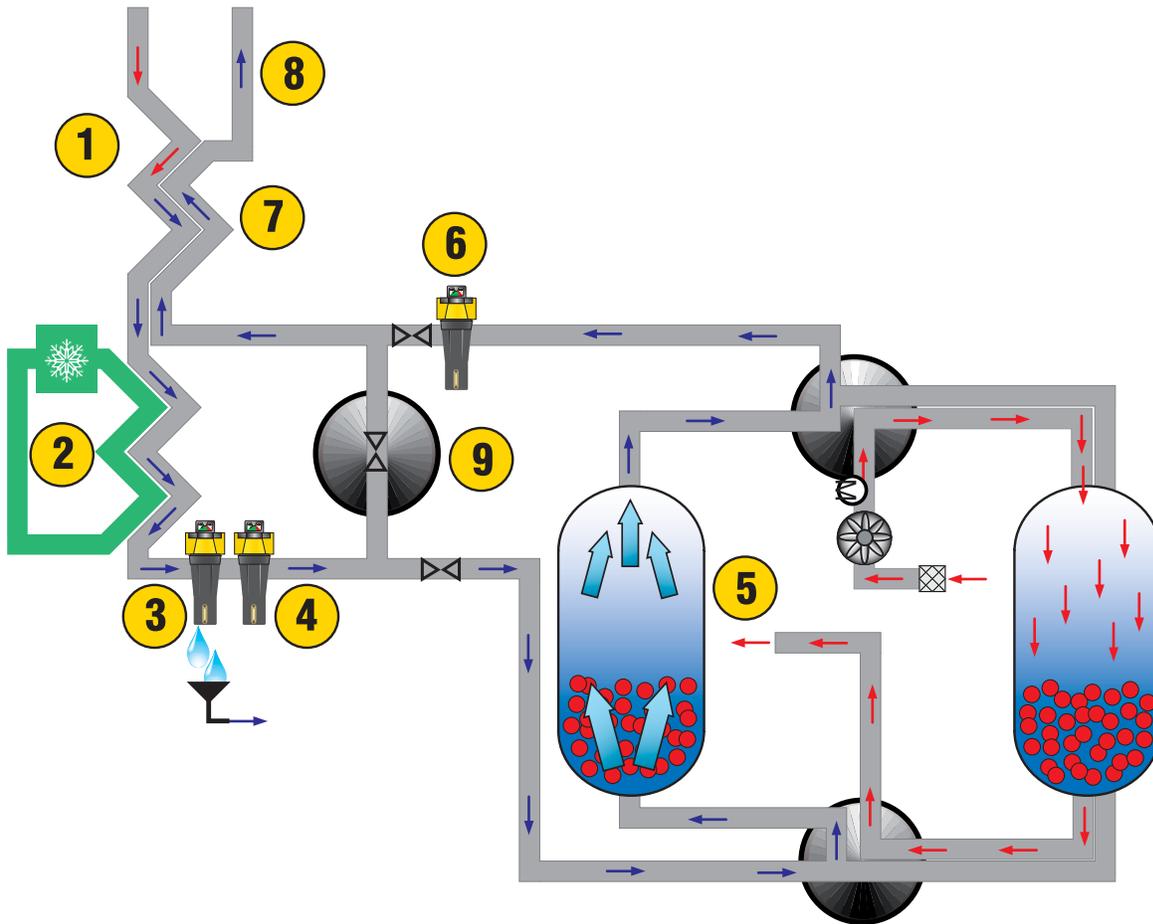
## Energy cost advantages:

Hybritec consumes significantly less power than other types of desiccant dryers. At rated conditions and producing a -40°F dew point for seven months per year with a 38°F dew point for the remaining five months, a combination system consumes:

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

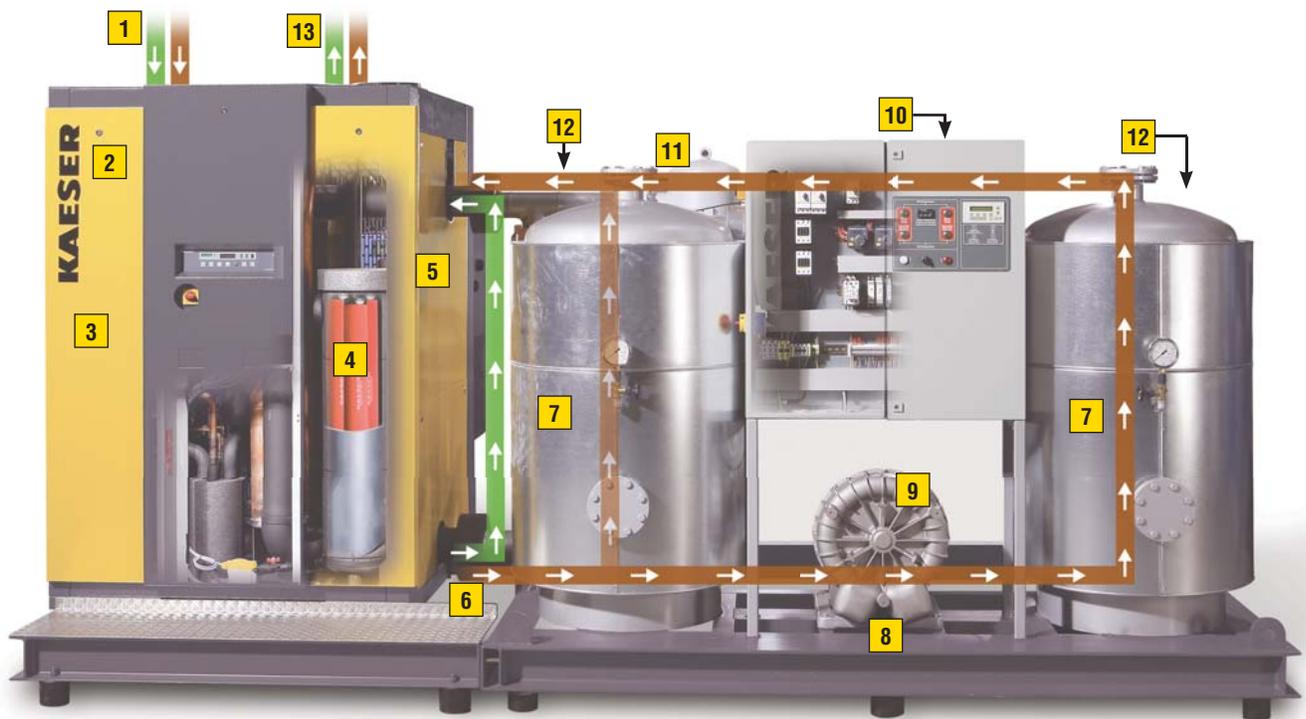


# How Hybritec functions



- 1** Compressed air (normally 100°F) enters the refrigerated dryer section through the air-to-air heat exchanger and temperature is reduced to about 70°F, condensing a significant amount of the water vapor. Some oil vapor may also be condensed here.
- 2** The mixture of 70°F saturated compressed air and liquid water then enters the air-to-refrigerant heat exchanger where the temperature is further reduced to about 38°F. More water vapor condenses as well as some oil vapor.
- 3** Liquid water and oil droplets are removed. The separator element also captures solid particles 3 micron and larger.
- 4** The cold-coalescing filter further reduces oil aerosol concentration to 0.01 PPMw. Particles, some as small as 0.01 micron, are captured.
- 5** The cold, saturated, oil-free and particle-free compressed air is now passed through a bed of desiccant where the dew point is reduced to -40°F.
- 6** A 1 micron particulate filter captures desiccant fines that may be swept out of the desiccant bed by the compressed air flow.
- 7** The cold compressed air flows back through the secondary side of the air-to-air heat exchanger, where it is warmed, typically to about 85°F to prevent condensation on downstream piping.
- 8** Compressed air exits the refrigerated dryer clean, oil-free and dried to -40°F pressure dew point.
- 9** In warmer months or whenever the lower dew point is not needed, the desiccant dryer may be easily bypassed and shut off so that only the refrigeration dryer will operate. The air will still flow through the moisture separator and the cold coalescing filter, but not the particulate filter. In addition to tremendous energy savings from turning off the desiccant dryer, pressure drop across the clean air treatment system will be reduced.

# Equipment design and features



- 1** Compressed air inlet
- 2** Air-to-air exchanger\*
- 3** Air-to-refrigerant exchanger\*
- 4** Moisture separator with drain
- 5** Cold coalescing filter\*
- 6** Desiccant dryer inlet (desiccant by-pass valves not shown)
- 7** Desiccant towers
- 8** Tower switching valves
- 9** Blower
- 10** Heater\*
- 11** Particulate filter\*
- 12** Purge air outlets
- 13** Compressed air outlet

\* not visible in photograph

## Refrigerated dryer features

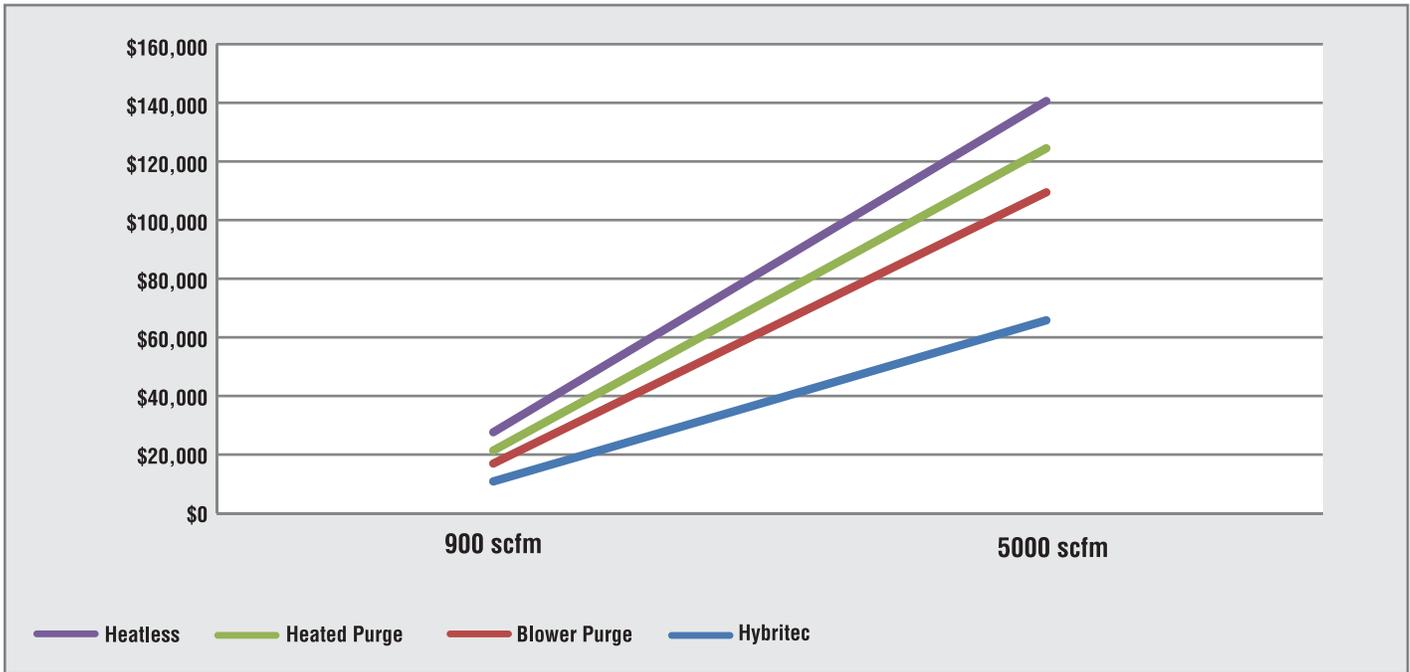
- Stainless steel plate heat exchangers
- Eco-Drain automatic electronic condensate drains
- Cold coalescing KOR oil removal filters
- Insulated cold system components
- CFC-free refrigerants on all models
- Powder-coated enclosure panels
- Energy saving scroll refrigerant compressor (DTG to DTI series) and refrigerant compressor with cylinder unloading (DTL series)

## Desiccant dryer features

- Load dependent Energy Management controller
- Diagnostics mode with indicator for valve switching sequence
- Dew point display with adjustable alarm values
- Temperature controller/indicator for regeneration air temperature
- Stainless steel flow diffusers
- Long life switching valves
- Large ports for easy desiccant replacement
- 1 micron particulate after-filter and external heater
- Insulated cold system components

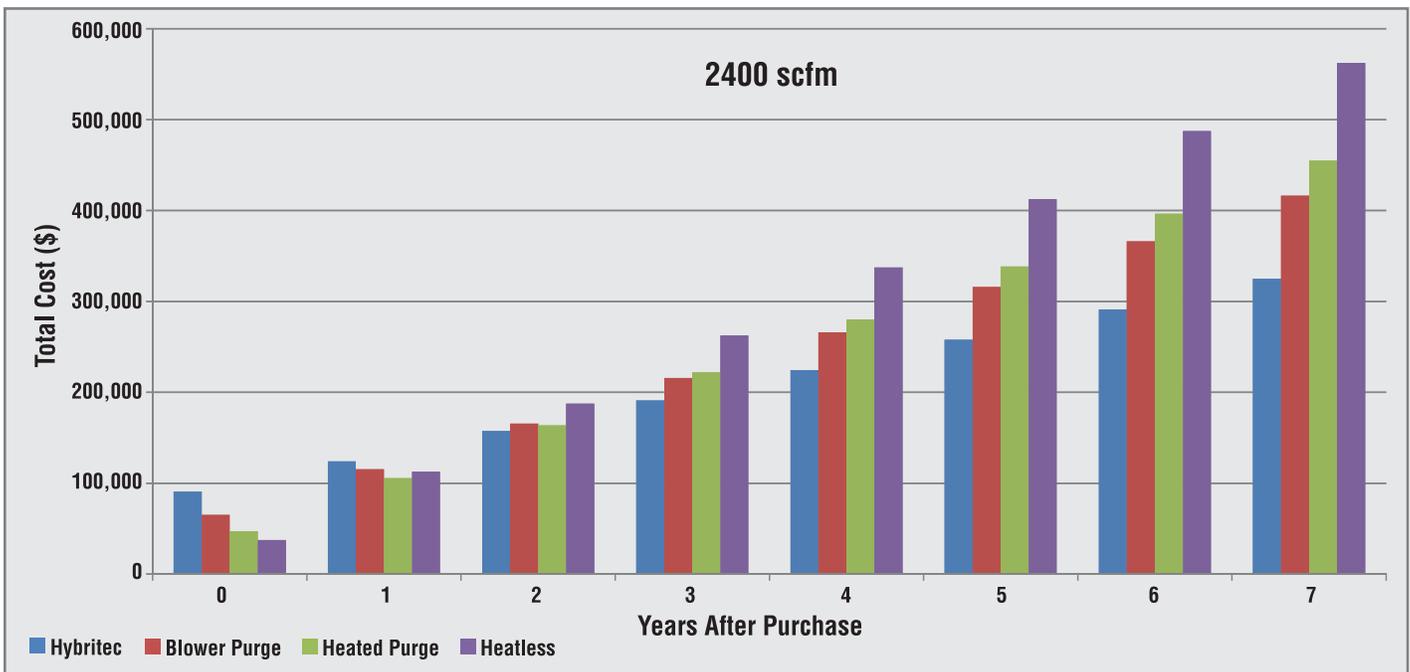
# Cost comparisons

## Annual operating and maintenance costs



Based on 8760 hours of operation at \$0.10/kWh running desiccant dryer 7 months.

## Total cost of purchase, operation, and maintenance



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.

# Maintenance and service advantages

## Use less desiccant

Since the refrigeration component removes 85% of the moisture, Hybritec's desiccant beds are smaller than a stand alone desiccant dryer sized for the same flow. For example, a 1500 scfm heated purge or blower purge dryer requires 2500 lb. of desiccant and a heatless dryer 2100 lb. By contrast, the Hybritec dryer needs only 1560 lb. of desiccant for the same flow. Consequently, the cost of desiccant replacement is much lower.

## Longer desiccant service

(1) The desiccant beds in the Hybritec are heated and cooled half as often as other heated dryer types. When operating at full capacity, the desiccant is regenerated every eight (8) hours instead of every four (4) hours as is typical of other heated dryer types.

- (2) The regeneration temperature of the Hybritec is nearly 200°F lower than a typical heated dryer, so there is less thermal stress on the desiccant.
- (3) If the dryer is used seasonally, desiccant service life is extended by the amount of time the desiccant dryer is off-line.

Combining **smaller desiccant beds** with **longer desiccant life** yields much lower annual replacement costs:

- Heated: 2500 lb. x  
1 change/2 years = 1250 lb./yr.
- Heatless: 2100 lb. x  
1 change/5 years = 420 lb./yr.
- Hybritec: 1560 lb. x  
1 change/7 years = 223 lb./yr.

## Reduced valve cycling

Because Hybritec dryers cycle 50% less than standard blower purge dryers and 99% less than heatless desiccant dryers, valves and other parts get much less wear and last longer.



## Specifications

Model	Rated Capacity (scfm)	Power Supply (V / Ph / Hz)	Inlet/Outlet Connections Flange (in.)	Dimensions W x D x H (in.)	Weight (lb.)
DTG 200/301	706	460 / 3 / 60	3	169 x 61 x 88	5600
DTH 250/371	883				6000
DTI 333/521	1175		4	181 x 74 x 88	7300
DTI 417/601	1472				7800
DTI 500/751	1765				9300
DTI 667/901	2355				9600
DTL 833/1101	2940				6
DTL 1000/1301	3530		203 x 128 x 81 (WC)	13,800	
DTL 1167/1501	4120		8	216 x 140 x 97 (AC)	16,100
DTL 1333/1751	4705			216 x 140 x 84 (WC)	17,000
DTL 1500/1755	5295			219 x 145 x 97 (AC)	19,700
			219 x 145 x 84 (WC)		

DTL series are made up of 2 skids. Dimensions reflect fully assembled system.  
AC = air-cooled. WC = water-cooled

Specifications are subject to change without notice.

## Options

- High pressures up to 232 psig
- Automatic seasonal bypass controller
- All models available with water-cooled refrigeration dryer
- Installation in 20-foot container (up to DTI 667/901)
- Speed controlled fan motors on refrigeration dryers (DTL 883/1101 and up)
- Electronic filter monitoring (Kaeser filter monitor)

## Automatic temperature sensing

With the optional thermostatic control system, Hybritec dryers are able to automatically switch from frost protection operation at colder times of the year to pure refrigeration dryer mode during the warmer months.



# KAESER COMPRESSORS

**Built for a lifetime.™**

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