

# Air Treatment



# Air Treatment

## Why Air Treatment?

*Dirt, water vapor, and other impurities enter the compressor with the atmospheric air. During the compression process, oil (liquid and vapor) is also commonly introduced. If not removed, these contaminants may cause costly production problems such as equipment contamination, accelerated tool wear, and product rejects. Kaeser offers a complete line of air treatment products to prepare compressed air for even the most stringent requirements.*

## Selecting Equipment

*Ambient air temperature, humidity, and quality will directly affect the effectiveness of air treatment equipment. Your application and environment will determine what level of air quality you need. Higher quality air can cost more to produce considering additional equipment purchases, more frequent maintenance, and higher energy consumption due to pressure drops and purge air. However, identifying and targeting applications with specific air quality requirements can actually help reduce operating costs. For applications requiring higher air quality levels, apply air treatment equipment at the point of use rather than the entire system.*

*Kaeser's factory trained representatives are skilled in selecting and sizing dryers, filters, and other air treatment products.*



## Global Standards

ISO 8573.1:2010 was developed by ISO (International Organization for Standardization) as a reference to help facility engineers specify compressed air quality for solid particulates, humidity, and oil.

A typical pharmaceutical plant, for example, might have a compressed air specification of ISO Quality Class **1.2.1**, as shown outlined in the specifications below.

SOLID PARTICLES / DUST			
Class	Max. particle count per m <sup>3</sup> of a particle size with d* (µm)		
	0.1<d≤0.5	0.5<d≤1.0	1.0<d≤5.0
0	Consult Kaeser		
1	≤ 20,000	≤ 400	≤ 10
2	≤ 400,000	≤ 6,000	≤ 100
3	not specified	≤ 90,000	≤ 1,000
4	not specified	not specified	≤ 10,000
5	not specified	not specified	≤ 100,000
Class	Particle concentration* Cp (mg/m <sup>3</sup> )		
6	0 < Cp ≤ 5		
7	5 < Cp ≤ 10		
X	Cp > 10		

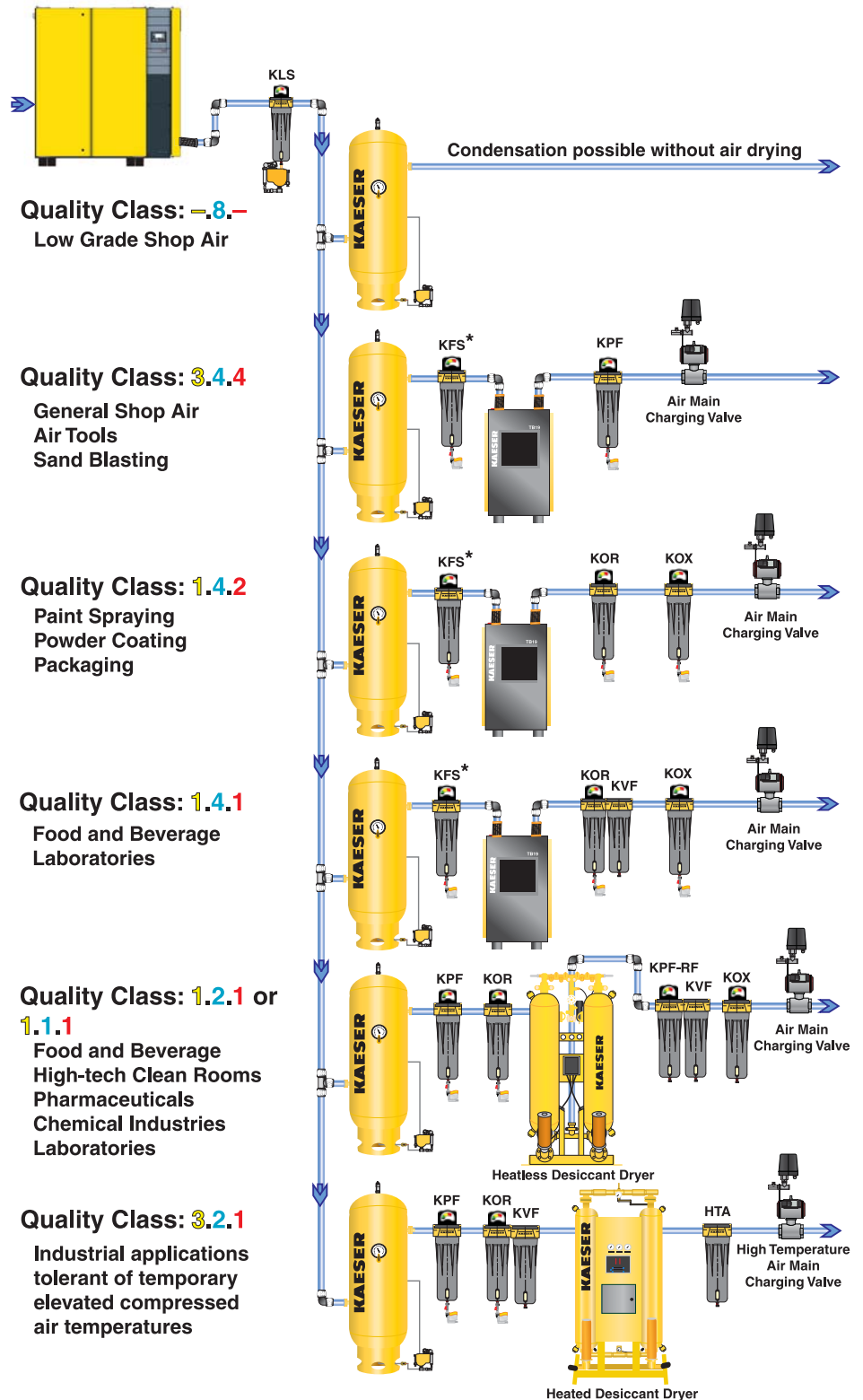
HUMIDITY AND LIQUID WATER		
Class	Pressure dew point	
0	Consult Kaeser	
1	≤ -70°C	≤ -94°F
2	≤ -40°C	≤ -40°F
3	≤ -20°C	≤ -4°F
4	≤ 3°C	≤ 38°F
5	≤ 7°C	≤ 45°F
6	≤ 10°C	≤ 50°F
Class	Concentration of liquid water* Cw (g/m <sup>3</sup> )	
7	Cw ≤ 0.5	
8	0.5 < Cw ≤ 5	
9	5 < Cw ≤ 10	
X	Cw > 10	

OIL		
Class	Total oil concentration* (liquid, aerosol, and vapor)	
	(mg/m <sup>3</sup> )	(ppm w/w)
0	Consult Kaeser	
1	≤ 0.01	≤ 0.008
2	≤ 0.1	≤ 0.08
3	≤ 1.0	≤ 0.8
4	≤ 5.0	≤ 4
X	> 5.0	> 4

\* At reference conditions: 68°F (20°C), 14.5 psia (1 bar), 0% relative humidity

## Example Air Treatment Configurations

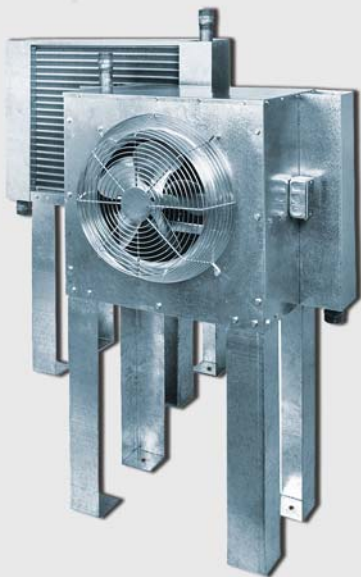
with ISO 8573.1: 2010 quality classes shown



\* To remove particulate created by corroding tanks and piping, use a KFS upstream of air treatment

The configurations above do not depict every possible dryer-filter combination. Your Kaeser representative will help select the appropriate air treatment products for your application.

Atmospheric air entering a compressor contains water vapor. The compression process heats the air enough that the ingested water vapor is still in the vapor state when air is discharged from the compressor. As the air travels downstream, the vapor cools and condenses into liquid. If not removed, it contaminates the entire compressed air system and causes corrosion. Corrosion in turn leads to air leaks, pressure drops, and scale formation. Products and processes are ruined, resulting in lost production time. Aftercoolers are an economical way to remove water vapor and cool air to safe, usable levels for many applications. Aftercoolers also prepare the air for further filtration and drying.



Air-cooled aftercooler

## Aftercoolers and Separators

### Air-Cooled (KAC) and Water-Cooled (KWC) Aftercoolers

Kaeser Rotary Screw compressors include built in aftercoolers and do not require an additional aftercooler. The KAC and KWC are recommended mainly for compressors with discharge temperatures above 110°F or any compressor that does not have a built in aftercooler.

Aftercoolers provide an economical way to remove as much as 70% of the water vapor in compressed air. Air-cooled aftercoolers are durable, free standing units that can cool compressed air down to 5°F above the ambient temperature. Kaeser water-cooled aftercoolers consist of a shell-and-tube heat exchanger in which compressed air can be cooled to within 10°F of the cooling water temperature. These are also available for high pressure applications.

Sizes: AC, up to 3500 scfm

Sizes: WC, up to 2700 scfm



Water-cooled aftercooler

### Kaeser Liquid Separators (KLS)

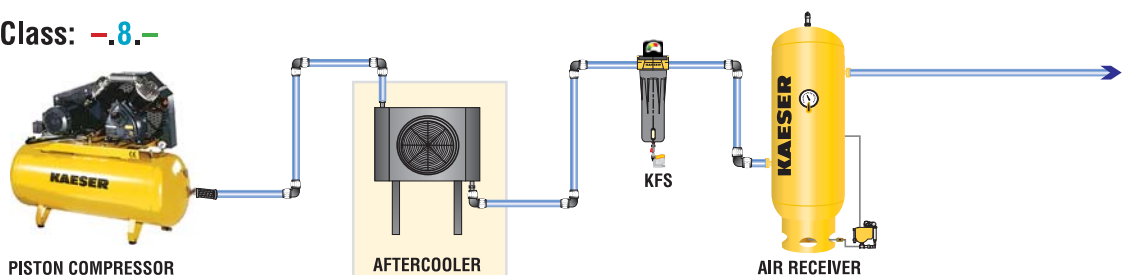
Kaeser Liquid Separators remove moisture from compressed air by means of a stainless steel, offset separator core. Water is forced out of the air stream and falls to the bottom for collection. They are typically placed at the discharge of aftercoolers, but can be used in any number of applications where large amounts of liquid must be removed. A KFS (see filter section) can be substituted in place of a KLS to provide particulate filtration as well.

Sizes up to 21,250 scfm



ISO 8573.1 Quality Class: **-.8.-**

Example:  
Low Grade Shop Air



Once the moisture is collected, it has to be discharged from the system. Kaeser offers a variety of drain traps to remove moisture automatically from separators, receiver tanks, intercoolers, aftercoolers, dryers, filters, and drip legs.



Eco-Drains



Automatic Magnetic Drain Traps

## Condensate Drain Traps

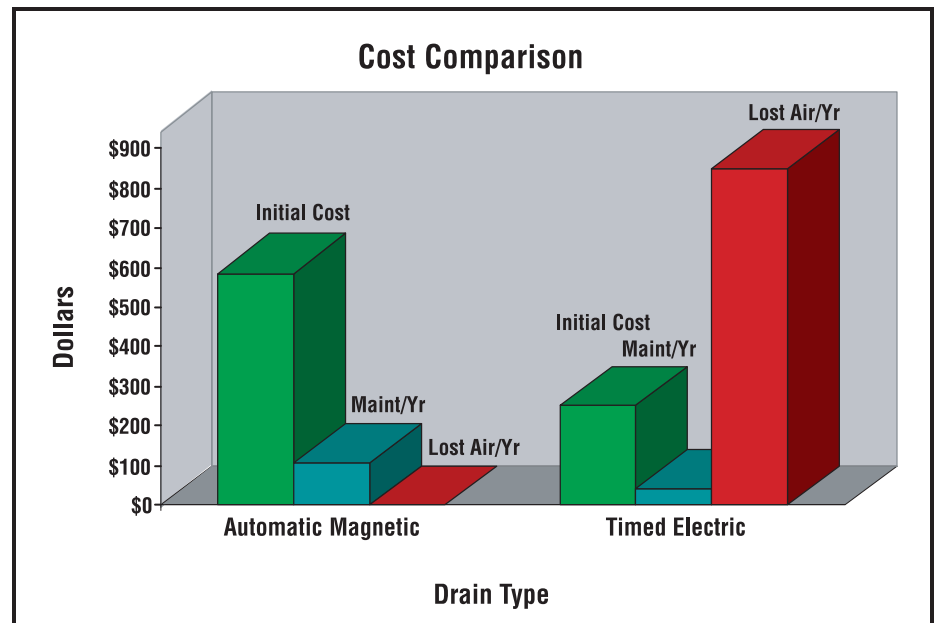
Kaeser's Automatic Magnetic Drain (AMD) and Eco-Drain series of automatic demand drains offer superior energy savings and excellent reliability. Designed only to open when condensate is present, they lower your electrical costs by conserving compressed air for intended uses.

### Eco-Drain

The Eco-Drain series is ideal for filters including our Filtered (KFS) and Liquid Separators (KLS) and Oil Removal Filters (KOR). It employs a capacitance sensor for actuation and a patented 3/2 way valve ensures that pilot air is contaminant free.

### Automatic Magnetic Drains (AMD 6550 and AMD 1550)

The AMD 6550 is a heavy-duty drain designed for very large liquid loads and severe conditions. The AMD 1550 can handle significant liquid loads and has been designed for use on filters. Both drains incorporate a float and magnetic actuator that is completely isolated from the condensate. AMDs require no electricity for operation and are exceptionally reliable.



Many users rely on timed electric drains. While simple and inexpensive, they are not cost effective in the long run. Because condensate accumulates at different rates depending on climate and season, these drains frequently open either too often or not often enough. Most users err on the side of too often, needlessly venting costly compressed air.

Filters provide the additional protection from contaminants that degrade process equipment and decrease air tool performance. Filters remove solid particles, oil aerosols, moisture, and oil vapors. Adding filters to the compressed air system will save considerable costs in process downtime, cleaning tools, and repairing equipment. The right filter combination plays a key role in preventing unwanted dirt and oil from reaching end products like food and beverages. Filters up to 780 scfm include bayonetted or screw on housings for easy element replacement. Other features include easy to read differential pressure gauges to signal element contamination, modular mounting, liquid level indicators, and internal drains. The latest filter media technology results in higher efficiencies and lower pressure drop. The elements are also color-coded for easy identification.

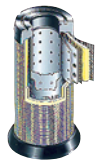
Sizes up to 21,250 scfm



Filters

## Filters

### Kaeser Filtered and Liquid Separators (KFS/KLS)



Kaeser Filtered and Liquid Separators (KFS/KLS) are extremely effective for water removal and also provide protection from contaminants.

They should be used for bulk liquid removal and placed between aftercoolers and air dryers. Without other air treatment, these filters can provide sufficient moisture removal for low grade shop air.

### Kaeser Particulate Filter (KPF)



Kaeser Particulate Filters (KPF) are general purpose air line filters designed to remove particles and aerosols of water and oil. They

can be used in wet or dry air streams, but serve primarily to protect the very fine media of oil coalescing filters from gross particulate contamination and heavy liquid loading. Use these filters upstream of KOR and KOX filters in desiccant dryer installations, or downstream of refrigerated dryers. For particulate removal downstream of heatless desiccant dryers use the "reverse flow" KPF-RF.

### Kaeser Oil Removal Filter (KOR)

Kaeser Oil Removal (KOR)



filters remove a large amount of the oil aerosols and remaining liquids as well as fine particles. These coalescing filters should be placed downstream of refrigerated dryers but upstream of desiccant dryers to prevent oil from contaminating the desiccant. A KFS or KPF should always be placed upstream of the KOR to ensure maximum effectiveness and long life.

### Kaeser Oil Removal Extra Fine Filters (KOX)



Kaeser Oil removal eXtra fine filters (KOX) offer even greater protection than the KOR series. They are also

coalescing filters and should be used in extra sensitive applications where oil is not tolerated. It is important for the KOX to have the proper up-stream protection (a KFS or KPF).

### Kaeser Vapor Filters (KVF)

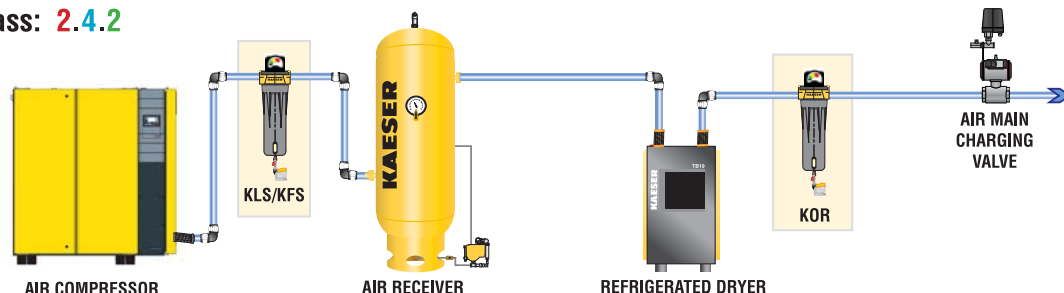


Kaeser Vapor Filter (KVF) remove oil vapors and odor from compressed air. Several

layers of activated carbon provide effective removal of these vapors. These filters should be placed downstream of KOR/KOX filters since they do not tolerate any liquid. The food, beverage, pharmaceutical, and chemical industries benefit from these filters in maintaining product quality.

ISO 8573.1 Quality Class: 2.4.2

Examples:  
Paint Spraying  
Powder Coating  
Packaging





Oil Mist Eliminator

## Oil Mist Eliminators (OME)

Oil Mist Eliminators (OME) are simply large oil removal filters with a very low pressure drop. Not only do they remove both oil aerosols and water, but they can handle large slugs of liquid. The cartridge life is normally 8 to 15 years, thus requiring virtually no maintenance.

*Sizes up to 3000 scfm*

## Kaeser Activated Carbon Towers (KAT)

Kaeser Activated Carbon Towers (KAT) remove oil vapor and odor. They are used where oil vapor and odor may contaminate end products such as food, drugs, and chemicals. The carbon beds are designed for a long life of up to 30,000 hours.

*Sizes up to 5500 scfm*



Single Tower Desiccant Dryer, High Temperature Afterfilter, and High Pressure Filter

## Single Tower Desiccant Dryer (KDF)

Kaeser single tower desiccant air dryers (KDF) provide dew points as low as -40°F and are ideal for small volume air applications. They are excellent for point of use drying where low dew points are required. No electrical power is required and regeneration is achieved by offline purging or desiccant replacement.

*Sizes up to 30 scfm*



KMM Membrane Dryer

## High Temperature Afterfilters (HTA)

High Temperature Afterfilters (HTA) are particulate filters designed for temperatures up to 450°F. They are commonly placed after heated desiccant dryers to take out the desiccant fines and handle the high temperatures induced by the heaters.

*Sizes up to 11,400 scfm*

## High Pressure Filters (HP)

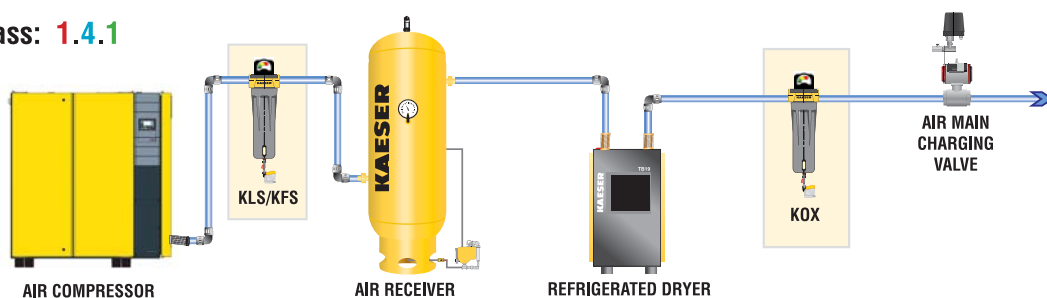
High Pressure filters (HP) are available for applications requiring pressures up to 1000 psig. They include seam welded stainless steel cores for greater durability and corrosion resistance. The HP filters are well suited for PET bottling systems and should be installed down-stream from high pressure compressors or boosters and dryers. They are also available in all filter grades except HTA; see previous page.

## Kaeser Membrane Dryers (KMM)

Kaeser Membrane Dryers (KMM) provide a dew point suppression without requiring any external power or regular maintenance. These dryers are well suited for point of use applications and are easy to install, requiring simple piping connections. They are lightweight and available with mounting brackets and prefilters for easy installation. Proper filtration includes a particulate/oil removal filter combination to prevent oil from contaminating the membrane.

ISO 8573.1 Quality Class: 1.4.1

Examples:  
Food and Beverage  
Laboratories



Refrigerated dryers serve most compressed air applications. Kaeser has a very wide range of refrigerated dryers from 10 to 12,500 scfm for a variety of applications. All Kaeser dryers use environmentally friendly refrigerant.



Refrigerated Air Dryer - TX Series



Refrigerated Air Dryer - H Series

## Refrigerated Air Dryers

### Small Dryers

Kaeser offers TX and H series dryers for smaller systems or point of use applications. These hot gas bypass designs combine consistent dew points with simplicity and reliability.

*Sizes from 10 to 125 scfm*

### Cycling Dryers

Kaeser Secotec cycling dryers offer energy savings by using cold storage and the Secotec control system. Solid material is used for thermal storage so leakage problems are avoided. The layout is designed for easy maintenance, accessibility, and minimal floor space. A precooler/reheater provides increased cooling efficiency. Their simple design and top quality construction make them extremely reliable.

*Sizes up to 885 scfm*

### Dual Control Dryers

Our Dual Control dryers are designed for fluctuating flow applications. This control method reduces energy consumption across a wide range of flows while ensuring a consistent dew point. These heavy duty industrial dryers are also available with a Demand Manager control in place of the Dual Control for more consistent air flows.

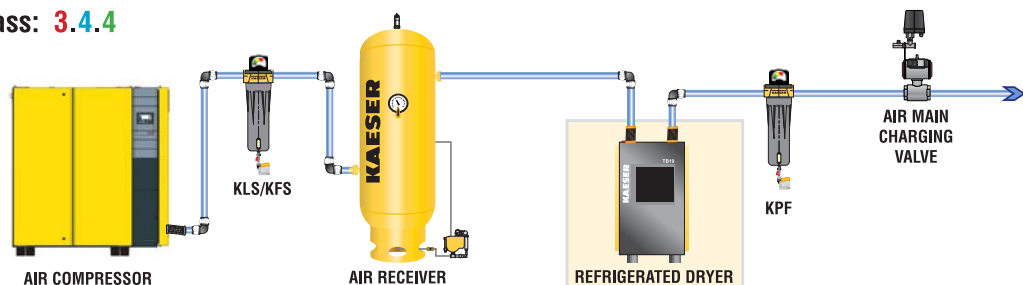
*Sizes from 600 to 3000 scfm*



Dual Control / Demand Manager Series

### ISO 8573.1 Quality Class: 3.4.4

**Examples:**  
General Shop Air  
Air Tools  
Sand Blasting





*High Capacity Refrigerated Dryers*

## High Capacity Dryers

For very large air systems, Kaeser offers high capacity refrigerated dryers built with combinations of independent 1250 and 2500 scfm modules. Using dual control scroll-type refrigerant compressors, this design has superior energy efficiency in direct proportion to the load over a wide range of flows. Both Installation and service are easier than with single larger, dryers. Up to five modules can be combined to increase capacity as your demand grows.

*Sizes from 3750 to 12,500 scfm*



*High Pressure Refrigerated Dryers*

## High Pressure Dryers (HT)

High pressure applications are also subject to the threat of contaminants and harmful moisture. Kaeser offers its HT line of dryers for PET bottling systems and other applications from 230-725 psig.

*Sizes up to 3000 scfm*

## High Inlet Temperature Dryers

Our HTRD's are designed for use with piston compressors with higher operating temperatures. They combine a separate aftercooler, separator, dryer and filter and are ideal for facilities with 5 to 30 hp piston compressors. HTRD's are lightweight and have a small footprint for convenient installation.

*Sizes up to 125 scfm*

## Kaeser's Cooling Air Units (KCA)

These dryers provide cold, dry compressed air for industrial processes including cooling molds, metal and glass production, maintaining inks at consistent temperatures, and more.

KCAs produce an outlet air temperature of 40°F in normal operation. These non-cycling refrigerated dryers have an air-to-refrigerant heat exchanger, a 3 micron KFS separator and a drain. Smaller models include a float-type drain and larger models include a capacitance-sensor operated Kaeser Eco-Drain. All units are easy to install and require little maintenance.

*Sizes up to 330 scfm*



*High Temperature Refrigerated Dryer*



*Cooling Air Units*

Desiccant dryers provide extremely dry air for processes that are very moisture sensitive or applications where the compressed air system is exposed to very low ambient temperatures. Dew points may be as low as -100°F. The desiccant material adsorbs moisture in the air until it reaches its maximum capacity at which point it must be regenerated. The method of regeneration is what differentiates the types of desiccant dryers (KAD, KED, and KBD).



Heatless Desiccant Dryer

## Desiccant Air Dryers

### Kaeser Heatless Desiccant Dryers (KAD)

Also called "pressure swing" desiccant dryers, KAD dryers regenerate without an external source of energy. Approximately 15% of the dry compressed air is used to regenerate the saturated tower. KAD's are initially less expensive than heat reactivated dryers, but consume more energy. Heatless dryers are the most capable of producing very low dew points.

Sizes: 40 – 5400 scfm

### Kaeser Heatless Wall-Mounted Desiccant Dryers (KADW)

Kaeser wall-mounted heatless dryers are available in 7 to 50 scfm sizes. The optional mounted filters provide easy installation for point of use applications.

Sizes: 7 – 50 scfm



Heatless Desiccant Dryer- Wall Mounted

### Kaeser Heated Purge Dryers (KED)

Kaeser heated purge dryers use only 7% of the compressed air supply for regeneration. Dry air is reduced in pressure and passed through a heater before being directed through the wet desiccant bed, regenerating it. Having an external heater, rather than having heating elements within the desiccant bed, prevents the desiccant from being exposed to temperatures higher than that required for regeneration, extending desiccant service life. KED dryers are less costly to operate than heatless dryers.

Sizes: 300 – 3200 scfm

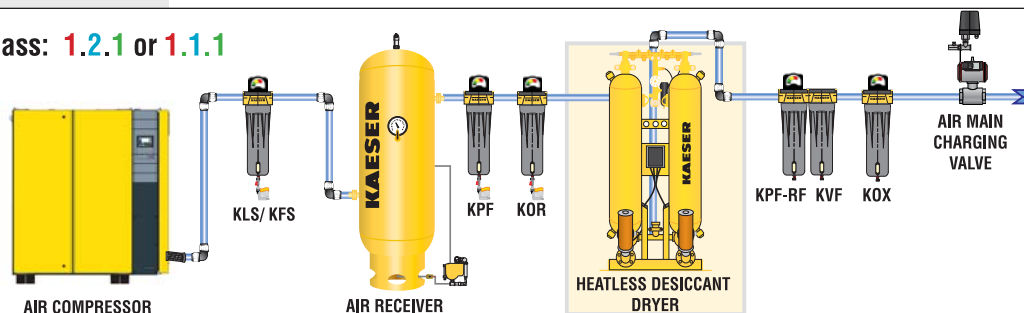
### Kaeser Heated Blower Purge Dryers (KBD)

Kaeser Blower Purge Dryers (KBD) use little or no purge air by introducing atmospheric air and heating it. Heating ambient air lowers its relative humidity, increasing its ability to hold moisture. The hot, dry ambient air regenerates the desiccant. KBD's provide excellent energy savings by eliminating the need to use costly compressed air for purging.

Sizes: 500 – 4300 scfm

ISO 8573.1 Quality Class: 1.2.1 or 1.1.1

**Examples:**  
Food and Beverage  
High-tech Clean Rooms  
Pharmaceutical  
Chemical Industries  
Laboratories





*Hybritec Combination Dryer*

## Hybritec Combination Dryer

This innovative compressed air 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, but unique, premise: air is first partially treated by a refrigerated dryer to remove the vast majority of the air's water vapor. This cold air is then treated by a desiccant dryer to further reduce the dew point. Finally, the cold, dry air is returned to the refrigerated dryer to be reheated and delivered to the air system.

The advantages of these hybrid dryers over other dryer types include: a consistent outlet dew point, reduced operating and maintenance costs, less power consumption, and longer desiccant service life. Hybritec dryers produce either refrigerated dew points of +38°F or desiccant dew points of -40°F.

*Sizes from 700 to 5300 scfm*



*Breathing Air System*

## Breathing Air Purifiers

Kaeser Breathing Air Purifiers (KBS) provide air for applications where workers cannot safely breathe ambient air. KBS purifiers include filters to remove contaminants and oil, a desiccant air dryer to remove moisture, and catalytic materials to reduce carbon monoxide concentrations to a level safe for continuous breathing. The KBS delivers OSHA's Grade D breathing air.

*Sizes up to 940 scfm*

# Condensate Removal

Compressed air condensate is a by-product of all compressors. It is a mixture of ambient hydrocarbons, compressor lubricant with ambient moisture, and particulates that have been concentrated during the compression process. Safely disposing of condensate is a required environmental practice. This oil/water mixture is classified as hazardous waste and cannot be discharged into municipal wastewater systems unless the oil and contaminants are removed. Kaeser's Condensate Filters (KCF) offer a reliable and economical method of oil/water separation.



*Kaeser Condensate Filters*

## Kaeser Condensate Manifold (KCM)



The KCM is a small vessel that collects condensate from multiple sources and safely diffuses residual air pressure to maximize separation effectiveness in the Kaeser Condensate Filter (or any oil/water separator).

Available in two models that vent up to 4 and 8 condensate lines. KCM is constructed from sturdy schedule 80 PVC and has a maximum pressure-at-inlet of 230 psig. Condensate lines are connected via easy push-to-connect fittings.

A venting muffler, mounting hardware, and 5 ft outlet hose are included.



# KAESER COMPRESSORS

***Built for a lifetime.™***

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