

Clean Air Treatment



Clean Air Treatment

Why Clean 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, dirt, liquid water and oil travel downstream causing product rejects, costly production delays, and increased maintenance costs. Problems such as corrosion, scaling, pressure loss, contamination and freezing are serious and create down time for compressed air systems. They lead to production problems such as contamination of equipment, accelerated tool wear and product rejects. Kaeser offers a complete selection of clean air treatment products to prepare compressed air for the stringent requirements of many applications.

Selecting Equipment

Consider the ambient conditions in selecting and sizing dryers, filters and other clean air treatment products. Ambient air temperature, humidity and quality will directly affect the air leaving the compressor and the effectiveness of air treatment equipment. Applying correction factors for ambient temperature, compressed air temperature and pressure will ensure proper size selection.

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 clean air treatment equipment at the point of use rather than the entire system.

Your Application

Your application will determine what level of air quality you need. Some of the more common applications can be found in the "Examples of Clean Air Treatment" section of this brochure. Other applications not shown may have similar requirements or a variation of the ones shown.

Global Standards

ISO 8573.1 was developed in 1991 by ISO (International Organization for Standardization) to help facility engineers specify compressed air quality globally with "Quality Classes" for solid particulates, humidity and oil. Quality classes provide an internationally accepted unit of measure. A typical pharmaceutical plant, for example, would have a compressed air specification of ISO Quality Class 1.2.1. This is equivalent to 0.01 micron particulate filtration, -40°F (-40°C) dew point, and 0.008 ppm (0.01 mg/m³) oil filtration.

Quality Classes	SOLIDS Maximum Particle Size (microns)	
	0	as specified
1	.01	
2	1	
3	5	
4	15	
5	40	
6	—	

Quality Classes	MOISTURE Dew Point	
	°C	°F
0	as specified	
1	-70	-94
2	-40	-40
3	-20	-4
4	3	38
5	7	45
6	10	50

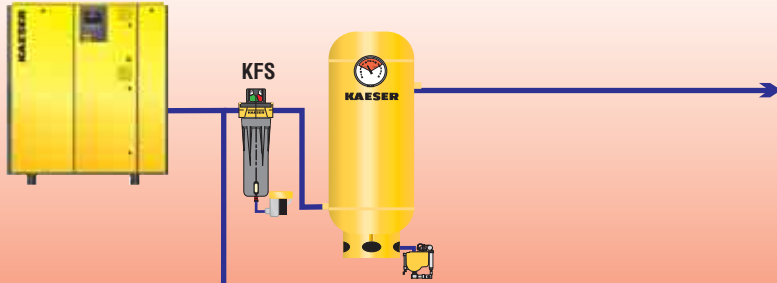
Quality Classes	OIL Liquid and Gas	
	mg/m ³	ppm _{w/w}
0	as specified	
1	0.01	0.008
2	0.1	0.08
3	1	0.8
4	5	4
5	>5	>4
6	—	—

Examples of Clean Air Treatment

A solution for every application!

The six levels below provide a framework for completing a compressed air system. Each level progresses to

cleaner and purer air by removing finer amounts of contamination, water, oil aerosols, and oil vapors. Note the location of each product and then look on the following pages for the function and capabilities of each.

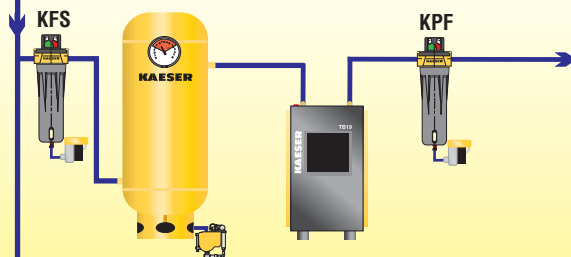


Level 1

Filtered Centrifugal Separator KFS removes all solids three microns and larger. Removes liquids: 99% of water droplets, 40% of oil aerosols.

ISO 8573.1 Quality Class: 3.x.5

Application: Primary stage for all compressed air treatment levels

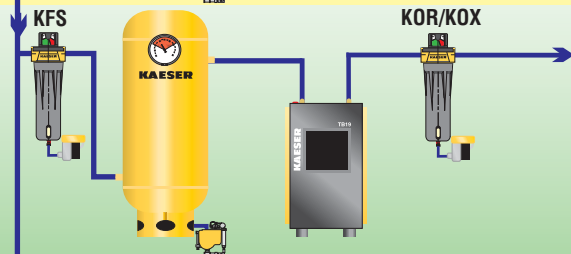


Level 2

Refrigerated Compressed Air Dryer produces pressure dew points as low as 35°F. **Air Line Filter** removes 70% of oil aerosols and all solid particles one micron and larger.

ISO 8573.1 Quality Class: 2.4.4

Applications: Air Tools, Sand Blasting

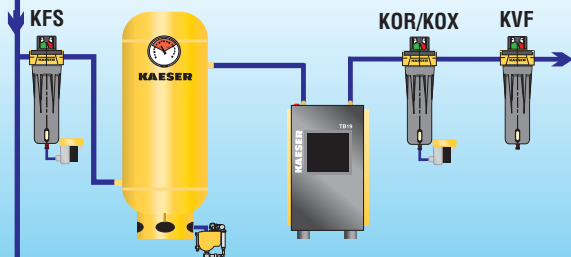


Level 3

Refrigerated Compressed Air Dryer produces pressure dew points as low as 35°F. **Oil Removal Filter** removes 99.999% of oil aerosols and all solid particles 0.01 microns and larger.

ISO 8573.1 Quality Class: 1.4.2

Applications: Instrument Air, Paint Spraying, Powder Coating

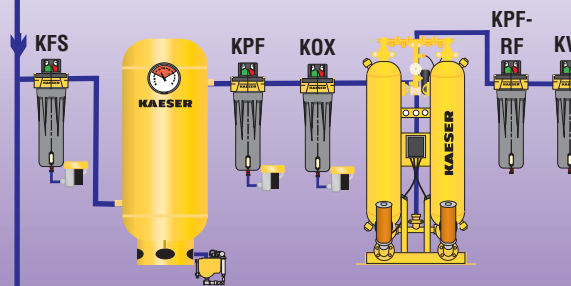


Level 4

Refrigerated Compressed Air Dryer produces pressure dew points as low as 35°F. **Oil Removal Filter** removes 99.999% of oil aerosols and all solid particles 0.01 microns and larger. **Oil Vapor Adsorber** removes oil vapor, oily smell and taste.

ISO 8573.1 Quality Class: 1.4.1

Applications: Food Industry, Chemical and Pharmaceutical Industry

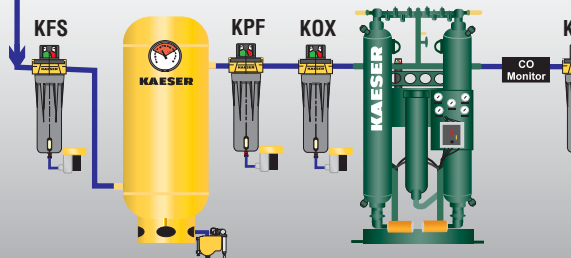


Level 5

Air Line Filter removes 70% of oil aerosols and all solid particles one micron and larger. **Oil Removal Filter** removes 99.999% of oil aerosols and all solid particles 0.01 microns and larger. **Low Dew Point Desiccant Dryer** produces pressure dew points as low as -100°F.

ISO 8573.1 Quality Class: 1.1.1

Applications: Breweries, Dairy Industry, Electronics Industry



Level 6

Breathing Air System (Continuous or Portable) removes common harmful compressed air contaminants and will produce Grade D breathing air.

ISO 8573.1 Quality Class: 1.2.1

Application: Breathing Air



Air-Cooled Aftercooler

Atmospheric air entering a compressor contains water vapor. The compression process concentrates these water vapors. Once 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 and lost production time results. Aftercoolers are an economical way to remove up to 70% of water vapor and cool air to safe, usable levels for many applications. Aftercoolers also prepare the air for further filtration and drying.



Membrane Dryer With Filter

Aftercoolers and Separators

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

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.

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.

Sizes: AC, up to 3500 scfm

Sizes: WC, up to 2700 scfm

High Pressure Aftercoolers

High Pressure Aftercoolers are available in a water-cooled version. Varying sizes and pressures are available. Stainless steel heat exchanger tubes provide durability for the demanding pressures.

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 can be substituted in place of a KLS to provide particulate filtration as well.

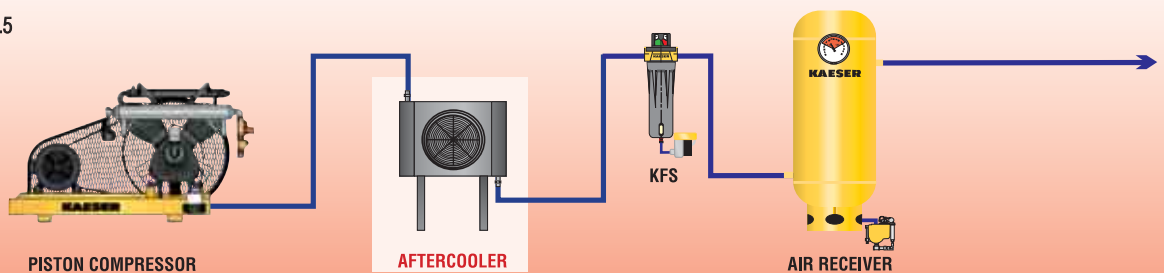
Sizes up to 21,250 scfm

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: 3.x.5

Level 1:
Low Grade Shop Air





Refrigerated Air Dryers

Refrigerated dryers dry air to pressure dew points as low as 35°F, which accounts for the majority of compressed air applications. The refrigeration system cools the air thereby allowing moisture to condense. All dryers include a moisture separator and drain for removing water from the system. Kaeser offers a variety of refrigerated dryers to meet general or specific needs.



High Inlet Temperature Dryer

Refrigerated Air Dryers

Refrigerated Air Dryers (TX, H and T Series)

Kaeser offers a very wide range of hot gas bypass refrigerated dryers with excellent dew point response. Larger T series dryers are available with energy saving controls such as our Demand Manager Control or Dual Control. The Demand Manager Control works best with steady airflow demand while the Dual Control matches energy requirements to fluctuating airflow. All units use environmentally friendly R-134a refrigerant in models up to 750 scfm, R-404a in models from 1000 to 3000 scfm.

Sizes up to 3000 scfm

Cycling Refrigerated Dryers (Secotec)

Kaeser cycling dryers offer the most 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 520 scfm

High Capacity Refrigerated Dryers (KHD)

KHD's are large non-cycling dryers available with a maximum working pressure of 175 psig (higher pressures are available). The multi-pass heat exchangers provide uniform cooling and stable dew point over a full range of flow conditions. The KHD's are designed for low pressure drop and include a 2-stage separator for maximum moisture removal.

Sizes up to 20,000 scfm

High Temperature Refrigerated Dryers (HTRD)

HTRD's replace a separate aftercooler, separator, dryer and filter. Designed for high inlet temperatures, they 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

High Pressure Refrigerated Dryers (HT)

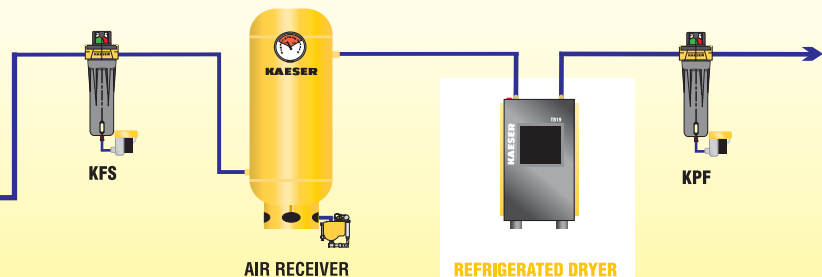
High pressure applications are also subject to the threat of contaminants and harmful moisture. Kaeser offers a line of dryers for PET bottling systems and other applications above 200 psig

Sizes up to 3750 scfm

Models from 500 to 900 psig

ISO 8573.1 Quality Class: 2.4.4

**Level 2:
General Shop Air
Air Tools
Sand Blasting**





Filters

Filters provide the additional protection from contaminants that degrade process equipment and decrease air tool performance. Filters remove the solid particles, oil aerosols, moisture and oil vapors that get past the dryers. Adding filters to the compressed air system will save considerable costs in process downtime, for 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. The filters 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

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 before air dryers and after aftercoolers. These filters provide sufficient filtration for low grade shop air.

Kaeser Particulate Filter (KPF)



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

They can be used in wet or dryer air streams, but serve primarily to protect the very fine media of oil and coalescing filters from gross particulate contamination and heavy liquid loading. Use these filters upstream of KOR and KOX filters in desiccant dryer installations, or down-stream 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 small particles. These coalescing filters should be placed downstream of refrigerated dryers to prevent oil carry-over and upstream of desiccant dryers to prevent oil from contaminating the desiccant. A KFS or KPF should always be placed upstream of the KOR to prevent it from overloading with liquid.

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, to prevent overloading with liquid.

Kaeser Vapor Filters (KVF)

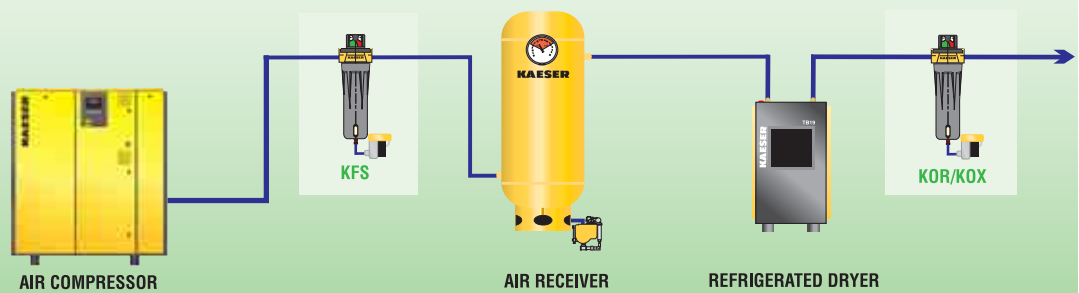


Kaeser Vapor Filter (KVF) remove oil vapors and odor from compressed air. Several layers of activated carbon provide effective removal of

these vapors. These filters should be placed downstream of KOR/KOX filters since they do not tolerate any liquid. The food and chemical industries benefit from these filters in maintaining product quality.

ISO 8573.1 Quality Class: 1.4.2

Level 3:
Instrument Air
Paint Spraying
Powder Coating
Packing Machines





Oil Mist Eliminator

Oil Mist Eliminators (OME)

Oil Mist Eliminators (OME) are basically 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 associated with compressed air. They are used where oil vapor and odor 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



Kaeser Activated Carbon Tower

Single Tower Desiccant Dryer (KDF)

Kaeser single tower desiccant air dryers that 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



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

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-line from high pressure compressors or boosters and dryers. They are also available in all filter grades except HTA; see previous page.

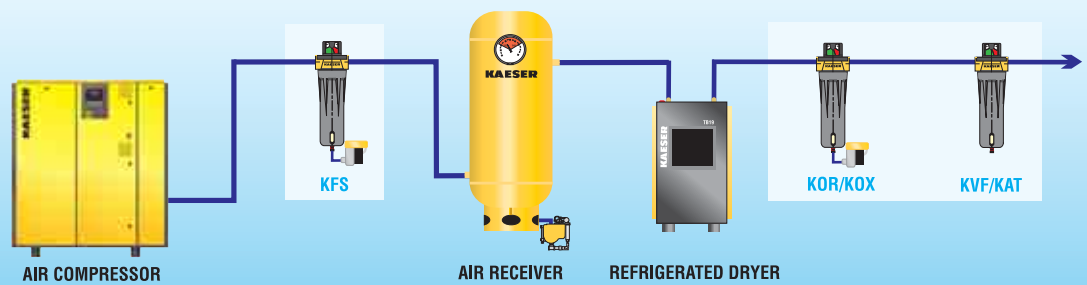
Filter Monitor (KFM)



The Kaeser Filter Monitor is a micro-processor control with LCD display. It indicates optimum element replacement based on operating time, differential pressure, and filter type. When equipped with the optional filter monitor relay box an alarm signal may be transmitted to a remote location.

ISO 8573.1 Quality Class: 1.4.1

Level 4:
Food Industry
Pharmaceutical &
Chemical Industries
Laboratories





Heatless Adsorption Dryer

Desiccant dryers provide extremely dry air for processes that are moisture sensitive or applications where the compressed air system is exposed to very low ambient temperatures. Dew points achieved are 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 or replaced. The method of regeneration is what differentiates the types of desiccant dryers (KAD, KED, and KBD).



Heatless Adsorption Dryer- Wall Mounted

Desiccant Air Dryers

Kaeser Adsorption Desiccant Dryers (KAD)

Kaeser Adsorption Desiccant dryers (KAD) are heatless reactivating dryers that rely on purge air for regeneration. Approximately 15% of the dry exhaust air is used to regenerate the saturated tower. KAD's are initially less expensive than heat reactivated dryers.

Sizes: 40 – 5400 scfm

Kaeser Adsorption Desiccant Wall Mounted Dryers (KADW)

Kaeser Adsorption Desiccant Wall mounted dryers are available in 5 to 25 scfm sizes. The optional mounted filters provide easy installation.

Sizes: 5 – 25 scfm

Kaeser Heated Purge Dryers (KED)

Kaeser Purge Dryers (KED) are heated regenerative dryers that use only 7% of exhaust air for purging. They heat the 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.

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 the 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

Breathing Air Systems



Kaeser Breathing Air Systems (KBS) provide safe air for applications where workers have to be protected from harmful gases and fumes. These systems include filters to remove contaminants and oil, a desiccant air

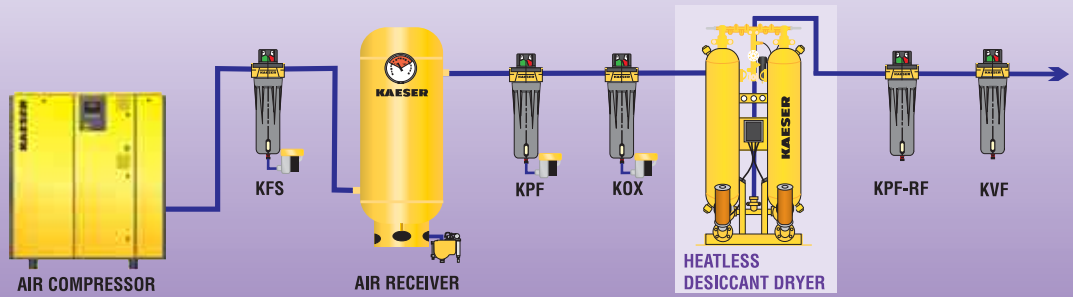
dryer to remove moisture, and catalytic materials to convert carbon monoxide to carbon dioxide. The KBS meet OSHA's standard for breathing air quality.

Sizes up to 862 scfm

ISO 8573.1 Quality Class: 1.1.1

Level 5:

Outdoor Pipelines
Breweries
Dairy Industry
Electronics Industry
Pharmaceutical &
Chemical Industries
Laboratories





Automatic Magnetic Drain Trap

Once the moisture is collected it has to be discharged from the system. If it is not, the water will accumulate and move down line into the piping system contaminating your equipment or process. Kaeser offers a variety of drain traps to remove moisture automatically. Drain traps remove moisture from separators, receiver tanks, intercoolers, aftercoolers, dryers, filters, and drip legs.



Eco-Drains

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.

AMD-6550

The AMD-6550 is a heavy-duty, float-actuated model designed for large liquid loads and severe conditions. Its magnetic actuator, which is completely isolated from the dirty condensate, prevents malfunction due to contamination build up, and requires no electricity. The AMD is exceptionally reliable.

Eco-Drain

The Eco-Drain series is ideal for dryers, filters and smaller tanks. It employs a capacitance sensor for actuation and a patented 3/2 way valve ensure that control air is contaminant free.

Economical Alternative

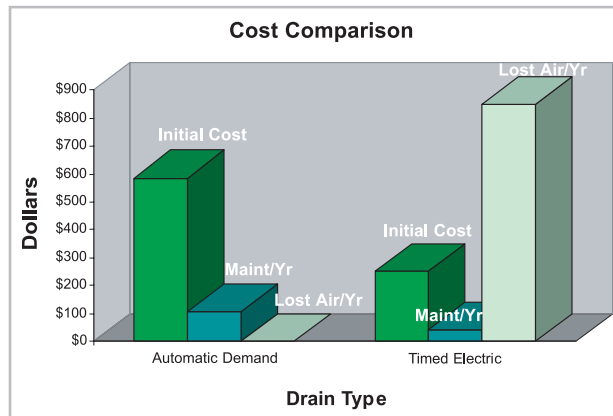
The ADT uses a float to activate a valve and release water. The mechanical actuation prevents costly compressed air from being released and eliminates the need for electrical connection.



The ADT uses a float to activate a valve and release water. The mechanical actuation prevents costly compressed air from being released and eliminates the need for electrical connection.



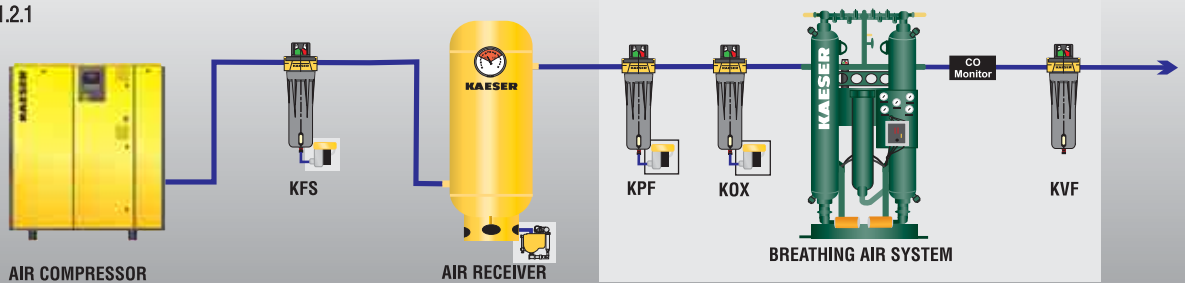
ADT 190 and snap traps



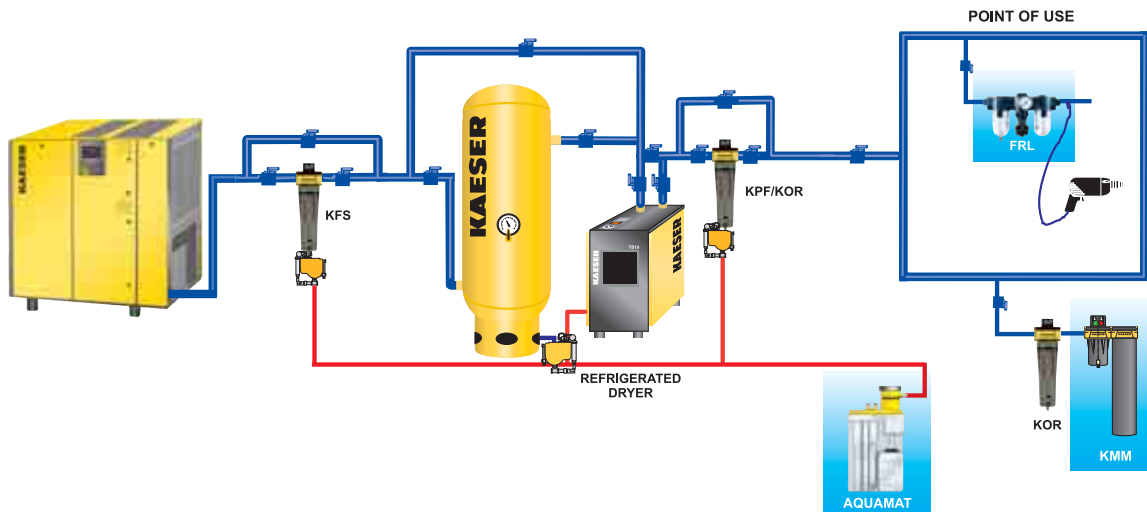
Many users rely on timed electric drains. While simple and inexpensive, they are not cost effective in the long run. Because condensate accumulates at different rates depending on climate and season, these drains frequently either open too often or not often enough. Most users err on the side of too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

ISO 8573.1 Quality Class: 1.2.1

Level 6:
Breathing Air
Meets OSHA
grade D)



COMPRESSED AIR SYSTEM



Environmental Protection

Compressed air condensate is a by-product of all compressors. It is a mixture of oil and water with ambient particulates and hydrocarbons that have been concentrated during the compression process. Disposing of compressed air condensate is a major environmental concern. 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 Aquamat and KCF condensate management systems offer a reliable and economical method of oil/water separation.



Aquamat Condensate Separator



Kaeser Condensate Filter

KAESER COMPRESSORS

Built for a lifetime.™

Corporate Headquarters:
P.O. Box 946
Fredericksburg, Virginia 22404
Phone 540-898-5500
Fax 540-898-5520
www.kaeser.com

Certified Management Systems



The Air Systems Specialist

With over 85 years of experience, Kaeser is the air systems specialist. Our extensive 100,000 square foot facility allows us to provide unequalled product availability. With service centers nationwide and our 24-hour emergency parts guarantee, Kaeser customers can rely on the best after-sales support in the industry. Kaeser stands committed to providing the highest quality air system for your specific compressed air needs.