SECOTEC®
Refrigeration Dryers

Air flow rate
0.6 to 22 m³/min

KAESER COMPRESSORS

SECOTEC® – Saves even more energy

Why is it necessary to dry compressed air?

The atmospheric air drawn into a compressor is a mixture of gases that always contains water vapour. However, the amount of water vapour air can carry varies and is mostly dependent on temperature. As air temperature rises – which occurs during compression – the air's capacity to hold moisture increases also. When the air is cooled, its capacity to hold moisture reduces which causes the excess moisture to condense. This condensate is then removed in the centrifugal separator, or the air receiver, downstream of the compressor. Even then, the air is still 100% saturated with water vapour.

This is why, as the air cools further, significant amounts of condensate can accumulate in the air distribution piping and at takeoff points.

System failure, production downtime and costly service and repair work are therefore unavoidable without additional air-drying.

The SECOTEC® dryer

Refrigeration drying is usually the most efficient solution for the majority of compressed air applications. Air-drying is now made even more cost-effective with KAESER's advanced SECOTEC® systems.

The SECOTEC® system

In developing the SECOTEC® dryer, KAESER's goal was to produce a system that consumed minimal energy and which would provide optimal reliability and user-friendliness. The resulting SECOTEC® system fulfils all of these requirements and, in contrast to most refrigeration drying systems, uses a highly efficient cycling system: SECOTEC® control. Therefore, the dryer's refrigeration compressor cuts in and consumes power only when necessary.

Variant 1

*For **generally consistent air demand**, the SECOTEC® dryer is located downstream of the compressor and air receiver.*

Variant 2

*For **heavily fluctuating air demand**, the SECOTEC® dryer is located between the compressor, centrifugal separator and air receiver.*

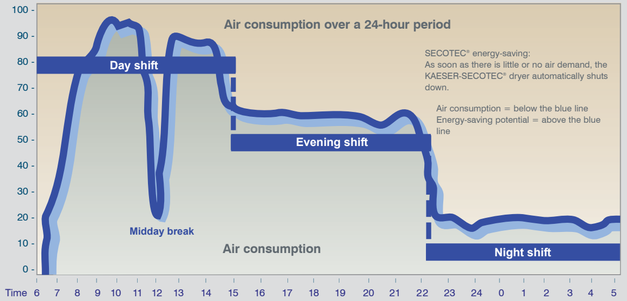
The cost-saving effect of the SECOTEC® system

For example, the TB 19 dryer (air flow 2.1 m³/min) saves a total of □ 267 per year compared with non-cycling dryers when working in single shift operation (8760 hours, of which only 1000 are under full load) at a kWh price of □ 0.08. This cost saving is calculated using the following formula:

(8760 h - 1000 h) x 0.43 kW x 0.08 €/kWh = 267 €

The adjacent graph shows a typical compressed air consumption profile. During breaks, periods of low demand and shutdown SECOTEC® dryers save energy because the refrigerant system is shut down - the control system operates without preset run-on periods. The integrated thermal storage mass ensures that the system is ready for operation at all times. A further advantage of SECOTEC® dryers is that they have a very low pressure drop compared with alternative drying systems.

This allows the maximum pressure of the compressors to be reduced, consequently enabling additional energy savings.



Condensate Separator

As with all KAESER products, SECOTEC® dryers are designed for maximum reliability. They are equipped with a specially designed condensate separator made from corrosion-resistant stainless steel that reliably removes condensate from the air even under fluctuating airflow conditions.

ECO DRAIN

SECOTEC® refrigeration dryers are fitted as standard* with an ECO DRAIN condensate drain. Unlike time-controlled solenoid valves, this electronically controlled level-sensing drain reliably removes condensate without pressure loss. As a result, the ECO DRAIN enables further energy savings and contributes to the outstanding reliability of the dryer.

*) Model TA 5 is fitted with a float drain as standard

Lower differential pressure

If a dryer has a differential pressure (pressure drop) of 0.5 bar for example, then the screw compressor upstream requires 3 percent more energy. The differential pressure of SECOTEC® dryers is reduced to a minimum thanks to generously-sized design: Depending on model, the figure ranges from 0.07 to 0.24 bar under reference conditions to ISO 7183*. This means that in addition to the energy savings achieved by SECOTEC® cycling control, further significant reductions in air costs are made possible as a result of the compressor being able to operate at a lower pressure. The pressure differential remains low even after years of operation.

*) See "Technical Specifications".

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Technical Specifications

- Air dryers must be selected to suit actual operational conditions:
- The maximum possible flow rate through the refrigeration dryer rises with increasing working pressure.
- In contrast, the maximum possible flow rate through the dryer falls with increasing air inlet temperature.
- The maximum possible flow rate through the dryer also falls with increasing ambient temperature.

Model	Flow rate in m³/min at 7 bar working pressure ►	Differential pressure bar	Max. working pressure bar	Effective power consumption kW	Power supply	Refrig-erant	Air connection (female thread)	Con-densate outlet mm	Dimensions in mm Height	Width	Depth	Weight kg
TA 5	0.6	0.07	16	0.25	230 V 50 Hz 1 Ph	R 134a	G ¾	DN 6	747	484	630	70
TA 8	0.85	0.14		0.25								80
TA 11	1.25	0.17		0.28								85
TB 19	2.1	0.19		0.43			G1	DN 9	963	540	620	108
TB 26	2.55	0.20		0.61								116
TC 31	3.2	0.20		0.73			G 1¼		1009	660	765	155
TC 36	3.9	0.23		0.8								170
TC 44	4.7	0.15		0.9								200
TD 51	5.65	0.11		0.86	400 V 50 Hz 3 Ph		G 1½		1186	759	1125	251
TD 61	7.0	0.15		1.1								
TD 76	8.25	0.17		1.4			G 2		1186	759	1125	287
TE 91	10.15	0,15		1.15					1540	1060	1480	570
TE 121	12.7	0.18		1.45								660
TE 141	14.3	0.24		1.6								660
TF 172	17.0	0.17		2.85			DN 80	DN 13	1750	1034	1629	645
TF 202	22.0	0.19		3.65								740

► Performance data for reference conditions to ISO 7183, option A; ambient temperature 25 °C, air inlet temperature 35 °C, pressure dew point 3 °C. The flow rate changes for other operating conditions.

Correction factors for deviating operating conditions (flow rates in m³/min x $c_{...}$)

Deviating working pressure p at dryer inlet

p (bar)	3	4	5	6	7	8	9	10	11	12	13	14	15	16
c_p	0.75	0.84	0.9	0.95	1	1.04	1.07	1.1	1.12	1.15	1.17	1.19	1.21	1.23

Air inlet temperature T_i

T_i (°C)	30	35	40	45	50
c_{Ti}	1.2	1	0.83	0.72	0.6

Ambient temperature T_a

T_a (°C)	25	30	35	40
c_{Ta}	1	0.985	0.97	0.94

Calculation of dryer flow rate under deviating conditions:

Example:

Working pressure:	10 bar(g)	▻ Table	▻ c_p	= 1.1
Air inlet temperature:	40 °C	▻ Table	▻ c_{Ti}	= 0.83
Ambient temperature:	30 °C	▻ Table	▻ c_{Ta}	= 0.985

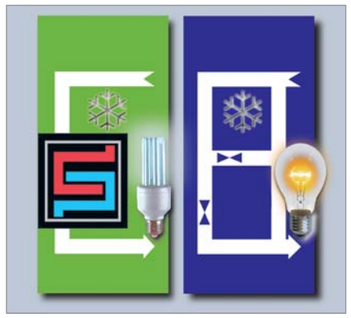
Selected dryer is a TB 19 with 2.1 m³/min ($V_{reference}$)

Max. possible flow rate under operating conditions:

$V_{max.\ operational} = V_{reference} \times c_p \times c_{Ti} \times c_{Ta}$

$V_{max.\ operational} = 2.1\ m^3/min \times 1.1 \times 0.83 \times 0.985 = 1.89\ m^3/min$

SECOTEC® – Eight Decisive Advantages



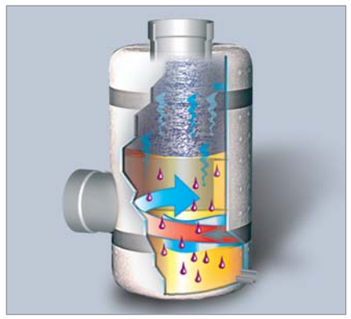
1 Energy savings all day, every day, with SECOTEC® control

SECOTEC® control is a cycling control system that activates the dryer's refrigerant compressor only when necessary. The basic requirement for this type of control is a high capacity thermal mass: It is cooled down to cut-out temperature by the refrigeration circuit and extracts the heat from the compressed air flowing through the heat exchanger. As soon as the temperature of the thermal mass rises to the cut-in temperature the refrigerant compressor starts and cools it down again. Due to the thermal mass's high capacity, the refrigerant compressor can be shut down as soon as the lower temperature is reached. This feature considerably reduces power consumption compared with non-cycling controllers or controllers with a run-on period.

delta P only 0.07 – max. 0.24 bar

2 Lower pressure drop means more savings

The air/air and refrigerant/air heat exchangers are equipped with generously sized copper piping to ensure minimal pressure drop. The smooth inner walls of the piping prevent deposits from accumulating, so that the pressure drop across the SECOTEC® dryer remains low, even after years of operation. In addition, SECOTEC® dryers do not require a pre-filter, which means that costly pressure drops caused by additional filters are avoided.



3 Efficient stainless steel condensate separator

A deflector plate forces the compressed air that streams into the separator into circular motion. The air then flows through a stainless steel wire mesh that ensures 99.9% water separation from the air. With perfect matching of components, this degree of separation remains almost constant even with fluctuating air flow. This allows the required pressure dew point of +3 °C to be reliably maintained. The separator tank and wire mesh are made from stainless steel so that no corrosion can occur. Solid particles are also washed out and separated with the condensate.

4 Dependable, intelligent condensate drainage

The **ECO-DRAIN** is fitted with an intelligent level-sensing control that prevents loss of pressure though the condensate drain line. When the collector tank is full, the level sensor opens a diaphragm valve and the condensate is drained off. The electronics keep the valve open until the container is empty and close it again before any compressed air can escape.

5 Simple, cost-effective servicing

All components in SECOTEC® dryers, such as heat exchangers, the refrigerant circuit, condensate separator and condensate drain, are easily accessible from above when the unit's panels are removed. Service valves are also provided to make inspection of the refrigerant circuit as simple as possible. Furthermore, the condenser is located at the front of the dryer, which allows possible dirt accumulation to be quickly spotted and rectified. Logical component layout and the tower design not only enable maintenance work to be carried out easily, but also significantly reduce servicing requirement and therefore costs.

6 Industrial quality control cabinet for increased safety

Every SECOTEC® dryer is EN 60204-1 compliant and is tested for electromagnetic compatibility in accordance with applicable EMC standards. Unlike equipment conforming to VDE 07010, SECOTEC® dryers conform to a strict industrial standard and are therefore equipped with a control cabinet to IP 54, a control transformer and fuses for the control and power circuits. The control transformer ensures that the control circuits are DC-isolated from the mains, so that personnel are protected even if a short circuit occurs. The whole system is designed with maximum safety and reliability in mind.

Fuses conform to EN 60204-1, as external fuses on the electrical supply side are not permitted for use in industrial environments, e.g. due to long supply cables.

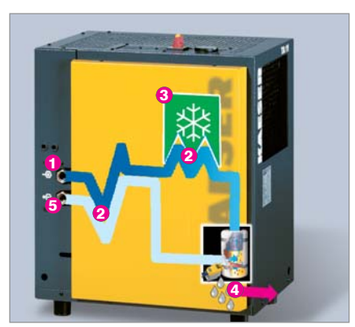
7 User-friendly operation

The tower construction of the SECOTEC® dryer makes servicing work simple and ensures user-friendly operation. Due to its convenient position on all models, the control panel can be viewed at a glance, whilst a dew point trend gauge integrated within the panel monitors dryer operation. System features include: Emergency/Off switch, LEDs to indicate "Thermal Mass Active" and "Refrigerant Compressor ON". Optional from models TE 91 upwards and standard from TF models upwards: LEDs to indicate "High Dew Point" and "ECO Drain Alarm". All of these features provide ease of operation and enhance system reliability.

8 Unrivalled reliability

Operation of SECOTEC® refrigeration dryers can be divided into four stages: **Stage 1:** the hot compressed air (1) entering the dryer is initially cooled* in the upper part of the heat exchanger (2) by the cold compressed air leaving the dryer. **Stage 2:** the air is cooled down further to the dew point temperature in the lower part of the heat exchanger (2) by a refrigerant circuit with a thermal mass (3). **Stage 3:** the condensate formed as a result of the cooling process is separated from the compressed air by the multistage, maintenance-free separator (4). The condensate is removed from the separator by the automatic ECO DRAIN (4). **Stage 4:** the cold and dry air passes out of dryer outlet (5) after passing through the upper part of the heat exchanger (2) where it takes some of the heat* from the incoming air.

*) Model TA 5: without initial cooling and reheating, stages 2-3 use float drain.



SECOTEC® - Equipment

General design

Tower construction with removable side panels, sheet steel panelling powder-coated outside and galvanised inside; all cold components are insulated; all materials used are CFC-free; the built-in control cabinet is enclosure-protected to IP54, air to air heat exchanger (model TA 8 upwards); condensate separating system, automatic condensate drain; scope of delivery includes refrigerant and oil.

Control panel

Equipped with dew point trend gauge, Emergency/Off switch, LEDs to indicate "Thermal Mass Active" and "Refrigerant Compressor ON". Volt-free relay contacts for "High Dew Point" and "Compressor ON" are fitted as standard on models TC 31 and upwards. LEDs for "High Dew Point" and "ECO Drain Alarm" are optional on TE models upwards.

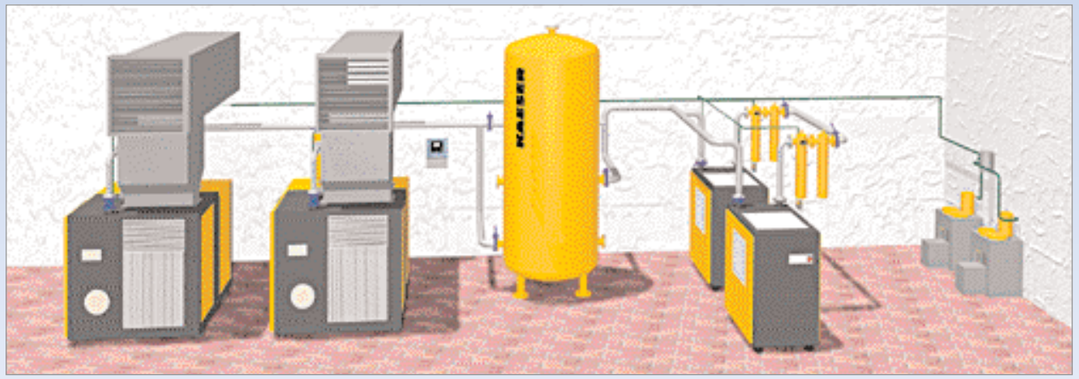
Refrigerant circuit

Hermetically-sealed refrigerant circuit equipped with service valves, SECOTEC cycling control with thermal mass, automatic dew point control and a generously sized refrigerant compressor.

Optional accessories

Bypass piping system. This option ensures compressed air is supplied even while service work is carried out on the refrigeration dryer.

Comprehensive design know-how



KESS (KAESER's Energy Saving Service) provides comprehensive analysis of your compressed air usage, enabling KAESER's experts to plan and design a system that is specially tailored to meet all of your compressed air requirements. This service combines tried and tested compressed air components, user advice and services with cutting-edge technology to ensure maximum efficiency - KAESER air systems typically operate at 95 percent load capacity or more. Every KAESER compressed air system illustrates KAESER's commitment to producing application-specific quality compressed air at the lowest possible cost, combined with unsurpassed reliability. Use this expertise to your advantage and let KAESER design your compressed air system.

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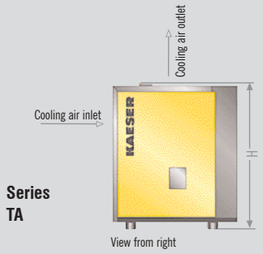
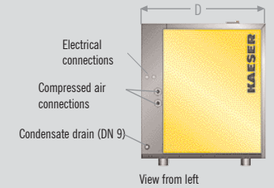
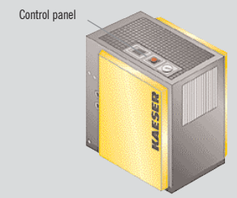
Dimensions

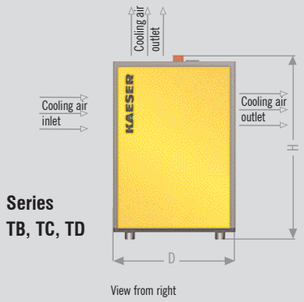
Series TA

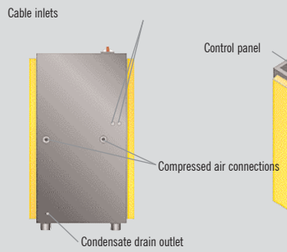




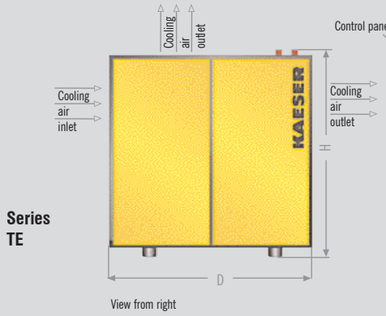


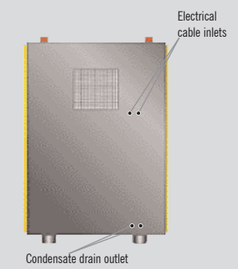
Series TB, TC, TD

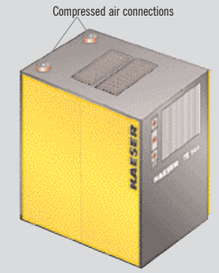




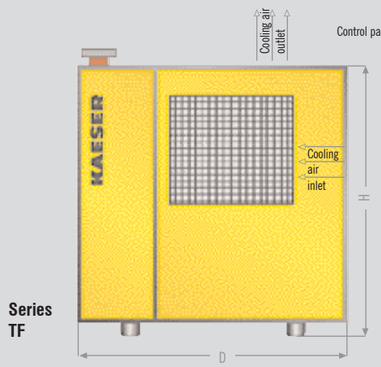
Series TE

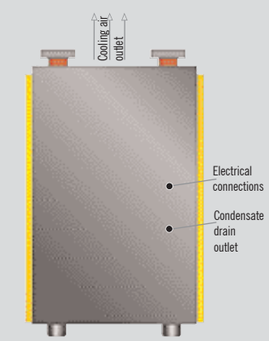


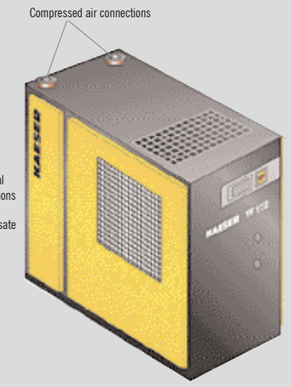




Series TF







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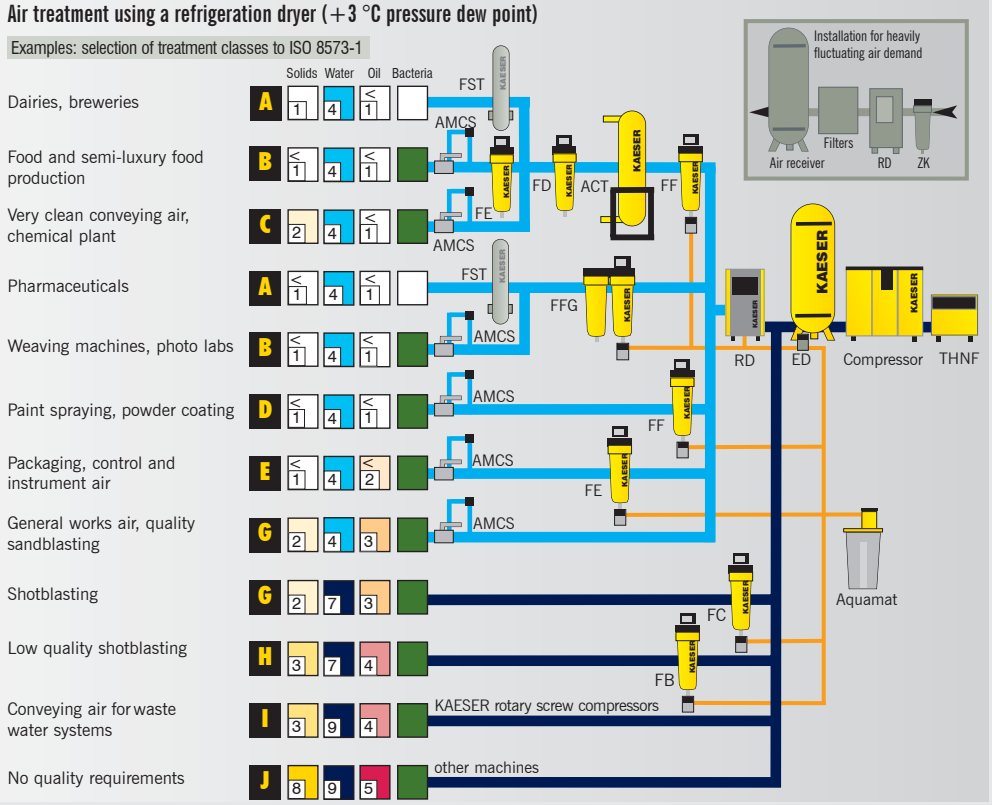
Different fields of application need different grades of air treatment

Choose the required grade of treatment according to your field of application:

Air treatment using a refrigeration dryer (+3 °C pressure dew point)

Examples: selection of treatment classes to ISO 8573-1



Explanation:

THNF = bag filter
cleans dusty and highly contaminated intake air

ZK = centrifugal separator
removes condensate

ED = ECO Drain
electronic level-controlled condensate drain

FB = prefilter 3 µm
separates liquid droplets and solid particles >3 µm, oil content ≤5 mg/m³

FC = prefilter 1 µm
separates oil droplets and solid particles >1 µm, oil content ≤1 mg/m³

FD = particulate filter 1 µm
separates dust particles (attrition) >1 µm

FE = microfilter 0.01 ppm
separates aerosol oils and solid particles >0.01 µm, aerosol content ≤0.01 mg/m³

FF = microfilter 0.001 ppm
separates aerosol oils and solid particles >0.01 µm, oil content ≤0.001 mg/m³

FG = activated carbon filter
for adsorption of oil vapours, oil vapour content ≤0.003 mg/m³

FFG = combination filter
comprising FF and FG

RD = refrigeration dryer
pressure dew point to +3 °C

DD = desiccant dryer
for compressed air drying; DC series - heatless regeneration, pressure dew point to -70 °C; DW, DN, DTL and DTW series - heat regeneration, pressure dew point to -40 °C

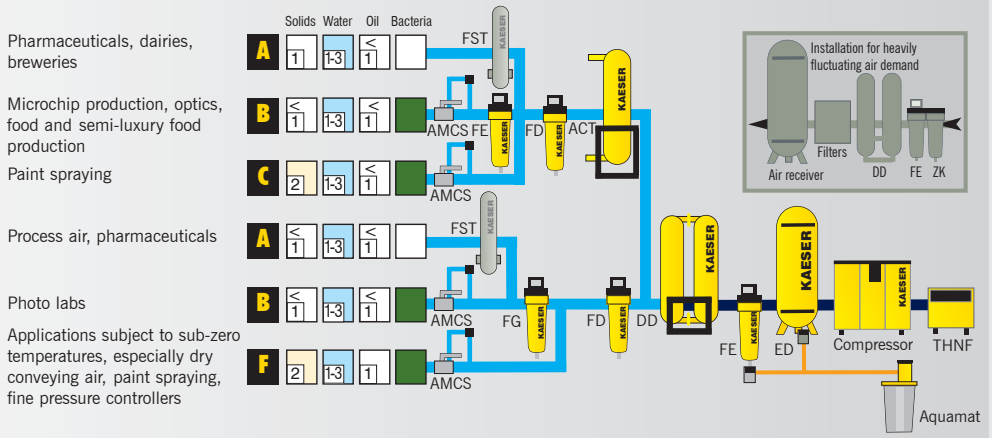
ACT = activated carbon adsorber
for adsorption of oil vapours, oil vapour content ≤0.003 mg/m³

FST = sterile filter
for bacteria-free air

Aquamat = condensate treatment system

AMCS = air-main charging system

For air mains subject to sub-zero temperatures: treatment systems with desiccant dryers (pressure dew point to -70 °C)



Contaminants:

+ solids -
+ water -
+ oil -
+ bacteria -

Degree of filtration:

ISO 8573-1 Class	Solid particles: Max. no. of particles per m³ with size d (µm) 0.1 < d ≤ 0.5	0.5 < d ≤ 1.0	1.0 < d ≤ 5.0	Solid particles: Mass concentration µm	mg/m³	Humidity: Pressure dew point (x = liquid water *** 3)	Oil concentration mg/m³
0	as specified by user						
1	–	100	1	0	–	–	≤ -70 °C	≤ 0.01
2	–	100000	1000	10	–	–	≤ -40 °C	≤ 0.1
3	–	–	10000	500	–	–	≤ -20 °C	≤ 1.0
4	–	–	–	1000	–	–	≤ +3 °C	≤ 5.0
5	–	–	–	20000	–	–	≤ +7 °C	–
6			–		≤ 5	≤ 5	≤ +10 °C	–
7			–		≤ 40	≤ 10	x ≤ 0.5	–
8			–		–	–	0.5 < x ≤ 5.0	–
9			–		–	–	5.0 < x ≤ 10.0	–

A Oil vapour content ≤ 0.003 mg/m³, particle retention > 0.01 µm sterile, odourless and taste-free

B Oil vapour content ≤ 0.003 mg/m³, particle retention > 0.01 µm

C Oil vapour content ≤ 0.003 mg/m³, particle retention > 1 µm

D Aerosol oil≤ 0.001 mg/m³, particle retention > 0.01 µm

E Aerosol oil≤ 0.01 mg/m³, particle retention > 0.01 µm

F Aerosol oil≤ 0.01 mg/m³, particle retention > 1 µm

G Aerosol oil ≤ 1 mg/m³, particle retention > 1 µm

H Aerosol oil≤ 5 mg/m³, particle retention > 3 µm

I Aerosol oil ≤ 5 mg/m³, particle retention > 1 µm

J Untreated

LGA InterCert Certified QM-System ISO 9001:2000
LGA InterCert Certified EM-System ISO 14001

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