KAESER COMPRESSORS

www.kaeser.com

Refrigeration Dryers TG – TI Series

Air flow 30.8 to 90.0 m³/min

KAESER COMPRESSORS

Energy-saving dryers

Save energy and money with a high-efficiency dryer

The innovative energy-saving system

In developing the energy-saving dryer, KAESER's goal was to produce a system that consumed minimal energy and which would provide optimal reliability and user friendliness.

KAESER's patented energy-saving system fulfils all of these requirements and, in contrast to comparable refrigeration drying systems, uses a highly efficient refrigerant compressor.

Super efficient refrigerant compressor

The newly developed refrigerant compressor is able to regulate the volume of refrigerant that circulates within the refrigeration circuit in such a way that it also reduces the compressor's power consumption. This is achieved via a solenoid valve which varies the volume of the compression chamber depending on compressed air cooling demand.

Integrated FE micro-filter (Option)

Energy-saving refrigeration dryers from Kaeser Kompressoren can be equipped with a FE micro-filter. This makes installation significantly easier. Cold compressed air (+3 °C) flows through the FE micro-filter which causes oil vapours to condense to form oil aerosols that can then be reliably separated from the air. Separation and filtration performance can be monitored via electronic filter monitors and an optional monitor box for signal conversion.

Durability with long-term value retention

The compressed air circuit is manufactured from high quality, durable materials. The copper-soldered stainless steel plate heat exchanger features generously sized piping and was specifically designed for use with compressed air applications. Service-friendly separator- and filtration- tanks made from stainless steel make filter changes simple.

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 that air can carry depends on the temperature. As air temperature rises – which occurs during compression – the air's ability to hold moisture increases also. When the air is cooled, its capacity to hold moisture reduces which causes the water vapour to condense.

Removing the moisture from the compressed air not only prevents costly breakdowns and production downtime, but also keeps maintenance and repair costs to a minimum.

Energy saving dryer system

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 energy-saving system.

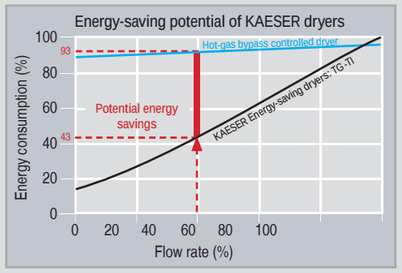
Energy saving with KAESER

For example: TH 451 at 40 % flow rate:

Annual energy saving:
€ 1,643 = 2.5 kW x (0.93 - 0.43) x 8760 h/year x 0.15 €/kWh
(Power consumption at 40 % flow volume: 2.5 kW)

CO_2 – reduction:
9.68 t CO_2/year; 98.6 t CO_2/10 years (1000 kWh power = 0.6 t CO_2 emissions)

Savings day after day



Energy-saving dryers from Kaeser Kompressoren enable significant savings all day, every day. For example, at 40 % airflow they consume only 43 % of their nominal energy requirement. This represents energy cost savings of approximately 54 % when compared with a conventional dryer with hot gas bypass control. In addition, each unit is fitted as standard with a timer which allows further savings to be made, e.g. in periods of low demand and down-time, such as during work breaks and the weekend - every kilowatt saved reduces CO_2 emissions and consequently benefits the environment. Moreover, extra savings of approximately 1000 Euros per year are possible if the dryers are used in air systems with redundant compressed air treatment and drying capacity, i.e. operating at 50 to 70 percent of rated compressed air flow.

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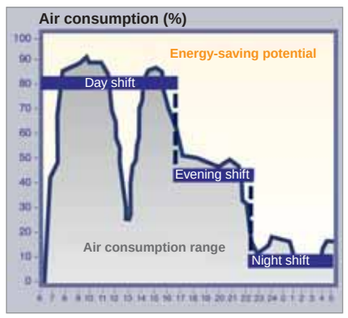
High-efficiency dryers – Eight decisive advantages

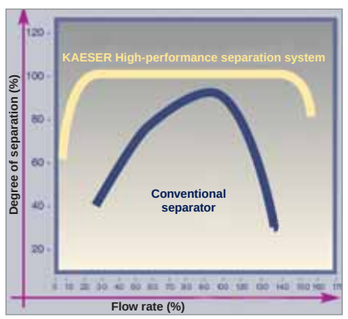


1 Daily savings

KAESER energy saving dryers consume electrical power only when actually drying air. The energy-saving control uses a combination of compressed air temperature measurement, programmable logic control and a refrigerant compressor that adjusts the size of its compression chamber according to flow volume. Electrical power consumption is directly proportional to air flow rate. For example, at 40 % maximum air flow rate, electrical power consumption is only 43 % of rated maximum. The result: significant savings day in, day out, year after year.

2 Minimal pressure drop for optimised energy costs

The generously proportioned separator and smooth-flow heat exchanger keep pressure drop over the dryer to an absolute minimum - appreciably less than other dryer designs. As a result, this enables the air network's maximum working pressure to be significantly reduced. This can help achieve considerable savings, as each 1 bar decrease potentially results in a 6 % reduction in energy consumption and a 25 % decrease in air leakage losses. In addition, KAESER energy-saving dryers also feature a contamination-resistant heat exchanger, which means that unlike other dryers they do not require a separate pre-filter. This achieves further energy savings and avoids additional investment costs.



3 High performance stainless steel separator system

Together with solid particles up to three microns, the condensate that forms during compressed air cooling is removed efficiently and reliably from the air via a high performance coalescence separator. Furthermore, the system's design ensures reliable condensate separation even under partial load conditions. A constant degree of separation is ensured from 10 to 150 % of nominal flow rate, even with widely fluctuating demand. This is particularly important for redundancy of dryers in large air supply systems.

4 Premium quality plate heat exchanger

The air/air and air/refrigerant stainless steel plate heat exchangers were specially developed for use in refrigeration dryers. Generously sized copper piping not only ensures minimal pressure drop, but also simplifies installation of ducting and pipe work. Furthermore, under normal conditions there is no need for an additional pre-filter, as all pipe work is both contaminant- and corrosion-resistant. All of these factors ensure that every KAESER energy-saving dryer provides many years of reliable service and retains unrivalled residual value.

5 Reliable and efficient condensate drainage

The ECO DRAIN condensate drain is equipped with an automatic level sensing control which opens a diaphragm valve that enables condensate to drain away when the collector tank is full. The electronic control system keeps the valve open until the container is empty and closes it again before any compressed air can escape.

6 Industrial quality control cabinet

Every KAESER energy-saving dryer is EN 60204-1 compliant and is tested for electromagnetic compatibility in accordance with applicable EMC standards. Unlike equipment conforming to VDE 0700, KAESER refrigeration dryers conform to a strict industrial standard and are equipped with a high-protection control cabinet and fuses for the control & power circuits. In addition, a control transformer ensures that the control circuits are DC-isolated from the mains. The whole system is designed with maximum safety and reliability in mind.

7 Optional filter monitoring

Energy-saving dryers from Kaeser Kompressoren can be equipped with an optional FE micro-filter. This provides electronic monitoring of the filter and the high-performance separator system. Microprocessor-controlled filter monitors and 'Monitor boxes' are installed to generate and forward signals. This option also provides remote filter monitoring capability. The "Group" and "Safety" alarm contacts provide additional security for specialised air treatment requirements.

8 Unrivalled reliability

Operation of the refrigeration dryer can be divided into four stages:

Stage 1: Warm, moist compressed air enters through the port (1) into the air/air exchanger (2) where it is pre-cooled by the cold, dried air leaving the dryer. Stage 2: The air is cooled further to the dew point temperature in the lower part of the heat exchanger (3) by the refrigerant circuit (4). Stage 3: Condensate formed as a result of the cooling process is removed from the air by the highly effective separation system (5). The condensate is removed from the separator by the automatic ECO DRAIN. Stage 4: The dried air is reheated in the upper part of the heat exchanger (2) before leaving the dryer outlet (6).

Equipment

General design

Tower layout with removable side panels; all panels powder-coated. All cold components are thermally insulated and all materials used are free of CFC. The integrated control cabinet is enclosure protected to IP 54 and contains a programmable logic controller. The dryer is equipped with air-to-air and air-to-refrigerant heat exchangers, a condensate separating system, an electronic condensate drain and top-positioned air connecting flanges. Scope of delivery includes refrigerant and oil charge.

Control panel

Display of energy savings, current flow rate and pressure dew point, two-line plain text display, three LED status indicators, ten selectable languages, ON/OFF key, test key for the electronic condensate drain, three timer programming keys, reset key and main switch.

Refrigerant circuit

Hermetically-sealed refrigerant circuit, scroll refrigerant compressor with variablere frigerant compression.

Stainless steel heat exchanger

The air/air and air/refrigerant heat exchangers are manufactured from premium quality stainless steel to ensure long service life and minimal maintenance requirement.

Construction

1. Flow-optimised smooth bore copper piping
2. Separator with integrated filter (optional)
3. Heat exchanger package
4. ECO DRAIN condensate drain
5. Condenser fan

Options

- Integrated stainless steel FE microfilter downstream from the separator, located at the coldest point
- Integrated stainless steel FE microfilter with electronic filter monitoring (sensors and monitor box)
- Water-cooled version
- Additional language modules available for control panel
- Profibus converter
- Pressure dew point monitoring
- 1 and 5 year maintenance packages

Technical specifications

Model	Flow rate at 7 bar Working pressure m³/min	Max. working pressure bar	Effective power consumption kW	Compressed air connection	Condensate drainage	Dimensions in mm W x D x H	Weight kg
TG 301	30.8	16	3.1	DN 80	2 x R 3/4	1032 x 1270 x 2162	520
TH 371	37.5	16	4.3	DN 100	2 x R 3/4	1287 x 1270 x 2162	690
TH 451	45.0	16	5.9	DN 100	2 x R 3/4	1287 x 1270 x 2162	690
TI 521	52.5	16	6.7	DN 150	2 x R 3/4	1510 x 1438 x 2162	880
TI 601	60.0	16	7.5	DN 150	2 x R 3/4	1510 x 1438 x 2162	880
TI 751	75.0	16	9.4	DN 150	2 x R 3/4	1510 x 1438 x 2162	1050
TI 901	90.0	16	11.5	DN 150	2 x R 3/4	1510 x 1438 x 2162	1200

Power supply 400 V, 50 Hz, 3 ph – Refrigerant R 404a

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 flow rates

Ambient temperature		*+ 25 °C*	*+ 30 °C*	*+ 35 °C*	*+ 40 °C*	*+ 45 °C*	
Correction factor		1.0	0.94	0.89	0.83	0.78	
Air inlet temperature		*+ 25 °C*	*+ 30 °C*	*+ 35 °C*	*+ 40 °C*	*+ 45 °C*	*+ 50 °C*
Pressure	3 bar	1.42	1.00	0.79	0.63	0.51	0.43
	5 bar	1.57	1.08	0.87	0.77	0.65	0.56
	7 bar	1.67	1.22	1.00	0.84	0.71	0.63
	9 bar	1.76	1.29	1.07	0.91	0.78	0.67
	11 bar	1.84	1.36	1.13	0.96	0.82	0.73
	13 bar	1.90	1.41	1.18	1.00	0.86	0.77

Correction factor

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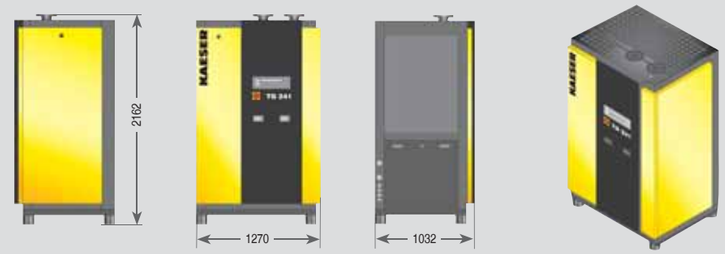
Comprehensive design know-how

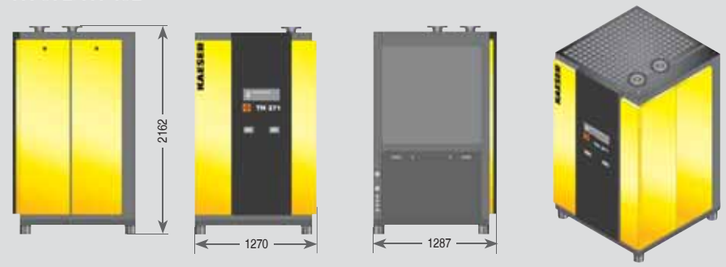
KESS (KAESER's Energy Saving System) provides comprehensive analysis of your compressed air usage, enabling KAESER's experts to plan and design a system that is specially tailored to meet all of your compressed air needs. Typically ensuring a 95-98 % load capacity, KAESER compressed air systems provide exceptional efficiency and produce application-specific quality compressed air at lowest possible cost. Use this expertise to your advantage and let KAESER's experts design your compressed air system.

Dimensions

TG 301



TH 371/TH 451

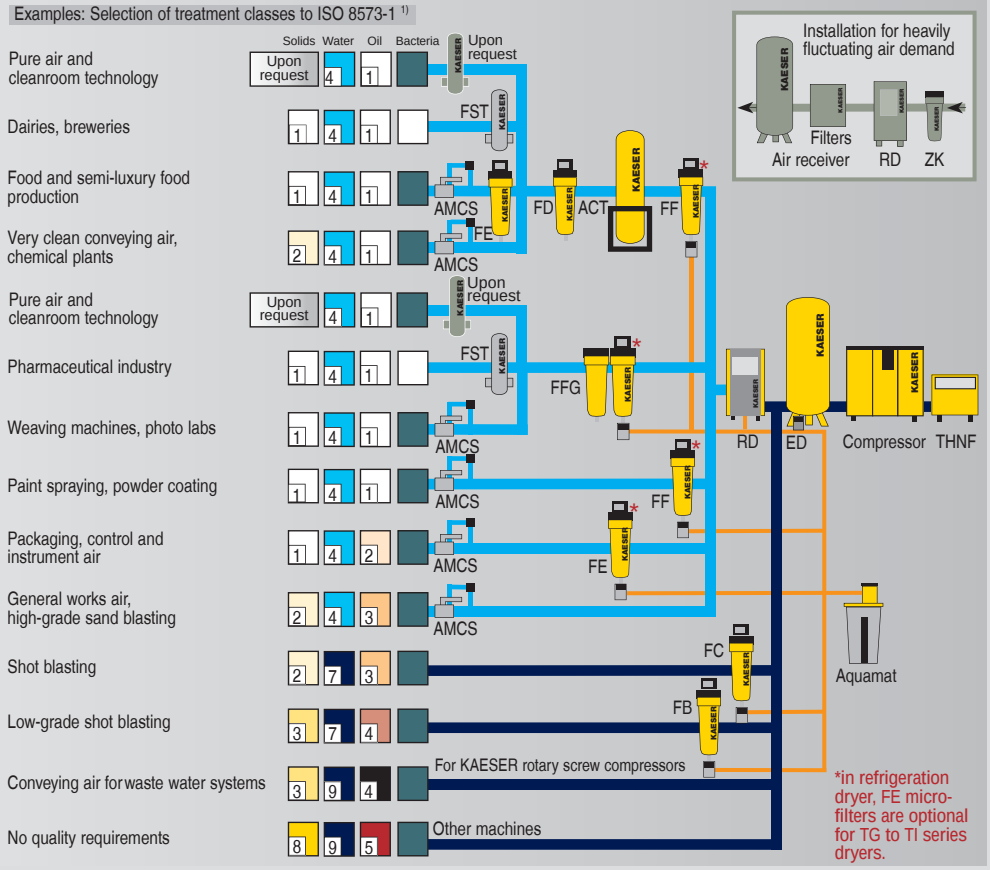


TI 521 to TI 901

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 [1)]



Explanation:

THNF = Bag filter
Cleans dusty and heavily contaminated intake air

ZK = Centrifugal separator
Separates accumulating condensate

ED = Eco Drain
Electronic level-controlled condensate drain

FB = Pre-filter

FC = Pre-filter

FD = Particulate filter (attrition)

FE = Micro-filter
Separates aerosol oil and solid particles

FF = Micro-filter
Separates aerosol oil and solid particles

FG = Activated carbon filter
For adsorption of oil vapours

FFG = Activated carbon and micro-filter combination

RD = Refrigeration dryer
For drying compressed air, pressure dew point to +3 °C

DD = Desiccant dryer
For drying compressed air, pressure dew point to -70 °C

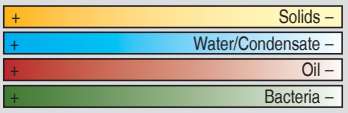
ACT = Activated carbon adsorber
For adsorption of oil vapours

FST = Sterile filter
For sterile compressed air

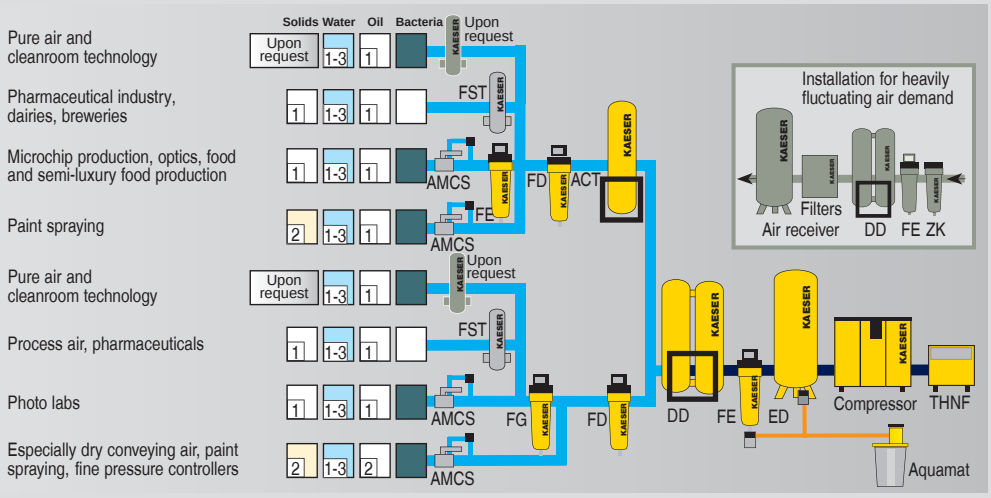
Aquamat = Condensate treatment system

AMCS = Air-main charging system

Contaminants:



For air mains subject to sub-zero temperatures:
Compressed air treatment with a desiccant dryer (down to -70 °C pressure dew point)



Degree of filtration:

Class ISO 8573-1	Solid particles[1)]		Humidity[2)]	Total oil content[2)]
	Max. particle size µm	Max. particle concentration mg/m³	Pressure dew point (x = liquid water in g/m³)	mg/m³
0	e.g. Consult Kaeser regarding pure air and cleanroom technology			
1	0.1	0.1	≤ - 70	≤ 0.01
2	1	1	≤ - 40	≤ 0.1
3	5	5	≤ - 20	≤ 1
4	15	8	≤ + 3	≤ 5
5	40	10	≤ + 7	–
6	–	–	≤ + 10	–
7	–	–	x ≤ 0.5	–
8	–	–	0.5 < x ≤ 5	–
9	–	–	5 < x ≤ 10	–

[1)] As per ISO 8573-1:1991 (The specification for particle content is not measured as per ISO 8573-1:2001, as the limits defined therein for Class 1 are to be applied to 'Clean Rooms')
[2)] As per ISO 8573-1:2001

LGA InterCert Certified QM-System ISO 9001:2000
LGA InterCert Certified EM-System ISO 14001:2004

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