

## **Rotary Screw Compressors BSD/CSD/CSDX T SFC Series**

With the world-renowned SIGMA PROFILE 

Free air delivery 0.87 to 16.10 m<sup>3</sup>/min, Pressures 5.5 to 15 bar



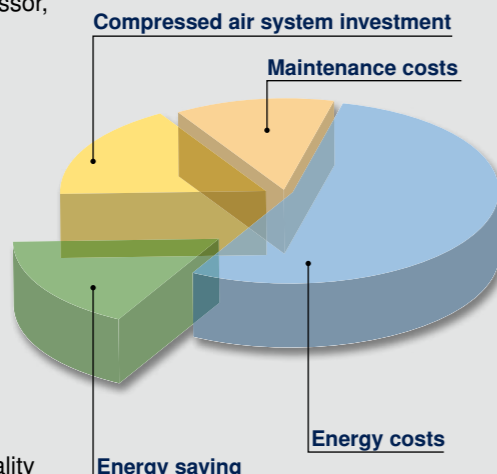
**What do you look for in a compressor with variable frequency drive and refrigeration dryer?**

As a user, you expect maximum efficiency, reliability and consistent air quality from your compressed air system.

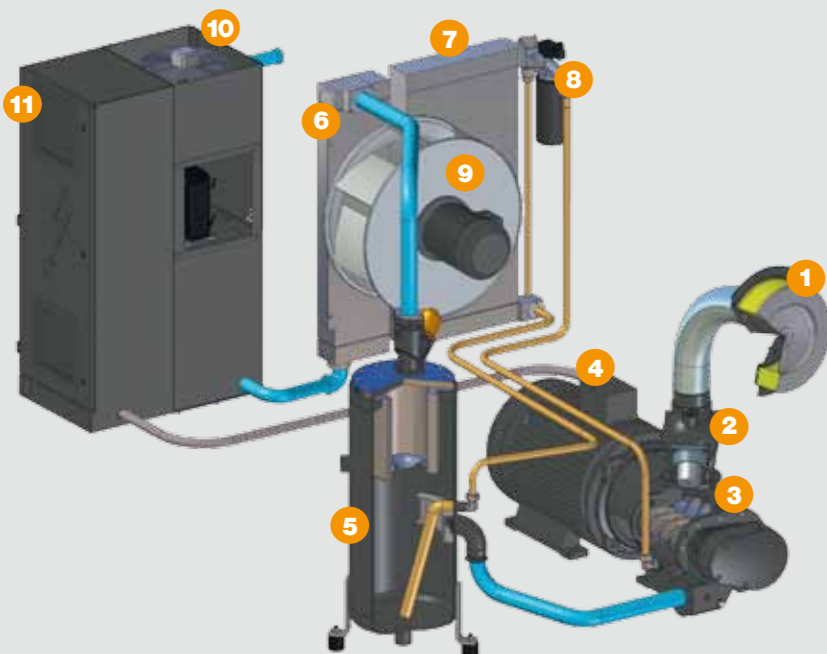
That may sound simple, but these advantages are influenced by many different factors:

Energy costs, for example, taken over the lifetime of a compressor, add up to a multiple of investment costs.

Efficient energy consumption therefore plays a vital role in every compressed air system, as does compressor reliability. In addition, the compressed air should be free from condensate and treated to provide the required level of quality appropriate for the specific application. These measures ensure enhanced system reliability and significantly reduce maintenance costs in the air distribution network, pneumatic controls and all other associated compressed air powered equipment.



**Function diagram**



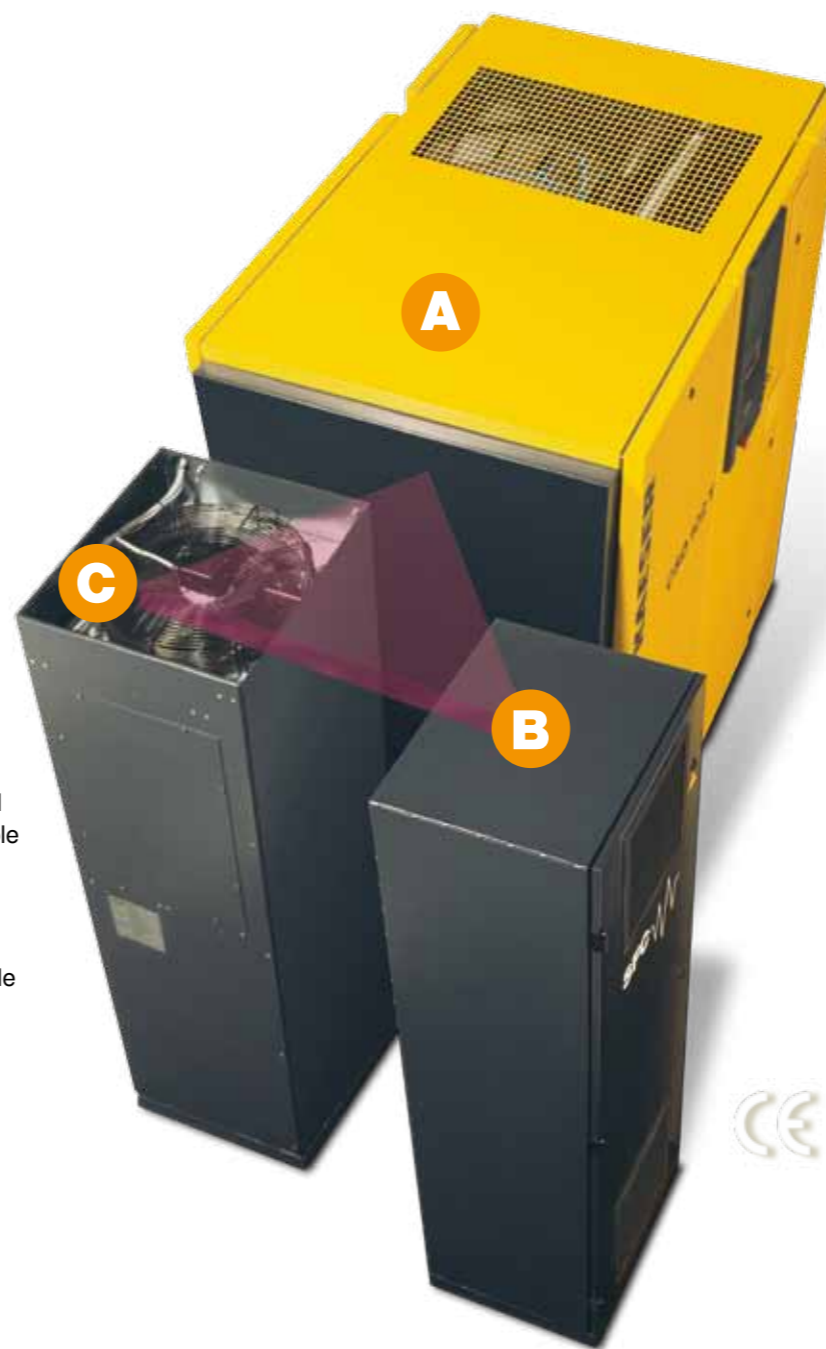
**T SFC — Integrated Modular Design**

**KAESER's solution: Versatile modular design**

Available with a modular refrigeration dryer and/or SFC variable frequency drive, BSD, CSD and CSDX rotary screw compressors fulfil every customer requirement:

They are highly energy efficient, quieter than quiet, require minimal maintenance, are extremely reliable and deliver the very best in air quality.

Furthermore, these turnkey compressed air systems are simple to install and offer outstanding versatility.



**BSD, CSD and CSDX – Efficiency as standard**

The new BSD, CSD and CSDX series compressors with energy saving 1:1 drive form the basis for KAESER's versatile modular concept. They are particularly efficient, durable and reliable, as each is equipped with a generously-sized low-speed airend featuring SIGMA PROFILE rotors.

**T: Refrigeration dryer**

BSD, CSD and CSDX compressors can be supplied with an integrated refrigeration dryer module as required. The compressor and dryer are housed in separate cabinets with individual cooling air apertures to enhance operational reliability.

**SFC – Sigma Frequency Control**

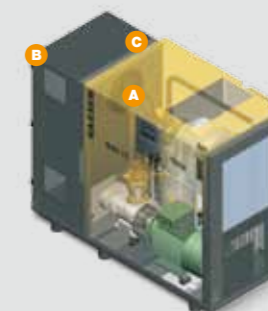
The SFC variable frequency drive module is available for all BSD, CSD and CSDX compressors. The SFC module and the compressor form a compact, hard-wired unit with a compact footprint and short

communication paths between the control electronics and drive motor. Each package is delivered tested and ready for operation.

- 1 Intake filter
- 2 Inlet valve
- 3 SIGMA PROFILE airend
- 4 Drive motor
- 5 Separator tank
- 6 Compressed air aftercooler
- 7 Fluid cooler
- 8 Fluid filter
- 9 Radial fan
- 10 Integrated refrigeration dryer
- 11 Frequency converter (SFC module)

**Maximum Flexibility**

KAESER's versatile range of modular T SFC packages ensures that a model is available to suit every compressed air need. The refrigeration dryer module C transforms a standard rotary screw compressor into a compact compressed air system that delivers quality dried-air in accordance with the highest standards. With the addition of the SFC module B, the compressor speed can be automatically adjusted to meet varying air demand. All possible combinations of these three modules are available.



- A = BSD, CSD or CSDX rotary screw compressor
- B = SFC
- C = Refrigeration dryer (T)

# BSD T – CSDX T: With Compact Refrigeration Dryer

## Innovative: The BSD T, CSD T and CSDX T

The new BSD T, CSD T and CSDX T rotary screw compressor packages meet every customer requirement, as they combine maximum reliability with outstanding efficiency.

With the addition of the integrated refrigeration dryer module, these high performance units are transformed into complete air supply systems.

Easy to maintain, the dryer is contained in its own separate housing within the unit to prevent exposure to heat from the compressor package, considerably increasing operational reliability and enabling use in ambient temperatures of up to +45 °C.



CSD 102 T rear view

Thermal insulation is omitted from the illustration



## Dependable centrifugal separator

A centrifugal separator with an electronically controlled ECO DRAIN is installed between the compressor and the dryer. This ensures safe and efficient initial separation and drainage of the condensate even under conditions of high ambient temperature and humidity.



## Refrigeration dryer with ECO DRAIN

The refrigeration dryer also features an ECO DRAIN. The advanced level-controlled condensate drain eliminates the compressed air losses associated with solenoid valve control. This both saves energy and considerably enhances the reliability of the compressed air supply.



## Stainless steel plate heat exchanger

The dryer's stainless steel plate heat exchanger is both corrosion and contamination-resistant. Even with fluctuating airflow, the separate stainless steel condensate separator reliably removes the accumulating condensate from the air. The

dryer's components and piping are designed to provide exceptional operational security and reliability.

## Turnkey operation

The integrated refrigeration dryer module is directly attached to the standard unit and is ready for immediate use. The modular design allows the components in the dryer to be generously sized and easily accessible for maintenance. It also prevents exposure of the refrigeration dryer to any heat from the compressor package.

The high performance cooling system ensures reliable air package operation up to an ambient temperature of +45 °C and significantly increases compressed air availability.



## SIGMA CONTROL

The SIGMA CONTROL compressor controller constantly monitors the compressor, refrigeration dryer and condensate drains. If required, signals from the dryer can be defined as alarms and forwarded to a centralised control centre.

# SFC – Ultimate Efficiency



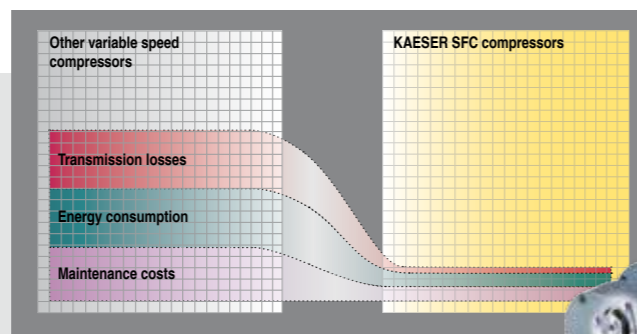
CSDX 162 T SFC front view

## Maximum flexibility: BSD SFC, CSD SFC and CSDX SFC series

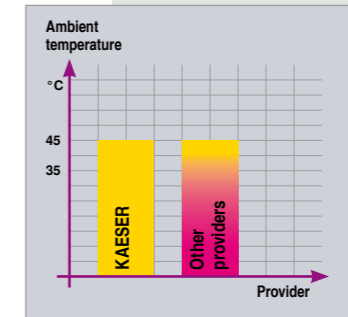
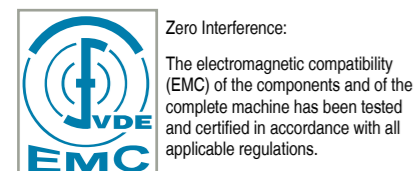
Every KAESER rotary screw compressor is equipped with a large, efficient airend featuring high performance SIGMA PROFILE rotors. The airends in BSD, CSD and CSDX units are powered by a direct drive system that eliminates the transmission losses associated with gear drive systems, enabling these compressors to provide significant energy savings.

Considerable savings can also be achieved with the addition of a SIGMA FREQUENCY CONTROL (SFC) module.

Depending on the size of the compressor installation, energy consumption in larger compressed air systems can be reduced by up to 50%.

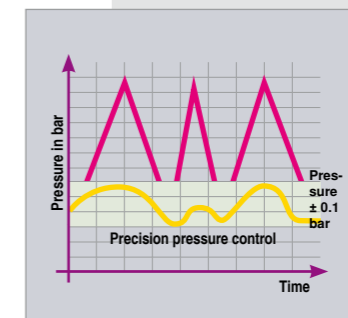


BSD SFC, CSD SFC and CSDXSFC compressor packages are highly efficient direct drive units featuring variable speed control. With high-efficiency performance throughout the entire control range, large, low speed airends featuring the energy saving SIGMA Profile have significant advantages over smaller, high speed airends.



## Perfect performance – even with high ambient temperatures

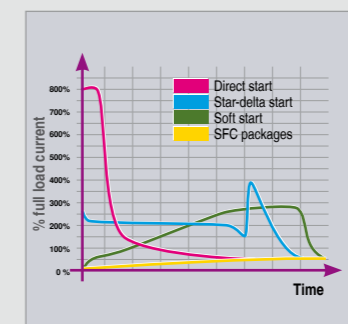
The generously-sized SFC module with its efficiently cooled control cabinet allows trouble-free operation in ambient temperatures up to +45 °C.



## Consistent pressure

Air delivery from a BSD SFC, CSD SFC or CSDX SFC compressor can be matched to actual air demand according to required system pressure, by continuously adjusting drive motor speed (and therefore the airend) within its specified control range. Depending on the buffer capacity of the downstream air network, it is therefore possible to

precisely maintain working pressure to within  $\pm 0.1$  bar and, as a result, to reduce maximum system pressure. This can lead to significant savings, as each 1 bar reduction in pressure amounts to a 7 percent reduction in energy consumption.



## Soft start with no current spikes

Soft start allows a gradual increase in drive motor current from zero to full load, enabling almost unlimited motor switching frequency i.e. the number of times the motor can be switched on within a defined time period without overheating. Current spikes that can potentially cause damage to power

systems and equipment are reliably eliminated without the need for additional expensive electronics. In addition, the continuously variable acceleration and deceleration of moving parts reduces dynamic loading.

All packages are designed to operate at full load, 7 days a week, yet require no additional maintenance. **Triple savings with 1:1 drive:** Significantly increasing reliability and service life, **direct drive** reduces the number of components needed in comparison with gear drive and eliminates the associated transmission losses. Sound levels are also considerably lower. The benefits speak for themselves: **efficient power transmission, optimal power consumption and reduced servicing / downtime costs.**

# BSD/CSD/CSDX T SFC – Eight Decisive Advantages



## 1 SIGMA PROFILE air end

A specific drive power can be used to turn a smaller air end at high speed or a larger air end at slow speed. Larger, low speed air ends are more efficient, delivering more compressed air for the same drive power. That is why KAESER developed air ends especially for the BSD, CSD and CSDX series that precisely match the individual drive power and motor speed of each machine in the range. The slightly higher investment cost of the larger air end is quickly recovered by the energy saved during operation.



## 2 Energy-saving 1:1 drive

The advantages of the 1:1 drive system are not just limited to the elimination of transmission losses: The motor and air end are joined by the coupling and its housing to form a compact and durable unit that, apart from greasing of the motor bearings, requires no regular maintenance. Should the coupling ever need to be replaced, it takes just a few minutes without any disassembly of the unit, as the opening in the housing is more than large enough to replace the two coupling sections.



## 3 Low speed operation

Each BSD SFC, CSD SFC and CSDX SFC compressor has exactly the same mechanical components as those used in KAESER's fixed speed compressors. This not only ensures unrivalled reliability and compressed air availability, but also guarantees optimum energy efficiency. The most efficient method of producing compressed air is by using large, low speed air ends – air ends in BSD/CSD/CSDX SFC compressors have a typical maximum rotation speed of approximately 3600 rpm. Further advantages include long service life and reduced maintenance requirement. The use of standardised drive motors also contributes to long-term compressed air availability.



## 4 SIGMA CONTROL

Based on robust PC architecture, the SIGMA Control offers the possibility of Dual, Quadro, Vario and Continuous control. Clearly marked navigation and input keys on the user interface are used to move around within the menu options of the four line alpha-numeric display. This powerful compressor controller can also display information in any 1 of 30 selectable languages at just the press of a button. The SIGMA CONTROL automatically regulates and monitors the compressor. The Profibus interface enables exchange of data and operational parameters allowing the SIGMA Control to communicate with other air management systems such as the SIGMA Air Manager. Interfaces are provided as standard for connection of a modem, a second compressor in base-load sequencing mode and for connection to data networks (Profibus DP).

## 5 Efficient stainless steel condensate separator

The separator tank in the refrigeration dryer is made of stainless steel and is therefore completely corrosion resistant. 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. This figure remains almost constant – even with fluctuating airflow – reliably maintaining the required pressure dew point. Solid particles are also washed out and eliminated together with the condensate.



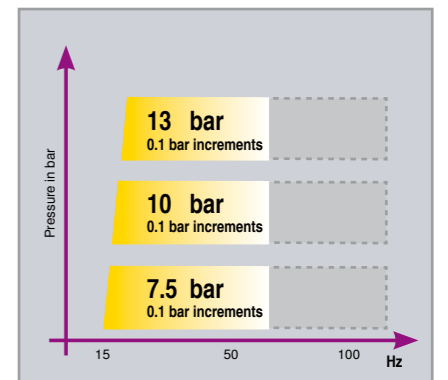
## 6 SFC module from Siemens

Siemens frequency converters are used exclusively in KAESER's speed controlled compressors for several reasons: Siemens manufactures the industrial PC-based SIGMA CONTROL compressor controller, which enables seamless communication with the SFC control cabinet. Furthermore, the worldwide presence of Siemens ensures dependable service. The SFC control cabinet and SIGMA CONTROL are Class A1 tested and certified as per electromagnetic compatibility regulation EN 55011, both as individual components and as an integrated system.



## 7 Flexible pressure adjustment

The wide range of 1:1 drive air ends available makes it possible to select the one that works most efficiently within the pressure and performance range required. This ensures that every BSD/CSD/CSDX SFC compressor operates with the most efficient pressure-frequency profile. Furthermore, the SIGMA CONTROL is equipped with a pressure-to-frequency profile that guarantees maximum flexibility for air delivery and pressure whilst providing best possible efficiency.



## 8 Specific power is the key

Large, low speed air ends are more efficient than small high speed air ends since they supply more air for the same drive power. This is not just the case at full load, but also applies throughout the entire control range, which is particularly important for variable speed machines. The specific energy requirement of 6.4 kW per m<sup>3</sup>/min for a KAESER SFC compressor operating at 7.5 bar can be considered as an excellent indication of the machine's efficiency. Variable frequency controlled compressors are only truly efficient if they have low energy consumption throughout their entire control range.



# Equipment

## Complete unit

Ready for operation, fully automatic, super silenced, vibration damped, all panels powder coated.

## Sound insulation

Panels lined with laminated mineral wool.

## Vibration damping

Double insulated anti-vibration mountings using rubber bonded metal elements.

## Airend

Genuine KAESER single-stage rotary screw airend with SIGMA PROFILE rotors and cooling fluid injection for optimised rotor cooling.

## Drive

Direct, high-flex coupling, without gearing.

## Electric motor

Premium efficiency electric motor of quality German manufacture to IP 55 and Insulation Class F for additional reserve.

## Connection from motor to airend

Airend with integral coupling flange.



## Electrical components

Control cabinet to IP 54, control transformer, Siemens Masterdrive with control unit, volt-free contacts for ventilation control.

## Fluid and air flow

Dry air intake filter with pre-filtration, pneumatic inlet and venting valves, fluid reservoir with three-stage separator



system, pressure relief valve, minimum pressure / check valve, thermostatic valve and micro-filter in coolant circuit, all fully piped using flexible couplings.

## Cooling

Air cooled; separate aluminium coolers for compressed air and fluid, radial fan driven by its own motor.

## Refrigeration dryer

CFC-free, R 134a refrigerant, fully insulated, hermetically sealed refrigerant circuit, hot-gas bypass control, electronic condensate drain and upstream centrifugal separator.

## SIGMA CONTROL

Interfaces for data communication comprising: RS 232 for a modem, RS 485 for a slave compressor in base load sequencing mode (not with SFC models), Profibus DP interface for data networks. Prepared for Teleservice.



## Ergonomic control panel

Red, yellow and green LEDs show the operational state of the machine at a glance. Also features a four-

line plain text display, 30 selectable languages, touch keys with icons and a duty cycle indicator.

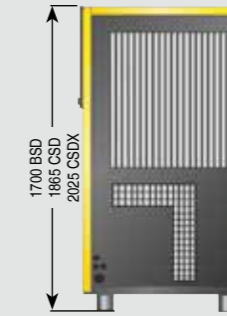
## Prime functions

Fully automatic monitoring and regulation of airend discharge temperature; monitoring of motor current, direction of airend rotation, air filter, fluid filter and fluid separator cartridge; display of performance data, service intervals of primary components, operating hours, status data and event memory data. Selection of Dual, Quadro, Vario and Continuous control modes as required.

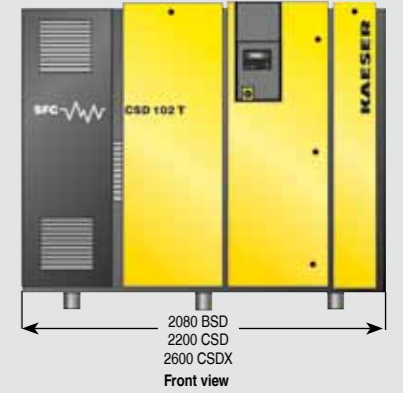
(For further information refer to SIGMA CONTROL/SIGMA CONTROL BASIC brochure P-780)

# KAESER COMPRESSORS

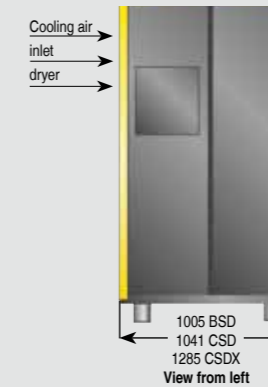
## Dimensions



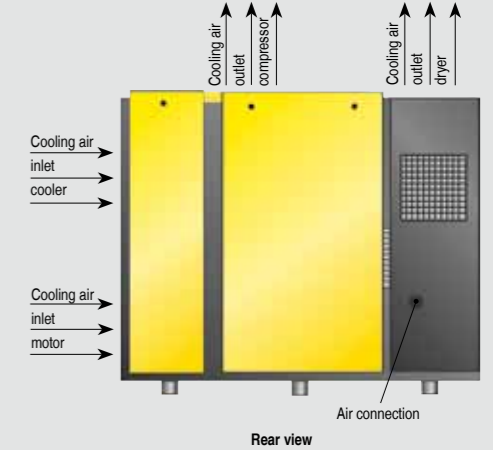
View from right



Front view



View from left



Rear view

Air connection

## Technical Specifications BSD/CSD/CSDX T SFC

T - Version with integrated refrigeration dryer (refrigerant R 134 a)

Rated motor power	Model	Operating pressure	FAD*) Complete unit at working pressure	Max. working pressure	Dryer power consumption	Sound pressure level **)	Weight
kW		bar	m³/min	bar	kW	dB(A)	kg
30	BSD 62 T	7.5	5.65	8	0.8	69	1200
		10	4.45	11			
		13	3.60	15			
37	BSD 72 T	7.5	7.00	8	0.8	70	1250
		10	5.60	11			
		13	4.40	15			
45	BSD 81 T	7.5	8.16	8	1.1	72	1350
		10	6.79	11			
		13	5.43	15			
45	CSD 82 T	7.5	8.26	8	1.1	71	1460
		10	6.89	11			
		13	5.50	15			
55	CSD 102 T	7.5	10.14	8	1.1	72	1510
		10	8.19	11			
		13	6.74	15			
75	CSD 122 T	7.5	12.01	8	1.4	73	1540
		10	10.05	11			
		13	8.08	15			
75	CSDX 137 T	7.5	13.71	8	2.2	72	2250
		10	11.87	11			
		13	9.88	15			
90	CSDX 162 T	7.5	16.11	8	2.2	73	2350
		10	13.50	11			
		13	11.70	15			

SFC - Version with variable speed drive

Model	Operating pressure	FAD*) Complete unit at working pressure	Max. working pressure	Sound pressure level **)	Weight
	bar	m³/min	bar	dB(A)	kg
BSD 72 SFC	7.5	1.57 - 6.25	8.5	72	1220
	10	1.16 - 5.34	11		
	13	0.87 - 4.45	15		
CSD 82 SFC	7.5	1.92 - 8.20	8.5	72	1350
	10	1.49 - 6.90	11		
	13	1.10 - 5.80	15		
CSD 102 SFC	7.5	2.33 - 9.90	8.5	73	1560
	10	1.87 - 8.95	11		
	13	1.40 - 7.30	15		
CSD 122 SFC	7.5	2.88 - 12.28	8.5	74	1610
	10	2.18 - 10.50	11		
	13	1.86 - 8.90	15		
CSDX 137 SFC	7.5	3.39 - 13.25	8.5	74	2200
	10	2.81 - 11.30	11		
	13	2.13 - 9.62	15		
CSDX 162 SFC	7.5	3.93 - 15.85	8.5	75	2400
	10	3.36 - 14.03	11		
	13	2.60 - 12.00	15		

T SFC - Version with variable speed drive and integrated refrigeration dryer

Model	Operating pressure	FAD*) Complete unit at working pressure	Max. working pressure	Dryer power consumption	Sound pressure level **)	Weight	Dimensions
	bar	m³/min	bar	kW	dB(A)	kg	W x D x H mm
BSD 72 T SFC	7.5	1.57 - 6.25	8.5	0.8	72	1340	2080 x 1005 x 1700
	10	1.16 - 5.34	11				
	13	0.87 - 4.45	15				
CSD 82 T SFC	7.5	1.92 - 8.20	8.5	1.1	72	1580	2200 x 1041 x 1865
	10	1.49 - 6.90	11				
	13	1.10 - 5.80	15				
CSD 102 T SFC	7.5	2.33 - 9.90	8.5	1.1	73	1700	2200 x 1041 x 1865
	10	1.87 - 8.95	11				
	13	1.40 - 7.30	15				
CSD 122 T SFC	7.5	2.88 - 12.28	8.5	1.4	74	1770	2200 x 1041 x 1865
	10	2.18 - 10.50	11				
	13	1.86 - 8.90	15				
CSDX 137 T SFC	7.5	3.39 - 13.25	8.5	2.2	74	2400	2600 x 1285 x 2025
	10	2.81 - 11.30	11				
	13	2.13 - 9.62	15				
CSDX 162 T SFC	7.5	3.93 - 15.85	8.5	2.2	75	2600	2600 x 1285 x 2025
	10	3.36 - 14.03	11				
	13	2.60 - 12.00	15				



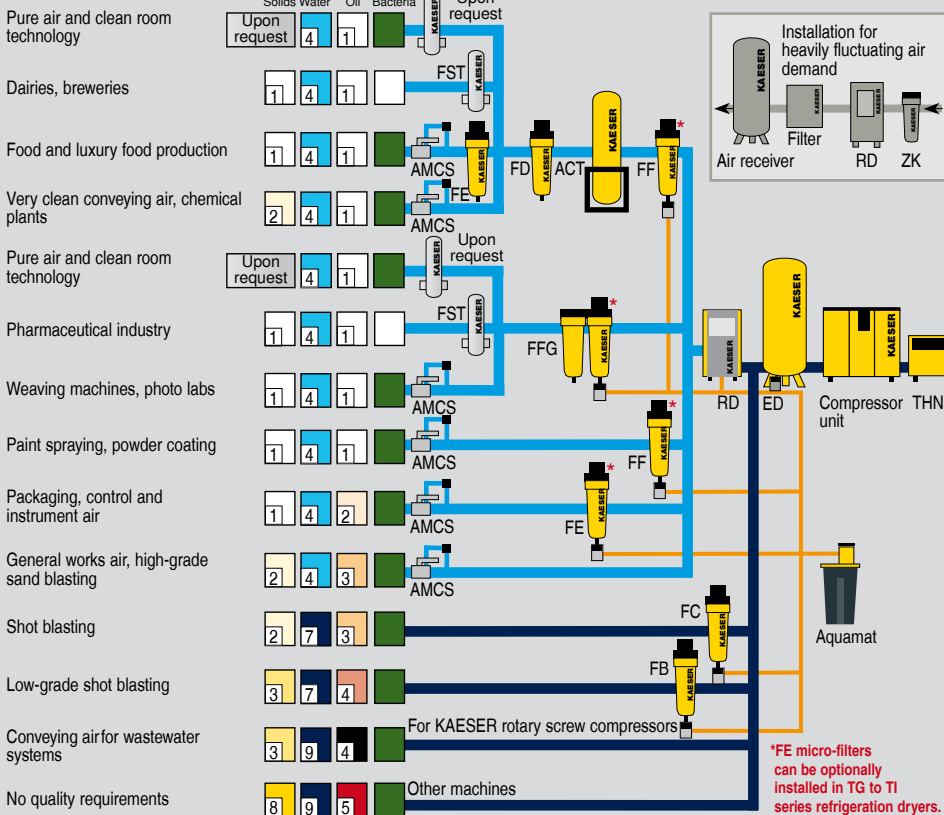
3D-view

\*) FAD as per ISO 1217:2009, Annex C; \*\*) Sound pressure level as per ISO 2151 and basic standard ISO 9614-2, tolerance: +/- 3 dB(A)

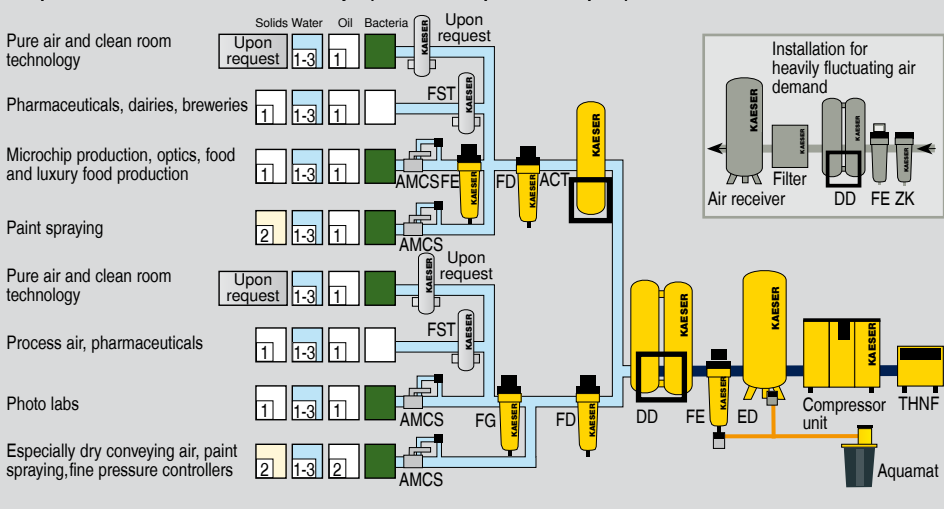
## Choose the required grade of treatment according to your field of application:

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

Application examples: selection of treatment classes to ISO 8573-1



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



Explanation	
THNF	Bag filter
ZK	Centrifugal separator
ED	ECO DRAIN
FB / FC	Pre-filter
FD	Particulate filter
FE / FF	Microfilter
FG	Activated carbon filter
FFG	Activated carbon and microfilter combination
RD	Refrigeration dryer
DD	Desiccant dryer
ACT	ACT activated carbon adsorber
FST	Sterile filters
Aquamat	Aquamat
AMCS	Air-main charging system

## Compressed air quality classes to ISO 8573-1(2010):

Solid particles / dust			
Class	Max. particle count per m³ of a particle size with d [µm]*		
	0.1 ≤ d ≤ 0.5	0.5 ≤ d ≤ 1.0	1.0 ≤ d ≤ 5.0
0	e.g. Consult KAESER regarding pure air and cleanroom technology		
1	≤ 20,000	≤ 400	≤ 10
2	≤ 400,000	≤ 6,000	≤ 100
3	not defined	≤ 90,000	≤ 1,000
4	not defined	not defined	≤ 10,000
5	not defined	not defined	≤ 100,000

Class	Particle concentration C <sub>p</sub> [mg/m³]*
6	0 < C <sub>p</sub> ≤ 5
7	5 < C <sub>p</sub> ≤ 10
X	C <sub>p</sub> > 10

Water	
Class	Pressure dew point [°C]
0	e.g. Consult KAESER regarding pure air and cleanroom technology
1	≤ -70 °C
2	≤ -40 °C
3	≤ -20 °C
4	≤ +3 °C
5	≤ +7 °C
6	≤ +10 °C

Class	Concentration of liquid water C <sub>w</sub> [g/m³]*
7	C <sub>w</sub> ≤ 0.5
8	0.5 < C <sub>w</sub> ≤ 5
9	5 < C <sub>w</sub> ≤ 10
X	C <sub>w</sub> ≤ 10

Oil	
Class	Total oil concentration (fluid, aerosol + gaseous) [mg/m³]*
0	e.g. Consult KAESER regarding pure air and cleanroom technology
1	≤ 0.01
2	≤ 0.1
3	≤ 1.0
4	≤ 5.0
X	> 5.0

\*1) At reference conditions 20 °C, 1 bar(a), 0% humidity