KAESER COMPRESSORS

Desiccant Dryers

heatless regenerated

DC Series

Air flow rates
0.15 to 154.53 m^3/min

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Why do we need to dry compressed air?

The atmospheric air drawn into a compressor is a mixture of gases that always contains water vapour. The amount of water vapour air can carry varies and is mostly dependent on temperature. When the air is heated by the compression process it can carry more moisture but when the compressed air cools, excess moisture is precipitated out in the form of condensate. This condensate collects in the downstream centrifugal separator or air receiver. Even then, the air is still saturated to 100 per cent with water vapour. If allowed to flow into the air main in this state, the air would cool further and condensate would be deposited in the pipework and the consumer devices, leading to corrosion and breakdown. Therefore, additional drying is essential to avoid costly maintenance and repair work.

Function

Compressed air enters the dryer through a microfilter that removes solid particles larger than 0.01 μm and any residual oil. The pre-filtered air then passes through the inlet valve and via the lower flow distributor into one of the two desiccant chambers.

Moisture is removed from the air as it passes upward through the desiccant bed and out of the chamber via the upper flow distributor. It then passes through a check valve, a particulate filter and out into the air network.

A portion of the dried compressed air is diverted through a control valve to regenerate the desiccant in the second chamber. Flow through the two chambers is cycled at set intervals so that one is drying while the other is being regenerated.

1. Microfilter
2. Inlet valve
3. Desiccant chamber
4. Desiccant bed
5. Check and control valves (not visible)
6. Desiccant chamber
7. Particulate filter

DC – low pressure dew point for all applications

Matched to the demand and integrated into the system

As experienced suppliers of complete compressed air systems, KAESER's design concept for the DC series of desiccant dryers focused on the need for seamless integration into air systems of various sizes.

A finely graded, wide range of small, compact and large models ensures the right dryer for every application to provide reliable and economic compressed air drying.

SIGMA-Dry

The specially selected activated aluminium oxide desiccant has excellent properties of adsorption and regeneration for long-lasting, low pressure dew point with minimum pressure drop. The desiccant pellets are resistant to the effects of water and mechanical stress and their size is selected for optimum function of the chamber flow distributor and sieve base.

Small models DC 1.5 to 7.5

The ten-minute cycling rate ensures a reliably low pressure dew point down to -40 °C even during periods of low air demand. The compact arrangement, ease of installation and the protective enclosure makes the dryer ideal for decentralized applications.

Compact models DC 12 to 133

Minimum pressure drop across the dryer and a low regenerating air requirement reduce the volume of desiccant needed and the size of filters to be installed so that servicing and operating costs are reduced as well. Intelligent controllers (ECO Control basic, fitted as standard, or optional ECO Control) economically match machine capacity to air demand. The dryers can be equipped with enclosures and soundproofing and are available in versions for outdoor installation.

Large models DC 169 to 1545

These large machines for compressed air up to 10 bar (optionally up to 16 bar) in open design are as reliable and economic as their compact brothers. Their modular construction simplifies transport and installation and the ready accessibility of all components makes for uncomplicated maintenance and service work.

Combatible with activated carbon adsorbers

Series ACT activated carbon adsorbers are available in capacities exactly matching DC dryers from model 12 upwards to deliver oil-free air to the most stringent requirements (< 0.003 mg of oil per cubic metre of compressed air) The compact design of DC dryers up to model 133 enables direct coupling to ACT activated carbon adsorbers.

Dependable drying down to a PDP of -70 °C

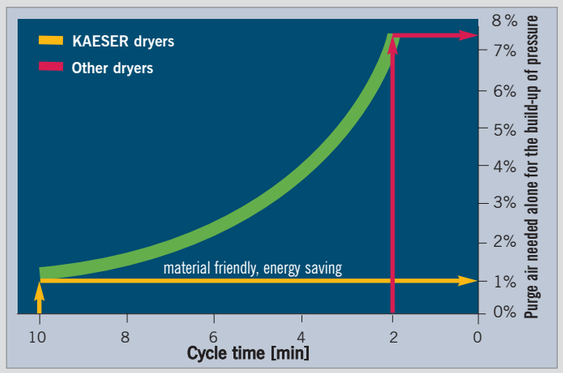
Fundamentally adequate dimensions of all KAESER'S DC desiccant dryers are the basis for dependably low pressure dew points, even in continuous operation under arduous conditions. Very little is lost from the large volume of highly effective SIGMA Dry desiccant with which the chambers are initially filled. Minimal volumes of dried compressed air are needed for the regeneration of the desiccant throughout its longer than average life. Long cycling times contribute to reduced stress, trouble-free performance and extended life of the flow-optimised components comprising the dryer and the attached KAESER microfilter and particulate filter.

Small in size – but great in efficiency

DC 1.5 - 7.5

In their protective cabinets, the machines at the lower end of the DC desiccant dryer range offer plenty of performance in a compact, easily installed package. They are constructed of high quality components and reliably maintain a low pressure dew point even in continuous operation. Their long, energy-thrifty cycle times protect components and minimize maintenance. Their consumption of purge air is minimal.

They can be wall-mounted, which makes them particularly suitable for local air drying. In containerised compressed air supply systems, the production of instrument air or in the packaging and pharmaceutical industries they are an ideal solution where extremely low pressure dew points are needed.



Dependable drying in a material friendly, ten-minute cycle time

Being able to reach a pressure dew point of -40 °C in a ten-minute cycle time reduces the frequency of changeovers from chamber to chamber and therefore material wear on the valves and the desiccant itself. Long cycling times also mean that less compressed air is needed for pressure build-up after regeneration. A two-minute cycle time, for instance, would consume 7.6 percent of the dried compressed air, whereas the ten-minute cycle time of the small KAESER DC dryers reduces this demand to not more than 1.3 percent, saving energy and prolonging the life of the desiccant. The generous cross-sectional dimension of the drying chambers and the even air flow through the desiccant resulting from the specially designed sieve elements are factors contributing towards reliability and economy of operation.

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Desiccant chambers

Designed in accordance with the Pressure Equipment Directive 97/23/EC for one million load cycles at 10 bar (optional 16 bar), the desiccant chambers have a typical continuous operational life expectancy exceeding ten years.

Well-proven components

Sound valve engineering results in smooth changeover cycles that can be observed on the pressure gauges, one on each desiccant chamber. All the small DC desiccant dryers are fitted with easily accessible KAESER microfilters upstream and particulate filters downstream as standard.

Time control

KAESER's easy to operate time control allows straightforward preselection of the two pressure dew points of -40 and -70 °C.

E-Pack (universal option)

In machines with the E-Pack option, the inlet filter is fitted with an electronically controlled condensate drain (ECO-Drain) that eliminates condensate without loss of air pressure. In addition, both the inlet and outlet filters are electronically monitored.

Intermittent operation (option)

In applications where the drying phase is frequently interrupted, the intermittent operation option can save energy. If air demand drops off and the compressor ceases to deliver air during a dryer mid-cycle, i.e. the desiccant in one chamber has not yet adsorbed all the moisture it can and the desiccant in the other chamber is still being regenerated, dry air from the receiver is fed back to the dryer to complete the regeneration phase. When air starts to flow again a fully regenerated chamber is ready to accept the load.

Serie DC –
powerful, compact, reliable

DC 12 - 1545
minimal operating and service costs

The compact and large DC dryers are easily transported and installed and highly dependable.
Intelligent design and the use of top quality components are the keys to minimal operating and service costs. These are reflected particularly in the low purge air requirement of 13.5 percent and the generous volume of highly effective SIGMA Dry desiccant contained in each chamber.

The controllers with which these models are equipped, the ECO CONTROL basic, fitted as standard, or optionally, ECO CONTROL, offer a multitude of energy-saving and efficiency-improving functions.

Rounding off the package with inlet and outlet filters from KAESER puts the final stamp on reliabiity.

Desiccant chambers

Designed in accordance with AD2000 and the Pressure Equipment Directive 97/23/EC for one million load cycles the desiccant chambers have a typical continuous operational life expectancy exceeding ten years.

Sure operation

High quality changeover valves ensure a low pressure drop and gentle pressure build-up to minimise pressure swings in the air main. Each step of the changeover is pressure-monitored. The volume of purge air is exactly regulated by valve and pressure gauge to match demand, and a moisture indicator provides a visual function check.

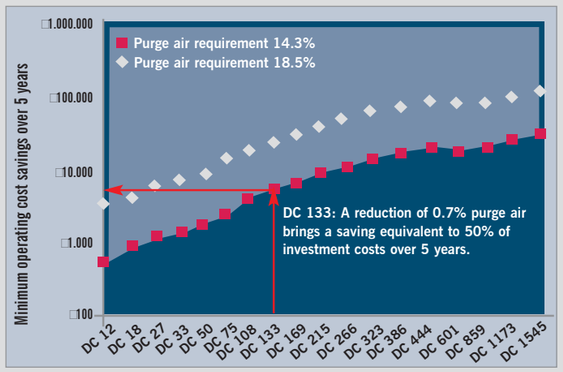
Simple maintenance

The radial arrangement of the chamber inlet and outlet ports eases desiccant changing at the highest and lowest points of the chambers and these ports also serve for chamber inspection. The filter housings are also easily accessible and the silencer can be easily dismantled for cleaning, all of which simplifies maintenance and keeps costs down.

Quiet running

Standard equipment includes at least two (according to model) effective silencers and further optional soundproofing is available for individual models to meet even more stringent sound level erquirements. Soundproof enclosures can reduce the emission of the compact dryers to as low as 65 dB(A).

Specification: operation under reference conditions (purge air requirement 13.5%), PDP -40 °C, ten-minute cycle time (5 min adsorption, 4 min desorption, 1 min pressure build-up), running time 8000 hours p.a., compressedd air generating costs euro 0.02/m³, current DC list price.



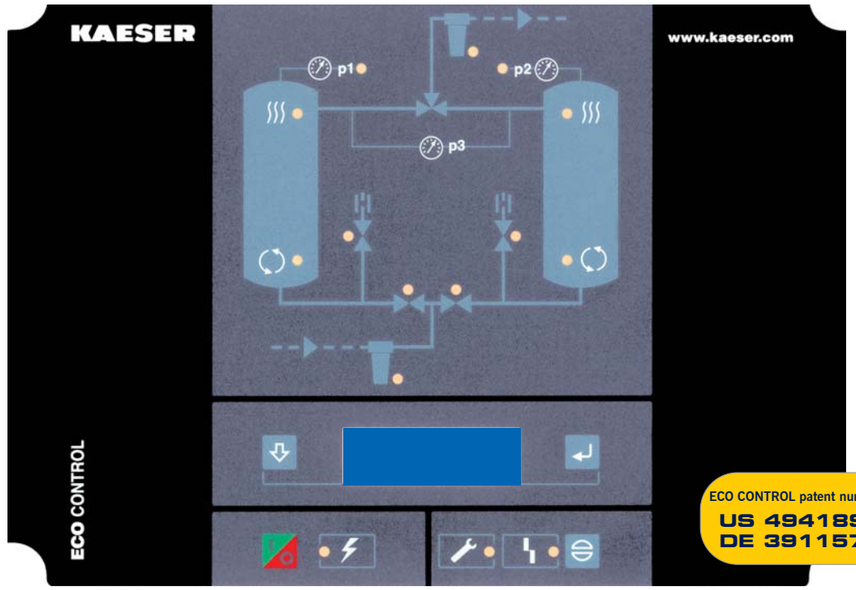
Economic PDP reliability down to -70 °C

Low pressure dew points are continuously achieved, especially under full load and even with high inlet temperatures. With a purge air requirement of only 13.5 percent (average of a single cycle under reference conditions) these dryers are particularly economical in comparison with others and their investment cost is quickly amortised from savings made (see graphic). This low purge air requirement is the result of the generous dimensions of the desiccant chambers and their charge, which, even under extreme loading, ensures sufficient air contact time with the SIGMA Dry desiccant. Load is distributed evenly through the desiccant bed by the stainless steel flow distributors. The heat generated by the adsorption process is stored in the desiccant bed and re-used during the regeneration phase to contribute to the low purge air demand of the machine. The long cycle time means fewer changeovers per hour, reducing wear and energy consumption.

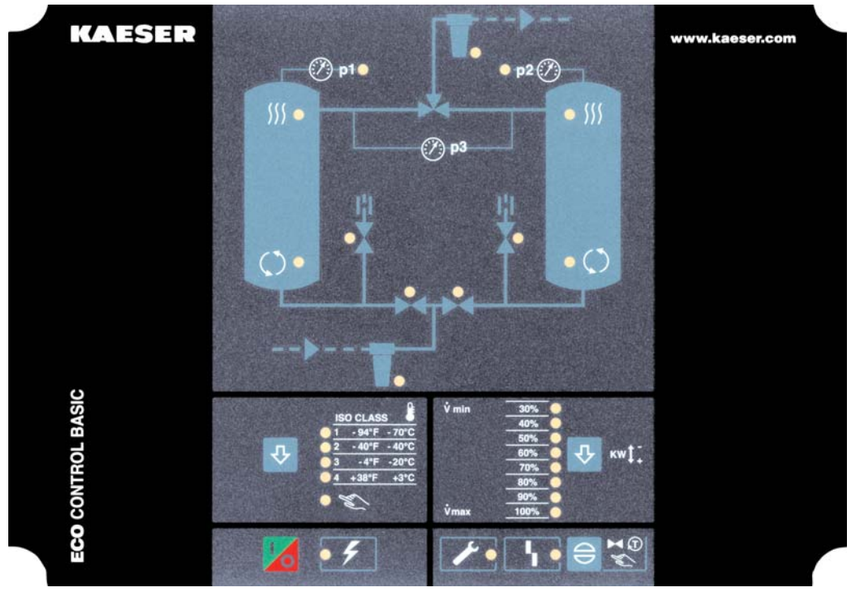
ECO CONTROL

ECO CONTROL basic

Intelligent and thrifty machine control



ECO CONTROL patent numbers:
US 4941894
DE 3911574

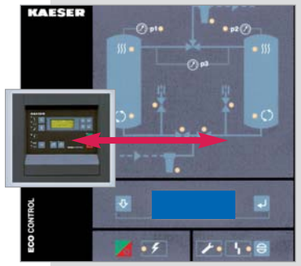


Flexible and service-friendly

A choice of two energy-saving controllers are available for models from DC 12 upwards, both featuring user-friendly control panels.

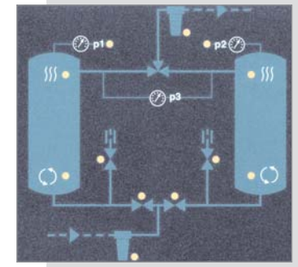
The **ECO Control basic**, with which standard dryers are equipped, carefully regulates the volume of purge air consumed for regeneration while the optional **ECO Control** "E-Pack" version features a patented **trend recognition dew point regulation** for maximum power saving.

Both controllers offer intermittent operation, networking possibilities and, thanks to comprehensive status and warning indications, are particularly easy to service.



User-friendly

The clearly laid out and easily understood operating panel with plain text display in any of five languages makes monitoring of functions and setting the pressure dew point straightforward and stress-free.

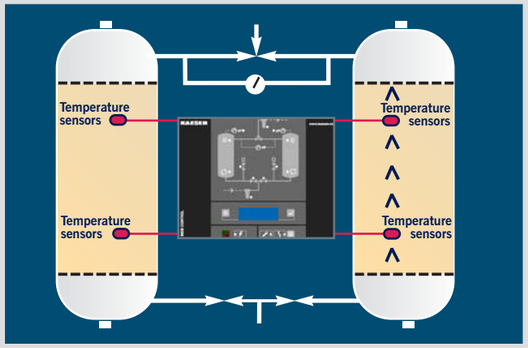


Service-friendly

The flow diagram with LED-illuminated symbols for pressure switches, valves and chambers clearly indicates the operational status and service requirement. The exact valve sequence can be easily checked in manual test mode.

Networking with SIGMA AIR MANAGER

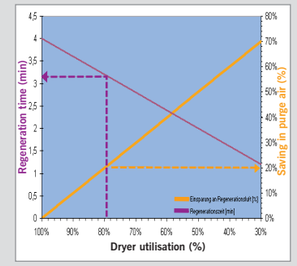
Both ECO CONTROL versions are equipped with remote on/off, volt-free contacts that can be open circuit monitored. An analog input is provided to which a dew point measuring device may be connected and its readings displayed on the ECO CONTROL.



ECO CONTROL: patented trend recognition dew point regulation

The ECO control is particularly thrifty with regard to variable flow rate, pressure or temperature. The **trend recognition dew point regulation** is more cost-effective and reliable compared to convential dew point controllers since it reacts to changes in the desiccant temperature differential rather than subsequent changes in the dew point at the dryer outlet. The measurement and relative comparison of temperature differential is made anew for every machine cycle. Changeover of chambers is timed according to air demand to maximise desiccant utilisation so that the drying phase can be extended by up to 30 minutes with resulting savings in purge air consumption.

- There is no need for a dew point measuring device. Such devices are expensive and require maintenance and also incur the costs of regular calibration.
- Unlike a dew point measuring device, the function of the temperature sensor is easily checked by means of open circuit monitoring.



ECO CONTROL basic: saves purge air

By means of a pushbutton on the ECO Control *basic*, the dryer can be matched to airflows less than the nominal flow rate. If, with a view to increased future demand, a dryer has been chosen one size larger than current demand and is, therefore, utilised to only 80%, the regeneration time can be reduced from 4 to 3.2 minutes, thereby saving 20% purge air consumption. This allows the installed drying capacity in the air system to be varied to suit actual demand.

Equipment

Feature		Small desiccant dryers DC 1.5 - 7.5		Compact desiccant dryers DC 12 - 133		Large desiccant dryers DC 169 - 1545	
		Basic version	E-Pack	Basic version	E-Pack	Basic version	E-Pack
General design	Steel cabinet for outdoor installation (not frost protected)	●	●	–	●	–	–
	Open steel frame	–	–	●	–	●	●
	Primed and painted	●	●	●	●	●	●
	Desiccant charge and removal through ports on the chamber's highest and lowest points	–	–	●	●	●	●
	Auxiliary heating for ambient temperatures down to -20 °C	–	–	–	●	–	–
	Special pressure vessel acceptance (ASME / Lloyds / UDT etc.)	○	○	○	○	○	○
	Special pressures up to 16 bar	○	○	●	●	○	○
Treatment	Two desiccant chambers with changeover regulated in line with demand	●	●	●	●	●	●
	Full charge of KAESER high capacity desiccant **SIGMA Dry**	●	●	●	●	●	●
	KAESER model FE inlet microfilter and model FD particulate outlet filter	●	●	●	●	●	●
	Control air filter	–	–	●	●	●	●
	Additional inlet and/or outlet filters	○	○	○	○	○	○
Control and monitoring components	Load-dependent **ECO CONTROL**	–	–	–	●	–	●
	ECO CONTROL basic with purge air saving mode	–	–	●	–	●	–
	KAESER time controller	●	●	–	–	–	–
	Electronic **ECO DRAIN** condensate drain on the inlet filter	–	●	–	●	–	●
	Pilot-controlled condensate drain on the inlet filter	●	–	●	–	●	–
	Electronic monitoring of inlet and outlet filters	–	●	–	●	–	●
	Analog pressure differential indicators on the inlet and outlet filters	●	–	●	–	●	–
	Moisture indicator	–	–	●	●	●	●
	Filter monitorbox for forwarding alarm messages	○	○	○	○	○	○
	Dew point measuring device	○	○	○	○	○	○
	Intermittent operation	○ [1]	○ [1]	●	● [1)]	●	●
Noise protection	Silencer	●	●	●	●	●	●
	Sound enclosure for sound reduction down to 65 dB(A) depending on model	–	–	○	–	○	○

● Standard equipment ○ Option – Not possible [1)]Additional cost

Technical specification

Model	Flow rate [1)] [m³/min]	Connection	Open design [2)]		Enclosed design [2)]		Rated power
			Weight [kg]	Dimensions W x D x H [mm]	Weight [kg]	Dimensions W x D x H [mm]	Watt]
DC 1.5 (E)	0,15	R 3/8			37	796 x 778 x 170	50
DC 2.8 (E)	0.28	R 3/8			54	796 x 778 x 170	50
DC 4.2 (E)	0.42	R 3/8			62	796 x 778 x 170	50
DC 5.8 (E)	0.58	R 3/8			78	792 x 930 x 217	50
DC 7.5 (E)	0.75	R ½			89	792 x 930 x 217	50
DC 12 (E)	1.2	R ½	165	2000 x 800 x 800	202	2000 x 800 x 800	50
DC 18 (E)	1.8	R ¾	210	2000 x 800 x 800	247	2000 x 800 x 800	50
DC 27 (E)	2.7	R ¾	260	2000 x 800 x 800	297	2000 x 800 x 800	50
DC 33 (E)	3.3	R 1	310	2000 x 1200 x 800	354	2000 x 1200 x 800	50
DC 50 (E)	5.0	R 1	320	2000 x 1200 x 800	364	2000 x 1200 x 800	50
DC 75 (E)	7.5	R 1 ½	460	2000 x 1200 x 800	504	2000 x 1200 x 800	50
DC 108 (E)	10.8	R 1 ½	550	2000 x 1200 x 800	594	2000 x 1200 x 800	50
DC 133 (E)	13.3	R 2	615	2000 x 1200 x 800	659	2000 x 1200 x 800	50
DC 169 (E)	16.9	DN 80	1000	1930 x 1500 x 1300			50
DC 215 (E)	21.15	DN 80	1225	1950 x 1500 x 1400			50
DC 266 (E)	26.6	DN 80	1475	2070 x 1500 x 1450			50
DC 323 (E)	32.3	DN 80	1700	2090 x 1500 x 1500			50
DC 386 (E)	38.6	DN 100	1930	2190 x 1500 x 1700			50
DC 444 (E)	44.4	DN 100	2180	2220 x 1700 x 1750			50
DC 601 (E)	60.1	DN 100	2315	2300 x 1950 x 1900			50
DC 859 (E)	85.9	DN 100	3860	2500 x 2400 x 2040			50
DC 1173 (E)	117.3	DN 150	4500	2610 x 2690 x 2300			50
DC 1545 (E)	154.5	DN 150	5445	2510 x 2820 x 2560			50

[1)] As per ISO 7153, option A: reference point 1 bar_{abs}, 20 °C, operating point: inlet pressure 7 bar, inlet temperature +35 °C, ambient temperature 20 °C - [2)] Data of basic version

Correction factors for deviating operating conditions (flow rates in m^3/min x $c_{\_}$)

Deviating working pressure p at dryer inlet

p (bar)	4	5	6	7	8	9	10	11	12	13	14	15	16
c_p	0.63	0.76	0.89	1	1.07	1.13	1.18	1.23	1.28	1.33	1.38	1.42	1.47

Compressed air inlet temp. Ti

T_i (°C)	25	30	35	40	45	50
c_{Ti}	1	1	1	0.98	0.94	0.90
Pressure dew point (10 min cycle) °C	-46	-44	-41	-40	-40	-40
Pressure dew point (4 min cycle) °C	-83	-79	-75	-73	-73	-73

Calculation of flow rate under deviating conditions:

Working pressure example: 10 bar ► Table ► c_p = 1.18
Compressed air inlet temp.: 40 °C ► Table ► c_{Ti} = 0.98
► Pressure dew point: 10 min cycle = -40 °C
4 min cycle = -73 °C

Calculation example

Chosen dryer model DC 47 with 4.72 m³/min capacity

Max. possible flow rate under operating conditions

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

V_{max} = 4.72 m³/min x 1.18 x 0.98 = 5.45 m³/min

Estimation of purge air volume (V_{purge})

$V_{purge} \sim V_{max}$ x 13.5% = 5.45 m³/min x 13.5% = 0.74 m³/min

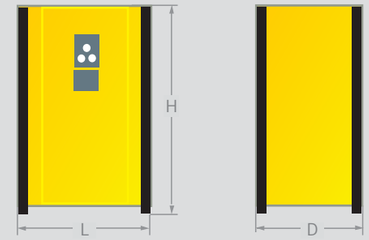
Estimation of usable air volume from the dryer (V_{usable})

$V_{usable} = V_{max} - V_{purge}$ = 5.45 m³/min - 0.74 m³/min = 4.71 m³/min

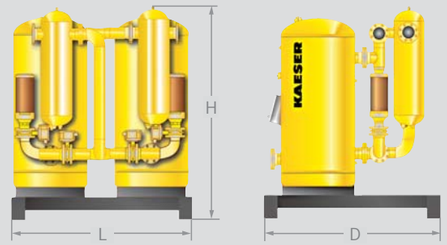
Dimensions

Models DC 1,5 to DC 7,5 E

Models DC 12 to DC 133 E



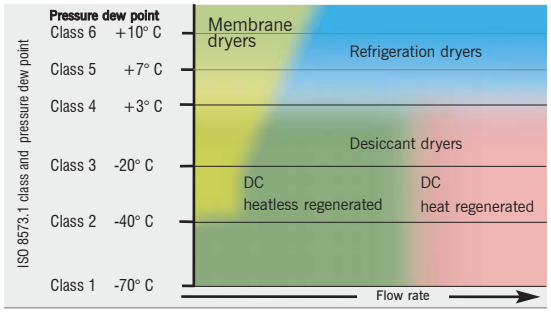
Models DC 169 to DC 1545



CE

Easy transport and connection

With a maximum height of only 2000 mm the desiccant dryer compact models can be transported on a standard Europalette. The horizontally and vertically offset inlet and outlet ports provide the user with a convenient choice of connecting pipeline layouts. The air outlet from compact models can be controlled by a changeover valve that eliminates the need for a pendular air line for the intermittent operation mode.



Applications for pressure dew points down to -70 °C

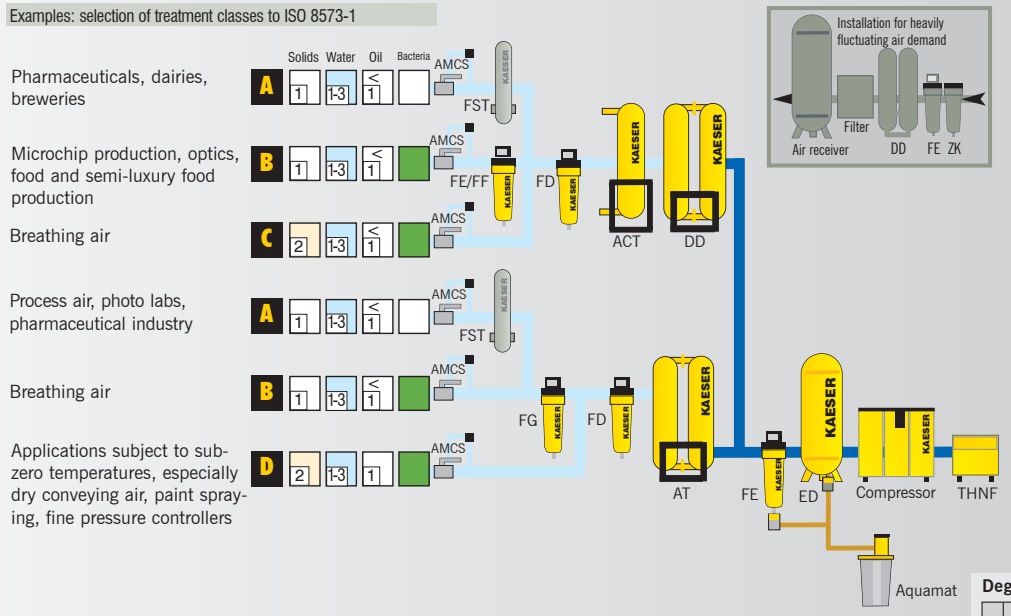
Extremely dry compressed air with pressure dew points as low as -70 °C is required by the pharmaceutical, food and beverage industries and for applications where the air may be subject to sub-zero temperatures. Such low moisture levels can be economically and reliably maintained by KAESER DC desiccant dryers.

Different applications need different grades of air treatment

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

Air treatment with a desiccant dryer (pressure dew point down to -70 °C)

Examples: selection of treatment classes to ISO 8573-1



A Oil vapour content ≤ 0.003 mg/m³, particle retention > 0.01 µm, sterile, odourless and tasteless
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 ≤ 0.01 mg/m³, particle retention > 1 µm

Explanation

THNF = bag filter
cleans dusty and highly contaminated intake air

ZK= centrifugal separator
removes condensate

ED= ECO DRAIN
electronic level-controlled condensate drain

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

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

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

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

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

FST=sterile filter
for bacteria-free air

Aquamat=condensate treatment unit

AMCS=air main charging system

Contaminants

+ Solids -
+ Water/condensate -
+ 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: Max. mass concentration µm	mg/m³	Moisture: Pressure dew point (x = liquid water content in g/m³)	Total oil content 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	–

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

KAESER KOMPRESSOREN GmbH
P.O. Box 2143 - 96410 Coburg - GERMANY — Phone +49 9561 640-0 - Fax +49 9561 640130
www.kaeser.com - e-mail: productinfo@kaeser.com

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