KAESER COMPRESSORS

Membrane Dryer

KMM Series

Air inflow rate
0.018 to 4.633 m³/min

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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. The amount of water vapour air can carry varies however, and is mostly dependent on temperature. If the temperature rises, as happens with compression, then so does the capacity for air to carry moisture. 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 downstream centrifugal separator or the air receiver. Even then, the air is often still totally 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. Therefore, additional drying is essential to avoid production downtime and interruptions, as well as to reduce costly maintenance and repair work.

How it works

The dryer must always be provided with a pre-filter. Compressed air passes through the filter and enters the dryer housing, flows down the gap (1) between the housing and the membrane insert and is deflected upwards at the base of the housing to pass over the bundle of hollow fibres (5). Any particles carried by the air are deposited in the housing base reservoir (3). Water molecules permeate through the all of the membrane fibres to their interior, where the pressure is close to atmospheric pressure. The dried compressed air emerges near the top of the membrane bundle into the central cavity and exits the dryer. A small portion of this dried air is diverted down through the interior of the membrane fibres to carry the water molecules out through the bottom of the dryer housing and release them into the ambient surroundings. The expansion of this compressed purge air on its way down the fibres aids its ability to carry moisture.

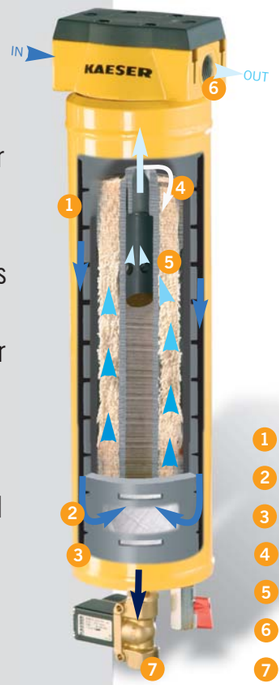
Decentralised
compressed air drying

KMM – efficient, reliable and maintenance-free

The KAESER Membrane Module (KMM) not only features the unique 'Inflow Concept' which is designed for long-term efficient air drying and maximum service life, but also uses new highly effective hollow fibre membranes that are woven in a densely packed 'helix' structure. Requiring minimal space, no consumables and no power source, the KMM achieves pressure dew points from +10 to -40 °C without residue and the need for maintenance.

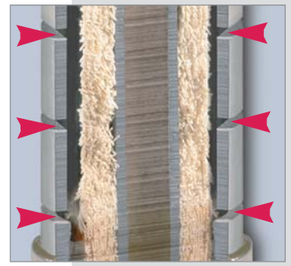
KAESER – providing systems, not just compressors

All KAESER equipment, from compressors to air treatment applications, is designed for optimum reliability and efficiency.



1. Gap (between housing and membrane insert)
2. Air deflector
3. Base reservoir
4. Purge air flow
5. Membrane fibre bundle
6. Compressed air outlet
7. Purge air outlet

'Inflow' System

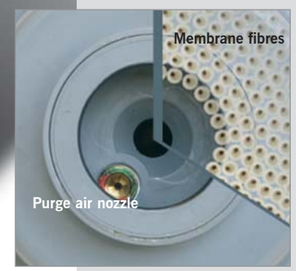


The 'Inflow' concept of outside-to-inside permeation subjects the fibres to external pressure load (instead of internal as with conventional membrane dryers) enhancing fibre stability and drying performance.

Efficient 'Helix' Structure

The membrane fibres are wound in a 'helix' structure that increases the fibre surface area in contact with the compressed air. This results in even air distribution and increased efficiency in a reliable, compact drying unit.

Precision Purge Air Nozzle



Precision purge air delivery via a specifically dimensioned nozzle significantly reduces operating costs, as only the required volume of compressed air for purge use is diverted.

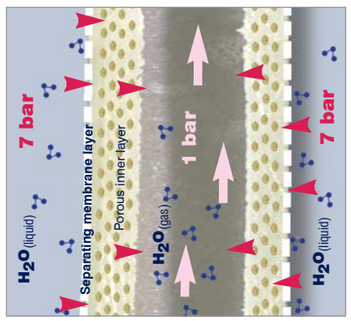
Patented Design

With a US patent and a European patent pending, the new KMM Membrane Dryer is turning heads for several reasons. The 'Inflow' concept ensures outstanding drying results through highly effective moisture removal, enhanced pressure stability and reduced differential pressure. The design also provides protection from any contamination that may enter the dryer, as it is trapped before it can reach the sensitive membrane fibres.

Purge Air Stop Valve (option)

To avoid unnecessary flow of purge air, the solenoid stop valve on the purge air outlet can be set to close during times when there is no compressed air demand.

KMM – Eight Decisive Advantages

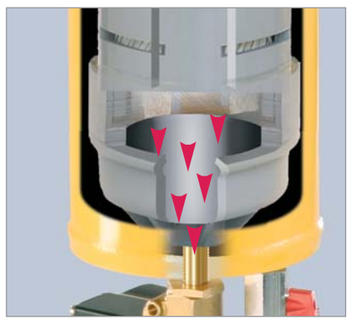


1 'Inflow' Concept

Each hollow membrane fibre consists of a highly porous interior support layer and an external separating membrane layer that is permeable only by water. The pressure differential between the moist compressed air outside the fibre and the flow of purge air, at close to atmospheric pressure, through the centre encourages water molecules to permeate through the fibre wall. The pores of the inner layer remain open and are able to transport water vapour even if the outer layer becomes saturated by moisture at the module inlet or by condensation on the fibres.

2 Outstanding Performance

The helically wound membrane fibre bundle improves the diameter-to-length ratio of the insert reducing the overall length of the dryer. At the same time it presents the maximum membrane surface area to the moist air and ensures an even flow of air through the bundle. This feature, combined with the 'Inflow' concept, results in outstanding drying performance from a compact and highly efficient package.



3 Maximum Reliability

The membrane fibres, and therefore the fibre bundle, are subjected to significantly lower pressure load than conventional dryer designs that pass compressed air through the inside of the fibres. The attached KAESER microfilter fully protects the membrane insert from dirt particles, aerosols and oils. Should any particles find their way into the dryer they are safely deposited in the base reservoir. The 1/4" ball valve on the base of the housing enables easy inspection of operational status.

4 Maintenance- and Cost-Free

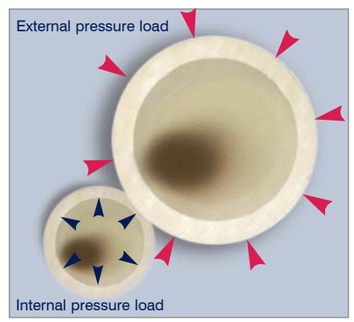
The dryer features a rugged, welded aluminium housing; requires no external power source; has no moving parts and releases the moisture removed from the compressed air as harmless water vapour into the ambient surroundings. With only the pre- and after-filters requiring intermittent replacement, the dryer uses no additional consumable items.

5 Purge Air Stop Valve (option)

The purge air outlet in the dryer housing can accept a silenced solenoid valve that can be closed to stop the escape of purge air when the consumer being fed by the dryer is shutdown.

6 External Pressure Load

The fibres in conventional membrane dryers are usually subjected to internal pressure load, but in the KMM module the outer surface of the highly porous membrane fibres is subjected to external pressure load which significantly increases resistance to mechanical instability and extends dryer module service life.



7 Clean and Environmentally-Friendly

For exceptionally safe and reliable condensate drainage, the pre-filtration stage can be equipped with an electronic ECO-Drain system. Pre-filtration can also be monitored using a filter monitor (E-Pack version) and optional filter monitor box.

8 Simple Installation

The membrane dryer and attached microfilter form a compact unit that can be coupled directly to the consumer, or be mounted on a wall by using the optional mountings. All housings meet the requirements of the Pressure Equipment Directive 97/23/EC and are CFC-free.

Versions and Options

KMM with FE/FF filter – basic version

- KMM membrane dryer employing the 'Inflow' concept and helically wound fibres
- ready fitted with FE/FF pre-filter (see back page)
- pre-filter equipped with a float-controlled condensate drain and pressure differential indicator

KMM with FE/FF filter – E-Pack

As basic version but with the filter equipped with an ECO-Drain electronic level-controlled condensate drain

– high quality level sensor
– intelligent control electronics
– self-monitoring
– easily maintained
– condensate elimination without air loss

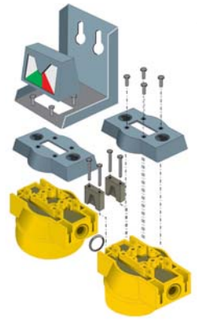
KMM with FE/FF filter and optional purge air stop valve for energy saving

– solenoid valve
– 230 V, 50/60 Hz, 8 W
– open when de-energised
– outlet silencer
– fully assembled

KMM with FE/FF filter and filter monitor

– electronic monitoring of filter insert status
– microprocessor-controlled LCD display
– direct input facility
– monitors operating time, pressure differential and most economical operating mode
– filter change indicator
– continuous pressure-differential measurement
– sends alarm signals via the additional monitor box to the SIGMA AIR MANAGER

Installation and connection set

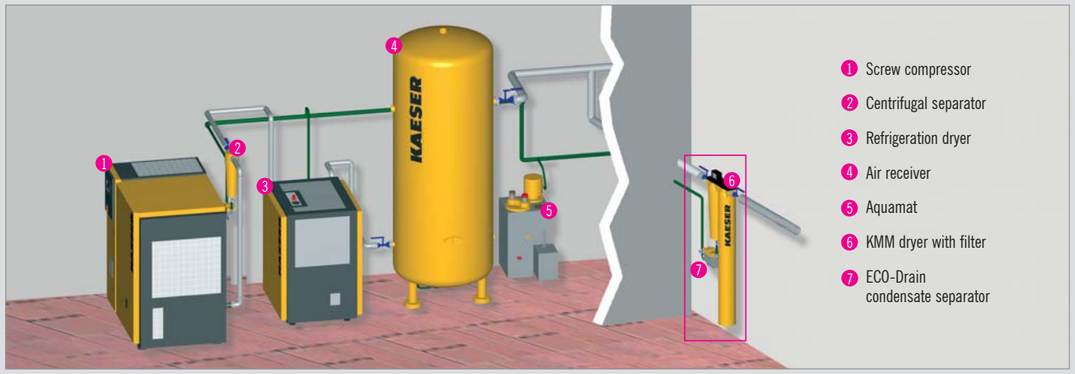


– modular design for simple connection of additional filters (e.g. connection of FFG combination filter)

Wall bracket

– for wall mounting of KMM with filter

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. The service combines tried and tested compressed air components, user advice and services. To benefit from decades of expertise in compressed air system design and construction, let KAESER plan your compressed air system.

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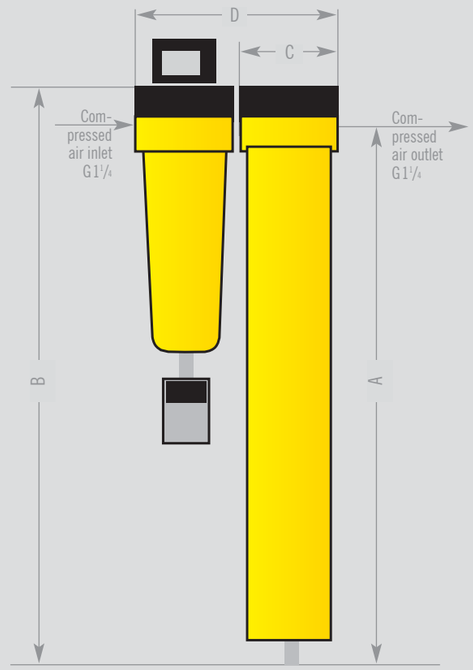
Dimensions

KMM compressed air dryer



Technical specification

Model	Flow rate * (m³/min) for pressure dew points from + 3° C inlet	+ 10° C inlet	+ 30° C inlet	Compressed air connection Internal thread	Dimensions in mm A	B	C	D	Filter model FE/FF	Total weight with filter kg
KMM 1	0.052	0.038	0.035	R 3/8	260	298	105	210	6	6.1
KMM 2	0.148	0.115	0.108		362	400	105	210		6.4
KMM 3	0.333	0.257	0.238		464	502	105	210		6.6
KMM 4	0.435	0.340	0.318		664	702	105	210		7.2
KMM 5	0.815	0.632	0.588	R 3/4	473	514	133	266	28	9.3
KMM 6	1.258	0.985	0.918		670	711	133	266		10.6
KMM 7	2.395	1.862	1.733	R 1	718	762	164	297	48	12.4
KMM 8	3.452	2.745	2.573		819	876	194	327		20.7
KMM 9	4.417	2.563	3.342		987	1035	194	327		22.9

*) In accordance with ISO 7153 option A: reference point 1 bar (abs), 20°C.
Reference point: inlet pressure 7 bar (g), ambient temperature 20°C. Please contact our technical department regarding special applications and versions operating under different ambient conditions.

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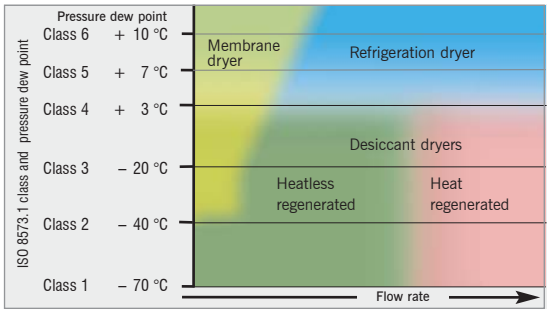


Membrane dryer applications

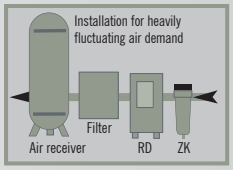
- Limited space and/or mobile operation (container, vehicle)
- Seasonal operation at sub-zero temperatures downstream of a refrigeration dryer for pressure dew points below +3 °C (workshops, petrol stations)
- Local drying of relatively small air volumes directly at a consumer (CNC machine) or where no space is available for any other form of dryer or where instant drying is needed

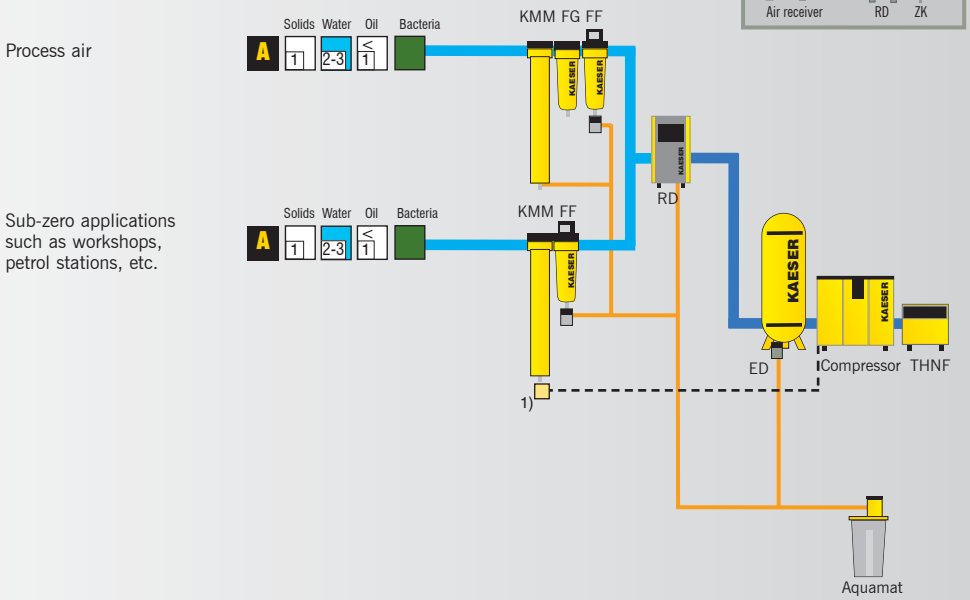
Different fields of application need different grades of air treatment

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

Air treatment with a membrane dryer (pressure dew point down to - 40 °C)

Examples: selection of treatment classes to ISO 8573-1





Explanation

THNF = bag filter
cleans dusty and highly contaminated intake air

ED = ECO-DRAIN
electronic level-controlled condensate drain

KMM = membrane dryer

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 >0.01µm, oil content ≤0.001mg/m³

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

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

Aquamat = condensate treatment unit

ZK = centrifugal seperator

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: µm	Solid particles: 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	–

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

1) Purge air stop valve option - prevents air loss at zero air demand

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

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