

# COMPACT-FILTER

Essentials



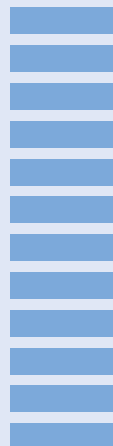
Your partner for filter technology

## AMBIENT AIR AREA OF APPLICATION

Compact filters are designed for the sophisticated fine dust filtration of supply air, which frequently consists mainly of ambient air.

Ambient air always includes particulate and molecular additions, such as solid or liquid aerosols, micro-organisms and gases. Atmospheric aerosols are classified into the following sizes:

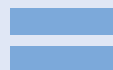
Coarse dust particles:	Diameter > 2,5 µm
Fine dust particles:	Diameter 0,1 µm-2,5 µm
Suspended dust particles:	Diameter < 0,1 µm



Coarse dust particles represent the predominant content (> 95%) of the volume and the mass of atmospheric aerosols. With reference to the number of overall particles, they are of subordinate importance (< 2%). They sediment near the point of origin due to their relatively high weight. Many coarse dust particles are substances of natural origin, where the human filter system in the respiratory tract has evolved to deal with them, and it does so effectively.

Fine dust and suspended dust particles represent a volume and mass fraction of < 5% of the entire atmospheric particle collective. Their particle number fraction, on the other hand, is more than 98% of all atmospheric particles. Due to their small dimensions they are often transported over wide areas by natural air movement. The contamination of the ambient air with this particle type is therefore strongly dependent on location (urban, maritime or rural zones).

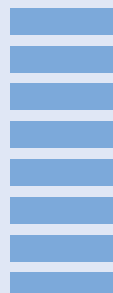
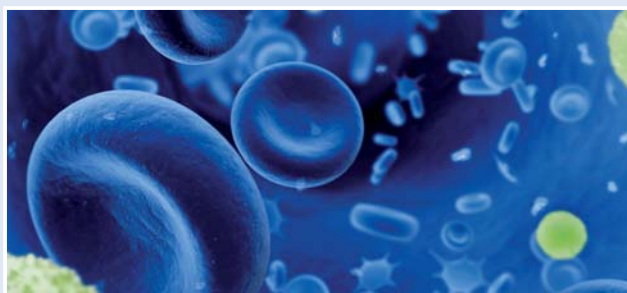
The air exchange, the geographic elevation, as well as the respective season, represent further influences.



## DANGERS THROUGH FINE DUST POLLUTION

In urban population centers, fine dust and suspended dust particles occur which are mainly of civilization-related (anthropological) origin. They come mostly from combustion processes (e.g. vehicle traffic, heating plants), as well as industrial processes (e.g. production, power generation).

Such particles tend to agglomeration and form large, jagged surfaces with high adsorption potential for gases, liquids and biogenic substances (e.g. micro-organisms).



As a result of the addition processes of pollutants (e.g. heavy metals, hydrocarbons, pesticides, plasticizer, flame-retardants, also bacteria and viruses), the hazard potential for persons of these already toxic fine dust and suspended dust particles is increased by a multiple.

Furthermore, toxic ultrafine dusts penetrate into the organism almost unobstructed, since the human defense has not been able to develop any effective protective barrier against this. Ultrafine dust in the respiration organs can lead to respiratory tract infections, such as bronchitis, asthma or carcinomas. Ultrafine dust smaller than 0.1 µm can advance far more deeply into the human organism and pass the alveolus and cellular membrane. In the bloodstream they are frequently triggers for cardiovascular illnesses.

Public awareness of the above-described dangers to human health has increased significantly in past years. In order to check the health danger, limit values have been stipulated on a European level for air pollution in the outside air with the Directive 2008/50/EG. Typical dust concentrations are to be taken from VDI 3677.

Table 1: Air pollution/limit value EC Directive 2008/50/EG.

Contamination	Averaging period	Standard value	Source
Sulfur dioxide SO <sub>2</sub>	24 h	125 µg/m <sup>3</sup>	EG 2008/50
Sulfur dioxide SO <sub>2</sub>	1 year	50 µg/m <sup>3</sup>	EG 2008/50
Ozone O <sub>3</sub>	8 h	120 µg/m <sup>3</sup>	EG 2008/50
Nitrogen oxide NO <sub>2</sub>	1 year	40 µg/m <sup>3</sup>	EG 2008/50
Nitrogen oxide NO <sub>2</sub>	1 h	200 µg/m <sup>3</sup>	EG 2008/50
Suspended matter PM <sub>10</sub>	24 h	50 µg/m <sup>3*</sup>	EG 2008/50
Suspended matter PM <sub>10</sub>	1 year	40 µg/m <sup>3</sup>	EG 2008/50
Suspended matter PM <sub>2,5</sub>	24 h	20 µg/m <sup>3</sup>	EG 2008/50

\* Exceeded on max. 35 days

## FINE DUST FILTRATION WITH COMPACT-FILTERS

Persons in urban population centers frequently spend only approx. three percent of their time daily in the open air. As a result of technical progress and global climate change, the room air is processed in many cases through ventilation and air conditioning systems. The increased air changes associated with that, in combination with emissions through non-suitable air filters, lead to an increase of the contamination in the rooms supplied.

As a result of modern filter systems coordinated with each other, the room air can be protected against contamination through fine dust with its described hazardous potential.

Compact filters indicate a special, design-related performance capability with respect to the deposit of

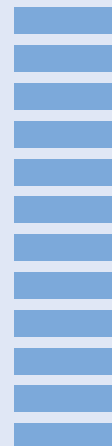
ultrafine particles. The significant feature of compact filters is the structure of pleated microfiber nonwoven, which is stabilized through an applied hot-melt spacer. The filter packets formed in this way are sealed V-shaped into a frame system, which has a surrounding 25 mm flange profile section.

Table 2: Separation efficiencies of air filters according to EN 779 in %

Filter class	Average arrestance A <sub>m</sub>	Average efficiency E <sub>m</sub>	Minimum efficiency E <sub>min</sub>
acc. to EN 779	(synthetic dust)	(DEHS-aerosol @ 0,4 µm)	(DEHS-aerosol @ 0,4 µm) after IPA treatment
G1	A <sub>m</sub> < 65	—	—
G2	65 ≤ A <sub>m</sub> < 80	—	—
G3	80 ≤ A <sub>m</sub> < 90	—	—
G4	90 ≤ A <sub>m</sub>	—	—
M5	—	40 ≤ E <sub>m</sub> < 60	—
M6	—	60 ≤ E <sub>m</sub> < 80	—
F7	—	80 ≤ E <sub>m</sub> < 90	35 ≤ E <sub>min</sub>
F8	—	90 ≤ E <sub>m</sub> < 95	55 ≤ E <sub>min</sub>
F9	—	95 ≤ E <sub>m</sub>	70 ≤ E <sub>min</sub>



As a result of the pleating, a comparatively large filter area with high stability results, which opens up special fields of application to compact filters. In particular, this construction design is used where high nominal airflow rates, large stability and high separation capacity are involved, for example in gas turbines, off-shore plants or for the protection of high-quality applications in clean-room technology.



The installation orientation of compact filters is as desired, and the flow direction can be selected according to the requirement. Thus the maintenance side is freely definable. As a result of the surrounding flange frame, these easily-inserted filters can be installed simply in standard installation frame systems.

Because of half installation depth with respect to traditional bag-type filters, compact filters make more than double the filter area available. A high separation capacity with low differential pressure level results from this. As a result of the stable, inherently-stiff construction design, they are particularly suitable for modern airflow variable system designs; the release of fiber fractions of the filter media (shedding effect) is almost excluded with compact filters.

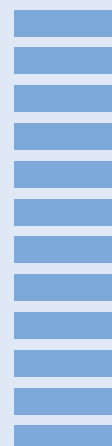
In combination with suitable upstream filters, they can also generate a considerable energy-saving potential with respect to traditional filter systems.



## KALTHOFF COMPACT FILTER TYPES

The KALTHOFF compact filter types are characterized in particular in that they offer solutions for the entire range of requirements. Whether the primary issues are the highest mechanical rigidity, very high air capacity or a compact filter construction design which is responsive to economic considerations, these types offer a well thought out solution for all demands. The concept of all types is based on the interaction of a uniform high efficiency with moderate pressure loss rise. This is achieved through the processing of high-quality filter

media on modern manufacturing plants, with manufacturing methodology which is media-specifically optimized. The KALTHOFF INTER-MELT process provides for a maximum of free filter area in this case, because it generates optimal pleating geometry and guarantees open structures with high levels of stability. Innovative filters, which are characterized by high cost-effectiveness and comprehensive operational safety, result from this technology. Kalthoff compact filters are setting new standards here.



## SAFETY

The employment of environmentally-protective and sustainable production procedures over the entire added-value chain, as well as the selection of safe and tested materials, are an important pillar of our company philosophy. The sanitary harmlessness of the products enjoys a high place value. Therefore RELIM composite micro spunbonds consist of pure, chemically-inert, organic fibrous materials. The fibers are bonded thermally, moisture-resistant in every form and free from binding agents. Neither CFC's nor other chlorinated compounds are employed, and the use of bleaching and coloring agents has been dispensed with. KALTHOFF composite micro spunbonds are FDA approved. Their employment in highly-sensitive areas

of the pharmaceutical or food industry is possible without any restrictions.

The micro-glass-fiber papers used in the FLUWID VSK types fulfill the certification criteria for employment in the pharmaceutical and medical-technical sectors.

According to the regulations of EN 15423 (fire protection of ventilating systems), air filters must be authorized according to EN 13501. Kalthoff compact filters satisfy this requirement and correspond to Class E (normally flammable), as is the case with our entire product range.

## QUALITY



Compliance with the high performance level is checked regularly during individual production stages and in the laboratory.

As a result, we guarantee our customers the durable, high product quality of all Kalthoff air filters.

In addition, there are test certificates from independent institutions available, which confirm the certificates of compliance.

## OUR PRODUCTS - COMPACT, EFFICIENT

The synthetic filter media of our RELIM VRK types are based on the composite nonwoven patented by Kalthoff. The synthetic micro-spunbond of electrically-uncharged, organic synthetic fibers has been adapted especially to the filtration of fine dusts.



The filter media is extremely robust and moisture-proof, and has a large dust-holding capacity with low initial pressure drop. Kalthoff composite filter media therefore have a high uniform efficiency with moderate pressure drop rise. In combination with modern technology, considerable operating cost reductions can be realized.

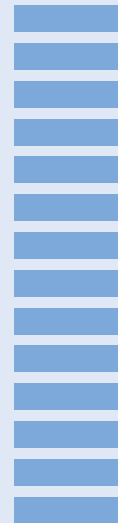
## RELIM VRK BLUE LINE

The **VRK Blue Line** industrial version is designed for the highest demands on the mechanical strength and stability, with high efficiency (e.g. in gas turbines).



The filter packs are completely sealed in the plastic casing made of pure polymer, therefore the filter can be extremely high mechanically charged. The burst pressure drop of this construction is far above 3000 Pa.

As a result of the employment of the fully-synthetic Kalthoff RELIM filter media, the filter is immune without limit to the action of moisture, and is therefore usable in applications with permanently high humidity.

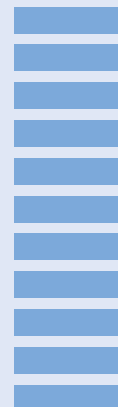


## RELIM VRK BLACK LINE



With the **VRK Black Line** version, the main features of the Blue Line version, such as RELIM filter media, 2-component sealant and plastic casing, are realized.

The sealant compounds and technology are adapted to employment in HVAC conditions.



## RELIM VRK LAMBDA



Kalthoff **RELIM VRK LAMBDA** compact filter is the most innovative product of the compact filter family, and is implemented with the consistent further development of our fully-synthetic product line. Here the established RELIM filter media is combined with our successful FIBERPLAST frame material.

The resulting FIBERPLAST composite frame system, with its resource-saving construction design and vertical pleats, optimizes the airflow geometry, increases the material efficiency and allows the filter to be far lighter. The RELIM VRK LAMBDA type is convincing with its enormous efficiency in the overall cost balance.

## FLUWID VSK

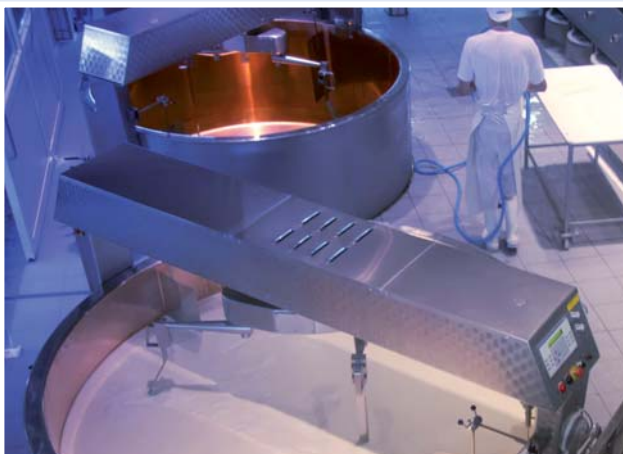
The **FLUWID VSK** version consists of close-pleated, one-layer, homogenously structured micro-glass-fiber paper, and is adjusted to high airflow rates by means of the Kalthoff INTERMELT process. The optimized pleat packs guarantee low pressure drop and constantly high filter efficiency. The pleat packs are completely sealed into the plastic frame.



- The FLUWID VSK version targets applications in which
- very large airflow rates are processed, and the filter
- is exposed to somewhat low levels of mechanical
- charging and moisture influence.

## HYGIENE

- In order to adapt to the requirements for a special hygienic standard, our RELIM VRK types
- have been examined by *Deutsches Hygiene Institut* (Berlin). It has been confirmed that all
- relevant standards and directives are satisfied in full scope with regard to hygiene (VDI 6022,
- D1946-4, SWKI 99-3, EN 13779 etc.).



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**Institut für  
geprüft  
RLT-Hygiene  
Lufthygiene**

Hygienerrelevante Merkmale

- VDI 6022 (D)
- VDI 3803 (D)
- ÖNORM H 6021 (A)
- SWKI VA 104-01 (CH)
- DIN EN 13779 (EU)
- DIN 1946 Teil 4 (D)
- SWKI 99-3 (CH)
- ÖNORM H 6020 (A)

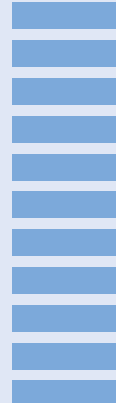
geprüft durch **ILH BERLIN**

The corresponding certificate is relevant, particularly in areas with the highest demands on hygiene, such as the packaging and filling of foodstuffs, in medical technology, in the pharmaceuticals industry or in hospitals.

## SERVICE

Our extensive filter stock enables a short-term delivery service for many usual standard products, which is optimally supported by our own vehicles.

In addition we fulfill further demands on valuable logistics, such as e.g. customer and/or object-related labeling and packaging with just in time delivery.



## TENDER TEXT

Kalthoff **RELIM VRK** compact filter type consisting of:

Close-pleated filter media of progressively structured, moisture-resistant, synthetic microspunbonds. The KALTHOFF INTERMELT process guarantees the highest level of filter media utilization. The filter packs are completely sealed into the dimensionally-stable plastic casing. The surrounding 25 mm flange guarantees simple and secure installation in standard installation frames. The mounting position of the filter is independent of position, thus the maintenance side is freely definable.

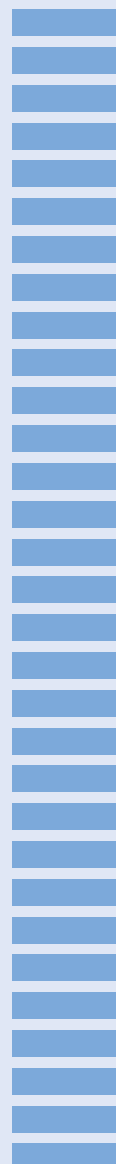
Kalthoff **RELIM VRK LAMBDA** compact filter type consisting of:

Close-pleated filter media of progressively structured, moisture-resistant, synthetic microspunbonds fabric. The KALTHOFF INTERMELT process guarantees the highest level of filter media utilization. The filter packs with vertical pleat-run are installed into the KALTHOFF FIBERPLAST composite frame system. The surrounding 25 mm flange guarantees simple and secure installation in standard installation frames. The mounting position of the filter is independent of position, thus the maintenance side is freely definable.

Kalthoff **FLUID VSK** compact filter type consisting of:

Close-pleated filter media of homogenously structured micro-glass-fiber paper. The KALTHOFF INTERMELT process guarantees high levels of stability and filter media utilization. The filter packs are completely sealed into the dimensionally-stable plastic casing. The surrounding 25 mm flange guarantees simple and secure installation in standard installation frames. The mounting position of the filter is independent of position, thus the maintenance side is freely definable.

All filter types are available in filter class M6, F7, F8 and F9, according to EN 779, and packed in transport-stable cartons.



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