viledon®

RELIABLE FOR STERILE AIR AND CLEANROOMS

MULTI-STAGE VILEDON AIR FILTRATION SYSTEMS

FREUDENBERG
FILTRATION TECHNOLOGIES

FREUDENBERG
INNOVATING TOGETHER

VILEDON AIR FILTRATION SYSTEMS

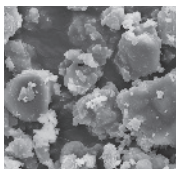
HIGHEST QUALITY FOR ABSOLUTE PURITY

High-tech demands maximum purity. The tightest manufacturing tolerances and absolute precision in the production of semiconductors or nanoprocessors can be achieved only under cleanroom conditions. The pharmaceutical industry also requires the same high demands on air purity in the production of pharmaceutical drugs and active ingredients. It uses special safety zones for certain production steps, protecting the product from contamination.

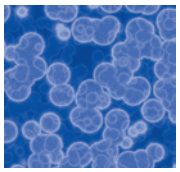
In addition to airborne particles and hazardous gases also germs need to be filtered reliably from the air. This is especially important in biotechnology, the pharmaceutical industry, and the production of foods and cosmetics. In addition, actions must be taken to protect adjacent areas and the environment from being contaminated by harmful airborne particles and germs.

High air purity is the essential requirement for sensitive controlled technical processes. Cleanrooms are used as they ensure a low-particle or, when necessary, a low-germ environment. Viledon® uses efficient multi-stage air filtration systems to achieve the required clean-air quality.

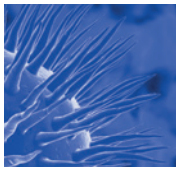
VILEDON AIR FILTRATION SYSTEMS PROVIDE RELIABLE PROTECTION AGAINST:



Atmospheric dust consists of, among others, road dust, soot, and organic components. Respirable fine dust (< 2.5 µm) is harmful to health as it can trigger inflammations in the lungs and transport toxic substances.



Bacteria multiply through cell division and are predominantly 1 to 5 µm in size. They can cause illnesses, such as cholera, diphtheria, whooping cough, tuberculosis, and typhoid fever.

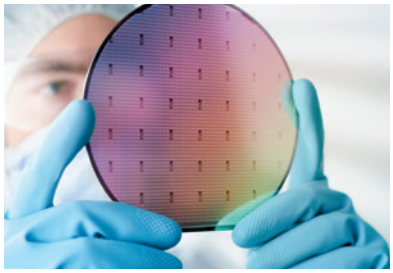


Viruses are tiny parasites (15 to 400 nm). Their structure consists of an outer layer and a nucleic acid core, which infects a susceptible cell as the means of reproduction. Viruses cause Ebola, influenza, measles, and chicken pox, among others.

CUSTOMIZED FILTER CONCEPTS

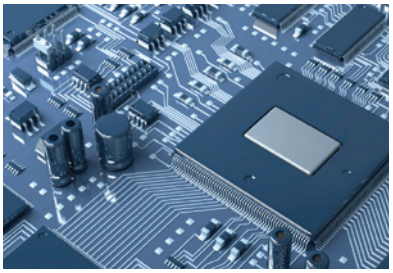
VILEDON PROVIDES OPTIMUM PROTECTION FOR YOUR APPLICATION

PROTECTION AGAINST PARTICLES AND GASES



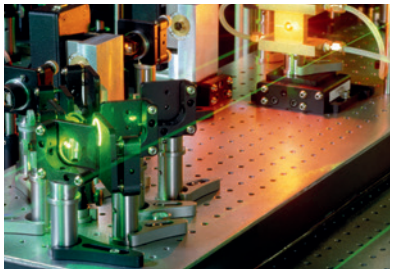
Semiconductor manufacturing

Whether microprocessors or microcontrollers, solar cells, photodetectors or light diodes are concerned, every miniscule particle can impair the performance of technical products.



Nanotechnology

In nano research, orders of magnitude range from 100 nanometers to individual atoms. The tiniest foreign particles will have a negative effect on the processes and must be removed from the air.



Optics and laser technology

Optics and laser technology require maximum precision. Maximum air purity is, therefore, an essential requirement for the best results.

PROTECTION AGAINST GERMS AND MICROORGANISMS

Pharmaceutical industry

In the manufacture of pharmaceuticals and active ingredients, it is crucial that germs and particles are reliably removed from the air to prevent contaminations and to ensure product purity.

Biotechnology

A multitude of various applications fall under the term biotechnology. What they have in common is a high demand for purity. Enzymes, cells, and organisms can be used only when high purity is achieved.

Food and beverage industry

Strict hygiene regulations govern the production of food and beverage. This affects also the air filtration, which must function reliably at all times.

THE MULTI-STAGE VILEDON FILTER CONCEPT

LOWER ENERGY COSTS AND CO_2 EMISSIONS

Increasing energy costs and the necessity to reduce CO_2 emissions are raising awareness about the energy consumption of ventilation and air conditioning systems (AHU: Air Handling Units). Freudenberg Filtration Technologies uses a concept that can filter particles and harmful germs from the air in a reliable and energy-saving way: the multi-stage Viledon® filter concept. The principle is simple and efficient: well-matched filter stages with Viledon® air filters of various filter classes and designs.

Usually a two-stage prefiltration consisting of Viledon® pocket filters and cassette filters removes coarse to fine particles. Not only are these air filters highly effectively, they also have excellent energy efficiency values according to EUROVENT. The combination of a high dust holding capacity and low pressure drop results in low energy consumption and a reduction in CO_2 emissions with controlled fans.

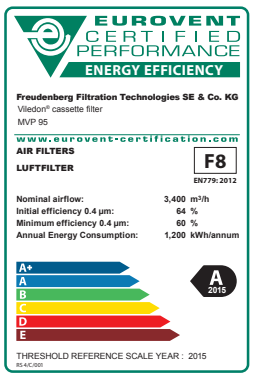
Viledon® EPA, HEPA and ULPA filters are used as a final filter stage. They are responsible for reliably arresting finest particles and germs and can be used in cleanrooms with turbulent or low-turbulent airflow.

Air is moved with low-turbulent, laminar airflow to achieve the highest clean-air quality directly at the sterile product. In adjacent areas, the air exchange rate should be adjusted to the process, equipment, and attendant persons depending on required cleanroom class. The way an area is supplied with filtered air must be designed so that effective airflow is ensured under all operating conditions and positive pressure is maintained compared to adjacent areas with a lower risk. The airflows are carefully routed so that particles generated by a person, a process or a machine are not carried into zones with a higher risk. When hazardous substances are being handled, EPA, HEPA and ULPA filters must also be used to clean the exhaust air.

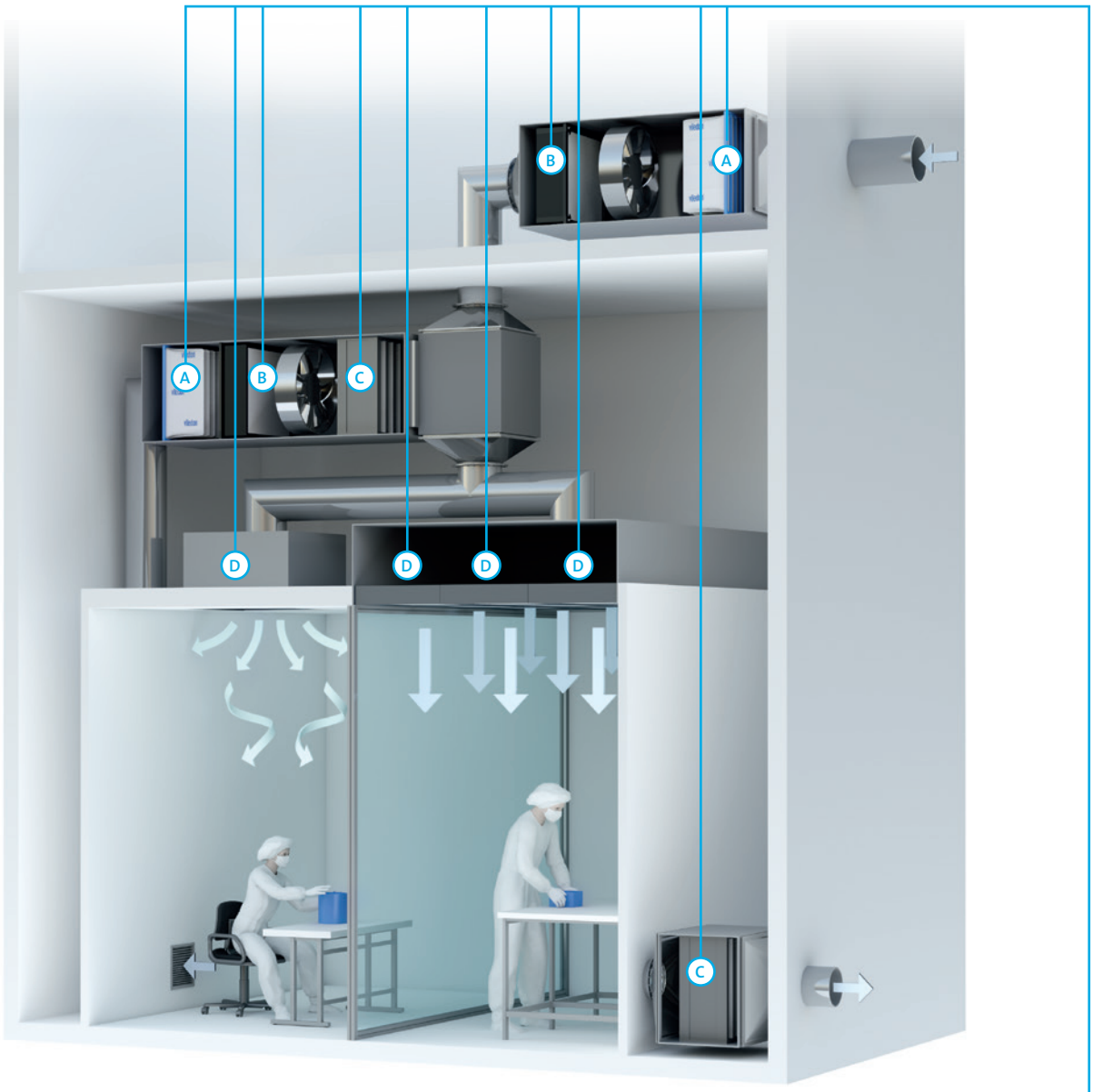
Summary

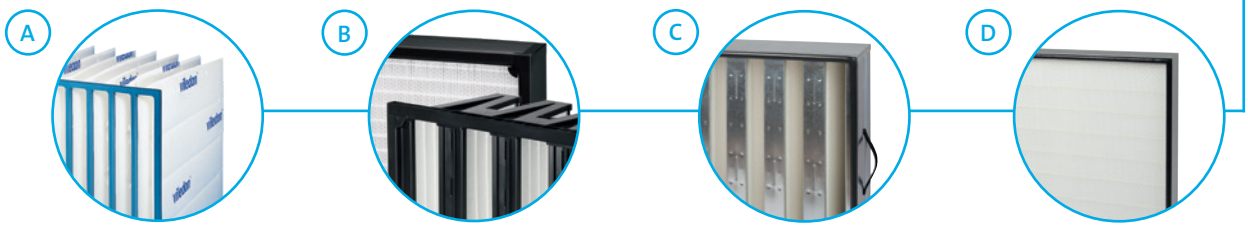
The perfect combination of filter stages reduces flow resistance in the air filtration system and lowering the amount of energy the fans consume. This reduces costs.

energy efficiency
performance



You will notice energy-efficient Viledon® air filters by their EUROVENT energy efficiency label.





Compact pocket filters
ISO ePM10 60%–ISO ePM1 80%
to ISO 16890

(M6–F8 to EN 779:2012)

Cassette filters
ISO ePM2 65%–ISO ePM1 85%
to ISO 16890

(F7–F9 to EN 779:2012)

High-volume flow EPA, HEPA and ULPA filters
H13–H14

EPA, HEPA and ULPA filters
H13–U15

The new edition of DIN 1946-4: 2018 for ventilation and air conditioning installations in buildings and rooms of the health care gives the following recommendation: Room air class II (medically used rooms that are not Class I) for 1st filter stage min. ISO ePM1 50% and 2nd filter stage min. ISO ePM1 80%. Room class I (operating theaters, etc.) in addition 3rd filter stage min. H13.

COMPREHENSIVE AIR FILTER PROGRAM FOR CLEANROOMS

MAXIMUM RELIABILITY IN PREFILTRATION

Particularly strict regulations apply to cleanrooms. Airborne particles and germs must be reduced to an absolute minimum in order to protect highly sensitive products and processes. For cleanroom technology, Viledon® offers a comprehensive air filter program with the filtration efficiencies ISO ePM10 60% to ISO ePM1 85% for prefiltration, meeting the highest demands in efficiency and operational dependability.

HIGH-PERFORMANCE, ECONOMICAL AND ENERGY-EFFICIENT

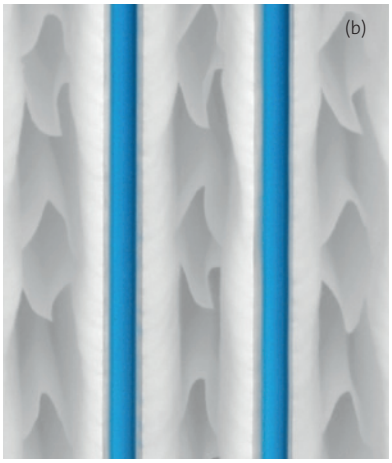
Viledon® Compact pocket filters offer high functional depenability and require no maintenance over the entire operating time. They are the optimum combination of stable arrestance performance for fine dusts, high dust holding capacity, low pressure drops, and long lifetime.

Compact pocket filters

FILTER TYPE	FILTER CLASS TO ISO 16890	FILTER CLASS TO EN 779:2012
T60	ISO ePM10 60%	M6
T90	ISO ePM2,5 70%	F7
MF90	ISO ePM2,5 70%	F7
MF95	ISO ePM1 80%	F8

Viledon® Compact pocket filters are free of glass-fibers

(a)



(b)

Your advantages with Viledon®

- High-performance nonwoven from own production: non-breaking, purely synthetic-organic filter media.
- Highly functional dependability against dust penetration due to leakproof welded filter pockets, foam-sealed into the front frame (a).
- Aerodynamically optimized welded-in spacers for inherently rigid filter pockets and uniform dust deposition (b).
- Non-corroding and moisture-resistant up to 100 % relative air humidity.

RELIABLE WITHOUT COMPROMISE: ISO EPM2,5 65% TO ISO EPM1 85%

Viledon® MaxiPleat cassette filters have excellent technical properties that create optimum media velocity with low pressure drops even at high volume flows. The high stability of the entire filter construction offers reliable operation, even under extreme conditions.

MaxiPleat cassette filters

FILTER TYPE	FILTER CLASS TO ISO 16890	FILTER CLASS TO EN 779:2012
MX 85	ISO ePM2,5 65%	F 7
MX 95	ISO ePM1 75%	F 8
MX 98	ISO ePM1 85%	F 9

Viledon® MX 95 cassette filters have outstanding energy-saving properties

The technology behind the product

The filter media in Viledon® MaxiPleat cassette filters consist of micro-glass-fiber paper, which maintains its V-shaped pleat geometry through a thermal embossing process. The conical dimples serve as spacers and stabilize the pleat package.

Your advantages with Viledon®

- No need to use foreign materials as spacers.
- Optimum V-shaped pleat geometry of the filter medium for homogeneous media velocity.
- Full utilization and uniform dust deposition on the filter area.

BEST PROPERTIES FOR MAXIMUM EFFECT

Viledon® MVP cassette filters have a high dust holding capacity and low pressure drop values. Casting the dimensionally stable pleat package in the plastic frame assures a high degree of security against dust breakthrough over the entire operational lifetime.

MVP cassette filters

FILTER TYPE	FILTER CLASS TO ISO 16890	FILTER CLASS TO EN 779:2012
MVP 85	ISO ePM2,5 70%	F 7
MVP 95	ISO ePM1 70%	F 8
MVP 98	ISO ePM1 85%	F 9

Viledon® MVP cassette filters offer an optimum price-performance ratio

COMPREHENSIVE AIR FILTER PROGRAM FOR CLEANROOMS

ABSOLUTE PURITY IN FINEST FILTRATION

For finest filtration, as the final filter stage in a multi-stage air filtration system, Viledon® EPA, HEPA and ULPA filters are particularly suitable. They meet the highest clean-air and sterility requirements in demanding air-conditioning technology and in sensitive industrial processes. Effective prefiltration protects these high-quality filters and extends their operational lifetime considerably.

RELIABLE AGAINST FINEST PARTICLES AND GERMS

Viledon® EPA, HEPA and ULPA filters with filter media consisting of high-arrestance micro-glass-fiber papers ensure homogeneous media velocity coupled with low pressure drops, even at a high volume flow. The frame is made of extruded anodized aluminum and is extremely solid and moisture-resistant. Each filter element is tested using state-of-the-art scanning equipment for filtration efficiency and leakproofing according to EN 1822:2009 and is delivered together with its test certificate.

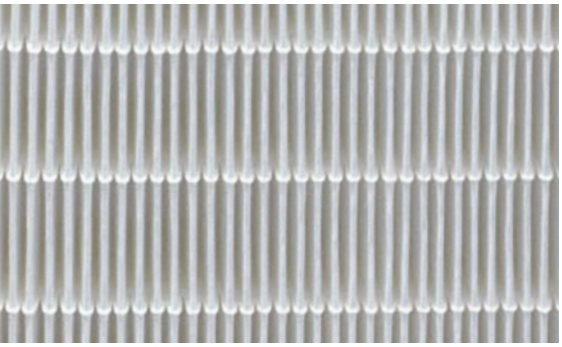
EPA, HEPA and ULPA filters with aluminum frame

Overall depth: 68 mm | 78 mm | 88 mm | 150 mm | 292 mm with semicircular PU seal, 80 mm with silgel seal

FILTER CLASS TO EN 1822:2009	FILTER CLASS TO ISO 29463	FILTRATION EFFICIENCY MPPS*
H 13	ISO 35 H	≥ 99.95 %
H 14	ISO 45 H	≥ 99.995 %
U 15	ISO 55 U	≥ 99.9995 %

* MPPS = Most Penetrating Particle Size

Viledon® EPA, HEPA and ULPA filters guarantee effective protection for sensitive products and processes



The technology behind the product

Viledon® EPA, HEPA and ULPA filters are made using MiniPleat technology, where thin hot-melt threads are used for fixing and spacing the pleats. This ensures flow-friendly geometry and equidistance of the pleats, facilitating homogenous airflow with a very low pressure drop. The result is particularly economical and reliable operation plus a quasi-laminar outflow.

MiniPleat-technology: equal distance between the pleats allows for homogeneous airflow.

FOR THE HIGHEST CLEAN-AIR AND STERILITY REQUIREMENTS

Thanks to the MiniPleat technology used and the V-shaped configuration of the pleat package, Viledon® high volume flow EPA, HEPA and ULPA filters have a particularly large filtering area. They provide reliable particle and germs arrestance in an efficient and economical way. The recessed grips at the side and a gripping lug allow for easier handling and installation.

Viledon® high volume flow filters are microbiologically inactive.

High volume flow HEPA filters with steel or stainless steel frame

Overall depth: 292 mm with foamed-on polyurethane gasket

FILTER CLASS TO EN 1822:2009	FILTER CLASS TO ISO 29463	ARRESTANCE EFFICIENCY MPPS*
H 13	ISO 35 H	≥ 99.95 %
H 14	ISO 45 H	≥ 99.995 %

* MPPS = Most Penetrating Particle Size

Also available:

- Ceiling air outlets for EPA, HEPA and ULPA filters with plastic or steel plenum
- Plastic plenum hood for filter classes H 14 and U 15

Plastic plenum hood

Ceiling air outlets

Viledon® air filters meet all hygiene requirements

Hygiene guideline VDI 6022 defines clear specifications for ventilation and air-conditioning systems and units in sensitive application areas such as cleanrooms. These requirements are in place to ensure the removal of harmful microorganisms and of inorganic and organic dust to protect sensitive products and processes. Viledon® air filters fulfill without restrictions all criteria of the VDI 6022 guideline "Hygiene requirements for ventilation and air-conditioning systems and units."

- Corrosion-free and moisture-resistant up to 100 % relative air humidity.
- The materials used prevent bacteria and fungi from growing.
- Reliably leakproof, even under extreme operating conditions.

MAXIMUM PROTECTION IN CLEANROOMS

TESTING AND CLASSIFICATION OF EPA, HEPA AND ULPA FILTERS

ISO 14644-1

Classification of cleanrooms

The EN ISO 14644 standard describes the requirements for cleanrooms and associated cleanroom areas. In production rooms, the purity levels of the air vary depending on the product as stipulated in EN ISO 14644-1. This guideline classifies rooms according to their particle count per cubic meter (depending on particle size).

EN 1822

Test methods for EPA, HEPA and ULPA filters

In Europe, EPA, HEPA and ULPA filters are subject to classification according to EN 1822 for filtration efficiency and zero leakage. HEPA and ULPA filters are also subject to individual tests. The international standard ISO 29463 is based on European standard EN 1822 and will probably replace this standard in the future. Both standards are based on the latest particle counting methods.

VDI 6022

Viledon® air filters satisfy the requirements

VDI Guidelines 6022 “hygiene requirements for ventilation and air-conditioning systems and units” defines clear specifications for the use in sensitive application areas, such as clean rooms. Viledon® pocket and HEPA filters satisfy all VDI 6022 criteria without restrictions.

Overview of definitions for ISO filter classes and related arrestance efficiency and penetration

GROUP	FILTER CLASS ACC. TO ISO 29463	FILTER CLASS ACC. TO EN 1822:2009	INTEGRAL VALUES FOR MPPS*		LOCAL VALUES FOR MPPS*	
			EFFICIENCY AT MPPS*	PENETRATION AT MPPS*	EFFICIENCY AT MPPS*	PENETRATION AT MPPS*
EPA	ISO 15 E	E 11	≥ 95 %	≤ 5 %	–	–
	ISO 20 E		≥ 99 %	≤ 1 %	–	–
	ISO 25 E	E 12	≥ 99.5 %	≤ 0.5 %	–	–
	ISO 30 E		≥ 99.9 %	≤ 0.1 %	–	–
HEPA	ISO 35 H	H 13	≥ 99.95 %	≤ 0.05 %	≥ 99.75 %	≤ 0.25 %
	ISO 40 H		≥ 99.99 %	≤ 0.01 %	≥ 99.95 %	≤ 0.05 %
	ISO 45 H	H 14	≥ 99.995 %	≤ 0.005 %	≥ 99.975 %	≤ 0.025 %
ULPA	ISO 50 U		≥ 99.999 %	≤ 0.001 %	≥ 99.995 %	≤ 0.005 %
	ISO 55 U	U 15	≥ 99.9995 %	≤ 0.0005 %	≥ 99.9975 %	≤ 0.0025 %
	ISO 60 U		≥ 99.9999 %	≤ 0.0001 %	≥ 99.9995 %	≤ 0.0005 %
	ISO 65 U	U 16	≥ 99.99995 %	≤ 0.00005 %	≥ 99.99975 %	≤ 0.00025 %
	ISO 70 U		≥ 99.99999 %	≤ 0.00001 %	≥ 99.9999 %	≤ 0.0001 %
	ISO 75 U	U 17	≥ 99.999995 %	≤ 0.000005 %	≥ 99.9999 %	≤ 0.0001 %

* MPPS = Most Penetrating Particle Size

Individual testing

Each one of our HEPA / ULPA filter elements is tested for filtration efficiency and leakproofing according to EN 1822:2009 and delivered with its test certificate.

ALL FROM A SINGLE SOURCE

COMPLETE AIR FILTER SYSTEMS AND COMPREHENSIVE SERVICE

Viledon® Engineering

Freudenberg Filtration Technologies combines a comprehensive range of reliable and energy-efficient filtration solutions with technical development and installation know-how for multi-stage filtration systems. Viledon® Engineering provides a complete service and installation program, including all construction elements for building new or modifying existing air filtration systems, especially in areas with stringent requirements on clean air quality.

Viledon® filterCair Service

With the Viledon® brand, Freudenberg Filtration Technologies offers an air filter program of filter classes ISO coarse (G 2) to U 15, the highest demands in efficiency, and operational dependability. Completing this portfolio is our excellent service offer Viledon® filterCair directly at the customer's site.

Your advantages with Viledon® filterCair

- Hygiene inspections and regular inspections in accordance with VDI 6022, using trained personnel .
- Filter comparison measurements.
- Energy efficiency measurements.
- Filter replacement, cleaning and disposal including approval measurement.
- Filter procurement, stockholding and disposition.
- Individual on-site advice
- Status analysis and detailed recommendations for action by our Viledon® filterCair experts
- Comprehensive, interactive and audit-relevant measurement reports

Find the optimal filter solution for your plant with e.FFECT based on ISO 16890. Standardized systems for supply air filtration are frequently inefficient and do not make full use of their potential for optimization. The more specifically filter systems are customized to the respective ambient conditions and plant requirements, the greater performance and reliability they achieve. Our experts work with you to develop the best filter solution for your plant on the basis of the testing standard ISO 16890. In the filter evaluation, typical urban and rural particle size distributions are considered based on the particulate matter fractions PM_1, $PM_{2,5}$ and PM_{10}, and filter filtration efficiencies are determined accordingly.

e.FFECT
electronic Freudenberg Filter Efficiency Calculation Tool

Discover more at:

www.freudenberg-filter.com

Or contact us:

+49 (0) 6201 80–6264

viledon@freudenberg-filter.com

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Freudenberg Filtration Technologies SE & Co. KG
69465 Weinheim, Germany
Phone +49 (0) 6201 80-6264 | Fax +49 (0) 6201 88-6299
viledon@freudenberg-filter.com | www.freudenberg-filter.com

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