Viledon Filters for Indoor Climate Control – the Safest Choice for the Cleanest Air

viledon®

The Freudenberg Nonwovens Group

Freudenberg

Aircraftsmanship ...
preconditions, standards, filter selection criteria

Reg. No. 1420

Freudenberg Vliesstoffe KG
Filter Division
Weinheim/Germany

The air's quality

Growing awareness of environmental and health concerns has meant that high-quality filtration of the breathing air in indoor climate control systems is of paramount importance. Indoor climate control systems incorporate air filters to clean the supply air, their main task being to minimize the quantities of gaseous or particulate pollutants entering the building through the air flow.

Sources of air pollution include natural particles, predominantly from erosion processes of the Earth's crust, in sizes > 2 µm. This size category also covers pollens, spores and certain species of bacteria. More frequently encountered, however, are pathogenic particles in sizes < 2 µm, most of them stemming from industrial and combustion processes, and from road traffic (see illustration).

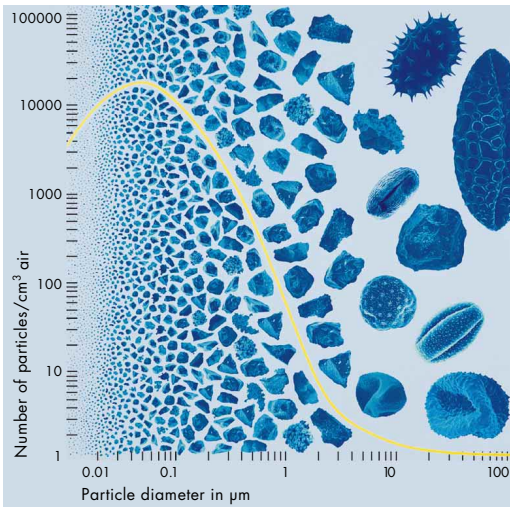
The Viledon range of filters has been optimally attuned to the requirements of indoor climate control in terms of product diversity, performance and quality. This means a broad spectrum of choices is offered for particle arrestance, from filter mats, AC and Compact pocket filters or MaxiPleat filters to HEPA/ULPA filters. Viledon CarboPleat and DuoPleat filters have proved highly efficacious in reducing pollutant gases and unwanted odors.

Standards in air filtration

Air filters are predominantly classified under European Standard EN 779, which differentiates between coarse filters (Filter Classes G1 – G4) and fine filters (Filter Classes F5 – F9). Coarse filters are evaluated in terms of their gravimetric arrestance, fine filters in terms of their efficiency with atmospheric aerosols. As an alternative to EN 779, the fractional arrestance test to EUROVENT 4/9 is increasingly popular for assessing the performance of fine filters. In this method of measurement, the arrestances for individual particle sizes are evaluated. The applicable standard for HEPA/ULPA filters is EN 1822, where the arrestance in MPPS, referred to as the arrestance minimum, is taken as a measure for purposes of filter classification.

The type test documented by the DIN mark of conformity for Viledon coarse and fine filters ensures a consistently verifiable quality of the filters concerned. Freudenberg's HEPA/ULPA filters are individually leak-tested, so that customers can be reassured their application's in good hands.

A modern quality management system to ISO 9001 safeguards all the operations involved, from the initial stages of development and applications engineering consultancy all the way through to delivery and after-sales service.



Average particle size distribution in the outside air (as per Hinds, 1982)

Crucial selection criteria for air filters

The Filter Class is the first and most important selection criterion for air filters used in indoor climate control. Besides the filter efficacy required, dust holding capacity and pressure drop (characteristic) are crucial factors in determining a filter's cost-efficiency.

Choosing the right air filter is an optimization problem between the performance efficacy required and minimized overall costs. Inexpensive air filters, for example, may, due to their operating characteristics (higher pressure drop, shorter lifetime, entail significantly higher operating costs for the end-user than the Viledon filters, with all their optimized filtering properties.

Viledon filters made of progressively structured or triple-layered progressive-design nonwovens, excel in terms of optimum arrestance and pressure drop values plus long lifetimes, making them extremely cost-efficient for their users.

The Viledon range of filters for indoor climate control at a glance

Type		Filter Class to EN 779 or EN 1822	Average arrestance [%] to EN 779	Filter minimum efficiency at MPPS [%] to EN 1822	Average efficiency [%] to EN 779	
PSB-Series		G2–G4	67/83/91			Filter mats/ Roll filters
P15-Series		G2–G4	67/85/94			
A 3/300 S		F5	97		46	
R/260		G3	80			
MP 45		G4	90			AC pocket filters + pleated panel filters
AC 35		G3	87			
AC 50		F5	98		50	
AC 75		F6			75	
AC 85		F7			86	
AC 95		F8			94	
G 35 S/G 35 SL		G3	86/87			Compact pocket filters
F 45 S/F 40		G4	95			
F 50		F5	97		51	
MF 70/T 60		F6	>99/99		75/63	
MF 90/T 90		F7	>99		84/85	
MF 95		F8	>99		94	
CarboPleat						Activated-carbon filters
DuoPleat		F7			85	
MX 75		F6	99		75	MaxiPleat filters
MX 85		F7	>99		86	
MX 95		F8	>99		92	
MX 98		F9	>99		96	
Series SF 11		H11		≥ 95		HEPA/ULPA filters
Series SF 13		H13		≥ 99.95		
Series SF 14		H14		≥ 99.995		
Mounting frame galvanized ARV, stainless steel ARE Besides mounting frames, we offer accessory components like plug-in gaskets, alternative spring systems, changing frames for filter mats, pressure drop gauges, and a lot more.						Mounting frames and other components
On request, we will modernize obsolete supply air systems or create new supply air systems, from concept to construction.						Conversion jobs/New systems

Filter mats – classical, ultra-durable or fine versions for stringent filtering requirements

Filter Mat P15/500 S

The filter media and their features

We use **high-performance nonwovens produced in-house from elastic, unbreakable polyester or polypropylene fibers.**

All filter media are **progressively structured.** Result: **longer filter lifetimes.**

Viledon filter mats are **moisture-resistant** up to 100 % relative humidity, and **thermally stable** up to 100°C. All filter media are **self-extinguishing** under the stringent requirements of **Fire Class F1** in conformity with DIN 53 438.

Applications and special characteristics

The classic models among Viledon's filter mats – the types in the PSB series – give excellent service in indoor climate control systems requiring a stable arrestance performance where high dust loadings and high air flow rates are involved. Thanks to their **high dust holding capacity and the resultant long lifetimes,** PSB filter mats are **particularly cost-efficient.**

Filter mats from the P15 series, thanks to the polypropylene fibers used in the medium, **are particularly resistant to chemicals like solvents, acids and lyes,** proving themselves to be **ultra-durable**. The filter material used in the P15 series can be cleaned by washing, beating or spraying, and then re-used.

The A 3/300 S filter mat , thanks to its very good arrestance capabilities, is a **multi-purpose** model used wherever **high-quality filtration in the fine-dust range** is demanded for protecting both people and machinery. The filter mat's clean-air side is specially smoothed for secure fiber bonding.

For traditional **coarse-dust arrestance** using roll filter systems, the R/260 is **the right filter option.** The clean-air side of this filter mat is reinforced by a support fabric, ensuring even and reliable advance of the filter material involved.

PSB/145 S	PSB/275 S	PSB/290 S	P15/150 S	P15/350 S	P15/500 S	A 3/300 S	R/260	
G2	G3	G4	G2	G3	G4	F5	G3	Filter Class to EN 779
67	83	91	67	85	94	97	80	% Average arrestance A_a
2	1.5	1	2	1.5	1	0.25	2.5	m/s Nominal media velocity
20	20	25	20	25	30	20	50	Pa Initial pressure drop
400	600	620	380	600	600	360	400	g/m^2 Dust holding capacity
			yes	yes	yes			Regenerability
2000/40	2000/20	2000/20	2000/40	2000/30	2000/20	2000/20	Ready-to-install rolls	mm/m Supplied as rolls useful width/length
to customer's request								Supplied as cut pieces

AC pocket filters and pleated panel filters – for reliable, high-performance cost-efficiency in every dimension

AC 85 pocket filter

MP 45 pleated panel filter

The filter media and the design

- We use **high-performance nonwovens produced in-house** from elastic, unbreakable synthetic-organic fibers and microfibers.
- All filter media have a **progressive,** or triple-layer-progressive **structure.**
- AC pocket filters **contain no glass fibers,** are **moisture-resistant** up to 100 % relative humidity, and thermally stable up to 55°C. The microbiologically inert filters offer **no nutrient medium for microorganic growth.**
- **High functional dependability** thanks to filter pockets' leak-free configuration.
- Non-corroding, fully incinerable frame made of recycled plastic.
- **Eco-friendly,** containing no PVC, dyestuffs or halogens.

Applications and special characteristics

Viledon AC (Air Conditioning) pocket filters have been developed specifically for indoor climate control, and excel in terms of **cost-efficient, dependable operation.**

The **AC 35 coarse filter** offers stable arrestance of heavy coarse-dust loadings, and is particularly suitable for use as a policing filter. The **AC 50 and AC 75 fine filters** combine good arrestance of fine dusts with high dust holding capacities at low pressure drops. The **AC 85 and AC 95** offer very good arrestance of fine dusts and microorganisms at low pressure drops. Thanks to its over 90 % arrestance of 0.5 µm particles, the **AC 95** provides **superlative room air quality.**

MP 45 pleated panel filters

The main application for the MP 45 is **prefiltration in ventilation and air-conditioning systems.** The filter medium used is a progressively structured nonwoven produced in-house from unbreakable synthetic-organic fibers. The frame is made out of rigid moisture-repellent cardboard, glued at its four inside edges to the pleated filter medium for a dust-proof seal. Diagonal supports give the frame enhanced stability. MP 45 panel filters, thanks to their pleated construction, provide greater dust holding capacity and longer lifetimes than flat-surface filter mats.

MP 45	AC 35 – 330 mm/ AC 35 – 510 mm	AC 50 – 330 mm/ AC 50 – 510 mm	AC 75 – 600 mm/ AC 75 – 510 mm	AC 85 – 600 mm/ AC 85 – 510 mm	AC 95 – 600 mm/ AC 95 – 510 mm	
G4	G3	F5	F6	F7	F8	Filter Class to EN 779
3,400	3,400	3,400	3,400	3,400	3,400	Rated volume flow m^3/h
70	35/30	55/50	75/80	90/95	135/145	Initial pressure drop Pa
200	200	250	300	300	300	Recommended final pressure drop Pa
90	85/87	96/98	–	–	–	Average arrestance A_a %
–	–	48/50	75/72	86/83	94/92	Average efficiency E_o %
595 x 595 x 48*	592 x 592 x 330/510**		592 x 592 x 600/510**			Dimensions W x H x D 1/1 version mm

* Besides the 595 x 595 mm size, a large number of other frame sizes in overall depths of 48 mm and 96 mm are available.

** AC filters are also available in the sub-sizes 5/6 (490 x 592 mm) and 1/2 (289 x 592 mm).

Compact pocket filters – ruggedly tough, ingeniously capacious and expertly safe

F 50 Compact pocket filter

The filter media and the design

We use high-performance nonwovens produced in-house from elastic, unbreakable **synthetic-organic fibers** and **microfibers.**

All filter media have a **progressive**, or triple-layer-progressive **structure**.

Compact pocket filters contain **no glass fibers**, are **non-corroding, moisture-resistant** up to 100 % relative humidity, **fully incinerable** and **self-extinguishing** to DIN 53 438 (Fire Class F1). All pocket filters are thermally stable up to 70°C, with temporary peaks up to 90°C (Filter Classes G3, G4) or up to 80°C (from Filter Class F5).

Maximized functional dependability thanks to filter pockets foamed into the PUR front frame for a leak-free configuration, welded-in aero-dynamically enhanced spacers in all long-pocket filters, and dimensionally stable construction of the filter element as a whole.

Applications and special characteristics

The **G 35 SL and F 40 pocket filters, plus the G 35 S and F 45 S** are **"ruggedly tough"** models, particularly well suited to applications demanding stable arrestance performance for high coarse-dust loadings and high air flow rates. They function very dependably under extremely moist and wet conditions, too. These models achieve medium clean-air quality in conjunction with high cost-efficiency and low energy costs. **The G 35 S and F 45 S,** by virtue of their shorter pockets, are the **space-saving filter option.**

The **"ingeniously capacious"** Compact F 50 sets new standards in terms of fine filtration, with a performance spectrum which guarantees high clean-air quality combined with cost-efficient affordability.

The Compact **MF 70** arrests a high proportion of critical fine particles like bacteria and fungus spores, thus offering security at a nonetheless low pressure drop.

The **MF 90 and MF 95 Compacts meet** even **the most stringent safety requirements** in sophisticated indoor climate control applications. Thanks to their triple-layered media structure with its high-arrestance microfibers, these **"safety experts"** produce a clean-air quality second to none.

The T 60 and T 90 filters originally developed for gas turbine supply air are also used by a lot of quality-conscious air-conditioning system operators, who appreciate the high dust holding capacity and the long lifetimes provided.

G 35 S / G 35 SL	F 45 S / F 40	F 50	MF 70 / T 60	MF 90 / T 90	MF 95		Filter Class to EN 779
G3	G4	F5	F6	F7/F8*	F8/F9*		Rated volume flow
3,400/4,250	3,400/4,250	4,250	4,250	4,250	4,250	m^3/h	Initial pressure drop
20	40/30	45	65	120/80	180	Pa	Recommended final pressure drop
200	200	250	400	400	400	Pa	Average arrestance A_a
86/87	95	97	>99/99	>99	>99	%	Average efficiency E_c
–	–	51	75/63	84/85	94	%	Dust holding capacity
1,180/2,300	590/1,425	1,380	700/1600	550/700	500	g	
G 35 S, F 45 S:	595 x 595 x 330		Sub-sizes 5/6 and 1/2 available			mm	Dimensions W x H x D 1/1 version
G 35 SL, F 40, F 50:	595 x 595 x 650		Sub-sizes 5/6, 1/2, 1/4 available				
T 60, T 90:	595 x 595 x 650		Sub-sizes 1/2, available				
MF 70, MF 90, MF 95:	595 x 595 x 650		Sub-sizes 5/6, 1/2, 1/4 available				

* At test volume flow of 3,400 m^3/h, MF 90 / MF 95 = F8 / F9

CarboPleat and DuoPleat activated-carbon filters – active opposers of gases and odours

CarboPleat activated-carbon filter

DuoPleat combination filter

The filter media and the design

The activated-carbon media used in Carbo Pleat and DuoPleat are secured in an open structure by means of a newly developed bonding process. **This ensures a maximum of active surface area for gas adsorption.**

DuoPleat filters are activated-carbon and particle filters in one: their unique filter media combine the special activated-carbon layer with a triple-layered high-performance nonwoven of synthetic-organic fibers and microfibers. This enables **Class F 7 particle filtration and effective gas adsorption** to be handled **in a single filter stage.**

The pleated filter media are mounted in a plastic-framed V-configuration, and cast-sealed to preclude leaks. The large filtering area installed, together with the unique structure of the filter media, provides not only a particularly high storage capacity and a long useful lifetime, but also very low pressure drops.

The filters contain **no glass fibers,** are **self-extinguishing** to DIN 53 438 (Fire Class F1), **non-corroding, and fully incinerable,** since there are no metal parts.

Applications and special characteristics

Viledon CarboPleat and DuoPleat filters improve the air quality of indoor climates, alleviate feelings of ill-health in connection with the Sick Building Syndrome, and protect sensitive products, processes and equipment by also eliminating pollutant gases and unwanted odours.

They are used in supply, exhaust and recirculated air filtration systems involving specialized requirements for the clean air quality, e.g.

- in hospitals, laboratories, printshops, catering kitchens, museums, airports, shopping malls, hotels, banks, insurance companies, office buildings, etc.
- in industrial processes in the chemical, pharmaceutical, food and beverage, optical, electronics and micro-electronics industries
- in compact air-conditioners
- as prefilters for HEPA and ULPA filters

The specialized structure and design of Viledon activated-carbon and combination filters produce long lifetimes and thus particularly cost-efficient and dependable operation.

CarboPleat	DuoPleat		
	F7		Filter Class to EN 779
3,400	3,400	m^3/h	Rated volume flow
75	110	Pa	Initial pressure drop
–	400	Pa	Recommended final pressure drop*
–	85	%	Average efficiency E_a
910	910	g	Filter capacity** - organic substance Toluene
140	140	g	- organic substance n-Butane
70	70	g	- inorganic substance SO_2
1/1: 590 x 590 x 292, 5/6: 590 x 490 x 292, 1/2: 590 x 287 x 292		mm	Dimensions W x H x D

* This figure is recommended out of cost-efficiency considerations. It can be exceeded in certain applications without problems.

** The filter capacity was determined for upstream concentrations of the substances defined in the draft version of DIN 71 460/Part 2 "Air filters for motor vehicle compartments / Test method for adsorptive filters".

MaxiPleat filters – compact size, but consummate quality

MaxiPleat MX 95

The filter media and the design

- We use **high-strength glass-fiber papers with a special bonder system.**
- Unique, **patented conversion technology:** an **embossing process** ensures optimum pleat geometry and equidistant pleats, plus homogenous air flow coupled with a very low pressure drop. The V-shaped pleat configuration guarantees full utilization of the filter area with uniform dust deposition.
- The filter element is **light and disposal-friendly**, since the use of sealing and pleat spacing agents has been reduced to a minimum.
- A double-sided protection grid prevents damage to the filter medium. Available on request with double header frames.
- Frame and protection grid are made of halogen-free plastic and are **fully incinerable.**
- The entire filter element is non-corroding, since it has no metal parts. And the **risk of leakage** due to punctures from metal separators has been **eliminated.**
- All Viledon MaxiPleat filters are **moisture-resistant** up to 100 % relative humidity.
- **Maximized security against dust penetration,** thanks to interaction between the various material properties and process steps.

Applications and special characteristics

Viledon MaxiPleat filters are used for supply, exhaust and recirculated air filtration in indoor climate control systems which have very stringent requirements for clean air quality – particularly when space is limited, e.g.

- in sophisticated air-conditioning applications (hospitals, laboratories, libraries, museums, airports, office buildings, etc.)
- in compact air-conditioners
- as prefilters for HEPA/ULPA filters

All MaxiPleat filters also offer excellent protection against critical fine dusts and microorganisms, thus making a crucial contribution to cost-efficient operation of sensitive systems and processes. Thanks to the conical pleat geometry and a pleat depth of 250 mm, they exhibit very small pressure drops. With an **exceptionally high dust holding capacity** and **long lifetimes** in **extremely cost-efficient and dependable operation,** they set new standards in their filter classes.

MX 75	MX 85	MX 95	MX 98		Filter Class to EN 779
F6	F7	F8	F9		Rated volume flow
4,250	4,250	4,250	4,250	m^3/h	Initial pressure drop
100	110	120	150	Pa	Recommended final pressure drop
450	450	450	450	Pa	Average arrestance A_a
99	> 99	> 99	> 99	%	Average efficiency E_o
75	86	92	96	%	Dust holding capacity AC Fine/1000 Pa
2,300	1,900	1,700	1,500	g	Dust holding capacity ASHRAE-Dust/450 Pa
700	590	510	450	g	Dimensions W x H x D
1/1: 592 x 592 x 292, 5/6: 490 x 592 x 292, 1/2: 287 x 592 x 292				mm	

High Efficiency Particulate Air Filters – top of the class every time

Class H 13
HEPA/ULPA filter

The filter media and the design

- We use **micro glass-fiber papers with a special bonder system.**
- A **patented embossing process** ensures optimum pleat geometry and equidistant pleats, plus maximized, homogenous flow characteristics with a very small pressure drop.
- The frame is made of MDF (medium-density chipboard) and is thus fully incinerable. On request, the filters can also be supplied with steel or aluminum frames. With the H 14 filters, the standard frame is in extruded anodized aluminum.
- **Simple, no-leak installation,** thanks to an endless, homogeneously foamed-on polyurethane seal.
- The filter element is **light, disposal-friendly, and non-corroding,** since there are no metal parts. And the risk of leakage due to punctures from metal separators has been eliminated.
- Special accessories: gasket with integrity test channel or protection grid.
- All HEPA/ULPA filters are **moisture-resistant** up to 100% relative humidity, and thermally stable up to 80°C.

Applications and special characteristics

HEPA/ULPA filters of the H 11 and H 13/H 14 classes are used for supply, exhaust and recirculated air filtration in indoor climate control systems with ultra-stringent requirements for clean air quality and sterility, e.g.

- in hospital operating theaters and intensive-care units
- in highly sensitive industrial processes like pharmaceuticals, optics, electronics, precision mechanics and the food and beverage industries
- in cleanrooms

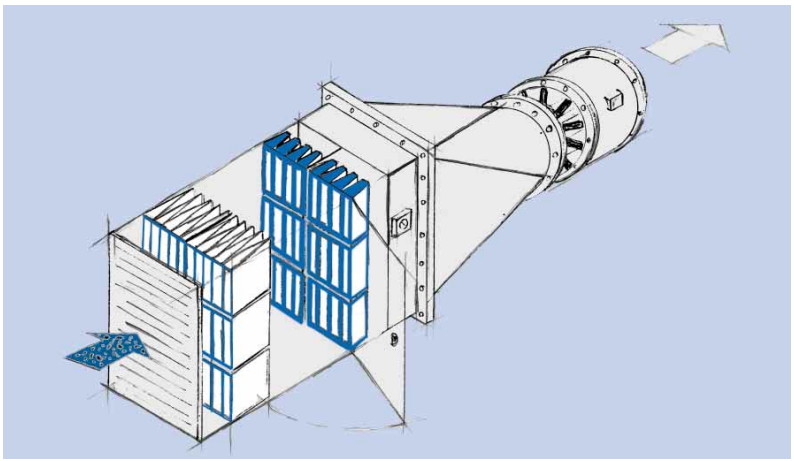
For cleanroom engineering, we also supply HEPA/ULPA filters up to Class U 17 on request.

Thanks to the very low pressure drops even at high volume flows, Viledon HEPA/ULPA filters provide **exceptionally dependable and cost-efficient operation for their users.** Particularly large air volumes can be handled at a given pressure drop, or outstandingly low pressure drops achieved for a given volume flow, thus enabling either conveniently compact dimensions or attractive energy savings to be implemented.

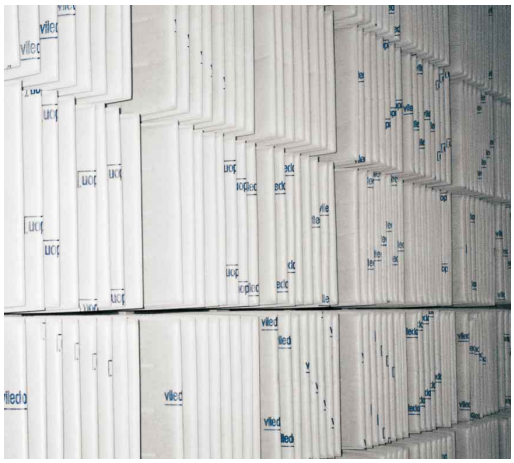
SF 11	SF 13	SF 13	SF 13	SF 14		Filter Class to EN 1822
H11	H13	H13	H13	H14		
292	78	150	292	71/92	mm	Overall depth
200/280	50	100	200/280	50/70	mm	Pleat depth
3,000/3,400	1,000	1,500	2,500/3,400	600	m^3/h	Rated volume flow for 610 x 610 mm^2 element
160	250	250	250	125/100	Pa	Initial pressure drop
600	600	600	600	600	Pa	Recommended final pressure drop
≥ 95	≥ 99.95	≥ 99.95	≥ 99.95	≥ 99.995	%	Filter minimum efficiency at MPPS*
–	K1, K2	K1, K2	K1, K2	–		Utilization category to ZH1/487 (BIA test)

* MPPS = Most Penetrating Particle Size

Viledon's conversion and new-system service, from concept to construction, plus important accessories



Design of an air intake filter system with 2-stage filtration



Filter system converted to Viledon Compact pocket filters

Benefits package

For conversion jobs on existing supply air systems or for building new ones, we offer on request a complete work package extending from concept to construction, and covering:

- Filter engineering consultancy in choosing the optimum types of filter for the requirement profile involved
- Planning and engineering work for the complete filter system, including various components like pressure drop measuring instruments, anti-weather screens, silencers, fans, electrics, and much more.
- Dismantling the old filter system, erecting the new one, followed by commissioning
- After-sales service support
- Filter replacement and disposal

Our service team of experienced designers, erectors and consultant engineers synergize their skills on site to ensure a fast, professional conversion or new-system job tailored specifically to your requirements.

Every range of filters needs accessories!

The extensive range of Viledon filters is supplemented by important accessories and other components:

- **Mounting frames** for Viledon Compact pocket filters and AC filters in stainless steel or galvanized sheeting and in sizes of 1/1, 5/6, 1/2 and 1/4.
- **Plug-in seals for mounting frames.** These are simple to install, exhibit longer lifetimes than their conventional counterparts, and are very weatherproof.
- **Alternative spring systems** in different lengths for all mounting frame systems. They enable you to compensate for a huge variety of filter element header frame heights available on the market.
- **Replacement frames for filter mats** in all the customary dimensions.
- **Pressure drop gauges,** with a choice ranging from ultra-simple versions to sophisticated devices featuring teletransmission and outputting a signal when the final pressure drop is reached.

Freudenberg Vliesstoffe KG • Filter Division
D-69465 Weinheim
Telefon +49 (0) 62 01 / 80 - 62 65 • Fax +49 (0) 62 01 / 88 - 62 99

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