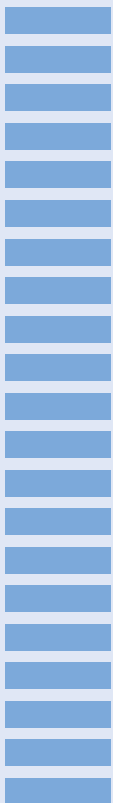


HEPA-FILTER

Essentials



Your partner for filter technology

FIELD OF APPLICATIONS

HEPA- (High Efficiency Particulate Air-) and ULPA- (Ultra Low Penetrating Air-) Filters are used whenever highest demands for air purity are concerned. They serve both, the protection of human beings and the environment (OP theatres, research, biotechnology, etc.) and the security of sensitive industrial processes (micro electronics, pharmaceutical industry, food technology, etc.).

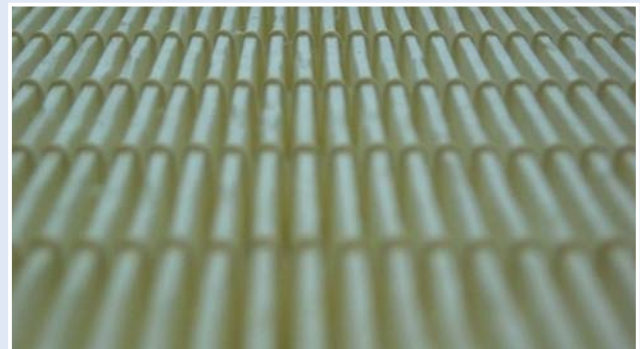
The required cleanroom class can only be realised by reliably working cleanroom technology, whose core are perfect filters.



KNOW HOW

HEPA- and ULPA-filters admit nearly a complete separation of ultra fine particles. During the separation of submicron particles the diffusion effect is the relevant mechanism. To support this effect the filter media needs a capacious separation surface. Therefore the main characteristics of high quality HEPA- and ULPA-Filters are a relatively low air velocity, finest fibrous filter media and large inner surfaces with optimised pleating technology.

With the EN 1822 a testing method for HEPA and ULPA-Filters is established, which provides at first to identify the MPPS (Most Penetrating Particle Size) on a flat sheet of filter media.

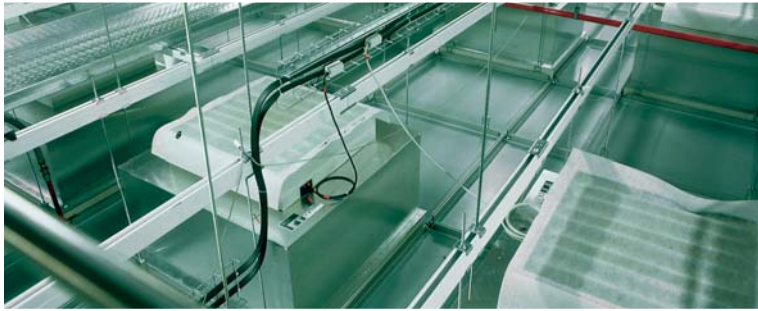


In the second step particles of this size are generated and infused to the filter. To define the efficiency of the filter its surface is scanned with laser particle counters. Depending on the efficiency the filter class is defined according to EN 1822.

Filter-class	Total		Local	
	Efficiency	Penetration	Efficiency	Penetration
H 10	≥ 85	≤ 15	≥ —	≤ —
H 11	≥ 95	≤ 5	≥ —	≤ —
H 12	≥ 99,5	≤ 0,5	≥ —	≤ —
H 13	≥ 99,95	≤ 0,05	≥ 99,75	≤ 0,25
H 14	≥ 99,995	≤ 0,005	≥ 99,975	≤ 0,025
U 15	≥ 99,9995	≤ 0,0005	≥ 99,9975	≤ 0,0025
U 16	≥ 99,99995	≤ 0,00005	≥ 99,99975	≤ 0,00025
U 17	≥ 99,999995	≤ 0,000005	≥ 99,9999	≤ 0,0001

figure 1: filter classes according EN 1822

CLEANROOMTECHNOLOGY



Today's technology separates the cleanroom in different zones depending on the effective local needed cleanroom class. Especially this required cleanroom class is established on that spot. This can be done by speed control of the single FFU's (Filter Fan Unit) or by several skirt systems (plastic skirt, air-barrier-systems, etc.).



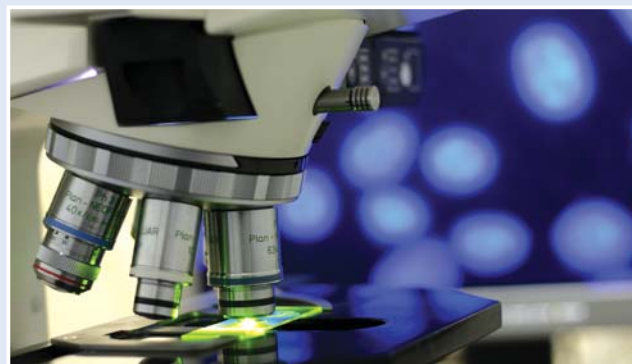
Closed Systems (Isolators) are requested when highest protection for ingredients or operators should be achieved.

The advantages of both systems, flexibility and safety, are combined today with room in room systems (**R**estricted **A**ccess **B**arrier **S**ystems = **RABS**). This technology is today's solution for rooms with different cleanliness zones and several needs of process conditions. It ensures high grade process automation. RABS-technology is seen more and more in modern cleanrooms. For save operating it is usually subject to strict guidelines.

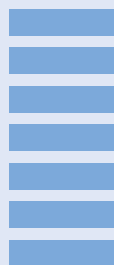
figure 2: comparison of different cleanroom classes

Int. standards	Cleanroom classes							
	D	C	6	A+B	4	3	2	
GMP-Guides								
ISO Class 14644-1	8	7	6	5	4	3	2	
US 209 d	100.000	10.000	1.000	100	10	1	—	
VDI 2083	6	5	4	3	2	1	0	
JACA	8	7	6	5	4	3	2	
max. particles (0,5µm) per cfm	100.000	10.000	1.000	100	10	1	—	
max. particles (0,5µm) per m³	3.530.000	353.000	35.300	3.530	353	35,3	3,53	

When terminal HEPA-filters can not be used (process-outgoing air), HEPA-filter housings are in operation. Different systems are in service, the highest technological features offer contact free filter service for hazardous operations.



OUR PRODUCTS



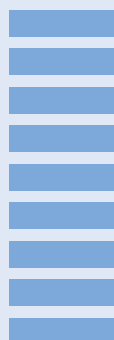
Kalthoff-HEPA-Filter panels are composed of high quality micro glass fibre paper and spacers of thermo-plastic adhesive. The self-supporting media pack with its optimised pleating geometry is connected particle tight to the frame. This filter type is usually placed in HEPA-Filter-Terminals.



Casing material:
MDF, galvanised steel, stainless steel, extruded aluminium

Sealing:
flat profile gasket, continuous foam seal, fluid seal, high temperature sealing

Optional available with protection grid

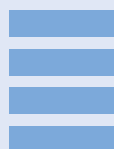


Kalthoff HEPA-Filter cells are made of high quality glass fibre paper with textile thread spacers. This V-shape construction combines high airflow rates and high filter efficiencies up to filter class H 14 (acc. EN 1822).



The enormous filter area is one of the main characters of this filter type. It is installed when highest airflow rates are needed (i. e. safe-change housings, filter casings).

The frame materials are MDF, galvanized steel or stainless steel. The filters are potted with PU. The standard gasket is a PU flat profile gasket. When other gaskets are required, please contact us.



OUR PRODUCTS

Kalthoff-Compact HEPA-Filters are made of high quality glass fibre paper with textile thread spacers. These filters are constructed for duct installation and they combine high airflow rates and high filter efficiencies up to filter class H 14 (acc. EN 1822).

The circulate flange (25mm) let this filter be easy installed in wall or duct mounting systems (prefiltration for cleanroom applications).

The materials of the frame are plastic or galvanized steel. The filters are potted with two components PU. Gaskets are available as flat profile gasket or continuous foam seal.



Kalthoff-HEPA-Cartridges are made of high quality glass fibre paper with textile thread spacers assembled as cartridge with aluminium frame and a flat profile gasket.

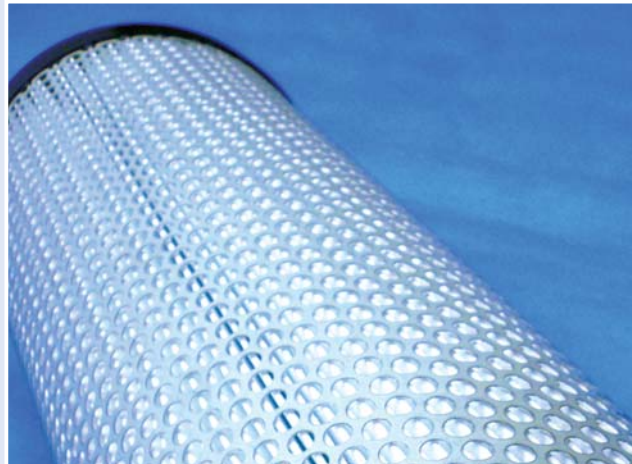
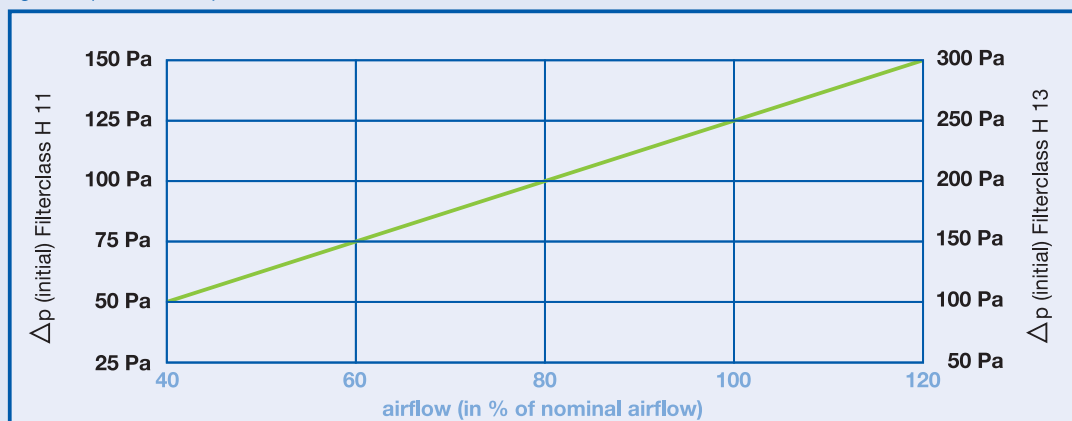
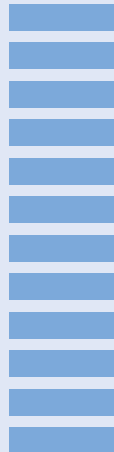


figure 3: pressure drop vs. nominal airflow



OUR PRODUCTS



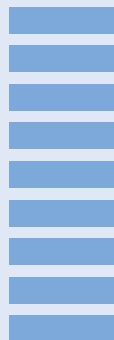
KALTHOFF HEPA- and ULPA-Filter panels are made of high quality glass fibre paper to ensure highest level of air filtration up to filter class U 16. They are constructed in minipleat-technology with thermoplastic adhesive spacers and PU-potting in an extruded aluminium frame. The sealing is typically a continuous foam seal or fluid seal.

This filter type is usually installed in cleanroom applications (filter ceilings, filter fan units, i.e.). To meet today's clean room requirements they are available in various types for several mounting systems.

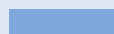
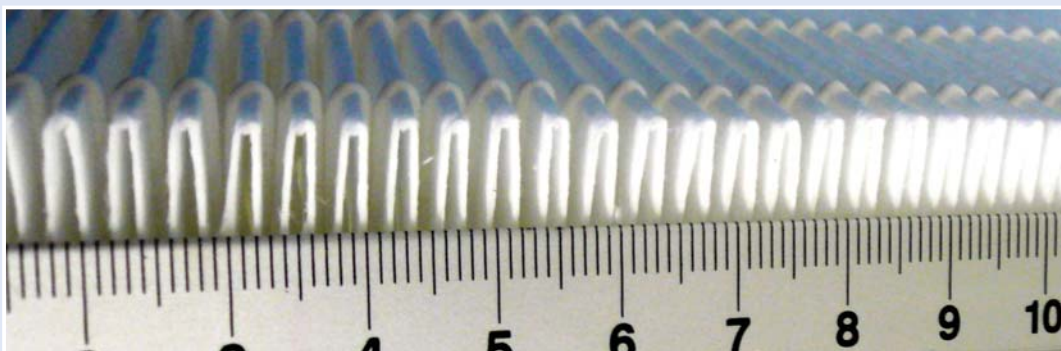


Due to the variation of the pleat height the filters can be individually dimensioned. This feature is very important for cleanrooms with long operation times. Filters with low pressure loss behaviour and long operation cycles enable our customers to save energy costs.

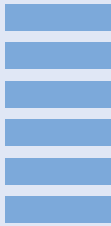
Kalthoff highest quality level filters have always a protection grid on both sides. Each filter panel is tested per scan test according to EN 1822. They are serialized, all required technical data are labelled on the filters. A test certificate is enclosed to each delivery.



Kalthoff-HEPA-Filters are available in merchantable standards as well as in customer specified various dimensions and types. For further information please don't hesitate to contact us.

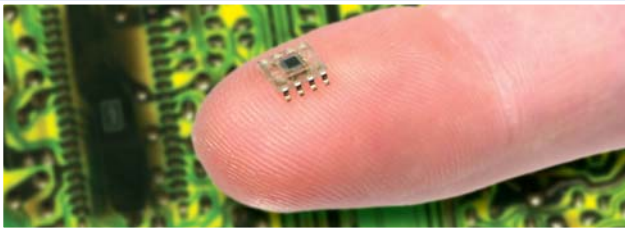


ENGINEERING

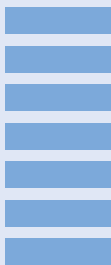


An extensive specialized knowledge is needed where each individual particle counts. Complex conjunctions of most diverse disciplines of the physics and micro technology as

you in the issues of the cleanroom technology. Our engineering will help you in asset-optimisation and take care for an efficient application and the perfect function of our products.



We perform hygienic maintenance and in-situ particle measurement with the entire documentation required.

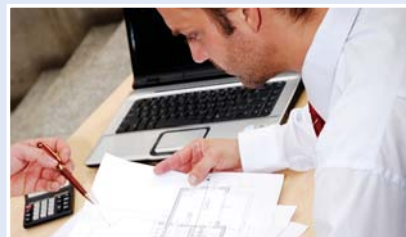


well as product specific characteristics of respective applications are concerned here.

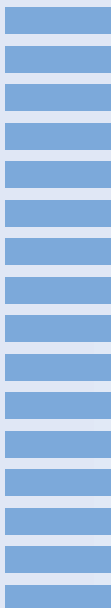
Specific engineering gives our clients an excellent position — as a team with our clients, service and operation specialists we develop customised filter solutions.

A team of committed specialists at our headquarters and at our engineering offices will advise and support

Thus, we create filter systems that fit all needs of a modern production.



QUALITY



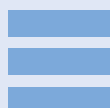
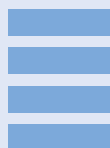
Each Kalthoff HEPA-Filter in filter class H13 is tested according to EN 1822. All required technical data are documented on the product label and it is signed by the inspector.

Each filter with higher filter class than H 13 is tested by scan test according to EN 1822. The test results (efficiency, pressure drop, i.e.) are documented in the test certificate which is enclosed to each delivery.

 Kalthoff Luftfilter und Filtermedien GmbH Gutenbergstr. 8 59379 Selm Tel. 02592 / 965-0 Fax 02592 / 965-99	Artikelnummer / Type: 800112	Abmessung / Dimensions: 305x610x292 mm
	Volumenstrom / Volume Flow: 1500 m³/h	Druckdifferenz / Pressure Differential: 250 Pa
Filterklasse / Filter Class: H14	Prüfmethode / Test Method: EN 1822	Luftriichtung / Air Flow Direction: 
925816/1 Prüfer / Inspector: Lfd.-Nr./Serial No.: 319668-00015	Abscheidegrad / Efficiency: 99,995 %	
Belegnummer: 2007-477289	Artikelbezeichnung: 27949728s001	

SERVICE

A wide stock of standard HEPA-Filters — which is supported by our own vehicles — provides for a short notice delivery service for established filter types.



SPECIFICATION TEXT

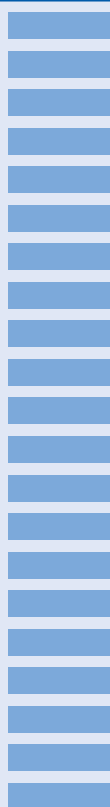
Kalthoff-HEPA-Filters consisting of:

High efficiency micro fibre filter media with spacers of thread. The self-supporting media pack with its optimised pleating geometry is sealed particle tight into the frame. The filters are optional available with protection grid.

Casing material: MDF, galvanised steel, stainless steel, extruded aluminium

Sealing: Flat profile gasket, continuous foam seal, fluid seal, high temperature gasket

Kalthoff-HEPA-filters better than filter class H 12 are separately tested acc. to EN 1822, serialised and labelled with the specific technical data. The filters are packed in solid cardboard boxes.



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info@kalthoff-luftfilter.de

