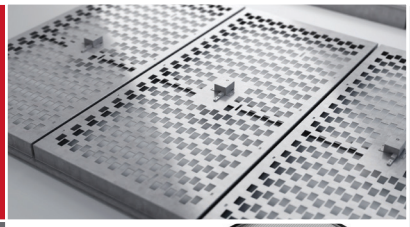
AAF INTERNATIONAL

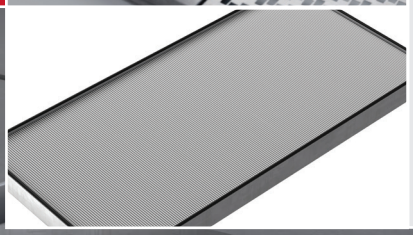
Bringing clean air to life.

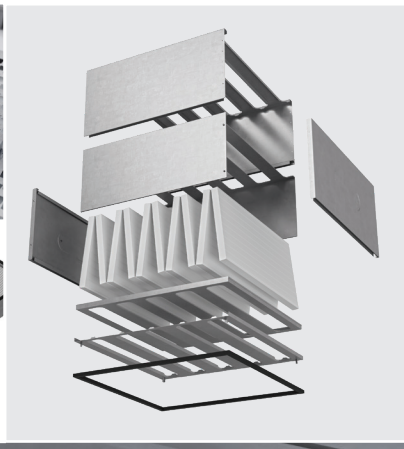
High Purity Filtration Solutions

Supply Housings and HEPA/ULPA Filters

AstroHood® and AstroFan® Housings
AstroCel® and MEGAcel® Filters







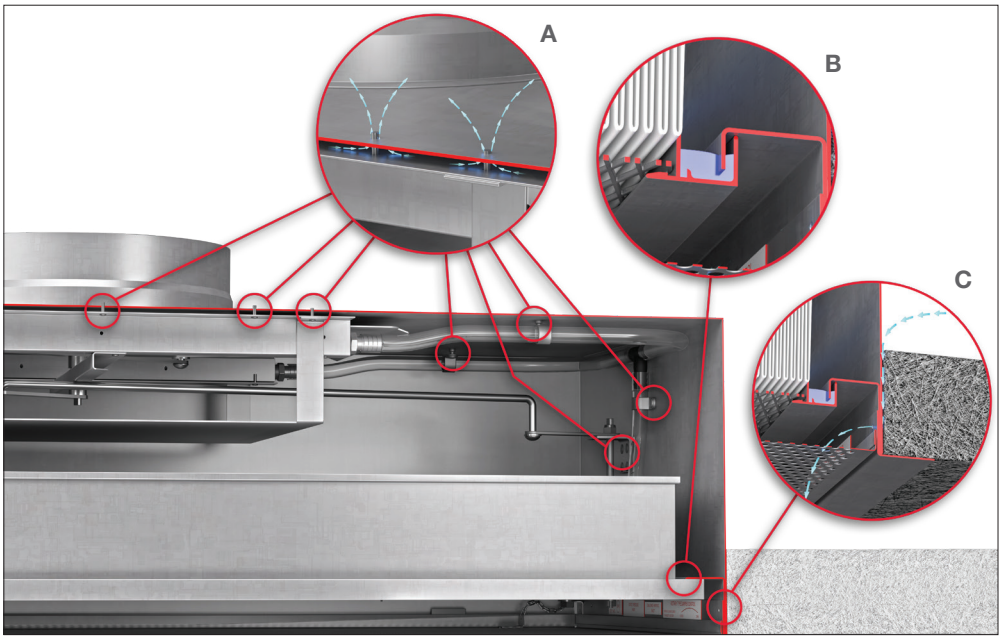
Ensuring System Integrity

Media + Seal + Housing = System Integrity

While we now clearly understand why media is the heart of the filter and the cleanroom, its success is still dependent on three other key factors:

1. The seal between the filter and the housing or holding frame
2. The construction of the housing or holding frame it will be contained in
3. The seal between the housing or holding frame and the ceiling or air handling unit it is connected to

Air will always travel the path of least resistance. Therefore, every connection point and construction method used to integrate the media, seal, and housing must be carefully considered and selected to ensure full system integrity.



Filter Seal to Housing

A Construction rivets connecting internal housing components represent potential leak paths if not designed correctly

B Example of fluid seal and knife-edge connection between filter and housing

C Representation of potential leak path between housing, trim, and ceiling

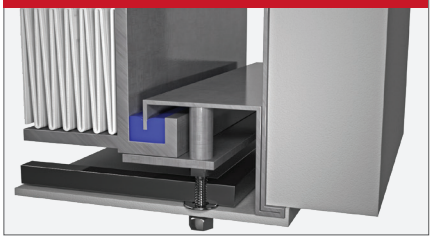
Seal Type Options for Consideration

The filter seal type selected will provide the critical connection point between the filter frame and the housing or holding frame it is installed in. Therefore, it is important to understand the options available to you, and their corresponding benefits, before making a selection.

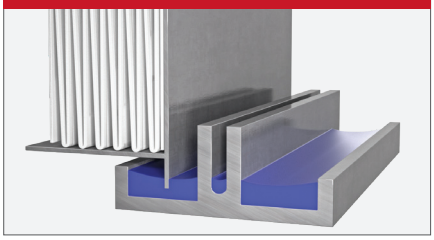
Some of the categories available are pictured below:

Dry

Fluid



Knife-Edge



Within the dry and fluid seal categories, there are various options available to best meet the requirements of your specific application.

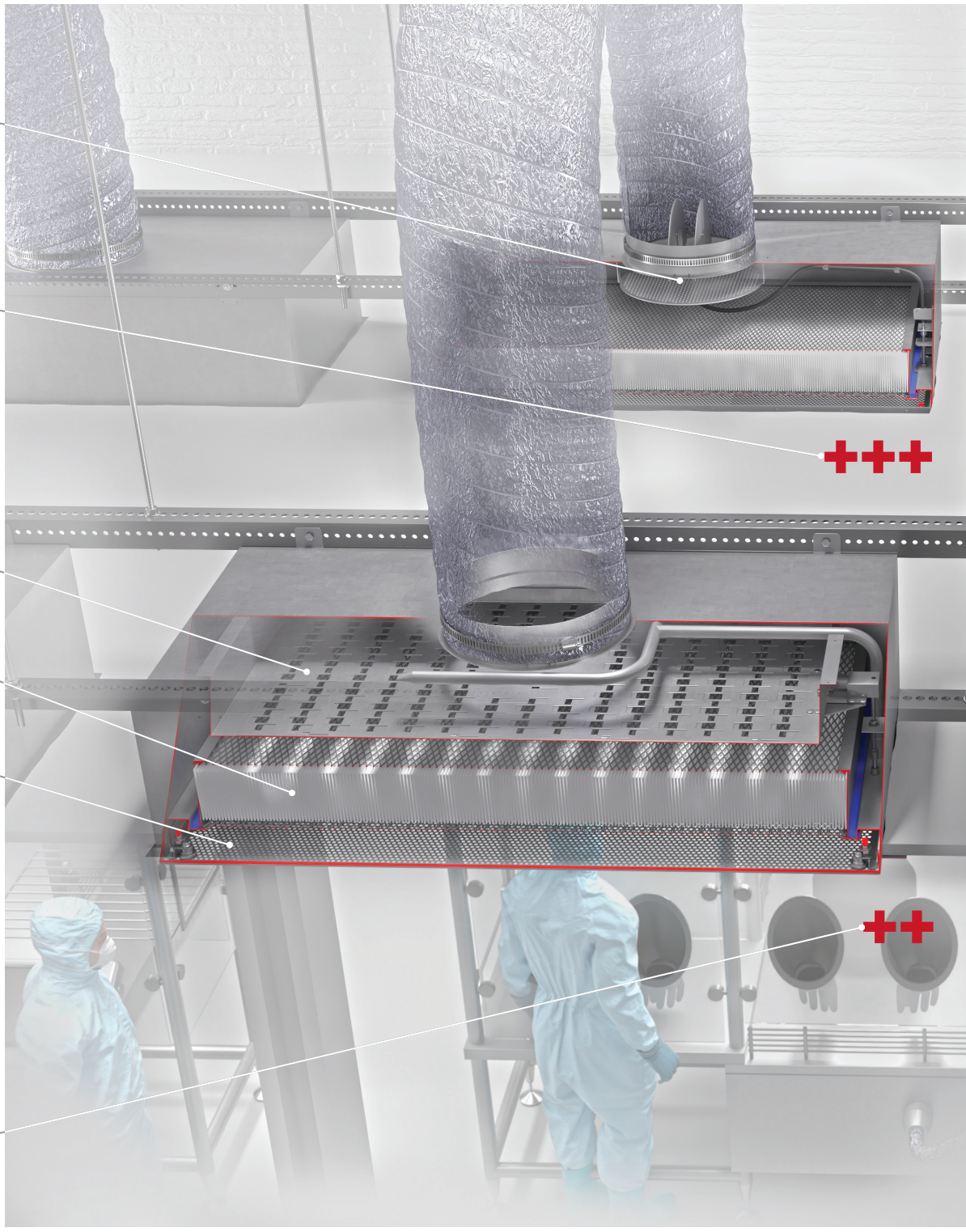
	MEGAcel® I ePTFE*	MEGAcel® II ePTFE*	MEGAcel® III ePTFE*	MEGAcel® I eFRM	MEGAcel® II eFRM	MEGAcel® III eFRM	AstroCel® I	AstroCel® II	AstroCel® III
Dry (PU-EPDM-Neoprene Gasket)	Option	Option	Option	Option	Option	Option	Option	Option	Option
Fluid Seal Filter & Knife Edge	Option	Option	Option	Option	Option	Option	Option	Option	Option
Silicone Gasket							Option		

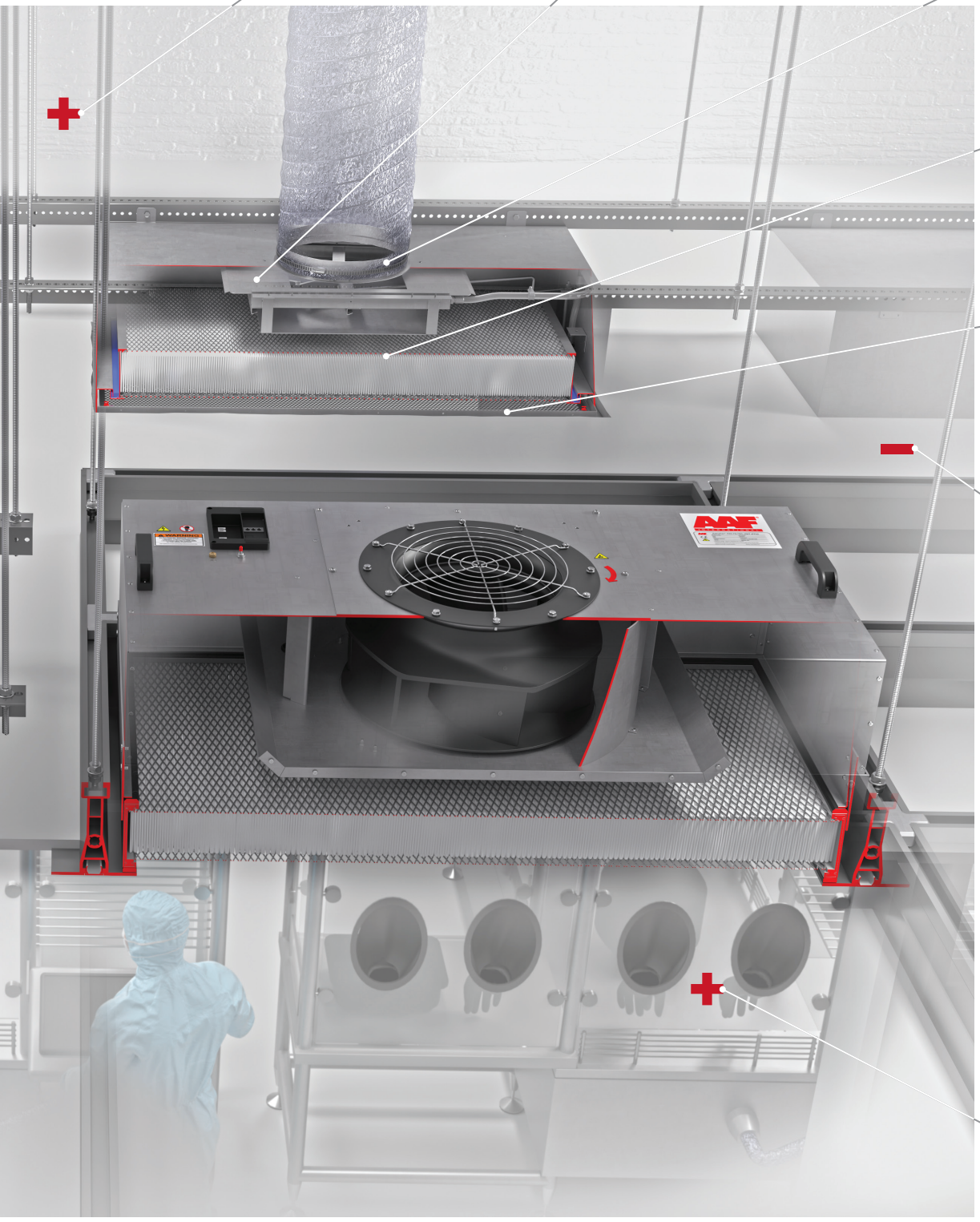
Each of these options can be selected for either the filter or the housing it will be installed in. Each respective seal type must be chosen for compatibility with its matching counterpart on the housing it will be installed in.

Maximizing System Economy

As with maximizing system integrity, maximizing system economy requires careful consideration of each contributing factor to total system pressure, rather than merely the pressure drop of the filter itself. When it comes to system economy, the whole is truly the sum of its parts, including the housing, damper, media type, media construction, and diffuser.

The application and component examples below clearly demonstrate the compound effect of each contributing factor to overall system pressure, and consequently, system economy. In them, one can see the combined pressure effect of a Housing (50-100 Pa) + a Filter (100 Pa) + a Diffuser (30-70 Pa) which could equate to an average clean pressure drop above 250 Pa, more than double the individual filter static that most stakeholders focus on during design discussions.





Typically positive in the plenum for direct ducted HEPA housings

Guillotine damper resistance 100-150 Pa depending on airflow

High inlet collar velocity 4,0-6,0 m/s depending on airflow and collar size

HEPA filter initial resistance can vary from 37-125 Pa depending on pack depth and media type (Glass or PTFE/FRM) and efficiency selected.

Diffuser pressure drop can vary from 5 Pa-75 Pa depending of type selected (Perf, 4-Way, Swirl)

Negative Pressure Plenum

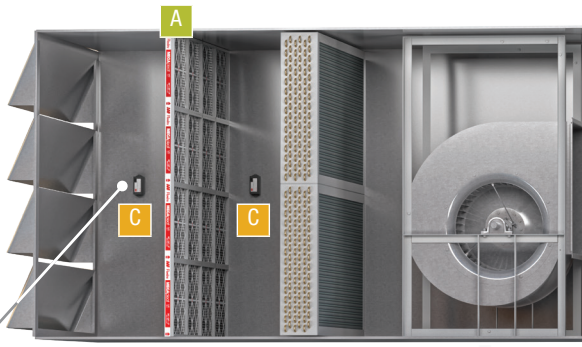
Using FFU's in an open negative pressure plenum design helps prevent leakage or by-pass of contaminants into the room.

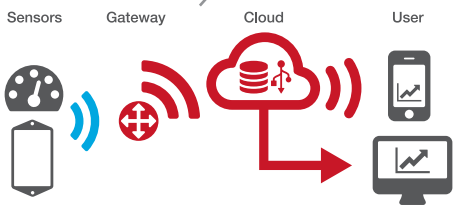
Another advantage to the FFU design is the reduction in size of the AHU's as the FFU's handle more of the recirculated air requirements that can save space and cost.

Positive Pressure Room

Life Science Cleanrooms

Control of viable and non-viable particles is crucial in many process applications in the Life Science industry. Protection of people from hazardous or potent compounds is equally important. There is a wide variety of supply, exhaust and recirculated air housings and filter types to address each application. It is important to utilize a manufacturer who can offer a fully integrated solution in order to minimize risk and points of potential failure.



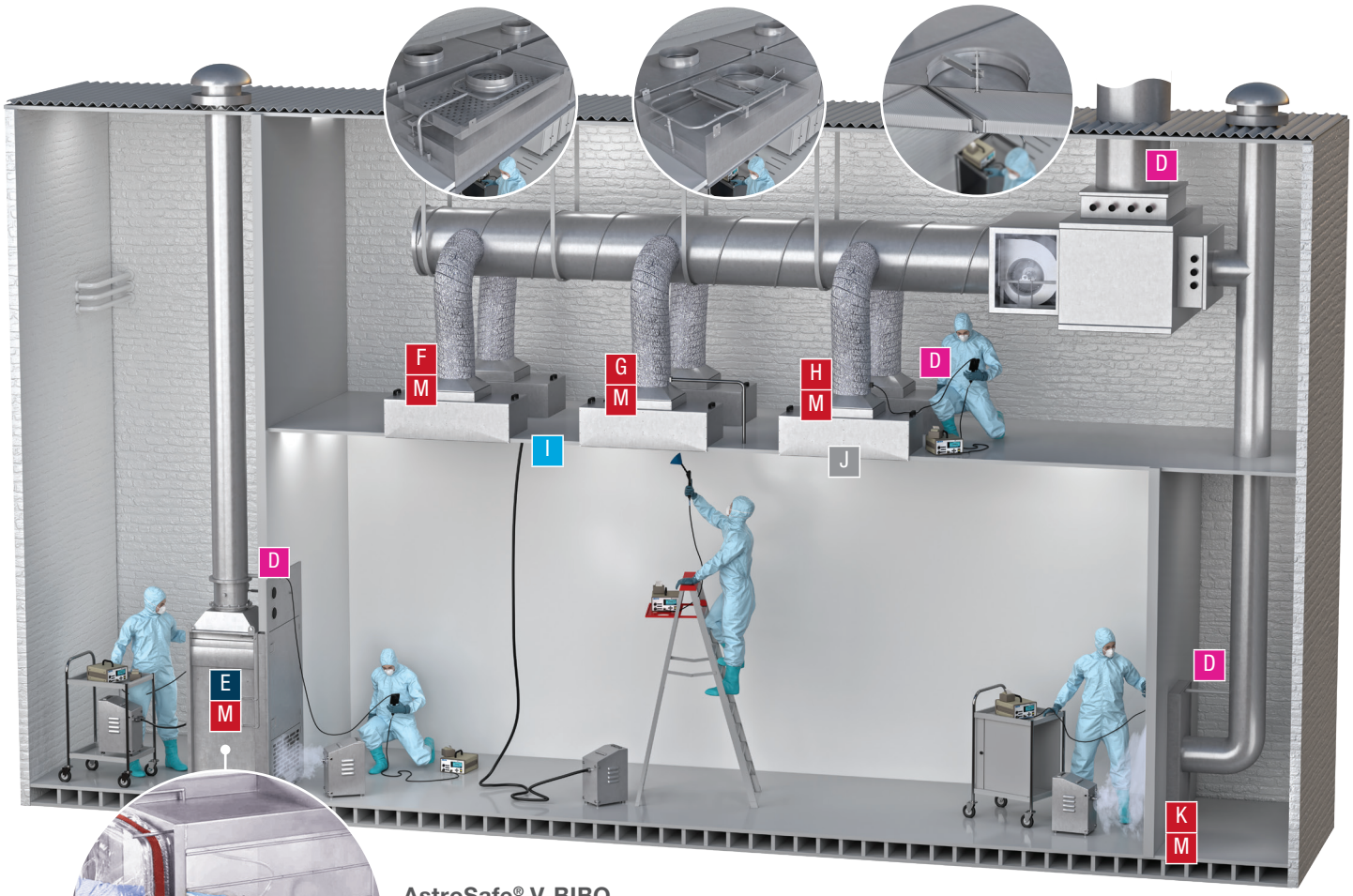


Sensor³60®
Cloud-based air quality and pressure drop measurement technology.

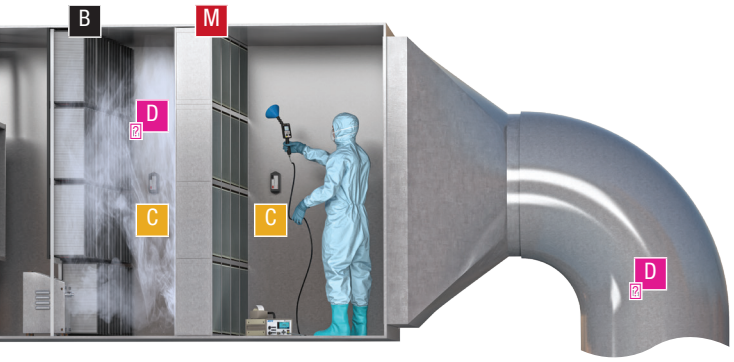
AstroHood® S-I
Aerosol dispersion ring with integrated ESD damper

AstroHood® S-II
Guillotine damper and aerosol injection

AstroHood® S-III
Integrated centerboard test port and diffusion disc



AstroSafe® V-BIBO
A 'safe change' or BIBO (Bag-In-Bag-Out) housing with an integrated manual scan section normally utilized when potent or hazardous compounds are in use.



MEGAcel® eFRM M

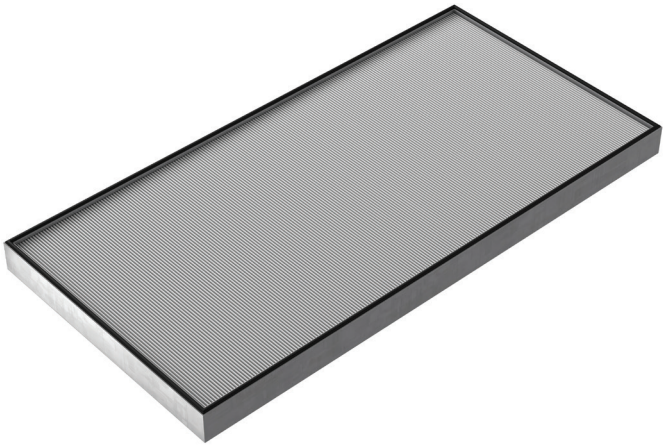
eFRM media exceeds industry requirements from an efficiency and aerosol challenge compatibility standpoint.

E F G H K N P

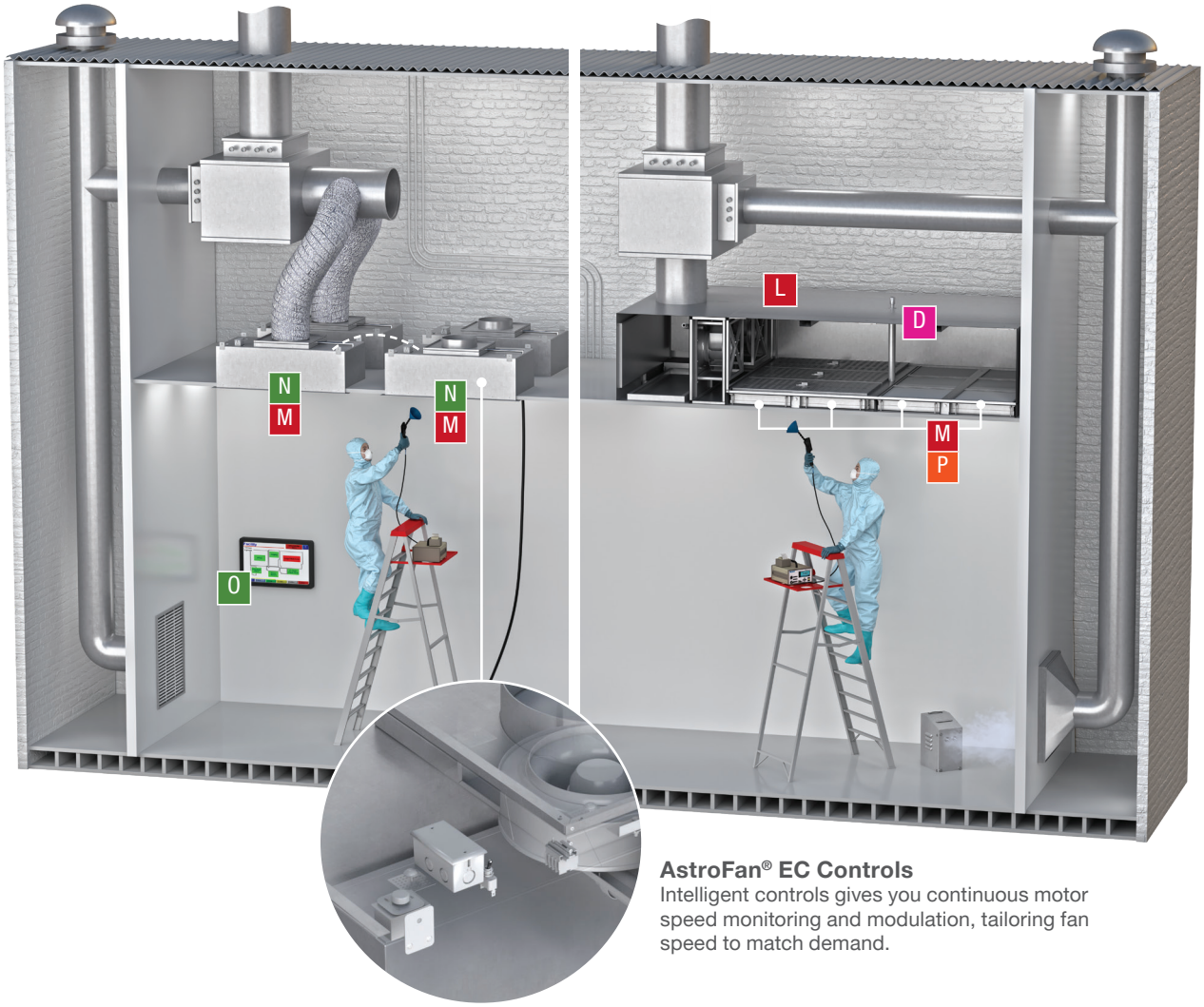
AHU Filter Testing

In situ integrity testing of HEPA filter banks is accomplished by injecting an aerosol (PSL) upstream of the filters and manually scanning the downstream side of the filters.

Alternate Overall Efficiency Test This can be performed by measuring a single point *upstream* ⍰ and *downstream* ⍰ of the filter.



A	DriPak®
B	VariCel® VXL/DriPak® NX
C	Sensor360®
D	Test Port
E	AstroSafe® V-BIBO
F	AstroHood® S-I
G	AstroHood® S-II
H	AstroHood® S-III
I	Injection Port
J	Central Test Port
K	AstroHood® E-I
L	AstroHood® Plenum
M	MEGAcel® eFRM
N	AstroFan®
O	AstroDrive™
P	ESD Damper



AstroFan® EC Controls

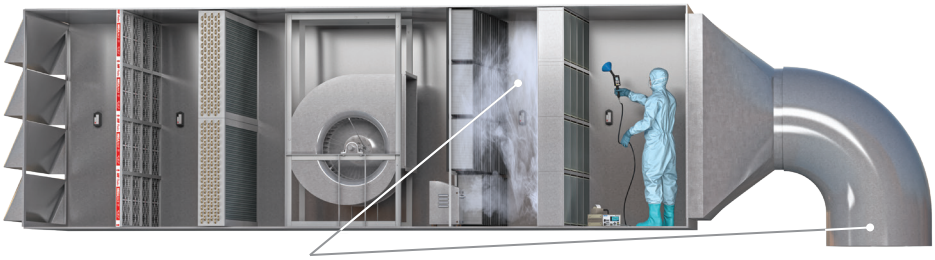
Intelligent controls gives you continuous motor speed monitoring and modulation, tailoring fan speed to match demand.

Testing and Certification

Ensuring system integrity does not end with product selection, configuration, and installation.
Monitoring and maintaining system integrity in the field is another critical step to ensuring that each system provides the clean air protection required for its specific application. Therefore, understanding the testing requirements for your facility and how that testing is accomplished will help you to select the ideal system for your needs.

The examples below of various test methods and access points will help serve as a guide for identifying key considerations in the selection and maintenance of your filtration system.

AHU O/E and Scan Test



When access is difficult or the SOP does not call for an actual manual scan test of the HEPA filters in the AHU, it is common to carry out an overall efficiency test. This normally means injecting an aerosol upstream allowing the aerosol to mix at a minimum of 10 duct diameters downstream and then taking a single or multiple point measurement downstream. Some applications request a multiple probe design that can be permanently fixed in the duct to get an even better representative sample downstream. The typical allowable limit is 0.01% or 0.005% of the upstream concentration.

In situ integrity testing of HEPA filter banks is accomplished by injecting an aerosol upstream of the filters and manually scanning the downstream side of the filters. Photometer scan test downstream.

Removal of prefilter to inject smoke

Exhaust Scan or Leak Testing

Leak testing from the interstitial space (BIBO or Non BIBO)

Overall efficiency testing from within the room

Injection of the aerosol from within the room

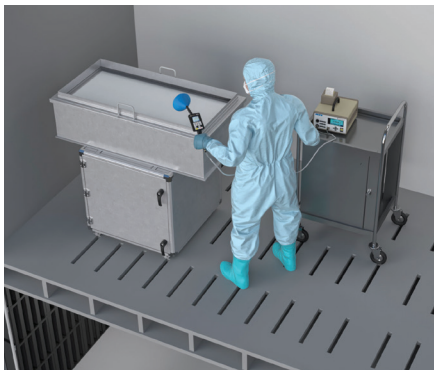
Supply Scan or Leak Testing in Room

Leak testing with a photometer or DPC

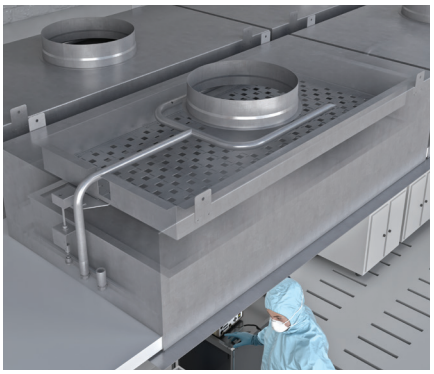
Injection of the aerosol from the plenum

Upstream measurement of aerosol if no access from the room side from injection at the AHU

Equipment Tested in Room



Bench testing of a HEPA/ULPA filter



Aerosol Injection Dispersion Ring upstream of the filter

Aerosol Injection for a FFU

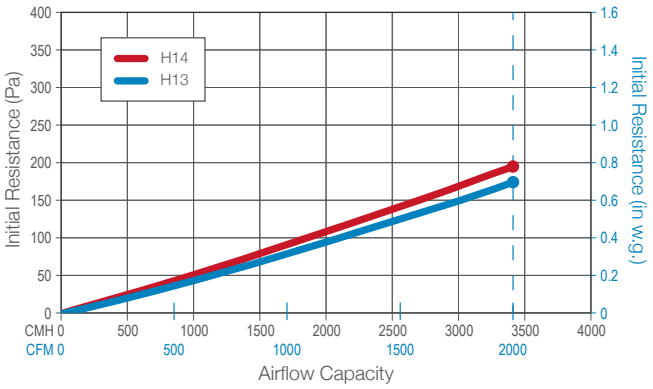
HEPA/ULPA Filters – Series I

Below you will find the most significant features of each HEPA/ULPA filter highlighted. This information is presented in order for you to make the best filter choices for your particular needs.

MEGAcel® I ePTFE

- ePTFE media combines ultra-high efficiency with the lowest possible pressure drop
- High tensile strength and chemically inert ePTFE reduces risk of media damage and degradation
- No boron outgassing
- Compatible with Discrete Particle Counter (DPC) test methods

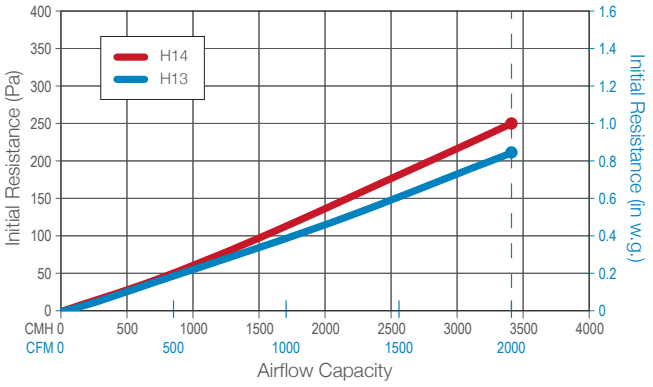
Initial Resistance vs. Airflow Capacity



MEGAcel® I eFRM

- Dual-layer eFRM media combines ultra-high efficiency and particulate loading with low pressure drop
- High tensile strength and chemically inert eFRM reduces risk of media damage and degradation
- No boron outgassing
- Compatible with Discrete Particle Counter (DPC) and photometric test methods, including high concentration oil-based aerosol testing

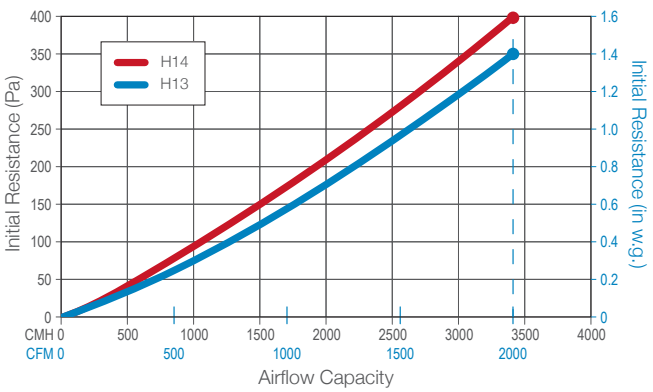
Initial Resistance vs. Airflow Capacity



AstroCel® I

- Utilizes high performance microglass media to provide high efficiency particulate removal
- Available as standard or high capacity (HC) with a variety of construction materials and cell side configurations
- HC configuration offers twice the airflow with a limited increase in initial resistance
- Compatible with Discrete Particle Counter (DPC) and photometric test methods

Initial Resistance vs. Airflow Capacity



UL classified according to UL Standard 900, ULC S111, and UL586.

HEPA/ULPA Filters – Series II

MEGAcel® II ePTFE

- ePTFE media combines ultra-high efficiency with the lowest possible pressure drop
- High tensile strength and chemically inert ePTFE reduces risk of media damage and degradation
- No boron outgassing
- Compatible with Discrete Particle Counter (DPC) test methods

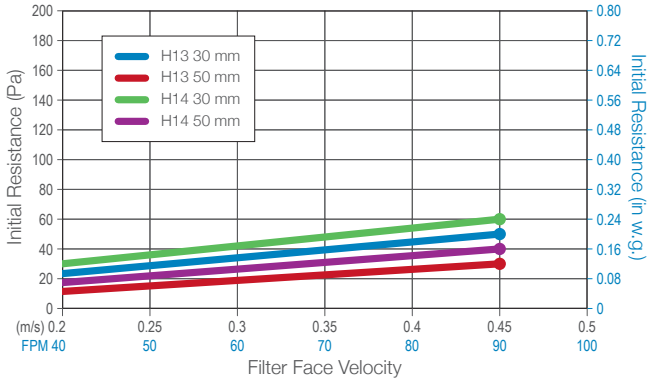
MEGAcel® II eFRM

- Dual-layer eFRM media combines ultra-high efficiency and particulate loading with low pressure drop
- High tensile strength and chemically inert eFRM reduces risk of media damage and degradation
- No boron outgassing
- Compatible with Discrete Particle Counter (DPC) and photometric test methods, including high concentration oil-based aerosol testing

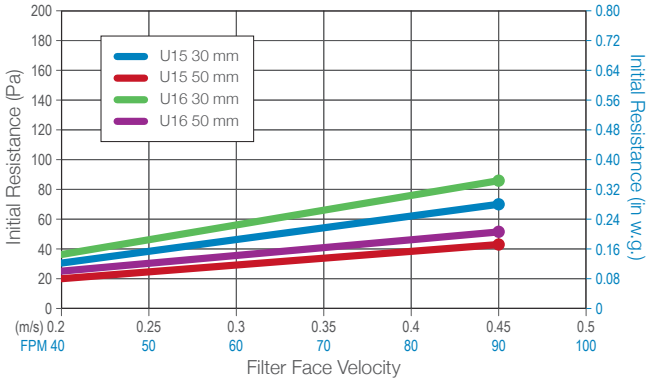
AstroCel® II

- Utilizes high performance microglass media to provide high efficiency particulate removal
- Optimally spaced mini-pleat media pack further minimizes pressure drop in this cleanroom panel configuration
- Wide range of efficiencies and pack depth options available
- Compatible with Discrete Particle Counter (DPC) and photometric test methods

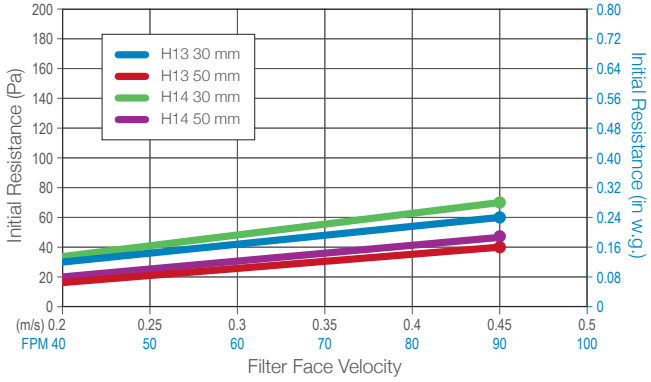
MEGAcel II ePTFE H13/H14
Initial Resistance vs. Filter Face Velocity



MEGAcel II ePTFE U15/U16
Initial Resistance vs. Filter Face Velocity

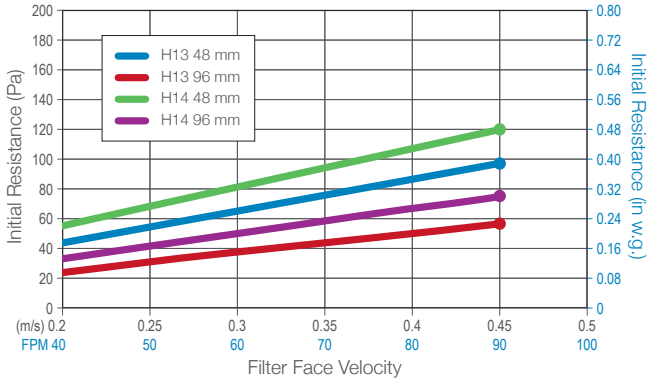


MEGAcel® II eFRM H13/H14
Initial Resistance vs. Filter Face Velocity

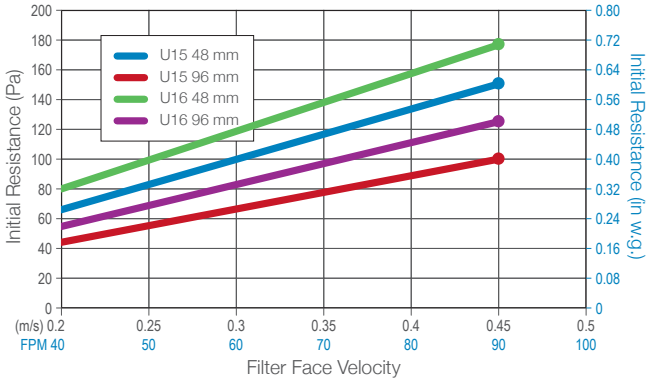


AAF's ultra-high efficiency membrane medias are trusted by more cleanroom manufacturers than any other membrane medias in the world

AstroCel® II H13/H14
Initial Resistance vs. Filter Face Velocity



AstroCel® II U15/U16
Initial Resistance vs. Filter Face Velocity

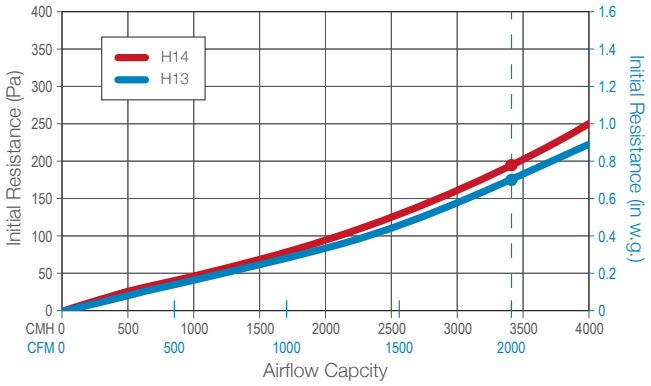


HEPA/ULPA Filters – Series III

MEGAcel® III eFRM

- V-shaped filter configuration, combined with dual-layer eFRM media, delivers higher flow and high capacity particulate loading with low pressure drop
- High tensile strength and chemically inert eFRM reduces risk of media damage and degradation
- No boron outgassing
- Compatible with Discrete Particle Counter (DPC) and photometric test methods, including high concentration oil-based aerosol testing as access and instrumentation allow

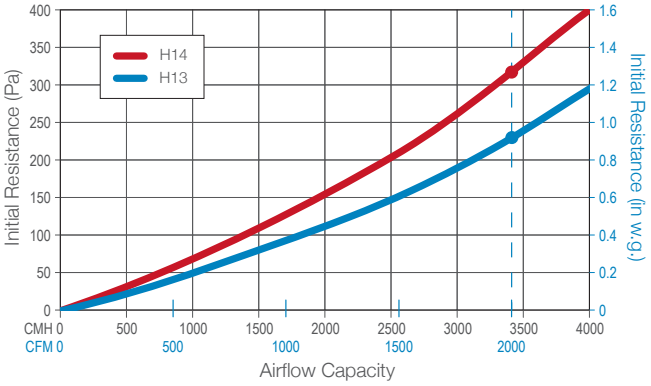
Initial Resistance vs. Airflow Capacity



AstroCel® III

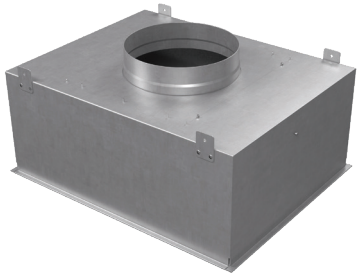
- V-shaped filter configuration, combined with high performance microglass media, delivers higher flow and a lower pressure drop vs traditional box style microglass HEPA filters
- Utilizes high performance microglass media to provide high efficiency particulate removal
- Compatible with Discrete Particle Counter (DPC) and photometric test methods as access and instrumentation allow

Initial Resistance vs. Airflow Capacity



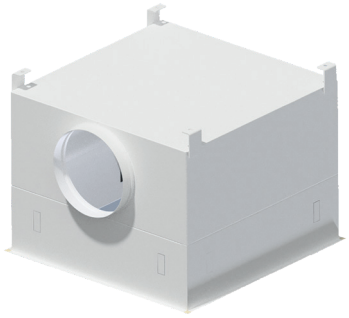
AstroHood® Series

The AstroHood® Series of supply and exhaust housings allows the user to optimize the design selection to suit specific room requirements.



AstroHood® S-I

- Fully welded hood body, pressure tested delivering a guaranteed leak free housing for life
- Gel or gasket seal bottom load design ensures a positive seal between the knife-edge or housing plenum
- All test ports and damper controls are accessible from the room side, fully sealed and pressure tested to ensure no bypass of contaminant
- ESD (Energy Saving Damper) is standard in the S-1 series, ensuring lowest operating costs when combined with the MEGAcel eFRM HEPA filter
- Fixed or removable trim with 1/4 turn fasteners or acorn nuts and integrated diffuser ensures a flush, easily accessible, low-maintenance solution



AstroHood® S-II

- Spot welded leakfree housing
- Gel or gasket seal bottom top load design
- All test ports and damper controls (optional) are accessible from the room side
- Different inlet design: top circular, side circular, side rectangular
- Different diffusers: Perforted, 4-Ways, Swril

AstroHood® S-III RSR

- The S-III RSR module has a roomside replaceable filter capability, combined with an extruded aluminum lightweight slim design housing
- AstroCel® II HEPA filter is standard, MEGAcel® eFRM filter is optional for lower operating costs
- Perforated diffuser with acorn nuts as standard
- Butterfly damper as standard accessible from the room side

AstroHood® S-III

- Lightweight disposable HEPA ceiling module
- Extruded aluminum housing and HEPA filter are factory sealed as one unit, eliminating potential leak paths through the housing
- Optional: Adjustable air diffusion disc and roomside accessible test port are available options
- Optional: Upstream pressure drop and aerosol measurements are available from the room side

AstroHood® Construction and Testing Options

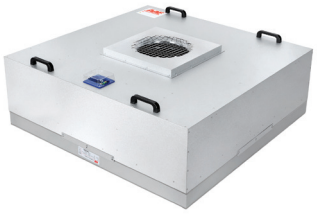
This table provides a thorough overview of the options available for our ducted modules, allowing you to make informed decisions for a given application and configuration. Each feature is denoted as standard (•), optional (Option), or not available ( ).

	AstroHood® I	AstroHood® II	AstroHood® II RSR	AstroHood® III
Stainless Steel (304L)	•	Option		
Stainless Steel (316L)	Option	Option		
Painted mild steel (RAL 9010)		•		
Anodised Aluminium			•	•
Fully welded	•	Option		
Spot welded and caulked		•		
Pressure Test Certificate (750 Pa)	•	Option		
Manual scan section				
Roomside Change	•	•	•	
ePTFE Filter	•	•	Option	Option
Filter Depths	2” / 50 mm ePTFE Standard	2” / 50 mm ePTFE Standard	2” / 48 mm AstroCel II	2” / 48 mm AstroCel II
Gel seal filters	•	•		
PU dry seal filters		Option		
Validated Aerosol Injection	•	Option (Tygon tubing)		
Upstream 100% PAO concentration port	•	•		
Filter Pressure monitoring	•	•		
Bubble-tight Damper (upstream)	Option	Option		
Guillotine (Flanders) Damper	•			
Butterfly Damper	Option	Option	Option	Option
Insulation	•			
Filter Guides	•	•		
Hinged Stainless Steel	•			
Mild Steel Painted Perforated Plate Diff		Option		
Four-way throw diffuser		Option		
Swirl diffuser		Option		
Perimeter Ceiling Trim	•	Option		
Circular top inlet	•	•	•	•
Circular side inlet	Option	Option		
Rectangular side inlet		Option		

AstroFan® FFU EC

In addition to air filters and non-powered supply housings, certain applications also require unit specific control of the speed and consistency of airflow into large-scale production spaces. Fan Filter Units (FFUs), especially when paired with robust electronic control systems, help to ensure the integrity of production processes within these applications and serve to maximize overall system economy.

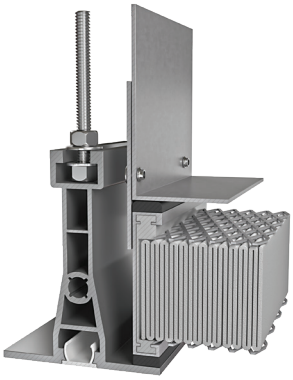
Selecting the right FFU depends upon a number of factors, including the degree of airflow control required, the desired level of energy efficiency, filter testing requirements for the space, and accessibility to the filter itself for testing and replacement. The information provided below and in the table to the right provide introductory guidance on selecting the ideal FFU for a given application.



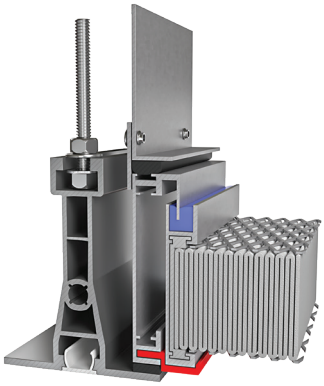
EC FFU

- Energy efficient motor minimizes operating costs
- Intelligent control system for large-scale networks of integrated FFUs
- Continuous motor speed monitoring and self-compensating fan speed
- Operates at near silent noise levels

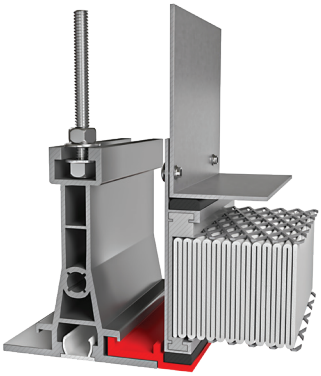
Installation Method



Top Side

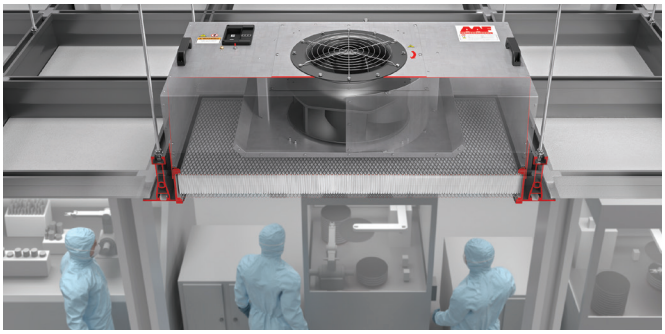


Roomside Change Frame

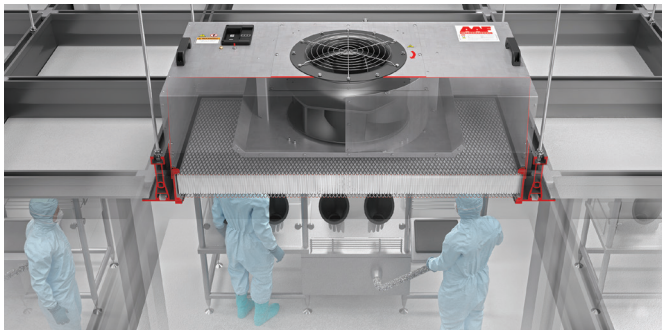


Roomside Change Grid

Installed Filters



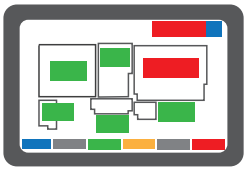
ePTFE Membrane Media for Microelectronics
**Also available with microglass HEPA & ULPA filter*



eFRM Membrane Media for Life Sciences

Control System Platform– AstroDrive™

PC Smart Control System



PLC Program Logical Control

IoT (Internet of Things)

MC Manual Control

Specification

AstroFan® EC FFU – Metric (Imperial)				
Dimension	6 x 6 (2 x 2)	6 x 9 (2 x 3)	6 x 12 (2 x 4)	12 x 12 (4 x 4)
Housing				
Actual Dimension	Refer to drawing			
Unit Height	355 mm (14 in.)			
* Weight	13 - 17 Kg (29 - 38 lbs.)	15 - 20 Kg (33 - 44 lbs.)	17 - 26 Kg (38 - 57 lbs.)	32 - 35 Kg (71 - 77 lbs.)
* Material	Aluminum			
Motor information				
Power supply	Single-phase - 208-277 VAC - 50/60Hz			
Rated current	1,8 A	1,8 A	1,5 A	1,5 A
Performance Data				
* Noise Level	< 50dB(A)			< 55 dB(A)
Air flow	520 m^3/h (306 CFM)	800 m^3/h (471 CFM)	1080 m^3/h (636 CFM)	2220 m^3/h (1307 CFM)
Total fan static pressure	350 Pa (1.4 in. w.g.)	350 Pa (1.4 in. w.g.)	350 Pa (1.4 in. w.g.)	320 Pa (1.3 in. w.g.)
Filter				
Filter Type	Glassfiber / Membrane			
Height	50 - 134mm (2 -5.3 in.)			
Gasket type	gel / gasket			
Efficiency	E 10 to U 17			
Installation Options	Top side / Roomside change frame / Roomside change grid			
Accessories	Cooling coils / Prefilter / AMC filter / Diffuser / Sensor / Test port			
Controls Platform	PC / PLC / IoT / Manual			

AAF International Plant Locations

AAF, the world's largest manufacturer of air filtration solutions, operates production, warehousing and distribution facilities in 22 countries across four continents. With its global headquarters in Louisville, Kentucky, AAF is committed to protecting people, processes and systems through the development and manufacturing of the highest quality air filters, filtration equipment, and associated housing and hardware available today.

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Momence, IL
Ontario, CA
Smithfield, NC
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Votorantim, Brazil
Washington, NC

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Gasny, France
Vitoria, Spain
Ecoparc, France
Trencin, Slovakia
Olaine, Latvia
Horndal, Sweden
Vantas, Finland

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Shah Alam, Malaysia
Suzhou, China
Shenzhen, China
Miaoli, Taiwan
Bangalore, India
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Yuki, Japan (Nippon Muki)

Bringing clean air to life.

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AAF International has a policy of continuous product research and improvement and reserves the right to change design and specifications without notice.