



# Esco Airstream®

## Fan Filter Units

Wide Range of Configurations to Suit  
Specific User and Process Requirements



# ESCO AIRSTREAM® FAN FILTER UNITS

## INTRODUCTION

Esco Airstream® Fan Filter Unit is a leading-edge fan filter unit (FFU) designed to provide HEPA/ULPA-filtered laminar airflow over a specific area. The FFU draws in contaminated air from the top of the module, and exhausts clean filtered air vertically in a unidirectional (laminar) air stream toward its base. FFUs are commonly used in the construction of ISO Class 3 to 8 cleanrooms (as per ISO 14644-1 standards).

With a leveraged experience of more than 40 years in cleanroom design and construction, Esco has developed an FFU that simply performs better at a lower cost. Even the company's in-house research and development facilities include an acoustically-insulated HEPA/ULPA-filtered test environment chamber, where Esco Airstream® FFU is optimized for low noise level and energy efficiency.

Esco's manufacturing capabilities range from complete computerized sheet metal design, to fabrication and assembly; a vertically-integrated approach which ensures that quality can be controlled in every step of the way. To ensure performance and quality, only materials from leading suppliers are used. Furthermore, all incoming raw materials are thoroughly inspected via a statistical sampling method.

### Quality control at factory before shipment:

- Functional tests and visual inspection
- Electrical safety analysis tests
- Air velocity testing

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Unlike other manufacturers, Esco is one of the few manufacturers of FFUs with core expertise in the design of other high performance clean air and containment equipment through its other business divisions.

### Common applications for these units include:

- Construction of conventional cleanrooms
- Conversion of normal wards into isolation rooms

- Integration and installation in areas, equipment and devices such as the following:
  - Modular hard and soft wall cleanrooms
  - Makeshift medical centres and hospitals
  - Isolation testing mobile tents and retrofit isolation rooms
  - Registration, reception, cashier and checkout counters
  - Laminar flow cabinets, containment carts, and other clean air devices
  - Pharmacies, grocery stalls, and other areas which call for a controlled room environment

During the COVID-19 pandemic, the Esco Airstream® FFU can serve as a protective barrier during over-the-counter transactions. This minimizes risk for cross-contamination during interactions which can often lead to transmission of the infection.



Figure 1. FFU placed over the hospital patient registration counter



Figure 2. FFU placed over the pharmacy counter



Figure 3. FFU placed over the airport check-in counters



Figure 4. FFU placed over the grocery counters

## GENERAL FEATURES

- Cleanroom-compatible constructed with completely smooth, lightweight and corrosion-resistant materials
- Permanently lubricated, direct-drive centrifugal blower
- Industry exclusive blower technology operates at higher energy efficiency levels with larger airflow volumes
- Proprietary construction technology creates better airflow uniformity across the entire filter face for superior laminar flow and product protection.
- Standard energy-efficient electronically commutated (EC) backward-curve centrifugal blower system
- Standard blower speed controller allows for easy adjusting of the FFU speed
- Improved mounting techniques and sound insulation to reduce blower noise for increased operator comfort and productivity.
- Quiet operation of less than 54 dBA (measured at a distance of 1 meter from the unit at the standard airflow velocity of 0.45 m/s or 90 fpm with standard EC blower). For detailed information on FFU noise levels, refer to page 6.

- Integral HEPA/ULPA filter (different filter types available upon request)
- Integral metal faceguard protects the HEPA/ULPA filter from damage during installation and transportation.
- Fan inlet guard grille ensures operator safety during installation and prevents large objects from falling into the casing and damaging the blower.
- Wide variety of selections of exterior construction materials and styles depending on the client-specific requirements and clean air application.
- Unique and modular one-piece blower and electrical assembly designed to be serviceable and easily replaceable at lower maintenance costs.
- Standard unit is shipped with 3 core electrical wires and an optional power cord, to be specified when ordering.

## FILTER FEATURES

### [H] Minipleat separatorless HEPA filter

### [U] Minipleat separatorless ULPA filter

- All filters are factory scan-tested and serialized
- All filters are UL certified, FM approved, and compliant to the requirements of the performance standards of EN1822:2009
- Different filter heights available: 50mm (low cost), 70mm (standard), 90mm (extra long life and reduced noise)

## FILTRATION AGENTS

Esco Airstream® Fan Filter Units are available with the latest compact and ultra-slim minipleat separatorless HEPA or ULPA filters.

The HEPA and ULPA filters are constructed with pleated ultrafine fiberglass which are glued into an aluminum frame.

The aluminium frame is gasketed to form the final filter assembly with a single-piece gasket that reduces the possibility of leakage and gasket damage.

## ADVANTAGES OF MINI-PLEAT SEPARATORLESS FILTER TECHNOLOGY

- Compact size that contains more pleat per unit of filter surface area.
- Increased media area with a more effective dust-holding capacity and a longer filter life.
- Aluminum frame that is lighter than the conventional wooden frame is used which also eliminates the possibility of swelling in moist conditions often observed with conventional wooden frames.
- Aluminum separators are used which eliminates or if not lessens damage to filters

### [U] SUPERIOR-EFFICIENCY ULPA FILTERS

ULPA filters (Ultra Low Penetration Air) are a superior filter type to the conventional HEPA (High Efficiency Particulate Air) filters used by most other manufacturers. While HEPA filters provide 99.99% typical efficiency at 0.3 micron level, ULPA filters provide 99.9995% typical efficiency at 0.12 micron level.

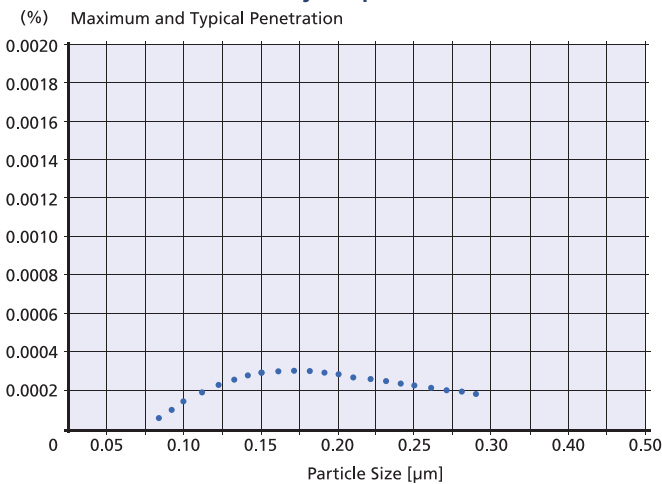
ULPA filters deliver localized clean air exceeding ISO Class 4 air cleanliness requirements. Recommended for use in the construction of cleanrooms meeting ISO Class 3 to 4 requirements or for ISO Class 4 clean air devices.

### [H] HIGH-EFFICIENCY HEPA FILTERS

While HEPA filters (High Efficiency Particulate Air) offered by competitors provide 99.99% typical efficiency at 0.3 micron level, HEPA filters on Esco fan filter units can provide 99.999% typical efficiency at 0.3 micron level.

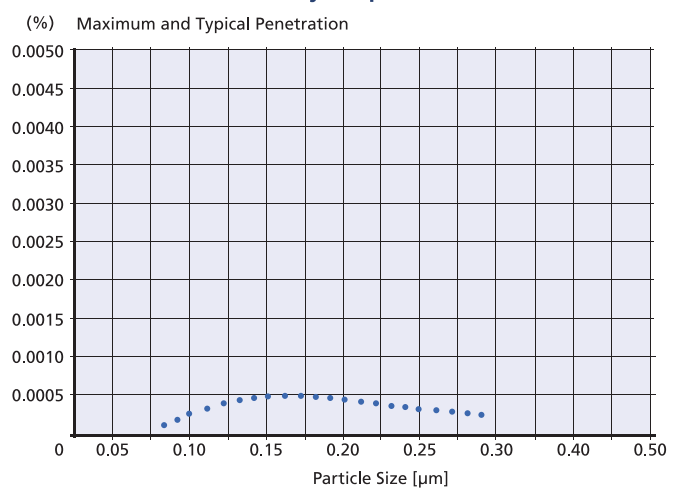
HEPA filters deliver localized clean air exceeding ISO Class 5 air cleanliness requirements (Grade A as per EU GMP). Recommended for use in the construction of cleanrooms meeting ISO Class 5 to 8 requirements or for ISO Class 5 clean air devices.

**ULPA Filter Efficiency Graph\***



• Typical Penetration

**HEPA Filter Efficiency Graph\***



• Typical Penetration

\*NOTE: Above filter efficiency graphs reflect filter efficiencies for HEPA & ULPA filters with 70mm/2.8" height for the nominal airflow velocity of 0.45 m/s or 90fpm. Filter efficiency figures change with different airflow settings and filter heights, e.g. filter efficiency will be higher for lower airflow velocities and vice versa.

## CONSTRUCTION OPTIONS

### Version 1 type (integral blower + filter casing)

Unit can be suspended from the ceiling which provides a better overall appearance since entire unit is in one-piece.

### Version 2 type (separate blower + housing module, and filter)

Unit cannot be suspended from the ceiling but is an affordable alternative to version 1. Suitable when the unit is to be mounted on the cleanroom ceiling.

*\*Refer to page 6 of this catalogue for engineering diagrams of versions 1 and 2 fan filter unit.*

### Version 3 type (Room Side Replaceable Everything or RSRE)

Unit utilizes a gel-sealed filter and allows all components such as filter and blower to be changed and replaced from within the room.

## EXTERIOR CONSTRUCTION MATERIALS

Choose from the following exterior construction materials to suit your requirements.

### [A] Aluminum

Aluminum construction is the most common material of choice which provides a cost-effective solution for all fan filter unit applications. Aluminum is light-weight, corrosion-resistant, not particle-generating, and is thus cleanroom-compatible. Esco uses only the highest quality anodized aluminium for an industrial-grade finish that is both aesthetic and durable.

### [P] Powder-Coated Steel

Construction in coated electrogalvanized steel with an abrasion-resistant powder-coated finish which provides a visually attractive, durable, smooth and totally cleanroom-compatible finish. Recommended when the FFU is exposed to exterior view such as in the construction of modular clean air devices and laminar flow cabinets, and when custom colours are required. Cost is approximately the same as aluminum construction.

### [S] Stainless Steel

Construction in stainless steel provides a visually attractive, durable and smooth finish. Recommended when required for pharmaceutical applications, and is the most expensive one among the 3 in terms of the cost.

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## BLOWERS USED ON AIRSTREAM® FAN FILTER UNITS

Esco Airstream® Fan Filter Units utilize permanently lubricated centrifugal external-rotor motor blowers.

External rotor-motor designs are known for their compact and flat build and energy-efficiency. Due to the fact that the external rotor motor is integrated in the impeller, the design allows optimal cooling of the motor (see illustration below).

All rotating parts are directly fitted to one component and dynamically balanced as such. Total weight is equally distributed to both bearings.

Esco Airstream® Fan Filter Units are available with energy-efficient electronically commutated (EC) backward-curve centrifugal blower systems.

### The main advantages of the external-rotor motor design include:

- Compact and low-noise construction (fan blades are attached directly to the outside of the rotor)
- Superior dynamically balanced design
- Perfect bearing alignment
- 100% speed control
- Optimum heat transfer out of motor leading to less stress to the insulation system
- Longer bearing service life



An example of a FFU with EC centrifugal blower connected to a laptop computer for remote monitoring and maintenance.



### EC blower

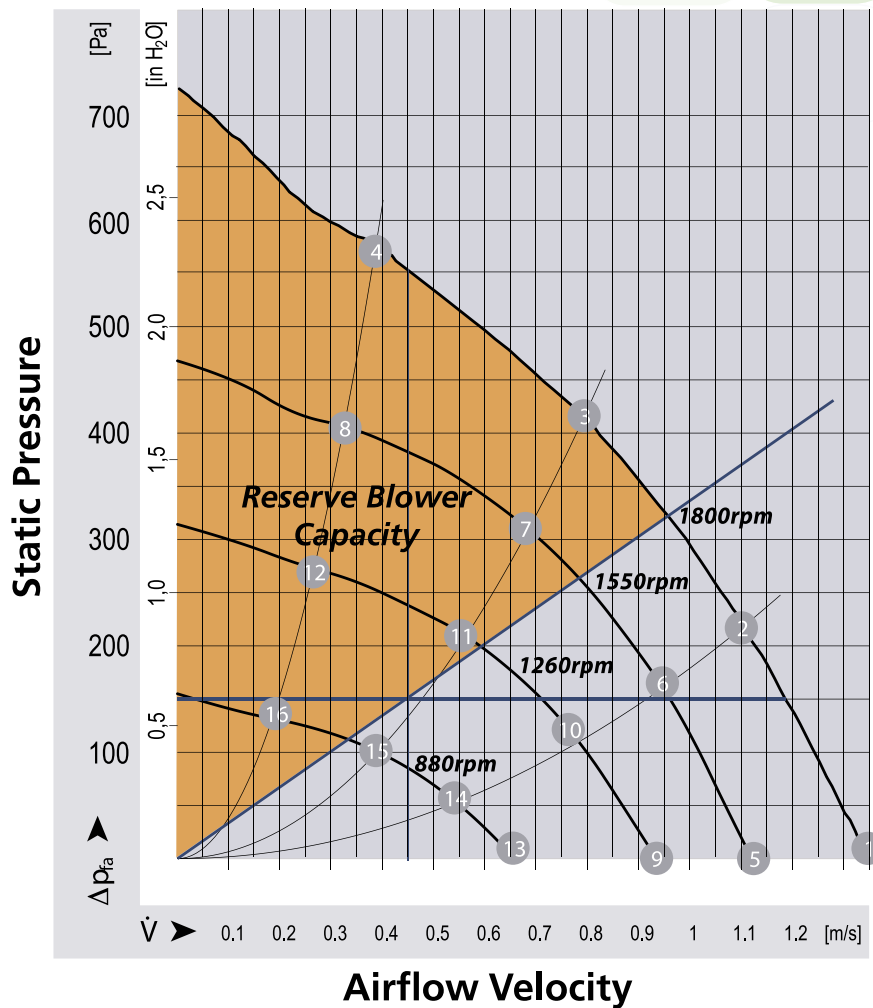
(optional remote monitoring + control system)

EC blower has the following advantages:

- Low noise level
- Low power consumption
- Low heat output
- With EC blowers, 100's of FFUs may be connected via a network to a single computer system for centralised maintenance and remote monitoring.

## SPECIFICATIONS FOR AIRSTREAM® FAN FILTER UNIT, STANDARD FFU SIZE: 2' X 4' / 600 MM X 1210 MM

### EC BLOWER



Reserve Blower Capacity is the area between the filter pressure-to-airflow line and the fan curve. Above data reflects Reserve Blower Capacity for a standard Airstream® Fan Filter Unit equipped with a pre-filter and a HEPA filter, FFU size: 2' x 4' / 600 mm x 1210 mm (standard height of 2.8" or 70 mm), with the nominal setting of 0.45 m/s and 150 Pa filter pressure drop.

For fan curves for other FFU sizes, please contact Esco.

#### BLOWER SPECIFICATIONS (EXAMPLE)

##### 2'x4'x2.8" (600x1210x70MM) MODELS

BLOWER TYPE	Typical Power Consumption*	Noise Level**
EC blower	80W	<54dBA

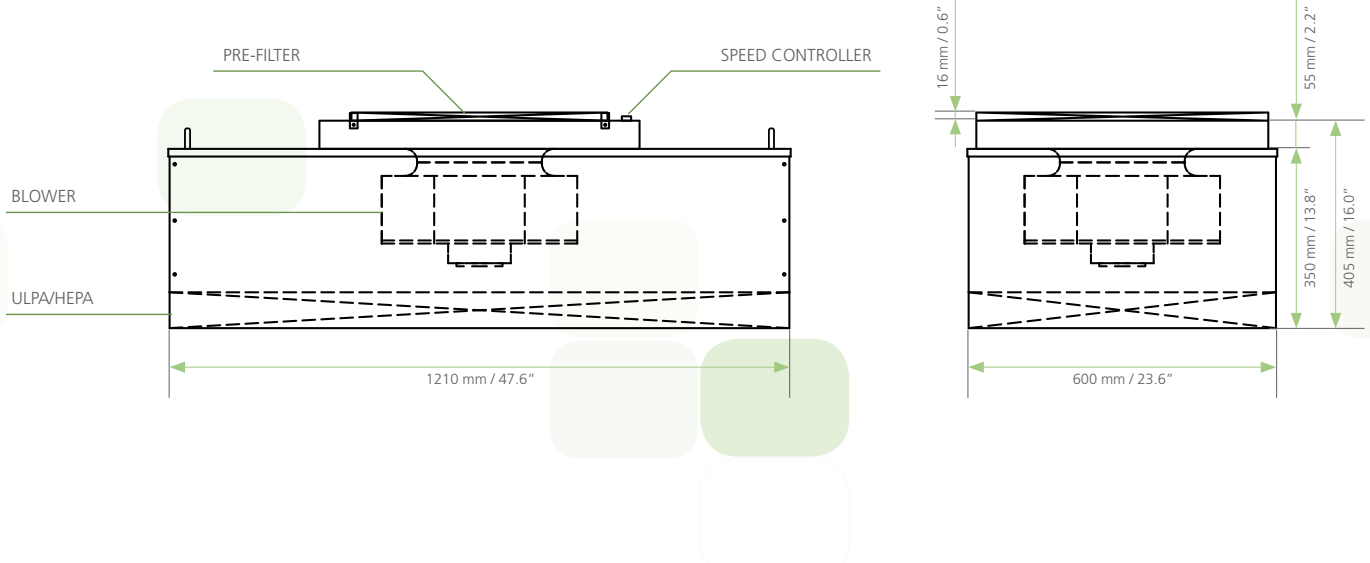
\*Applicable for 2'x4' FFU models at the standard airflow velocity of 0.45m/s or 90fpm.

\*\*Measured at a distance of 1m from the 2'x4' FFU unit at the standard airflow velocity of 0.45 m/s or 90fpm.

### VERSION 1 FAN FILTER UNIT EXAMPLE

Integral blower + filter casing

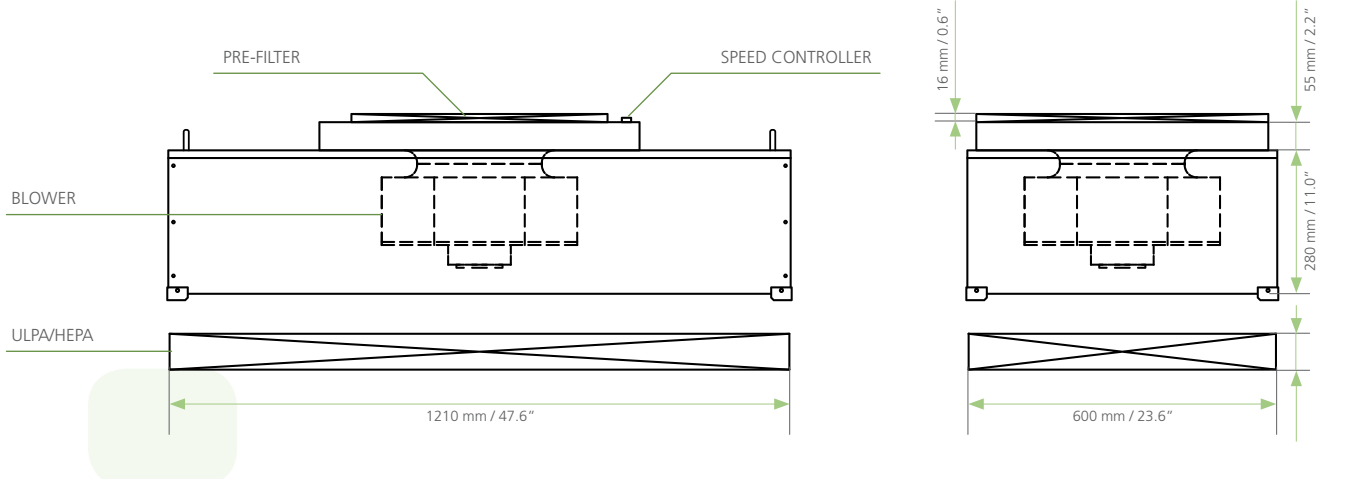
Size: 2' x 4'



### VERSION 2 FAN FILTER UNIT EXAMPLE

Separate blower + housing module and HEPA/ULPA Filter

Size: 2' x 4'



### ORDERING CODES

FFU - 2						
Model	Code	Standard Sizes	Code	Version Options	Code	Constru
Esco Airstream Fan Filter Unit	FFU	2' x 2' (600 mm x 600 mm)	1	Version 1 Integral Blower + Filter Casing	1	A
				Version 2 Separate Blower + Housing Module and Filter	2	Pov electro
		2' x 4' (600 mm x 1210 mm)	2	Version 3 Room Side Replaceable Everything (RSRE)	3	Sta

## GENERAL TECHNICAL SPECIFICATIONS

		2' x 2' models	2' x 4' models
Air Volume at Initial Airflow Velocity Setting		602 cmh / 355cfm	1150 cmh / 680 cfm
Standard Body Construction		Selection from Aluminum, Powder-coated electrogalvanized steel and Stainless steel <i>(Powder coated EG steel/ stainless steel 304/ stainless steel 316L are only available for version 3)</i>	
Filtration Elements	Pre-Filter	Non-washable and non-woven polyester fibers	
	Main Filter	HEPA (H14) or ULPA (U15) filter	
Filtration Efficiency	Pre-Filter	20% Efficiency with 85% Arrestance	
	HEPA	99.999% at 0.3µm	
	ULPA	99.9995% at 0.12µm	
Noise Level	EC blower (at initial speed setting; subject to ambient conditons)	<54 dBA	
	With optional extra high efficiency noise baffling	<50 dBA	
Power Supply Options	EC blower	7	100VAC, 50/60Hz, 1Ø
		8	220-240VAC, 50/60Hz, 1Ø
		9	110-130VAC, 60Hz, 1Ø

### OPTIONAL FEATURES (EXCLUSIVE FOR VERSION 3 ONLY)

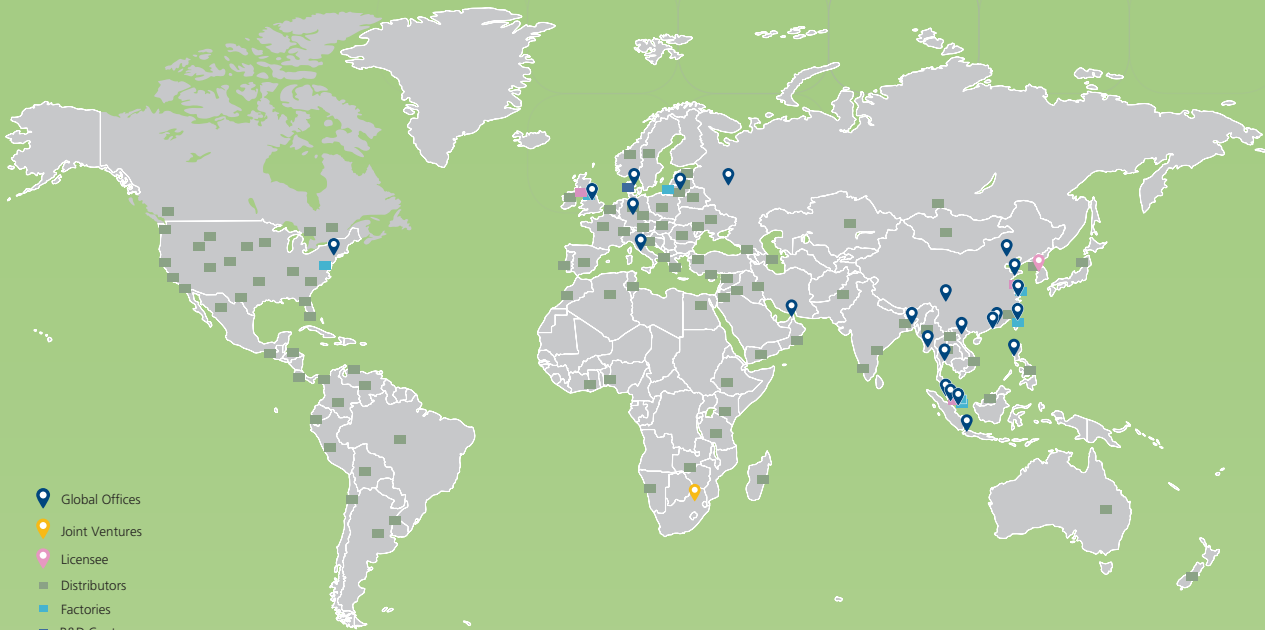
- Walkable plenum (uses thicker gauge metal sheet for the body, so it can support the weight of a person)
- Eye bolts for hanging the unit from a ceiling
- Collar for connection to A/C system
- Extra high efficiency noise baffling (reduces noise levels to less than 50dBA)
- Remotely adjustable speed controller
- Motor voltage measurement port
- Laminator available for +/-5% airflow uniformity
- Downstream or both side faceguard for protection against damage
- Removal of pre-filter
- Downstream gasketing

## 3 S - A H - 8

Construction Materials	Code	Blower Options	Code	Filter Options	Code	Electrical Supply Options	Code
Aluminum	A	EC fan	A	HEPA Filter	H	100VAC, 50/60Hz, 1Ø	7
Powder-coated galvanized steel	P					220-240VAC, 50/60Hz, 1Ø	8
Stainless steel	S			ULPA Filter	U	110-130VAC, 60Hz, 1Ø	9

# ESCO GLOBAL NETWORK

42 Locations In 21 Countries All Over The World



- Air Shower
- Aseptic Containment Isolator (ACTI)
- Ceiling Laminar Airflow Units
- Cleanroom Transfer Hatch
- Containment Barrier Isolator (CBI)
- Downflow Booth (DFB)
- Dynamic Floor Label Hatch
- Dynamic Pass Box
- Evidence Drying Cabinet
- Garment Storage Cabinet
- General Processing Platform Isolator (GPPI)
- Laminar Flow Horizontal Trolley
- Laminar Flow Straddle Units, Single and Double
- Laminar Flow Vertical Trolley
- Pass Box
- Soft Wall Cleanroom
- Sputum Booth
- Ventilated Balance Enclosure (VBE)
- Weighing and Dispensing Containment Isolator (WDCI)

Since 1978, Esco has emerged as a leader in the development of controlled environment, laboratory and pharmaceutical equipment solutions. Products sold in more than 100 countries include biological safety cabinets, fume hoods, ductless fume hoods, laminar flow clean benches, animal containment workstations, cytotoxic cabinets, hospital pharmacy isolators, and PCR cabinets and instrumentation. With the most extensive product line in the industry, Esco has passed more tests, in more languages, for more certifications, throughout more countries than any biosafety cabinet manufacturer in the world. Esco remains dedicated to delivering innovative solutions for the clinical, life science, research and industrial laboratory community. [www.escoglobal.com](http://www.escoglobal.com).



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