ESCO®

Airstream® Class II Biohazard Safety Cabinets

European Standard EN12469:2000 Tested

Class II Design: Personnel, Product / Sample, Environment Protection

Safe: Mini-pleated ULPA Filtration for 99.9998% Typical Efficiency

Easy to Use: Microprocessor-Based Control and Alarm System

Low Energy Consumption: Exclusive Backward-Curve Motorized Impeller Technology

Less Maintenance: Automatic Airflow Compensation

Comfortable: Ergonomic Sloped Front

Available in two different designs

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Specifications subject to change without notice.
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Airstream® *E-Series* Class II Biosafety Cabinet - Standard 4ft model on an optional support stand

Another key innovation for which Esco is now recognised for - our use of ***mini-pleat ULPA (Ultra Low Penetration Air) filter technology*** *as opposed to conventional HEPA filters - is especially pertinent to the applications for which these cabinets have been designed for. Operating at* ***typical efficiencies of 99.9998% at MPPS (Most Penetrating Particle Size) and 99.9999% at 0.3 and 0.12 microns*** *(compared with typical HEPA filters which are 99.99% efficient at 0.3 microns), ULPA filtration technology on these cabinets provides a higher level of operator, product and cross contamination protection.*

The Esco Airstream® Class II Biohazard Safety Cabinets are ***now available in two versions****:* ***E-series*** *(with transparent glass side walls) and* ***S-series*** *(with stainless steel interior).*

The Esco Airstream® Class II Biohazard Safety Cabinet has been ***independently certified and type-tested by Health Protection Agency (HPA, formerly CAMR****, the Centre for Applied Microbiological Research, Porton Down, Salisbury, UK) for compliance with the* ***Class II requirements of the EN12469:2000*** *(European standard for microbiological safety cabinets). The type-testing performed included stringent evaluations of cabinet airflows, containment, and operator comfort factors.*

NOTE: as of early 2001, this European standard has officially replaced the BS 5726 (British), DIN 12950 (German), NF X44-201 (French) standards for microbiological safety cabinets.

The Esco Airstream® E and S-series Class II Biohazard Safety Cabinets *are the latest generation of the original Esco Class II Biohazard Safety Cabinet product, offering a sensible balance of quality, performance features and cost-effectiveness.*

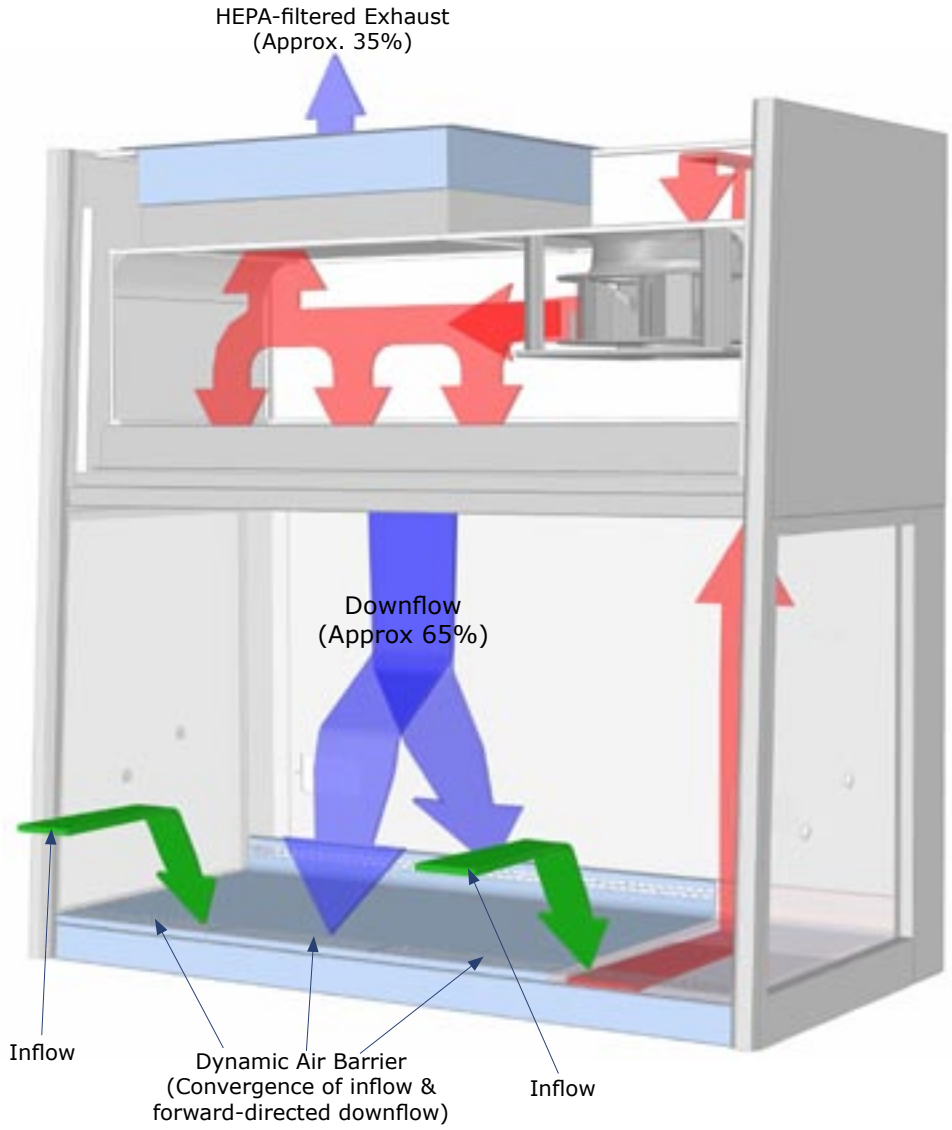
These models are suitable for use with agents assigned to ***biosafety levels 1, 2 and 3*** *(in particular 2 and 3) and provide unparalleled protection for the operator and the environment from biological hazards, in addition to an unequalled level of protection for the product from external airborne contamination and cross contamination.*

Drawing from a dialogue of over 20 years with our users, Esco engineers have re-designed every component for better performance, longer durability and easier use. Advanced airflow visualization has been employed during type-testing in our laboratories to ensure maximum containment for improved operator protection, and better airflow uniformity within the work zone for better product protection.

The industry-exclusive features designed into this cabinet include a world first (patent pending) ***backward curve motorized impeller*** *(replaces conventional blowers) positive plenum design. While the technology employed is state-of-the-art, the results obtained are simple to appreciate: better airflow uniformity for enhanced product protection, improved energy efficiency for lower operating costs, and a more comfortable working environment as a result of reduced noise and vibration levels.*

Airstream® *S-Series* Class II Biosafety Cabinet - Standard 4ft model on an optional support stand

Class II Cabinet Operating Principle



➧ Class II cabinets provide product, operator and environment protection. They are suitable for general microbiological work with agents assigned to biosafety levels 1, 2, or 3. *Class II cabinets are recommended for most applications and are the most common and cost-effective systems available on the market today.*

➧ The inflow moves from the room into perforations located towards the front of the work zone (in order to prevent contamination of the product, the inflow does not mix with the clean air present in the actual work zone of the cabinet), and then travels through an air return path below the work surface.

➧ An ULPA-filtered vertical laminar flow air stream within the cabinet (also referred to as the downflow - *large light blue arrows on the airflow diagram*) moves downwards from the top of the work zone towards the work surface. A filter mounted in the ceiling of the working area provides this airflow and ensure the work zone is continuously "bathed" in clean air, therefore protecting the product / samples in the work zone from contamination present in normal room air.

➧ The downflow is uniform - all velocity readings are within +/-20% of the average velocity. The uniform nature of the air stream ensures a high level of protection against cross-contamination between various samples placed at different locations within the cabinet work zone.

➧ Close to the work surface, the downflow air stream splits with a portion moving forward and entering the front air grille, and the remainder moving backward towards the back air grille. With the inflow, air is moved within the cabinet, through an air return path (underneath the work surface, and behind the back wall) to a plenum in which the blower system is mounted.

For the S-series: In addition, a small portion of the filtered downflow air enters the airflow intake perforations referred to as *side capture zones* at the front of the side walls at high velocities (*indicated on the diagram with small blue arrows)*. This forms an air barrier that ensures no contaminated air enters the actual work zone, and also prevents any contamination from escaping the cabinet.

➧ From the common air plenum, approximately 35% of the air is ULPA-filtered and exhausted (thus protecting the operator and the environment from exposure to biological hazards), while approximately 65% is ULPA-filtered and recirculated into the work zone as downflow.

➧ When remotely exhausted to the external atmosphere via a non-airtight thimble* connection (*optional*), the cabinet provides protection for the operator from volatile toxic chemicals used in trace amounts, which normally would not be removed by the exhaust ULPA filter.

*In accordance with NSF49 requirements, the cabinet shall be connected via a non-airtight, thimble connection.

Main Filtration Agents

Two high-quality **U15 ULPA filters with the typical efficiency of 99.9998% at MPPS and 99.9999% at both 0.3 and 0.12 microns** provide the best product and operator protection in the world; typical filter lifespan is more than 3 years depending on ambient operating conditions and total hours in usage per day.

ISO Class 3 air cleanliness within work zone as per ISO 14644.1 (equivalent to Class 1 as per the US Federal Standard 209E, **100 times "cleaner"** than the usual Class 100 classification on cabinets offered by the competition).

Mini-pleat separatorless ULPA filter technology reduces energy consumption and delivers increased laminar flow uniformity for better product / cross contamination protection; less bulky filters are also easier to handle.

Integral filter metal guard on ULPA filter prevents accidental damage to filter media; seamless filter gasket is permanently moulded on the filter frame and will not deteriorate over time.

Removable perforated powder-coated downflow diffuser provides additional protection against filter damage; in addition to increasing downflow uniformity for better product and cross contamination protection.

Main Features

Designed for ergonomics: the generously sized 173 mm / 7 inch work access opening (203 mm / 8 inch from work surface) allows easy access to the interior; the width of the inflow air grille has been minimized in order to place the work zone closer to the operator.

A removable, **rounded front armrest** extends the length of the cabinet's front edge and eliminates pressure points on the arms while maximizing cabinet containment - by increasing airflow laminarity into the plane of the work access opening.

Smooth, corrosion-resistant, attractive exterior is free of large protrusions and easy to clean.

The large, generously sized interior with more usable working space for the operator. Interior surfaces are designed to eliminate protrusions, channels, and any other difficult to clean areas - all joints, corners and seams are expertly sealed for **maximum cleanability**.

Built-in white 5000k fluorescent lighting offers excellent illumination throughout the work zone in order to reduce operator fatigue.

Front sash (sliding window) is **completely frameless** for maximum visibility into the work zone. An enclosure houses the sash as it is raised, thus preventing exposure to any biological hazards that may have adhered to the inside.

Sash is counterbalanced to allow operation with minimal physical force and effort; a **gas spring counter-balancing system** is employed.

Durable grade stainless steel work surface will never rust, chip, or generate particles.

Work tray(s) is (are) aesthetically designed with upward-curving back edge which makes cleaning the surface a breeze with no hard-to-clean joints.

Side perforation holes along the side of the work tray(s) ensure fail-safe cross-contamination prevention by eliminating the possibility of any dead-air zones within the cabinet.

The drain pan is generously sized to contain any liquid spills and can be easily cleaned.

Optional Retrofit Kits™, including accessories such as electrical outlets, service fixtures can easily be field-installed. No factory-fitting is necessary. All Retrofit Kit™ provisions are pre-installed on standard models (see engineering diagram on page 4 for further information).

E-series Features

UV-absorbing tempered glass sides increase operator comfort and provide a high level of protection against harmful UV rays when a UV lamp is installed; glass is also stronger and more durable compared to plastic materials.

Standard work surface is a multi-piece work tray. Each work surface tray is fabricated from a single piece of stainless steel without any fasteners, thus eliminating difficult-to-clean joints; each set of trays has lifting provisions to facilitate easy access to the lower drain spillage trough.

Individual trays are also easily removable for autoclaving and / or cleaning.

Standard Retrofit Kit™ Electrical Provisions are provided on workzone backwall.

S-series Features

Interior workzone is full stainless steel, which makes the workzone easy-to-clean. In addition, stainless steel is aesthetically pleasing to the eyes.

Standard work surface is a single-piece work tray. Work surface is fabricated from a single piece of stainless steel without any fasteners, thus eliminating difficult-to-clean joints; work tray has lifting provisions to facilitate easy access to the lower drain spillage trough.

Micro-holes near the front edge of the sidewalls (behind the sliding sash) eliminate the possibility of dead-air pockets.

Standard Retrofit Kit™ Electrical Provisions are provided on workzone sidewalls.

Control Features

Sentinel™ Microprocessor Control system allows the user to easily access cabinet functions.

Audible and visual alarms prompt the user in case of any unsafe cabinet condition, such as hardware failure or unsafe sash opening heights.

In order to prevent operator exposure to harmful ultraviolet radiation, **an UV interlock system** is a standard feature on all cabinets with a UV lamp; operator must close the sash in order for UV to activate; if sash is accidentally raised, the UV lamp will automatically deactivate to ensure safety.

Cabinet inflow and downflow velocities are continuously displayed on the LCD screen.

Optimum safety features: Admin. PIN can be set to restrict access to cabinet menu functions.

Blower Hour Meter to help the user monitor total cabinet usage time, and thus gauge when to replace the HEPA/ULPA filter(s). **UV Hour Meter** for monitoring total usage time of UV lamp.

Sentinel™ microprocessor control can set the cabinet in a special **Maintenance mode**, allowing for a bypass of cabinet presets. All system interlocks are disabled in this mode, and all raw inputs and outputs can be viewed for troubleshooting purposes. (For authorized service personnel only. Consult manual before activation).

Construction Features

Industrial-grade main body and dress panels constructed from electro-galvanised steel is durable.

All-metal frame is reinforced, welded and expertly gasketed, thus ensuring an airtight carcass for better safety to the operator and the environment.

The unique **electrolytic zinc coating** on the steel provides an additional barrier of protection against corrosion and rust as compared to conventional uncoated cold-rolled steels in order to maximize the service life of the cabinet.

All parts are finished in a specially selected, abrasion resistant **thermosetting powder coating** process that is both environmentally friendly (compared to conventional paints) as well as resistant to common disinfecting chemicals.

Permanently lubricated direct drive centrifugal blower(s); **energy efficient external rotor** type design reduces operating costs; industry exclusive **backward-curve motorised impeller design** guarantees better airflow uniformity, lower noise and lower overall energy consumption.

Extremely low noise (less than 60dBA) and vibration levels due to proprietary construction and mounting technology.

Built-in solid state variable speed controller(s) (infinitely adjustable from zero to the maximum setting) with built-in RFI and noise filters is superior to conventional "step" controllers.

Inherently self-balancing design eliminates the need for internal damper adjustments; system automatically maintains exhaust / recirculation airflow ratios throughout entire filter lifespan.

Esco's proprietary **Dynamic Chamber™** design places all contaminated areas under negative pressure or surrounds them with negative pressure; this fail-safe mechanism guarantees protection in case a leak develops in the cabinet's outer shell.

Inherently safe design maintains containment for protection even with some or all work trays removed, thus ensuring safety during cleaning.

Cabinet is shipped fully-assembled in the crate; simply plug the unit into a power source for operation - no local installation is required; 10 international plug types are available.

Maintenance Features

The electrical system of the cabinet has been designed in accordance with the requirements of the following standards: IEC 61010-1, EN 61010-1, UL 61010A-1 and CSA C22.2 No. 1010.1-92. All components are UL-listed or recognised. All cabinets are factory tested for electrical safety after production.

Colour-coded panels: access panels to electrical / electronics panel and filter / blower internal plenum are colour-coded red to caution users of the potentially dangerous / contaminated areas.

Instant-start, non-flickering, energy efficient **electronic ballasts** are used for lighting instead of conventional electromagnetic ballasts. There are no starters to replace.

Minimal downtime: all maintenance can be performed from the front of the cabinet thus eliminating the need for the unit to be physically relocated or disconnected from service connections. Complete isolation of all cabinet components (except the ULPA filters and the blower) from contaminated spaces means that maintenance can be performed safely without the need for time-consuming and costly fumigation / chemical decontamination.

Servicing your cabinet is a breeze with Esco's unique hinged maintenance panel. Simply remove the fasteners at both sides of the panel, lift it up, and mount it on self-supporting struts. The fluorescent lamps (mounted out of the air stream for perfect airflow uniformity), electrical components, electronic boards and display are all mounted behind this panel.

The modular electrical system can be replaced quickly with snap together connectors in case of any electrical fault, thus reducing downtime.

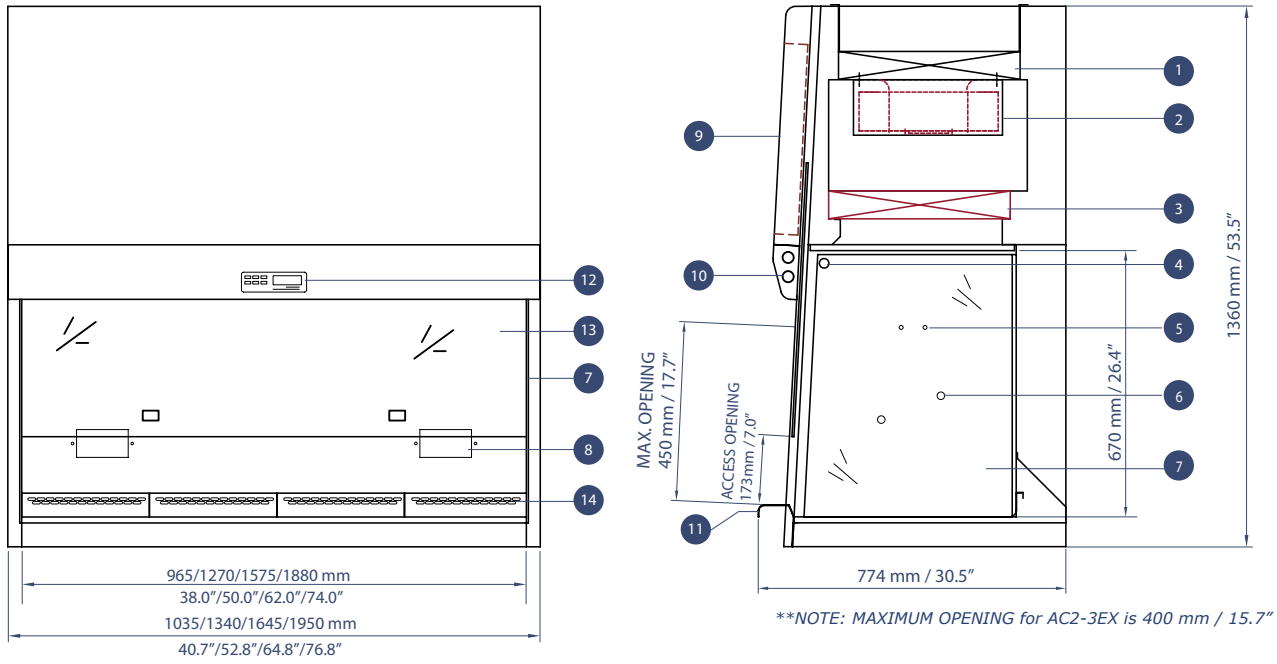
Most removable components can be removed without tools; a convenient tool kit is supplied with every cabinet with extra fasteners, misc. hardware and common hand tools required for service.

A plugged aerosol sampling port (connected to the common positive plenum) for filter testing by the aerosol challenge method is accessible from below the work tray.

A conveniently accessible paper-catch is integrated in the air return area in order to prevent wipes and small items from entering the blower.

For filter and blower maintenance, remove the access cover (secured and gasketed to the cabinet carcass) mounted on the front of the cabinet. Notice the lifting grip provisions that allow this cover to be removed with minimal physical effort. Your service provider can then access the internal plenum for filter replacement and blower maintenance.

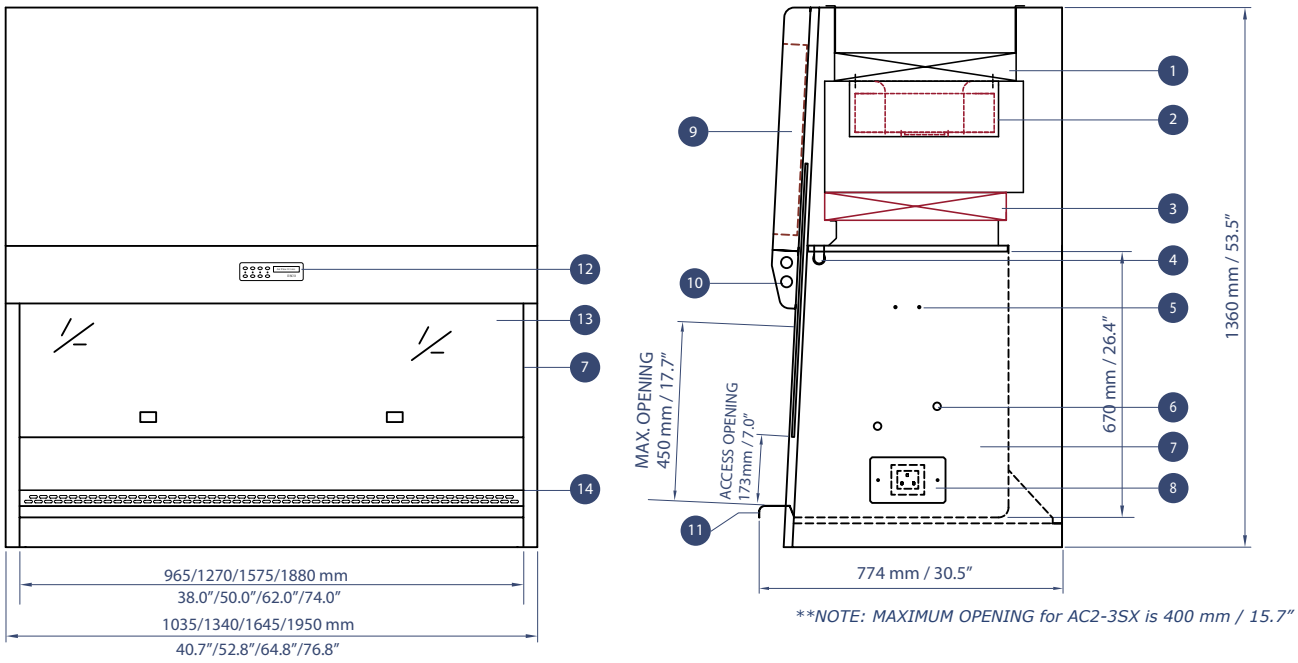
Airstream® E-series Class II Biosafety Cabinet (AC2 E-series)



***NOTE: MAXIMUM OPENING for AC2-3EX is 400 mm / 15.7"*

1. Exhaust ULPA Filter ***2.*** Blower ***3.*** Downflow ULPA Filter ***4.*** UV Light Retrofit Kit™ Provision ***5.*** IV Bar Retrofit Kit™ Provision
6. Service Fixture Retrofit Kit™ Provisions (2 on each sidewall) ***7.*** Tempered Glass Side Panel
8. Electrical Outlet Retrofit Kit™ Provisions (*Optional* - 1 for 3ft Models, 2 for 4ft and above) ***9.*** Electrical / Electronics Module
10. Fluorescent Light ***11.*** Stainless Steel Armrest ***12.*** Esco Sentinel™ Microprocessor Control
13. Tempered Glass Sliding Sash Window ***14.*** Stainless Steel Multiple-piece Work Tray

Airstream® S-series Class II Biosafety Cabinet (AC2 S-series)



***NOTE: MAXIMUM OPENING for AC2-3SX is 400 mm / 15.7"*

1. Exhaust ULPA Filter ***2.*** Blower ***3.*** Downflow ULPA Filter ***4.*** UV Light Retrofit Kit™ Provision ***5.*** IV Bar Retrofit Kit™ Provision
6. Service Fixture Retrofit Kit™ Provisions (2 on each sidewall) ***7.*** Internal Stainless Steel Side Wall
8. Electrical Outlet Retrofit Kit™ Provisions (*Optional* - 1 for 3ft Models, 2 for 4ft and above) ***9.*** Electrical / Electronics Module
10. Fluorescent Light ***11.*** Stainless Steel Armrest ***12.*** Esco Sentinel™ Microprocessor Control
13. Tempered Glass Sliding Sash Window ***14.*** Stainless Steel Single-piece Work Tray

General Specifications		AC2-3XX	AC2-4XX (Standard Size)	AC2-5XX	AC2-6XX (Standard Size)
External Dimensions (L x W x H)		1035 x 774 x 1360 mm 40.7" x 30.5" x 52.9"	1340 x 774 x 1360 mm 52.7" x 30.5" x 52.9"	1645 x 774 x 1360 mm 64.7" x 30.5" x 52.9"	1950 x 774 x 1360 mm 76.7" x 30.5" x 52.9"
Internal Work Zone (L x W x H)		965 x 560 x 670 mm 38.0" x 22.0" x 26.4"	1270 x 560 x 670 mm 50.0" x 22.0" x 26.4"	1575 x 560 x 670 mm 62" x 22.0" x 26.4"	1880 x 560 x 670 mm 74.0" x 22.0" x 26.4"
Standards Compliance		**EN 12469:2000 type-tested (exceeds requirements for Class II microbiological safety cabinets**) Air cleanliness: ISO 14644.1 Class 3, IEST-G-CC1001, IEST-G-CC1002 and other equivalent requirements Filter performance: IEST-RP-CC034.1, IEST-RP-CC007.1, IEST-RP-CC001.3 and EN1822 Electrical safety: IEC 61010-1 / EN 61010-1 / UL 3101-1 / CSA C22.2 No. 1010.1-92			
Average Airflow Velocities	Inflow	Initial setpoint: 0.45 m/s or 90 fpm (audible / visual alarm will activate at 0.4m/s or 80fpm)			
	Downflow	Initial setpoint: 0.31 m/s or 61 fpm (uniformity is +/-20%)			
Airflow Volumes At Initial Airflow Velocity Setpoints	Inflow	290 cmh / 170 cfm	375 cmh / 220 cfm	460 cmh / 270 cfm	545 cmh / 320 cfm
	Downflow (70%)	560 cmh / 330 cfm	740 cmh / 440 cfm	920 cmh / 540 cfm	1100 cmh / 650 cfm
	Exhaust (30%)	290 cmh / 170 cfm	375 cmh / 220 cfm	460 cmh / 270 cfm	545 cmh / 320 cfm
Cleanliness Within Working Area		ISO 14644.1 Class 3, US Federal Standard 209E Class 1 / M1.5, AS 1386 Class 1.5, JIS B9920 Class 3, BS5295 Class C, Class M10,000 as per KS 27030.1 and equivalent classes of VDI 2083 and AFNOR X44101			
Downflow and Exhaust Filter Type		ULPA filter with integral metal guards and filter frame gaskets; fully compliant with EN 1822 and IEST-RP-CC001.3 requirements (each cabinet has individual downflow and exhaust filters)			
Filter Efficiency Ratings		Minimum: 99.9995% at 0.3µm / 99.9994% at 0.12µm / 99.9991% at MPPS Typical: 99.9999% at 0.3µm / 99.9999% at 0.12µm / 99.9998% at MPPS			
Noise Level		Typically <60 dBA at initial blower speed setting, according to EN 12469:2000 (based on 4 feet model, subject to acoustic properties of test environment)			
Light Intensity	E-Series	>1200 Lux / >111 foot candles, measured at work surface level (zero background) as per NSF49 test grid			
	S-series	>850 Lux / >79 foot candles, measured at work surface level (zero background) as per NSF49 test grid			
Main Body Construction		1.5mmt / 0.06" / 16 gauge electro-galvanized steel with white oven-baked epoxy powder-coated finish			
Side Wall Construction	E-series	Colourless and transparent UV-absorbing 5mm / 0.2" tempered glass			
	S-series	1.2 mmt / 0.05" / 18 gauge stainless steel grade 304			
Work Surface Construction	E-Series	1.2 mmt / 0.05" / 18 gauge stainless steel grade 304 with BA finish			
	S-Series	1.5 mmt / 0.06" / 16 gauge stainless steel grade 304 with 4B finish			
Maximum Power Consumption / Current	220-240VAC / 50Hz 1Ph	298W / 1.30A	312W / 1.35A	560W / 2.43A	576W / 2.50A
	110-130VAC / 60Hz 1Ph	398W / 3.32A	412W / 3.43A	760W / 6.33A	776W / 6.47A
Heat Output (in British Thermal Units)	220-240VAC / 50Hz 1Ph	1017 BTU	1065 BTU	1911 BTU	1966 BTU
	110-130VAC / 60Hz 1Ph	1358 BTU	1406 BTU	2594 BTU	2648 BTU
Net Weight (Approximate)		190 kgs / 418 lbs	225 kgs / 495 lbs	260 kgs / 572 lbs	310 kgs / 682 lbs
Max Shipping Weight		285 kgs / 627 lbs	320 kgs / 704 lbs	355 kgs / 781 lbs	405 kgs / 891 lbs
Max Shipping Dimensions (L x W x H)		1200 x 950 x 1880 mm 47.2" x 37.4" x 74.0"	1500 x 950 x 1880 mm 59.0" x 37.4" x 74.0"	1800 x 950 x 1880 mm 70.9" x 37.4" x 74.0"	2100 x 950 x 1880 mm 82.7" x 37.4" x 74.0"
Max Shipping Volume		2.14 cbm / 75.6 cbf	2.68 cbm / 94.6 cbf	3.21 cbm / 113.4 cbf	3.75 cbm / 132.4 cbf

NOTE: Esco Airstream® S & E-series Class II Biosafety Cabinets are also available in 2ft width (AC2-2EX or AC2-2SX) on special order. Contact Esco for further information.

Ordering Codes for Esco Airstream® Class II Biosafety Cabinets								
Power Supply Options	E-series				S-series			
	3 ft model	4 ft model	5 ft model	6 ft model	3 ft model	4 ft model	5 ft model	6 ft model
220-240VAC 50HZ, 1 phase	**AC2-3E1**	**AC2-4E1**	**AC2-5E1**	**AC2-6E1**	**AC2-3S1**	**AC2-4S1**	**AC2-5S1**	**AC2-6S1**
110-130VAC 60HZ, 1 phase	**AC2-3E2**	**AC2-4E2**	**AC2-5E2**	**AC2-6E2**	**AC2-3S2**	**AC2-4S2**	**AC2-5S2**	**AC2-6S2**
220-240VAC 60HZ, 1 phase	**AC2-3E3**	**AC2-4E3**	**AC2-5E3**	**AC2-6E3**	**AC2-3S3**	**AC2-4S3**	**AC2-5S3**	**AC2-6S3**
110-130VAC 50HZ, 1 phase	**AC2-3E4**	**AC2-4E4**	**AC2-5E4**	**AC2-6E4**	**AC2-3S4**	**AC2-4S4**	**AC2-5S4**	**AC2-6S4**
100-110VAC 50HZ / 60HZ	**AC2-3E5**	**AC2-4E5**	**AC2-5E5**	**AC2-6E5**	**AC2-3S5**	**AC2-4S5**	**AC2-5S5**	**AC2-6S5**

OTHER PRODUCTS AVAILABLE FROM ESCO BIOTECH:

Vertical Laminar Flow Cabinets
Horizontal Laminar Flow Cabinets
PCR Vertical Laminar Flow Cabinets

Class II Biosafety Cabinets
Class III Biosafety Cabinets

Cytotoxic Cabinets
IVF Cabinets
Weighing Cabinets
Animal Handling Workstations

Custom-Made Clean-Air / Containment Workstations

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