

Ordering Specifications
Esco Airstream ® Class III Biohazard Safety Cabinet (AC3-XBX)

Section I: General Requirements

1. The cabinet shall meet the performance requirements of Class III as per EN12469 (European standard)

NB: The standards BS5726 (British standard), DIN12950 (German standard), AFNOR NFX-44-2201 (French standard) for microbiological safety cabinets have been replaced as of 2001 by the European standard EN12469.

2. The cabinet shall provide the following degrees of protection, validated for every cabinet on a statistical sampling basis based on the microbiological test methods from EN12469. The manufacturer shall possess an in-house microbiological test facility for this purpose.
 - a. For the operator/laboratory environment against aerosols generated within the work zone
 - b. For the product/ samples/ processes within the work zone, against normal airborne contamination in ambient air
 - c. Against cross contamination for different samples placed within the work zone
4. The manufacturer shall individually test every cabinet before shipment. A test report shall be provided to the customer with a duplicate copy permanently attached to the cabinet. At a minimum, the following tests shall be performed:
 - a. Airflow Velocity
 - b. HEPA Filter PAO Aerosol Leak Test
 - c. Noise Level Test
 - d. Lighting Intensity Test
 - e. Vibration Test
5. On request, a representative of the purchaser may witness all tests. Tests shall be performed with research grade instruments and supervised by a third-party Biohazard Cabinet Field Certifier, in accordance with the test methods specified EN12469.
6. All 230VAC 50HZ models shall be CE marked.
7. The manufacturer must have a quality management system that is certified to ISO 9001, and an environmental management system that is certified to ISO 14001.
8. The manufacturer must provide a comprehensive customer reference list of worldwide users.

Section II: Filtration System

1. The cabinet shall be equipped with the following particulate filters:
 - a. One supply ULPA filter providing vertical unidirectional laminar flow inside the work zone
 - b. Dual exhaust ULPA filters to cleanse the exhaust air
2. All filters shall fulfill the following characteristics:
 - a. ULPA (Ultra Low Penetration Air) type (HEPA filters shall not be used)
 - b. Minipleat separatorless style (filters with aluminium separators shall not be used)
 - c. Metal framed (particle board/ wood frame filters shall not be used)
 - d. Typical efficiency of more than 99.9999% with particles sizes vary from 0.1 to 0.3 microns
 - e. Integral metal guard to prevent damage (external diffusers shall not be acceptable)
 - f. Scan-tested for leaks at time of manufacture
 - g. Scan-tested for leaks after assembly onto the cabinet with an aerosol challenge
3. The filters shall be easily accessible for scan-testing in the field without accessing any potentially contaminated areas.

Section III: Blower System

1. The cabinet shall be equipped with two direct-drive centrifugal blower, meeting the following requirements:
 - a. Dynamically balanced as an assembly in two planes to ISO 2710 (impellers which are balanced before the motor is installed shall not be acceptable as the imbalanced motor itself may contribute to noise and vibration)
 - b. External rotor type design (conventional induction motors shall not be acceptable due to high energy consumption and inferior heat dissipation)
 - c. An automatic thermal cut-out shall be provided to shut the blower down automatically in case it is overheated.
2. The blower system shall be designed for low noise, low vibration and maximum filter life.
3. The blower system shall be able to maintain airflow within a minimum window as the line voltage fluctuates. Test data to demonstrate this capability shall be available on request.

Section IV: Cabinet Control and Alarm System

1. The airflow alarm and control system shall be controlled using a microprocessor.
2. The cabinet shall be equipped with a soft touch keypad and continuously back-lit LCD for controlling the operation of the fan, light, UV lamp, and microprocessor menu (manual rocker-style switches are not acceptable as they are difficult to clean)

For safety, the UV lamp shall be interlocked with the fan / fluorescent lights.

3. The cabinet shall be equipped with a monitoring system providing visual and audible alarms for any unsafe conditions (airflow, and hardware errors). The alarms shall not be mutable except during cabinet setup, and when accessing special service functions.
4. Airflow shall be monitored with a thermistor-based true air velocity-sensing device mounted on the cabinet. Other primary means of monitoring the cabinet, such as pressure gauges (only acceptable as a secondary backup device), shall not be acceptable, since they do not monitor true airflow. The airflow display and alarm system shall be individually calibrated on the cabinet before shipment.
5. As a backup monitoring device, the cabinet shall be equipped with a pressure gauge mounted in the work zone at user eye-level. Pressure gauges mounted outside the work zone, which expose potentially contaminated positive pressure tubing, and which may / may not be easily visible from the normal seated position, are not acceptable. Pressure gauges shall be individually zeroed before mounting as well as dampened to prevent spurious fluctuations.
6. The control system shall also provide the following additional features:
 - a. Automatic shutdown of the UV lamp via a timer to conserve lamp life
 - b. Continuous digital display of air velocity on the LCD for constant monitoring
 - c. Security control via a password for turning the blower on / off as well as separate password to secure all service functions
 - d. 24-hr clock display
 - e. Automatic pre-purge and post-purge cycles to ensure correct cabinet operation. The cabinet control system shall be locked during pre-purge warm-up period to prevent any usage.
 - f. An optional PC-based software program shall be available on request for performing field updating of the cabinet control system software via the Internet, as well as parameter setting.

NB: This software shall not be mandatory and it shall be possible to perform all service functions on the cabinet keypad directly.

Section V: Safety Features

1. All panels leading to potentially contaminated and / or dangerous areas shall be color coded red. Warning labels alone shall not be acceptable.
2. The glass used for the front window shall be tempered glass. The glass shall be UV resistant and filtering to protect the user from UV radiation when the UV lamp is used.
3. The blower plenum shall be a permanent design constructed of steel. Cloth or bag based plenums, which are subject to mechanical failure, shall not be used.
4. The minimum Ultraviolet intensity at the geometric centre of the work surface at 254nm, shall be no less than 200 microwatts/cm² for a new lamp

5. The cabinet shall be designed such that all contaminated plenums are under negative pressure or surrounded by negative pressure.
6. Electrical connectors penetrating the contaminated areas shall be airtight. Special design connectors shall be used for this purpose. Sealant alone is not acceptable.
7. All components, with the exception of the blowers and filters, shall be located outside of contaminated air spaces to facilitate service work without the need to decontaminate the cabinet.
8. The cabinet shall be permanently marked with safety instructions clearly visible from the front.
9. All electrical components shall be UL listed or recognized or certified to any other accepted international standard.
10. The cabinet shall meet UL 61010A-1 / IEC 610101-1, EN 61010-1, UL 3101-1 and CSA C22.2 No. 10101-92.
11. The cabinet shall be designed to eliminate sharp edges, protrusions in order to minimize the risk of personal harm to the operator. All metal edges shall be dressed and deburred.
12. The cabinet shall meet the physical stability requirements specified in IEC 61010. The manufacturer shall be able to provide a test report, on request, as evidence.

Section VI: General Construction / User Features

1. Abrasion and corrosion resistant 304 grade stainless steel shall be used for the walls, work surface, and drain spillage trough in the cabinet. Other grades (which may possess inferior corrosion resistance properties) shall not be acceptable.
2. The work tray shall be of a single piece design, for joint-free construction. Alternative designs shall not be acceptable.
3. All welds shall be ground flush and smooth.
4. There shall be no screws / fasteners inside the work zone in splash-prone areas.
5. The manufacturer shall be able to provide evidence that all surfaces, joints and welds have been type-tested for cleanability.
6. The manufacturer shall be able to provide evidence that the cabinet can be decontaminated using a gas-phase agent such as formaldehyde. The manufacturer shall be able to prove that the decontamination protocol is effective by microbiological validation.
7. A comprehensive user and service manual shall be provided with the cabinet.

Section VII: Performance Features

1. The main body of the cabinet shall be constructed of electro-galvanized (zinc coated) steel for long service life. Conventional regular cold rolled steel without a zinc coating shall not be accepted.
2. The main body of the cabinet shall be finished using a thermoset powder coating process to provide a corrosion / abrasion resistant and aesthetic finish. Conventional paint finishes, which are less consistent as well as damaging to the environment, shall not be acceptable.

3. The surface finishing shall be textured for longer wear life. The manufacturer shall be able to provide test reports evaluating the chemical compatibility of the coating against common cleaning agents used in the laboratory, as well as abrasion resistance performance.
5. The air cleanliness in the work zone, with the cabinet operating in a normal room environment, shall be ISO Class 3 when tested using a laser particle counter.

Section VIII: Ergonomics

1. The cabinet shall be designed with a 10 degree sloped front to reduce glare, increase accessibility, and ensure a comfortable work position for the operator. A slope of less than 10 degrees is not acceptable.
2. Each cabinet shall be delivered with the following
 - a. Tool kit containing common hand tools as well as replacement fasteners and miscellaneous hardware
 - b. Original factory test report*
 - c. 1 copy of the User and Service Manual

*The factory test report shall be permanently and digitally archived by the manufacturer should it need to be obtained in the future in the field for cabinet re-certification.

3. Quick-start, flicker-free, low-glare, electronically ballasted lightning shall be provided in the cabinet. The minimum average light level when tested in accordance with EN12469 shall not be lower than 1000 lux. The colour of the lighting shall be warm. Conventional electromagnetic ballasts shall not be acceptable as they exhibit poor energy efficiency and high heat dissipation characteristics.
4. The interior of the cabinet, as well as the mounting of the fluorescent lamps, shall be designed in accordance with IESNA (Illumination Engineer Society of North America) recommends, as well as to prevent glare. All materials used in the cabinet work zone shall exhibit minimum glare characteristics.
5. The touch control keypad and cabinet LCD display shall be mounted in the centre, and sloped downwards. Alternative designs, which may not be clearly visible from a seated position, shall not be acceptable.
6. The cabinet shall be designed for low-noise operation. The manufacturer shall be able to provide complete acoustical analysis results upon request. If requested, the acoustical analysis shall be conducted, at a minimum, in a free field or semi absorbing test chamber. The octave band decibel analysis as well as the declared noise level, integrated on the A-weighted scale, shall be provided. A representative of the purchaser may witness this test.
7. The ergonomic requirements of the cabinet shall be designed in accordance with EN ISO 14738 N

SECTION IX: Installation and Service

1. The cabinet shall be packaged in seaworthy export wood crating. Less durable forms of packaging, for example corrugated carton, shall not be acceptable.
2. It shall be possible to lift the cabinet directly off the pallet from the front using a forklift and / or truck onto the support stand (if ordered).
3. The width of the cabinet shall be under 850mm without any disassembly, to enable it to pass through narrow spaces. Upon disassembly of decorative side panels, the

cabinet width shall be under 790mm.

4. The electrical circuit diagram as well as original factory test report shall be permanently attached to the cabinet, in addition to a summary of the service instructions.
5. The distributor and / or manufacturer shall be able, on request, to provide local on-site training for the user(s). The manufacturer shall have officially trained the distributor.
6. The distributor shall be able, on request, to certify the cabinet on-site after installation. The distributor may also engage or refer the customer to a third-party service provider. The following tests, at a minimum, shall be performed after installation:
 - a. Downflow velocity and uniformity
 - b. Filter leak scan (both downflow and exhaust filters)

Test procedures shall be in accordance with EN 12469.

Warning: It is the responsibility of the user to ensure the cabinet is tested after installation, in order to ensure all the safety requirements have been met.

7. The manufacturer shall provide a minimum parts warranty of 3 years, supported by the local distributor, for the cabinet with the exception of consumable items (filters, lamps etc.)
8. The cabinet shall be upgradable in the field:
 - b. Installation of UV lamp
 - c. Installation of exhaust collar / thimble for ducting of exhaust
9. If connected to exhaust ducting, all service work will not require the cabinet to be disconnected.
10. All service work (excluding installation work) shall be possible with no more than 1 service person (for a 4ft / 1.2m cabinet). The blower plenum shall be equipped with mechanical assisted lifting provisions to allow for easy filter replacement.

Site Requirements

Location

1. Sufficient clearance of 40 cm (minimum) is recommended between the highest point of the cabinet and the ceiling. If the distance is less than 40 cm, the airflow alarm system may require calibration. Exhaust filter area especially susceptible to disruptive air currents or air drafts.
2. For purposes of exhaust filter leak scanning, a minimum distance of 50 cm between the highest point of the cabinet and the ceiling is recommended
3. Adequate space is to be allocated for cleaning behind the cabinet and for performing decontamination procedure
4. A far away position from any source of heat sources (heaters, fan converters, etc.) for optimum operating conditions

Environmental and Electrical Conditions

This cabinet shall be designed for operation under the following environment and electrical conditions:

1. Indoor use
2. Altitudes up to 2000 meters or 6600 ft
3. 20% - 60% relative humidity
4. Temperature range from 20 deg C to 30 deg C (68 deg F to 86 deg F). The temperature in the laboratory is to be maintained within +/-2 deg C under all conditions
5. Main supply voltage fluctuations not to exceed +/- 10% of the nominal voltage. It is recommended that the voltage fluctuation doesn't exceed +/- 2% of the nominal voltage at all times
6. Installation Category: 2.0
Installation category (over-voltage category) defines the level of transient over-voltage which the instrument is designed to withstand safely. It depends on the nature of the electricity supply and its over-voltage protection means. For example, in CAT II, which is the category used for instruments in installations supplied from a supply comparable to public mains such as hospital and research laboratories and most industrial laboratories, the expected transient over-voltage is 2500 V for a 230 V supply and 1500 V for a 120 V supply
7. Pollution Degree: 2.0
Pollution degree describes the amount of conductive pollution present in the operating environment. Pollution degree 2 assumes that normally only non-conductive pollution such as dust occurs with the exception of occasional conductivity caused by condensation.