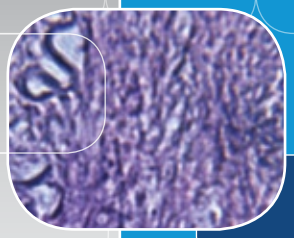


NEW!

Labculture®

Labculture Class II, Type B2 (Total Exhaust) Biological Safety Cabinet, Model LB2-4B_.

Class II, Type B2 (Total Exhaust) Biological Safety Cabinets

The Safety Solution for Life Science Laboratories

ESCO
WORLD CLASS. WORLDWIDE.

Main Features

- Lower exhaust volume and pressure, to save energy.
- Lower noise, for better working comfort.
- Lower height, to fit into shorter labs.
- Utilizes exhaust pressure switch, for fast and accurate alarm / switching.
- Dual airflow sensors to measure exhaust volume and downflow velocity.
- Esco Sentinel Gold controller with large LCD that simultaneously display key parameters.
- Quickstart mode, to turn the blower and lights ON/ OFF by moving sash to proper position.
- Simplified field calibration mode for easier airflow sensor calibration.
- Voltage free contacts to trigger external alarm external blower / damper.
- Built in RS 232 port for remote monitoring of cabinet operation.
- Unique Esco Dynamic Chamber™ plenum.
- Enhanced Auto Purge™ side-capture zones optimize containment.
- Long-life supply ULPA filter (per IEST-RP-CC001.3) with >99.999% efficiency for particle size between 0.1 to 0.3 microns.
- Angled supply filter matches cabinet profile to achieve best downflow uniformity.
- Frameless, shatterproof sash is easier to clean.
- Ergonomically angled front improves reach and comfort.
- Removable one-piece work surface simplifies cleaning.
- Raised airflow grille maintains safety by preventing blockage.
- Esco ISOCIDE™ antimicrobial coating on all painted surfaces minimizes contamination.
- Negative pressure plenum surrounds supply positive pressure plenum; no fabric bags are used.
- Work area on Esco 0.9 meter (3') cabinet is equivalent to work area offered on larger 1.2 meter (4') conventional cabinet.

The cabinets are KI-Discus tested on sampling basis for performance integrity. Available in 0.9, 1.2, 1.5 and 1.8 meter models (3', 4', 5' and 6'). Shown with optional telescoping stand.

Esco Labculture has passed more performance tests in more languages, for more certifications throughout more countries than any other biological safety cabinet in the world.

Operator, Product and Environmental Protection

The Esco Labculture Class II, Type B2 Total Exhaust Biological Safety Cabinet provides operator, product and environmental protection for biosafety Levels 1, 2 and 3. This cabinet can be used for handling Biohazard Level 4, provided that the operator wears positive pressure suit.

Containment and Protection

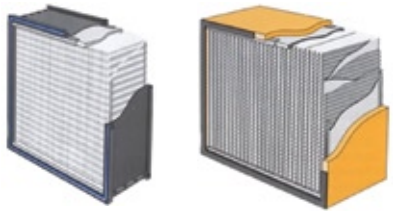
- The total exhaust design of the LB2 makes the cabinet suitable for microbiological work involving trace amounts of toxic chemicals.
- The non-recirculating design guarantees safety in cases where exhaust HEPA-filtration fails to ensure containment.
- Inflow of room air enters the front air grille to establish operator protection; room air does not enter the work zone, preventing product contamination.
- The front grille has proportionally larger perforation on the extreme left and right side. Combined with the side air gap between the work tray and the side wall, the stronger side capture zones increase protection in this critical area.
- The inflow grille has a convex shape to maintain operator protection by discouraging users from placing objects on it.
- Raised armrest prevents the likelihood of the inflow grille being blocked by the operator's arms.
- Auto-purge openings located at the front side walls eliminate eddy currents and dead air pockets in the critical area behind the sash window.
- The ULPA downflow (supply) filter is positioned proportionally to the cabinet front angle to direct more air forward to the front air grille.
- The inflow velocity, downflow velocity, air flow path, and intake geometry are precision tuned and tested to create an optimum air curtain on the front opening; this curtain maintains personal and product protection by increasing barrier protection.

Integrated Filtration System

A combination of a supply ULPA filter and an exhaust HEPA filter give the Labculture cabinet a fully integrated performance envelope for product, operator and environmental protection.

- ULPA supply filter (per IEST-RP-CC001.3), is tested to a typical efficiency of >99.999% for 0.1 to 0.3 micron particles; providing better filtration capability than conventional HEPA filters that have a typical efficiency of > 99.99% for 0.3 micron particles.
- HEPA exhaust filter (per IEST-RP-CC001.3), is tested to a typical efficiency of >99.99% for 0.3 micron particles.
- Modern separator-less mini-pleat filter construction maximizes the filter surface area to extend filter life and eliminate possible filter media damage by thin and sharp aluminum separators used in conventional HEPA filter construction.
- The filter frame and media is constructed in accordance with EN1822 requirements for fire retardant properties

Mini-pleat Separatorless Filter (left) vs. Conventional Aluminium Separator Filter (right)



Esco cabinets use Camfil Farr® mini-pleat filters without aluminum separators to increase filter efficiency, minimize the chance of leakage, and to prolong filter life. Filters include a lightweight aluminum frame for structural stability and elimination of swelling common to conventional wood frames.

- The supply ULPA filter provides ISO Class 3 (per ISO14644.1) clean air to the work surface in a gentle vertical laminar flow for product protection.
- The exhaust HEPA filter traps biohazard particles acquired from the work surface before air is exhausted via the ducting system to the external environment. The Model LB2 is provided with an integral exhaust collar for connecting the cabinet exhaust to an airtight ducting system. NB: Ductworks are not provided with standard product.

Front Sash Assembly

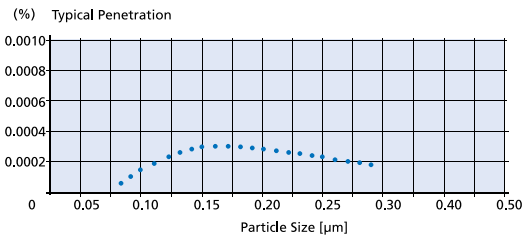
- Integrated sash proximity contacts sense sash position, serve as an interlock for the UV lamp, and activate an alarm if the sash is improperly positioned.
- The magnetic switch eliminates the chance of mechanical wear and tear typical of a mechanical switch.
- The back of the sash can be easily cleaned by removing the arm rest and lower the sash glass.
- The sash is counterbalanced for smooth and light sash moving operation.
- The counterbalance locking mechanism is inherently safe; it locks the counterbalance in place if either of the 2 cables is detached. The sash cable and cable clip have rated strength of more than 6x the weight of the sash window of the largest Labculture Class II cabinet (1.8 meter/6 ft model)
- The safety glass maintains containment if the sash is accidentally broken during cabinet operation.

Blower Efficiency

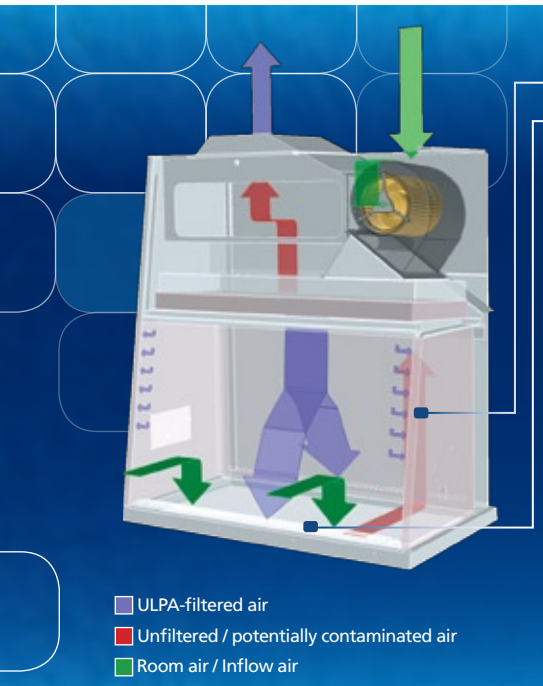
The Labculture blower system is designed for high performance operation, maximum energy efficiency and minimal maintenance.

- The blower/motor can maintain airflow velocity within 10% of original setpoint

Esco ULPA Filter Efficiency



Esco cabinets use supply ULPA filters (per IEST-RP-CC001.3) instead of conventional HEPA filters commonly found in biological safety cabinets. While HEPA filters offer 99.99% typical efficiency at 0.3 micron level, ULPA filters provide 99.999% typical efficiency for particle sizes of 0.1 to 0.3 micron level.



Cabinet Filtration System

Side capture zones

Dynamic air barrier, inflow and forward-directed downflow air converge

- Ambient air is pulled through the front grille to prevent contamination of the work surface and work product. The inflow does not mix with the clean air within the cabinet work zone.
- Ambient air is taken in through a pre-filter at the top of the cabinet, and passes through the downflow ULPA filter, entering the work zone as laminar flow. The uniform, non-turbulent air stream protects against cross contamination within and throughout the work area.
- Near the work surface, the downflow air stream splits with a portion moving toward the front air grille, and the remainder moving to the rear air grille. A small portion of the ULPA filtered downflow enters the intake perforations at the side capture zones at a higher velocity (small blue arrows).
- A combination of inflow and downflow air streams forms an air barrier that prevents contaminated room air from entering the work zone, and prevents work surface emissions from escaping the work zone. The downflow combined with the inflow air enters the common air plenum.
- All air in the common plenum is HEPA-filtered and exhausted via a dedicated ducting system to the external environment.

for a 50% increase in pressure loss over clean filters without manual speed control adjustment.

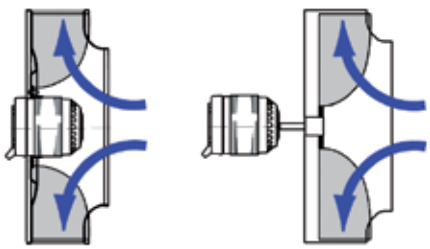
- The permanently lubricated direct-drive external rotor motor/blower reduces operating costs.
- The external rotor motor design allows for optimum cooling of the motor during extended operations and extends the motor bearing life.
- Built-in RFI and electrical noise filters eliminate interference with adjacent instrumentation.
- An integral blower hour meter tracks operating life and aids in predictive maintenance planning.
- To prevent fan damage, a paper-catch grille traps papers or towels that may drop down on the drain pan, preventing them from being pulled into the column by fan suction.

Sentinel Microprocessor Control, Alarm, Monitoring System

The Esco Sentinel microprocessor-based control system supervises operation of all cabinet functions.

- The control panel is located on the center of the cabinet, and angled down for easy access by the operator.
- Continuous monitoring of cabinet airflow is displayed on a bright, easy-to-read LCD panel.
- A temperature-independent, fast response pressure switch is used to trigger the airflow alarm and turn off the internal blower should exhaust is insufficient.
- An integrated, temperature-compensated true airflow velocity sensor provides an accurate airflow reading despite room temperature fluctuation.
- All electronic parts are contained inside a plug-and-play module.
- Microprocessor software updates are available from Esco for download. Sentinel functions are factory set to default to ON or OFF, depending on worldwide destination and local preferences. Default settings can be user activated through the touchpad data entry access.
- The airflow alarm can be activated or deactivated depending on user preference and nature of the work.
- Automatic start-up sequence will prepare the cabinet for normal operation and advise when safe conditions are established.
- Selectable Quickstart mode, to automatically turn on/off the cabinet blower and lights by simply moving the sash window to the correct position.
- An administrator controlled PIN (Personal Identification Number) can be set to restrict access to main menu.
- Zero Volt Relay Contacts to trigger external alarm.
- Zero Volt Relay Contacts to synchronize building exhaust blower with internal blower.

Esco Centrifugal Fan with External Rotor Motor (left) vs. Conventional Fan with Standard Motor (right)



- *Esco cabinets use German made **ebm-papst**® permanently lubricated, centrifugal motor/ blowers with external rotor designs.*
- *Integrated blades norrow the profile and eliminate the need for a motor shaft.*
- *Motors are selected for energy efficiency, compact design, and flat profile. The completely integrated assembly optimizes motor cooling.*
- *All rotating parts are unitized and balanced for smooth, quiet, vibration-free operation.*

A graphical interface indicates cabinet performance.

Digital read-out with alpha-numeric display indicates all input, status and alarm functions.

All functions can be user activated through touch-pad programming access; see Operations Manual.

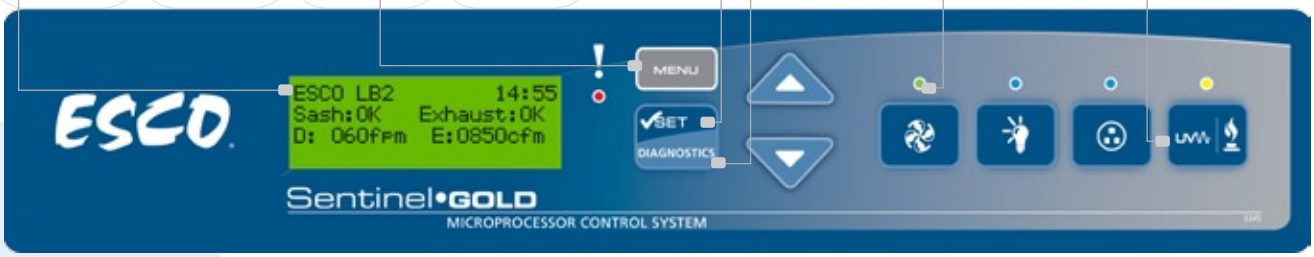
Touchpad data entry buttons permit control settings and access to diagnostics, default settings and hierarchical menus.

SET button doubles as Alarm mute button with adjustable ringback period.

Diagnostics button, to easily check the cabinet operating parameters and assist servicing.

Color coded indicator lamps display green for primary function (fan operation); blue for secondary function (fluorescent lights and electrical outlet); and orange for caution (UV lamp ON).

Programmable automatic UV light timer simplifies operation, enhances contamination control, extends UV lamp life and saves energy.



Sentinel™ Gold Microprocessor Control System, Programmable ■ *When programmed ON*

- *the start-up sequence confirms status with Air Safe and local time display.*
- *the Personal Identification Number (PIN) access restricts unauthorized adjustments.*
- *an airflow alarm warns of deviations from normal velocities.*

Consult your Esco Operating Manual or contact your Sales Representative for information on user-preference programming capabilities built into the Sentinel microprocessor platform.

- The field calibration mode makes it easier for certifiers to calibrate the airflow display.
- RS 232 data output port enables remote monitoring of cabinet operating parameters.
- Optional TCP/IP converter to connect RS 232 to network for remote monitoring.

Cabinet Construction

Robust construction and enhanced safety features qualify the cabinet for the most demanding laboratory applications. The cabinet is fully assembled and ready to install and operate when shipped.

- The interior work area is formed from a single piece of stainless-steel with large radius (25 mm / 1") corners to simplify cleaning.
- The cabinet work zone has no welded joints to collect contaminants or rust.
- All stainless steel work surfaces are removable for cleaning.
- Tray components lift and remove to provide easy access and encourage surface decontamination.
- A recessed central area and stainless steel drain pan channel spills.
- The drain pan is flush with the side walls to eliminate concealed or hard-to-clean spaces.
- There are no screws in the front or sides to trap contaminants or complicate cleaning.
- Optional service fittings are offset for easier access.
- External plumbing is concealed behind dress panels to maintain aesthetics.
- External surfaces are coated with Esco Isocide™ antimicrobial coating to protect against surface contamination and inhibit bacterial growth. Isocide eliminates 99.9% of surface bacteria within 24 hours of exposure.

Robust Cabinet Construction and Enhanced Safety Features

Service fixtures are offset for easier reach. Standard cabinets include two fixture provisions on each sidewall (one provision on each sidewall for 0.9 meter/3 ft. cabinet). Electrical outlets are mounted below service fixtures to minimize obstructions.

Helpful for certifiers, the hinged maintenance assembly opens to a fixed position on integrated, gas spring struts providing front service access.

All key components, with the exception of the blower/motor assembly, are mounted outside the air stream and away from contaminated air to permit service without decontamination. These include fluorescent lamps, UV lamp, electrical harnesses, electronic boards and microprocessor control.

- *Panels enclosing potentially hazardous areas or components such as microbiological contamination or electrical shock are color-coded to warn service technician.*
- *The telescoping Dynamic Chamber™ plenum minimizes physical lifting and accelerates filter change when required.*
- *Work area containment is maintained even when removable components are lifted out for cleaning.*

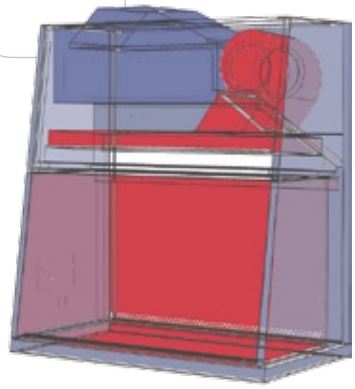
The one piece stainless steel work tray edges are radiused and easy to clean without crevices or joints.

The lower drain trough is a single-piece fabrication with wide open angles and a channel to direct spills to the drain.

- *The closed sidewall contains no perforations, air return slots or other hidden areas where contaminants can accumulate.*

Standards Compliance	Biosafety Cabinets	Air Quality	Filtration	Electrical Safety
	NSF / ANSI 49, USA (LB2-4B2, LB2-6B2) SFDA YY-0569, China	ISO 14644.1, Class 3, Worldwide JIS B9920, Class 3, Japan JIS BS5295, Class 3, Japan US Fed Std 209E, Class 1 USA	EN-1822 (H14 & H13), Europe IEST-RP-CC001.3, USA IEST-RP-CC007, USA IEST-RP-CC034.1, USA	UL 61010-1, USA CAN / CSA- C22.2 No. 61010-1 EN 61010-1, Europe IEC 61010-1, Worldwide

Dynamic Chamber™ Plenum Design



High negative pressure

Negative pressure *Positive pressure*

The Esco triple-wall design creates a Dynamic Chamber plenum which surrounds contaminated areas with negative pressure, preventing the possibility of contamination from leaks in filter seal, gasket or cabinet structure. The third wall conceals utilities.

Comfortable Ergonomic Design

The LB2 cabinet is engineered for comfort, utility value and safety.

- The 10° angled viewing window and narrow profile front grille improves reach into the work area.
- The instant-start 5000k fluorescent lamp operates on an electronic ballast to reduce heat, improve comfort and conserve energy.
- The lamp delivers uniform lighting to the work surface for greater comfort, reduced glare and improved productivity; see Technical Specifications.
- The front armrest is raised above the workzone to improve comfort and to ensure that the operator's arms do not block the forward airflow perforations.
- The optional adjustable support stand provides work surface height control.
- The frameless sash eliminates operator's line of sight blockage
- A generous sash opening allows for easier access into the work zone, provides ample room for transferring of small equipment (See Specifications.)
- The sliding window can be fully opened (Max sash opening is 457 mm / 18") to insert and remove larger instrumentation and equipment.

Electrical Safety and Certification

All components meet or exceed applicable safety requirements.

- Each cabinet is individually factory tested for electrical safety.
- Documentation specific to each cabinet serial number is maintained on file.
- UL Listed for USA and Canada.
- Certified to the US standard NSF / ANSI 49 for Class II biohazard cabinetry (refer to Standard Compliance table at the top of this page for the full list).
- Contact Esco or your Sales Representative for site preparation information; see Electrical Specifications.

Warranty

The Labculture cabinet is warranted for 3 years excluding consumable parts and accessories.

- Each cabinet is shipped with a comprehensive user's manual complete with a report documenting all test procedures.
- Additional IQ/OQ documentation is available upon request.
- Contact your local Sales Representative for specific warranty details or documentation requests.

Accessories and Options

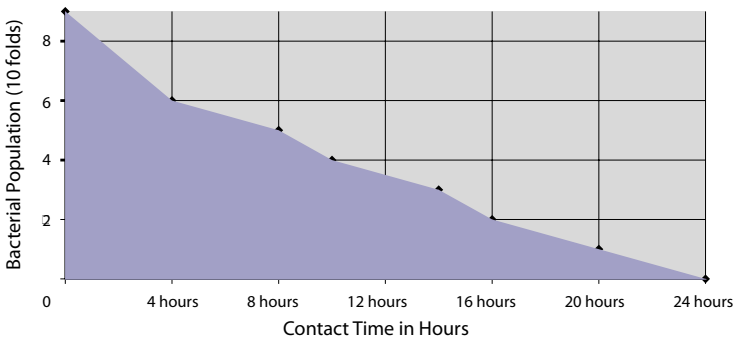
Esco offers a variety of options and accessories to meet local applications. Contact Esco or your local Sales Representative for ordering information.

Support Stands

- Fixed height, available 711 mm (28") or 864 mm (34")
  - With leveling feet, ±38.1 mm (1.5")
  - With casters
- Telescoping height stand for leveling feet, nominal range 660 mm or 960 mm (26" or 37.8")
- Telescoping height stand for casters, nominal range 660 mm or 880 mm (26" or 34.6")
  - Adjustable in 25.4 mm (1") increments
- Cradle stand, electrical hydraulic, infinitely adjustable, with casters
  - Elevates to seating or standing work surface height
  - When lowered permits movement through standard doorway

Note: • *Increases exterior dimensions.*
• *Requires flexible height duct connection*

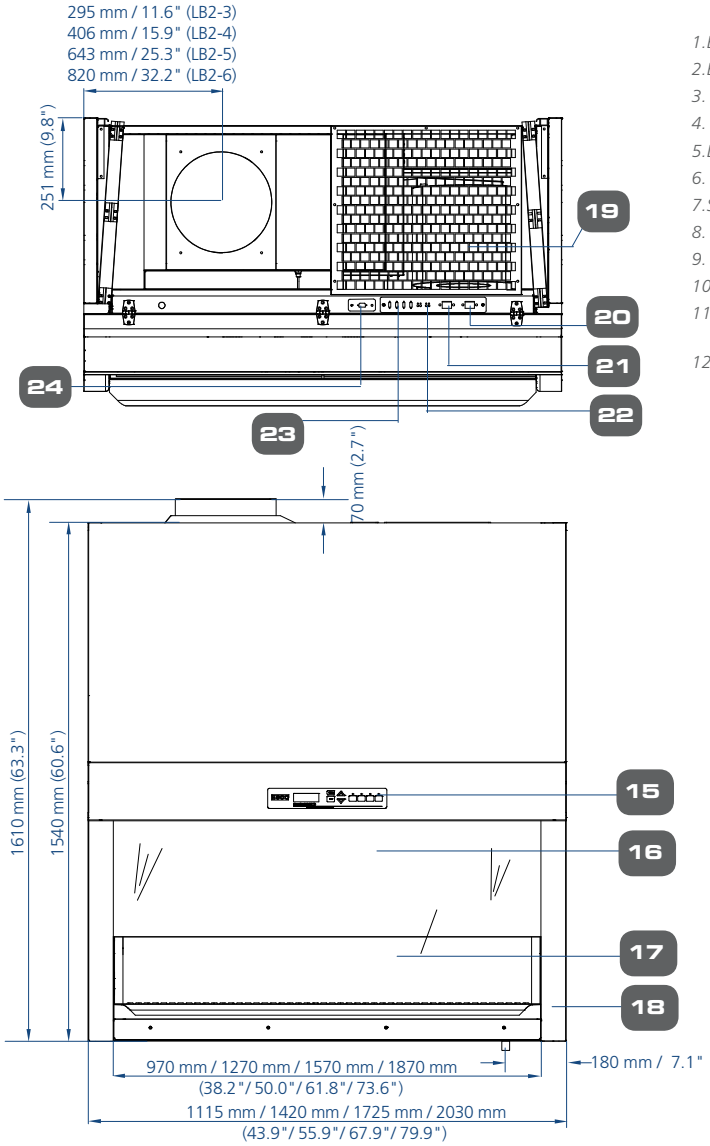
ISOCIDE™ Antimicrobial Powder-Coating



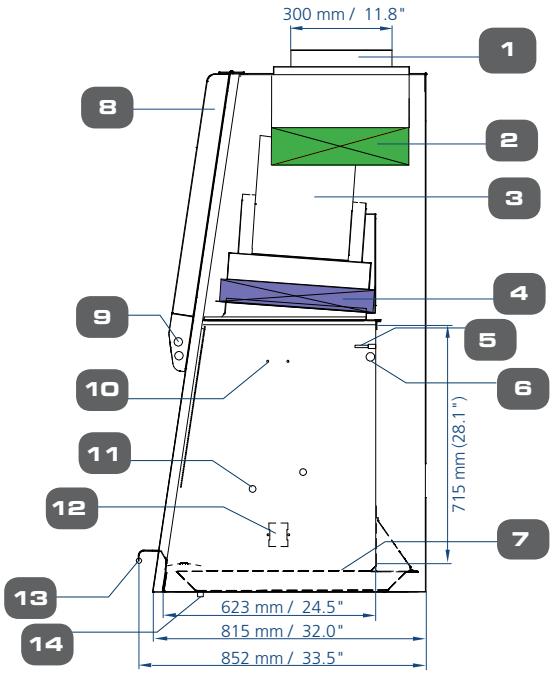
All exterior painted surfaces are powder-coated with Esco Isocide, an antimicrobial inhibitor to minimize contamination. Isocide is integrated into the coating substrate and cannot wash out or diminish by repeated cleaning. Performance results are available upon request.

The sash window can be lowered further down by removing the arm rest, to easily clean the upper back side of the glass.

Model LB2 Biological Safety Cabinet Technical Specifications



1. *Exhaust collar*
2. *Exhaust HEPA filter*
3. *Blower*
4. *Downflow ULPA filter, angled*
5. *Downflow Sensor*
6. *UV light Retrofit Kit™ provision*
7. *Single-piece stainless steel work tray*
8. *Electrical / Electronic panel*
9. *Fluorescent lamp*
10. *IV-Bar Retrofit Kit provision*
11. *Service Fixture Retrofit Kit provisions (2 on Each Side)*
12. *Electrical outlet Retrofit Kit provision (0.9 meter / 3' model - one single outlet in workzone) (1.2, 1.5 and 1.8 meter / 4',5' & 6' models - two single outlets in workzone)*
13. *Stainless steel armrest*
14. *Drain valve Retrofit Kit provision*
15. *Esco Sentinel™ Gold microprocessor control system*
16. *Safety glass sliding sash window*
17. *Single-piece stainless steel back wall and side walls*
18. *Removable side dress panel for plumbing access*
19. *Pre filter*
20. *Cabinet power inlet*
21. *Auxiliary power inlet*
22. *Zero voltage relay contact*
23. *Frequency selector(Japan cabinet only)*
24. *RS 232 port*



Accessories and Options (Cont.)

Electrical Outlets and Utility Fixtures

- Electrical outlet, ground fault, North America
- Electrical outlet, Europe / Worldwide
- Petcock (air, gas, vacuum)
  - North America (American) style
  - Europe / Worldwide style DIN 12898, DIN 12919, DIN 3537

Cabinet Accessories

- Germicidal UV lamp
  - Controlled by automatic UV lamp timer through Sentinel micro-processor control panel
  - Emission of 253.7 nanometers for most efficient decontamination.
  - Lamp is positioned away from operator line-of-sight for safety and proper exposure to interior surfaces.

Note: UV lamp intensity reduces over time and its effectiveness is subject to factors such as relative humidity in the cabinet, ambient air temperature and microbial species in the work zone.

- PVC armrest
  - Chemically treated, improves operator comfort, easy-to-clean. 711 mm (28") standard size
- Ergonomic lab chair
  - Laboratory grade construction, meets Class 100 cleanliness; alcohol resistant PVC materials
  - Adjustable 395-490 mm (15.6"-19.3")
- Ergonomic foot rest
  - Angled, helps maintain proper posture
  - Adjustable height
  - Anti-skid coating, chemical resistant finish
- IV bar, with hooks
  - Stainless steel construction
  - Available for all standard Esco cabinets
- Microscope viewing device
  - Mounting and viewing pouch integrated into sash. Factory installed; specify when ordering
- Anti blowback valve
  - Prevents flow from the facility HVAC system into the Esco product.
- Air tight damper
  - Seals the Esco product from the facility HVAC system during decontamination.

General Specifications		LB2-3B_	LB2-4B_	LB2-5B_	LB2-6B_
Nominal Size		0.9 meters (3')	1.2 meters (4')	1.5 meters (5')	1.8 meters (6')
External Dimension* (W x D x H)	Without Base Stand	1115 x 815 x 1610 mm 43.9" x 32.0" x 63.3"	1420 x 815 x 1610 mm 55.9" x 32.0" x 63.3"	1725 x 815 x 1610 mm 67.9" x 32.0" x 63.3"	2030 x 815 x 1610 mm 79.9" x 32.0" x 63.3"
	With Optional Base Stand, 711mm (28") type	1115 x 815 x 2321 mm 43.9" x 32.0" x 91.4"	1420 x 815 x 2321 mm 55.9" x 32.0" x 91.4"	1725 x 815 x 2321 mm 67.9" x 32.0" x 91.4"	2030 x 815 x 2321 mm 79.9" x 32.0" x 91.4"
Internal Dimensions (W x D x H)		970 x 623 x 670 mm 38.2" x 24.5" x 26.4"	1270 x 623 x 670 mm 50.0" x 24.5" x 26.4"	1570 x 623 x 670 mm 61.8" x 24.5" x 26.4"	1870 x 623 x 670 mm 73.6" x 24.5" x 26.4"
Usable Work Area		0.45 m^2 (4.8 sq.ft.)	0.6 m^2 (6.5 sq.ft.)	0.75 m^2 (8.1 sq.ft.)	0.9 m^2 (9.7 sq.ft.)
Tested Opening		203 mm (8.0")	203 mm (8.0")	203 mm (8.0")	203 mm (8.0")
Average Airflow Velocity	Inflow	0.53 m/s (105 fpm)			
	Downflow	0.31 m/s (60 fpm)			
Airflow Volume	Inflow	376 m^3/h (223 cfm)	492 m^3/ h (292 cfm)	608 m^3/ h (361 cfm)	724 m^3/ h (429 cfm)
	Downflow	628 m^3/h (363 cfm)	822 m^3/h (476 cfm)	1016 m^3/h (588 cfm)	1210 m^3/h (700 cfm)
	Concurrent Balance Value (CBV) Exhaust Volume at corresponding Static Pressure **Note:** Must use this for HVAC sizing**	1127 m^3/h (658 cfm)	1476 m^3/h (862 cfm)	1853 m^3/h (1091 cfm)	2173 m^3/h (1269 cfm)
	Minimum exhaust static pressure for clean exhaust filter***	400 Pa / 1.6 in H_2O	375 Pa / 1.5 in H_2O	375 Pa / 1.5 in H_2O	400 Pa / 1.6 in H_2O
	CBV Static Pressure with additional 174 Pa (0.7 in H_2O) required by NSF/ANSI 49:2010 **Note:** Must use this for HVAC sizing**	575 Pa / 2.3 in H_2O	550 Pa / 2.2 in H_2O	550 Pa / 2.2 in H_2O	575 Pa / 2.3 in H_2O
Supply ULPA Filter Typical Efficiency		>99.999% for particle size between 0.1 to 0.3 microns			
Exhaust HEPA Filter Typical Efficiency		>99.99% at 0.3 microns			
Sound Emission****	NSF / ANSI 49	57	58	59	60
	EN 12469	54	55	56	57
Fluorescent Lamp Intensity At Zero Ambient		> 1250 Lux (> 116 foot-candles)	> 1400 Lux (> 130 foot-candles)	> 1200 Lux (> 111 foot-candles)	> 1200 Lux (> 111 foot-candles)
Cabinet Construction	Main Body	Electro-galvanized steel with white oven-baked epoxy-polyester Isocide antimicrobial powder-coated finish			
	Work Zone	Stainless Steel Type 304 with No. 4B finish			
Electrical*****	220-240V, AC, 50Hz, 1Ø	LB2-3B1	LB2-4B1	LB2-5B1	LB2-6B1
	110-120V, AC, 60Hz, 1Ø	LB2-3B2	LB2-4B2	LB2-5B2	LB2-6B2
	220-240V, AC, 60Hz, 1Ø	LB2-3B3	LB2-4B3	LB2-5B3	LB2-6B3
Net Weight ******		279 kg / 615 lbs	317 kg / 699 lbs	359 kg / 791 lbs	438 kg / 966 lbs
Shipping Weight ******		318.8 kg / 703 lbs	380.5 kg / 839 lbs	402.0 kg / 886 lbs	491.3 kg / 1083 lbs
Shipping Dimensions, Maximum (W x D x H) ******		1210 x 940 x 1930 mm 47.6" x 37.0" x 75.9"	1520 x 940 x 1930 mm 59.8" x 37.0" x 75.9"	1900 x 940 x 1940 mm 74.8" x 37.0" x 76.4"	2150 x 940 x 1950 mm 84.7" x 37.0" x 76.8"
Shipping Volume, Maximum ******		2.19 m^3 (77.3 cu.ft.)	2.76 m^3 (97.4 cu.ft.)	3.46 m^3 (122.2 cu.ft.)	3.94 m^3 (139.1 cu.ft.)

* *height includes exhaust collar.*

** *This Concurrent Balance Value (CBV) Exhaust Volume (per Pitot Duct Traverse) and Static Pressure at cabinet exhaust connection should be used when sizing the HVAC exhaust & supply.*

*** *This minimum exhaust static pressure for clean exhaust filter should not be used for exhaust fan sizing, and it is listed here for comparative purpose only.*

**** *Noise reading at open field condition / anechoic chamber.*

***** *Additional voltages may be available; contact Esco for ordering information.*

****** *Cabinet only, excludes optional stand.*

Comprehensive Performance Testing At Esco

Every Labculture LA2 model manufactured by Esco is individually tested, documented by serial number and validated with the following test methods.

- *Inflow / downflow velocity*
- *PAO aerosol challenge for filter integrity*
- *Airflow pattern visualization*
- *Electrical safety to IEC61010-1*
- *Additional KI-Discus containment and microbiological testing are performed on statistical sampling basis.*

Microbiological Testing

Esco performs testing in accordance with more than 10 of the world's most recognized standards for local, regional and international criteria. Testing in our microbiology laboratory is conducted according to NSF / ANSI 49, EN 12469, and JIS K3800. An NSF-accredited biohazard cabinet field certifier is available in-house full-time to supervise all tests.

Harmless Bacillus Subtilis bacteria is used to challenge the cabinet, then incubated for 48 hours and the Colony Forming Units (CFU) are counted to determine the testing results. Increased microbiological challenge tests with objects inside the cabinet work zone, bunsen burner, external airflow disturbance, and Human-As-Mannequin test adapted from Fume Hood development were performed to simulate real-world conditions.

Personnel Protection Test

The test objective is to evaluate the safety of the cabinet for the personnel operating on potentially hazardous samples in the cabinet workzone.

- A nebulizer containing 55 mL of 5 to 8 x 10^8 spores/mL B.Subtilis spores is placed inside the workzone, 10 cm (4 inches) behind the front opening sash.
- Target slit air samplers and impingers are placed outside the workzone to capture B.Subtilis spores that may escape, then the sample is incubated
- Acceptance: The number of B.Subtilis CFU recovered from the agar plates shall not exceed 10 CFU per test.

Product Protection Test

The test objective is to determine cabinet protection to the product/samples inside the cabinet workzone from environmental contaminants.

- A nebulizer containing 55 mL of 5 to 8 x 10^6 spores/mL B.Subtilis is placed at 10 cm (4 inches) in front of sash window.
- Target agar plates are placed throughout the entire work surface.
- Acceptance: The number of Bacillus Subtilis CFU recovered from the agar plates shall not exceed 5 CFU per test.

Cross Contamination Test

The test objective is to evaluate cabinet protection from cross contamination of samples placed simultaneously inside the workzone.

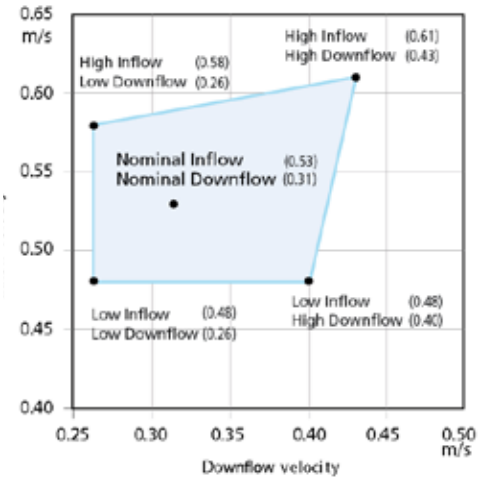
- A nebulizer containing 55 mL of spores (5 to 8 x 10^4/mL) is placed against one of the workzone sidewalls.
- Target agar plates are placed 36 cm (14 inches) away from the same side wall as the nebulizer.
- Acceptance: The number of Bacillus Subtilis CFU recovered on agar plates shall not exceed 2 CFU per test.

HPV Test Compliant: Safer Hydrogen Peroxide Vapor Decontamination Compatibility

Esco biological safety cabinets are Hydrogen Peroxide Vapor (HPV) compliant and decontaminatable cabinets tested with both BIOQUELL and STERIS patented processes. HPV is a safer and more efficient alternative to conventional decontamination using formaldehyde (CH_20):

- HPV is non-carcinogenic and odorless, while formaldehyde is carcinogenic, toxic and has pungent smell.
- HPV biological efficacy is independent of environmental variables, whereas formaldehyde efficacy is dependent on such variables.
- If there is a gap on the cabinet sealing, escaping HPV to the lab will decompose to become oxygen and water. Escaping formaldehyde, however, is harmful to people in the lab. Therefore HPV decontamination can be performed while people still working inside the lab, while formaldehyde decontamination must be performed with no one present in the lab. The HPV method improves safety, productivity, and reduces the time to seal the cabinet.
- HPV has a better penetration capacity, resulting in a full decontamination of the cabinet. The formaldehyde method is known to result in incomplete decontamination,
- HPV is more effective and rapid against biological organisms compared to formaldehyde.
- HPV requires approximately 4-7 hours for set-up, decontamination, and tear-down, compared to a total of 12-15 hours needed to complete a formaldehyde decontamination process.
- HPV decontamination effectiveness is independent of temperature and humidity. Formaldehyde requires temperature above 20°C and relative humidity above 65%
- For information on the BIOQUELL and STERIS HPV methodologies, contact Esco or your Sales Representative and ask for our HPV Decontamination Whitepapers.

The Performance Envelope Concept



Esco cabinets are designed to operate within a performance envelope to maintain protection for personnel, product and the environment.

Airflow parameters used to frame the performance envelope include both inflow velocity and downflow velocity.

The graph illustrates the boundaries of the performance envelope, as well as the nominal performance point at which tests are conducted.

The range between high and low Inflow, and high and low downflow, together with the fluid dynamics achieved through sophisticated cabinet design, proportionally size capture slots, and uniform laminar airflow, combine to deliver a complete containment and safety solution expected of a professional biological safety cabinet.

For details on the Esco performance envelope contact Esco or your Esco Sales Representative.

KI Discus Containment Test According to EN 12469 (Potassium Iodide)

Esco is currently one of the few companies in the world equipped to perform the KI Discus test for our customers. The KI Discus test is defined in the European Standard for microbiological safety cabinets, EN 12469, as a test method for validating the operator/personnel protection capabilities of the cabinet.

- The KI Discus test shows excellent correlation with the microbiological test method for operator protection, and is useful for validating the actual containment performance of the cabinet on-site.
- The KI-Discus takes only 45 minutes as opposed to 2 days for microbiological testing.
- Thus, Esco Labculture LB2 models are factory tested on a sampling basis using the KI Discus method for operator safety.

Purchase Specifications

LB2 Series Class II, Type B2 (Total Exhaust) Biological Safety Cabinet

General Performance and Certifications

1. The biological safety cabinet shall comply with one or more of the following international standards, and the manufacturer shall provide a certified copy of containment and performance tests equivalent to or greater than specified in the following independent international standards for biological safety, electrical and other functional characteristics: Class II, Type B2 per NSF / ANSI 49 (USA) and SFDA YY-0569
2. The cabinet shall protect (a) the operator and laboratory environment from particulates generated within the work zone; (b) the product and process within the work zone from airborne contamination from ambient air; (c) and the product and process within the work zone from cross contamination.
3. Each cabinet shall be listed by Underwriters' Laboratories (UL, cUL) or CE for electrical safety.
4. Original documentation specific to each cabinet serial number shall be provided with the cabinet and maintained in the manufacturers' records. Test data verifying all performance criteria shall be available upon request to include: (a) inflow velocity through direct inflow measurement method; (b) downflow velocity and uniformity; (c) filter leak scan with aerosol challenge for both filters; (d) electrical safety.
5. The cabinet shall be tested by KI-Discus test (European Standard EN12469:2000) on statistical sampling basis to validate operator/personnel protection. The retention efficiency for the front aperture shall be not less than 99.999%. Microbiological testing for cabinet performance shall also be performed on a statistical sampling basis.

Filtration System

6. The cabinet shall have one supply downflow filter and one exhaust filter. Supply filter shall be ULPA-type per IEST-RP-CC001.3 and meet EN1822 (H14) requirements. Exhaust filter shall be HEPA-type per IEST-RP-CC001.3 and meet EN 1822 (H13) requirements.
7. The filters shall be within an aluminum frame with mini-pleat design without aluminum separators; no wood or fiberboard shall be used in the filter assembly.
8. Typical ULPA filter efficiency shall be >99.999% for 0.1 to 0.3 microns. Typical HEPA Filter shall be >99.99% at 0.3 microns.
9. An integral filter guard shall be affixed to prevent damage to the filter media.
10. The filters shall be (a) individually scan tested by the manufacturer, (b) individually scan tested after assembly, and (b) easily accessible for scan testing in situ by means of a dedicated upstream sampling port accessible from within the cabinet.
11. The supply filter shall be angled and oriented to the 10° cabinet front angle to maximize downflow uniformity over the work surface.
12. A removable, perforated metal diffuser shall be installed below the supply filter to optimize airflow uniformity and to protect from damage.

Blower System

13. The cabinet shall have a direct drive, permanently lubricated centrifugal blower/motor dynamically balanced in two planes compliant to ISO 2710 for low noise, low vibration and long filter life.
14. The blower/motor shall have an external rotor design and include an automatic thermal cut-out to disable the motor in case of overheating.
15. The blower/motor shall compensate for filter loading.
16. The blower/motor system shall be enclosed within a dynamic chamber shaped steel plenum and integrated with the removable supply filter assembly to simplify filter changing.
17. The cabinet shall be equipped with an integral exhaust collar for connection to the laboratory ducting system.

Cabinet Design, Construction, Cleaning

18. The cabinet shall be of triple wall design whereby all positive pressure plenums capable of handling contaminated air shall be surrounded by negative pressure. No positive pressure areas shall be accessible external to the cabinet. The third wall shall conceal utilities.
19. The cabinet shall maintain containment performance even when removable work area components are removed for cleaning.
20. The work tray shall be one-piece, removable, stainless steel with radius corners without crevices or joints.
21. The cabinet shall have a stainless steel, one-piece fabricated drain trough with open angles to channel spills to a common drain.
22. The closed sidewall shall be sealed without perforations, return air slots or concealed areas which can contain contaminants.
23. The cabinet shall be free of sharp edges, non-functional protrusions, bolts, screws or hardware, and all metal edges shall be deburred.

Ergonomics and Convenience

24. The front sash shall be frameless to maximize visibility, and accessible for cleaning front and back. Sash glass shall be safety glass.
25. The sash counterbalance shall be suspended on two high-strength cables, and the sash shall lock into position in the event one cable becomes detached.
26. Magnetic, not mechanical, proximity sensors shall work in conjunction with the control system to indicate proper sash position for containment.
27. Fluorescent lamps shall be mounted behind the control panel module out of the work zone. Electronic ballasts shall be used to eliminate flicker, extend lamp life and reduce heat output.
28. The UV lamp shall operate via an automatic timer with automatic shut-off managed by the microprocessor controller and shall be interlocked with the blower/motor and fluorescent lights for safety.
29. The cabinet shall be designed with a 10° angled front to optimize user comfort, reduce glare and maximize reach into the work area.
30. The front grille shall be raised to prevent airflow blockage and improve comfort.
31. Penetrations for petcocks and service fittings shall be provided; penetrations shall be offset to improve user access.
32. The cabinet shall accommodate an optional mounting stand for fixed-height.

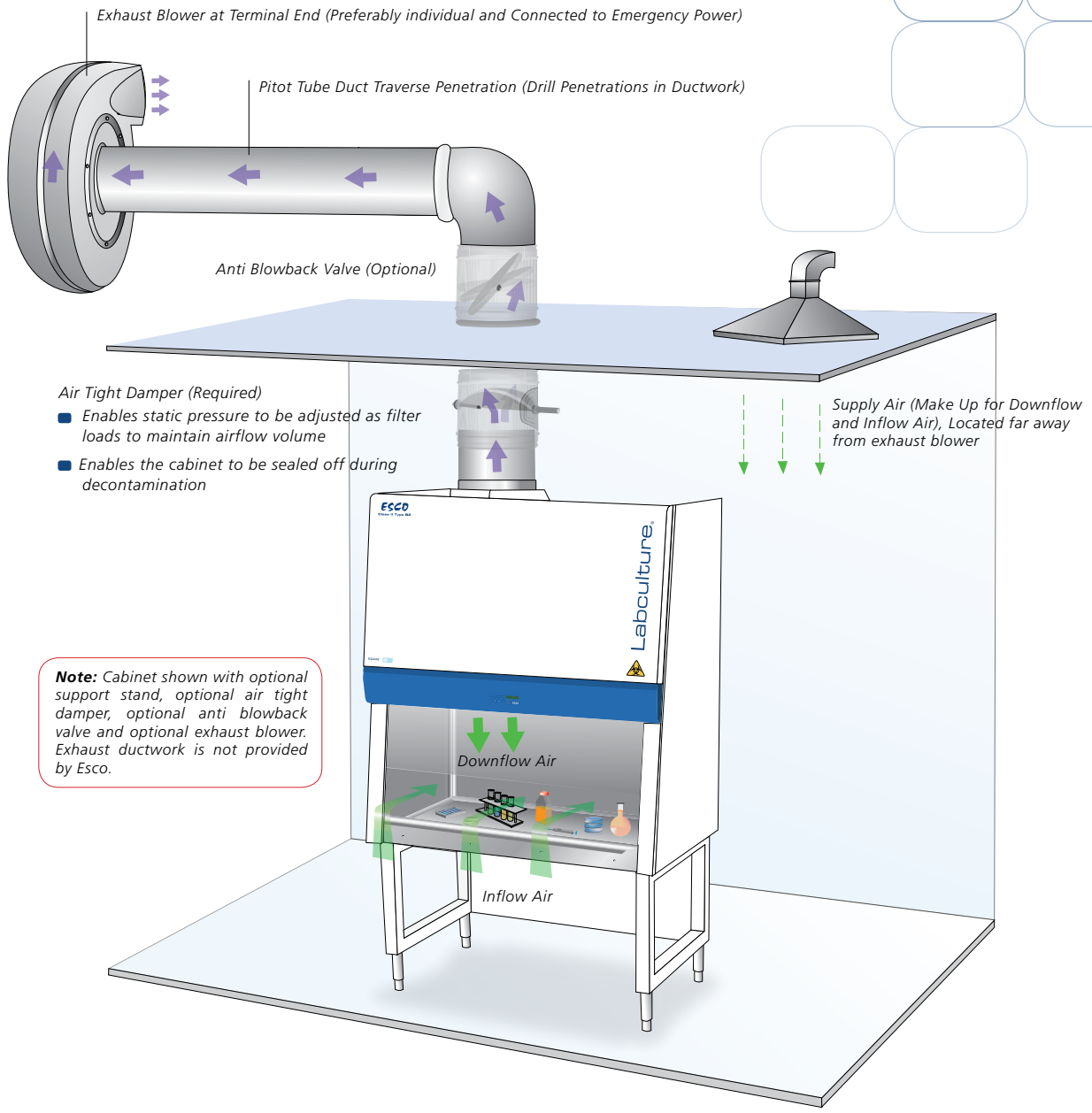
Control and Alarm System

33. All cabinet functions shall be managed by a programmable microprocessor control system capable of software updates via Internet downloads.
34. The microprocessor controller shall be mounted on the main control panel facing down toward the user.
35. The controller shall include soft-touch keypad controls and backlit LCD displays to permit operation of the blower/motor, light, UV lamp, electrical outlet(s) and menu.
36. The controller shall be user programmable in situ to enable or disable functions such as PIN (personal identification number) access restriction, cabinet start-up protocol, airflow alarm and other microprocessor controlled operations outlined in the user manual.
37. When programmed ON, the start-up protocol shall perform an automatic pre-purge and post-purge cycle to ensure proper cabinet operation.
38. The controller shall include a blower/motor hours meter to display aggregate motor running time to assist in predictive maintenance.
39. Audible and visual alarms shall be provided for unsafe conditions such as improper airflow or sash position.
40. Airflow shall be monitored by a temperature compensating, thermistor-based, true air velocity sensor mounted in the cabinet.
41. The airflow display and alarm system shall be individually calibrated before shipment.
42. The main control panel shall exhibit continuous display of air velocity and a 24-hour clock display.
43. Diagnostics button should be available on the control panel, to easily check the cabinet operating parameters and assist servicing.
44. The cabinet shall have field calibration mode that simplifies on-site calibration mode.
45. A selectable Quickstart mode should be available to automatically turn the blower and lights on/off by moving the sash window to correct position.
46. The BSC shall have RS 232 data output port for remote monitoring of cabinet operating parameters.
47. TCP/IP converter shall be available as an option, to connect RS 232 to network for remote monitoring.
48. Voltage free contacts shall be available to trigger external alarm and switch ON / OFF the external blower / damper.
49. Pressure switch shall be used to trigger the cabinet exhaust alarm and switch the internal blower ON / OFF.

Certification, Service and Decontamination

50. The cabinet shall be approved for both hydrogen peroxide vapor (HPV) and formaldehyde decontamination protocol.
51. All panels leading to potentially contaminated and/or hazardous areas shall be color coded red.
52. All components with the exception of blower/motor and ULPA filters shall be located outside of contaminated air spaces to facilitate servicing without the need to decontaminate the cabinet.
53. All exterior surfaces shall be painted with a permanent antimicrobial inhibitor coating to minimize contamination.

Installation for Labculture Class ll, Type B2 (Total Exhaust) Biological Safety Cabinet



Note: *Cabinet shown with optional support stand, optional air tight damper, optional anti blowback valve and optional exhaust blower. Exhaust ductwork is not provided by Esco.*

Check List

1. *Ensure a Class II, Type B2 cabinet is required for the application.*
2. *Provide an exhaust system (ductwork and blower) capable of delivering the required airflow volume and static pressure at the connection point (note the Required CBV Exhaust Volume and NSF required Static Pressure listed on Page 8. Remember to add the pressure loss for the specified airflow volume in the ductwork).*
3. *A dedicated exhaust system (one exhaust blower to one cabinet) is strongly recommended. It is also recommended the exhaust system be operated continuously.*
4. *Ensure the lab is supplied with sufficient makeup air.*
5. *Provide an air tight damper (mandatory) and anti blowback valve (optional).*
6. *Provide provisions for pitot tube duct traverse. These can be drilled in the ductwork on-site.*
7. *Observe Esco recommendations on suitable cabinet location, especially putting the cabinet away from external airflow disturbances.*
8. *Certify cabinet after installation before use.*

Biological Safety Products
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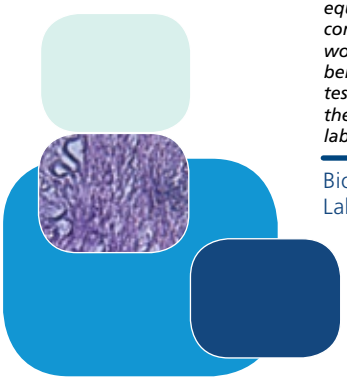
PCR Products
Pharmacy Products
Lab Animal Research Products
Lab Thermostatics Products
Lab Ventilation / Chemical Fume Products / Lab Furniture
Powder Handling Products

Since 1978, Esco has emerged as a leader in the development of controlled environment, laboratory and cleanroom equipment solutions. Products sold in more than 100 countries include biological safety cabinets, cleanroom products, compounding pharmacy equipment, containment / pharma products, ductless fume hoods, in vitro fertilization workstations, lab animal research products, laboratory fume hoods, laboratory ovens and incubators, laminar flow clean benches and PCR products 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.



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