

*Product survey: Biological safety cabinets*

# Handling Air

Microbiological safety cabinets (MCS) rank amongst the most essential equipments in life science laboratories. There's every chance you'll see a researcher sitting in front of a MCS whenever you open the door to a biological lab.

The primary function of an MSC is to protect the lab personell, the environment, and – if necessary – the products in the MSC-workspace from biological hazards or contaminations, respectively. Depending on the offered protection, safety cabinets are split into classes I, II and III. Class I safety cabinets have a pretty simple design and provide the least protection. They basically consist of four parts: a stainless steel bench, a sheet metal hood with a front window made of laminated glass placed on top of the bench, a fan installed in the roof of the hood and an air filter.

The fan draws the air through an aperture between bench and front window into the cabinet, it then streams over the workspace and up to the ceiling of the hood, where it passes a High-Efficiency-Particulate (HEPA)-Filter and is exhausted into the room. Hence only the operator is protected from hazardous micro-organisms, while the samples inside the work space may be contaminated with airborne particles.

Since a lot of biological work, especially in cell culture, requires a protected work space, many labs routinely use class II MSCs that protect both, the operator outside and the product inside the cabinet. They are by far the most popular safety cabinets installed in life science labs. Compared to class I MSCs the airstreams inside a class II cabinet are completely different and instead of just one, two or three HEPA filters clean the in-coming or exhausted air.

## Well-balanced airstreams

The air enters the cabinet through a grille at the front of the bench and is channeled below the bench surface to a plenum at the upper rear of the hood. A fan pushes approximately 70% of the air downwards through a HEPA-filter into the interior of the cabinet, where it floats the workspace as a laminar flow insulating it from the exterior.

The rest passes a second HEPA-filter at the top of the cabinet and is released into the room or a fume duct. A fine balance

between the air streaming in through the grille and the laminar downward flow is essential for proper operation of class II MSCs.

To further reduce the risk of contamination with airborne particles or leaking seals, a third HEPA-filter may be inserted into the channel below the bench to immediately clean the air after entering the grille.

## Isolators

Class I and II MSCs are sufficient for Biosafety-Level (BSL)-1, 2 and 3 laboratories. However, there is no room for class I MSCs in BSL-4 labs and class II cabinets are only allowed in these areas when the operator wears a positively pressurised work-suit. Usually, BSL-4 labs are equipped with class III MSCs also called isolators consisting of welded, gas-tight, negatively pressurised stainless steel chambers, with a sealed front window. Access to the workspace is provided by two long neoprene gauntlets that are integrated into the front window and reach into the interior of the chamber.

## Fact or fancy?

The technical and biohazard aspects of MSCs are regulated in European standards EN 12469 and 12980, dictating minimum safety levels to which manufacturers must adhere. However, there are two other important features that may distinguish a half-decent from a brilliant MSC. One is noise and the other is ergonomics. Sitting all day long in an awkward position in front of a safety cabinet that is humming like a swarm of hornets is anything but pleasant.

Manufacturers promise in their brochures and flyers that noise levels are kept in the range of about 45 and 56 dB (three-filter MSCs are usually louder than two-filter devices) and that the safety cabinets are ergonomically optimised. However, you should check for yourself, whether these advertising claims are fact or fancy by carefully trying out your favourite MSC before buying.

HARALD ZÄHRINGER

Laminar flow cabinets				
Company/Distributor	Name of product	Classification/Biosafety/Application(s)	Miscellaneous, Specialities, Generally	Price [€]
<b>ALS Automated Lab Solutions</b> Jena, Germany www.als-jena.com Contact: Jens Eberhardt Phone +49-3641-4820-0 info@als-jena.com	ALS CellCelector Incubator Flowbox	Environmental-control incubator laminar flow cabinet with temperature-, CO <sub>2</sub> - and humidity control features   Long-time screening experiments and long-running time-lapse imaging   Hypoxy-features available as an option	Incubator features like temperature control, CO <sub>2</sub> -regulation and humidity control   O <sub>2</sub> -regulation possible   Fully closed system for usage with automation equipment   Customisation possibilities   OEM possibilities	Starting at 25,000.-
<b>Berner International</b> Elmshorn, Germany www.berner-international.eu Contact: Guido Maik Phone +49-4121-43560 info@berner-international.de	Berner FlowSafe B-[MaxPro]x	Class II biological safety cabinets with 2- or 3-filter systems in different sizes for different types of laboratories   Suitable for BSL 1-4 laboratories   For the safe handling of biological substances hazardous to health	Type-tested & certified to DIN 12980 and DIN EN 12469   Ergonomic design   Easy to clean   Maximum legroom	On request
<b>Cleanair/Telstar</b> Woerden, The Netherlands www.cleanair.eu Contact: Phone +31-348411114	Clean Air EF Clean Air EF/S	Class II biological safety cabinet   Operator, product and environment protection EN12469	Two HEPA H-14 filters   Sloped window   TÜV certified	On request
	Clean Air EF / B Clean Air EF/S B	Class II biological safety cabinet   Operator, product and environment protection   EN12469, DIN 12980   For cytotoxic medicines	Three HEPA H-14 filters   Ergonomic sloped window   TÜV certified	On request
	Clean Air CLF Clean Air DLF	Horizontal laminar flow bench   Product protection   Class 100 (ISO 5)   Cell & tissue culture	One HEPA H-14 filter	On request
	Clean Air DLF / PCR	Vertical laminar flow bench   Product protection   Class 100 (ISO 5)   PCR	Built in UV light   Stainless steel interior	On request
	Clean Air NEG Greenline	Powder extraction cabinet   Operator protection	Energy-efficient   Low sound level   Compact and ergonomical design	On request
	Clean Air IsoFlow	Class II + biological safety isolator   Operator, product and environment protection   For cytotoxic medicines	Isolator with hatches and gloves   Negative or positive pressure   Ergonomic design	On request
	Clean Air CS	Cytolator / Sterilator   Operator, product and environment protection	Isolator with hatches and gloves   Negative or positive pressure	On request
	Clean Air MSC III	Class III biological safety cabinet   Operator, product and environment protection	Two HEPA H-14 filters   Turbulent air flow	On request
<b>Esco</b> Wiltshire, UK www.escoqb.com Contact: Phone +44-1725-514-555 gavin.barrett@escoqb.com	Infinity	Class II microbiological safety cabinet   Certified to DIN EN 12469 by TÜV-NORD, Germany for safety and performance	Inherently safe double-fan system   Esco Accuflow micro-processor-based motor speed controller   Motorized sliding sash   Extremely low noise level of less than 56dBA	On request
	NordicSafe	Class II microbiological safety cabinets	Lowest noise MSC in the industry   ECM blower for low energy consumption   Half-speed mode   Zero volt relay   Quickstart and RS 232   1200 mm external width   HPA certified to EN 12469	On request
	Airstream (E-Series)	Class II biological safety cabinet	Energy-saving   Cost-effective   Quickstart and RS 232   HPA certified to EN 12469	On request
	Airstream	Class III biosafety cabinet   Biological safety levels 1, 2, 3 or 4	Designed for BSL-4   Safer dual exhaust filters   Magnehelic pressure gauge	On request
	Labculture	Class II biosafety cabinet	Low noise BSC   Quickstart and RS 232   HPA certified to EN 12469	On request
<b>Integra Biosciences</b> Fernwald, Germany www.integra-biosciences.de Contact: Andreas Gund Phone: +49-6404-809-0 info@integra-biosciences.de	Labgard NU-437E	Class II / GS (TÜV Nord), EN 12469	HEPEX zero-leak airflow system   Stainless steel workface   <55 dB   Sizes 3, 4, 5, and 6 ft   New energy-efficient DC-ECM motor	On request
	Cellgard NU-480E	Class II / GS (TÜV Nord), EN 12469	HEPEX zero-leak airflow system   Motorised window   < 55 dB   Sizes 3, 4, 5, 6 ft   New energy-efficient DC-ECM motor	On request
	Cellgard NU-481E	Class II / GS (TÜV Nord), EN 12469, DIN 12980	3-filter biosafety cabinet   HEPEX Zero-leak airflow System   Motorised Window   Sizes 4, 6 ft   New energy-efficient DC-ECM motor	On request
<b>Kojair Tech</b> Teollisuustie, Finland www.kojair.com Contact: Phone +358-3-471-7000 sales.germany@kojair.com	Kojair Biowizard Standard Line	In accordance with the EN 12469   Class II cabinet	Low price   Stainless steel table tops and bottom sink   Side windows   Electrical front sash   4 sizes available	6,580.-
	Kojair Biowizard Silver Line Blue	In accordance with the EN 12469   TÜV certification   Class II cabinet	Very low noise   Low power consumption   High downflow up to 0,5 m/s   Very good lighting, 2000 Lux incl. dimmer   4 sizes available	8,085.-
	Kojair Biowizard Golden Line Ergosilence	In accordance with the EN 12469   TÜV certification   Class II cabinet	Most silent cabinet on market   Electric-driven base stand   High downflow up to 0,5 m/s   Perfect lighting, up to 3.500 Lux incl. dimmer   Deeper table tops with gel-filled arm rests	10,210.-
	Kojair Biowizard Xtra Line	In accordance with the EN 12469, DIN 12980   TÜV certification   Class II cabinet	Low noise 3-filter system   Standard filter used   High downflow up to 0,5 m/s   Exhaust cooling and double or charcoal filter available   3 sizes	12,140.-
	Kojair Biowizard BW-3	In accordance with the EN 12469   Class III cabinet	Low price   Curved window optimises view   Easy & complete cleaning   Standard filter used   1 to 4 personnel sizes available	14,745.-

Laminar flow cabinets				
Company/Distributor	Name of product	Classification/Biosafety/Application(s)	Miscellaneous, Specialities, Generally	Price [€]
<b>Kojair Tech</b> (continued) Contact: see page 52	Kojair Cleanwizard V	LAF for product protection   By ISO 14644	Low airflow against user   Tight stainless steel table top   Side windows   Electrical front sash   4 sizes available	6,405.-
	Kojair KC-1	In accordance with the EN 12469   Class I cabinet	Low price   Good lighting   Sockets inside   Tight stainless steel table top   Front window	5,445.-
	Kojair taylor made solutions	In accordance with ISO 14644 for product, personal environment protection	Housings   Powder units   LAF ceilings   Operating theatres   Protecting production areas	On request
<b>NuAire</b> Plymouth, MN, USA www.nuaire.com Contact: Bobbie Brittan Phone +1-763-553-1270 bbrittan@nuaire.com	AireGard NU-201 AireGard NU-301 AireGard NU-126	Class I, BSL 1, 2, 3	Provides a clean air environment	On request
	AireGard NU-121	Class I, BSL 1, 2, 3	ISO Class 5 environment	On request
	LabGard NU-125	Class II, BSL 1, 2, 3	Protection for your robotics	On request
	LabGard NU-813	Class I, BSL 1, 2, 3	Portable safety for personnel protection	On request
	LabGard NU-819	Class I, BSL 1, 2, 3	Provides optimal personnel protection	On request
	LabGard NU-425 LabGard NU-427 LabGard NU-430/435 LabGard NU-437 LabGard NU-440	Class II, BSL 1, 2, 3	Controlled environments for optimum protection	On request
	CellGard NU-475 CellGard NU-477 CellGard NU-480 CellGard NU-481	Class II, BSL 1, 2, 3	Ergonomically correct   Environmentally safe	On request
	<b>Peqlab Biotechnologie</b> Erlangen, Germany www.peqlab.com Contact: Emanuel Clausing Phone +49-9131-6107020 info@peqlab.de	UV Sterilising PCR Workstation	Protects against contamination when setting up PCR reactions or other molecular biology techniques sensitive to contamination	Large work space 70.6 x 54.4 cm   Four pre-installed plug outlets   Two optional shelves for storing tubes, containers or pipettes   UV light automatically shuts off if unit is opened   Unit top and work surface made of antimicrobial coated stainless steel
<b>Telstar Life Science solutions</b> Terrassa, Spain www.telstar.eu Contact: Phone +34-937-361-600	Mini-H	Horizontal laminar flow bench   Product protection   Class 100   Cell and tissue culture	One HEPA H-14 filter	On request
	H-100 Series	Horizontal laminar flow bench   Product protection   Cell and tissue culture	One HEPA H-14 filter	On request
	Mini V/PCR	Vertical laminar flow bench   Product protection   For PCR process	One HEPA H-14 filter   Built in UV	On request
	V-100 Series	Vertical laminar flow bench   Cell and tissue culture	One HEPA H-14 filter   Recirculated	On request
	V30/V70 Series	See above	Two HEPA H-14 filters   70% recirculated   30% exhaust	On request
	Bio II A Series	Class II - microbiological safety cabinets   Pathogens categories 1,2 and 3	Two HEPA H-14 filters	On request
	CytoSTAR	Class II - microbiological safety cabinets	Three HEPA H-14 filters   For cytotoxic medicines	On request
	Bio I Advance Series	Class II - microbiological safety cabinets   Pathogens categories 1,2 and 3	Two HEPA H-14 filters   Manual sloped window   Advanced and compact design	On request
	BioULTRA Series	Class II - microbiological safety cabinets	Two HEPA H-14 filters   Motorised sloped window	On request
CytoULTRA Series	See above	Three HEPA H-14 filters   Motorised sloped window   For cytotoxic medicines	On request	
<b>Thermo Scientific</b> www.thermoscientific.com	Herasafe KS, Class II Biological Safety Cabinet	Independently tested and certified to EN 12469 standard for Class II biological safety cabinets by TÜV Nord / Compliant with NSF/ANSI 49 for Class II biological safety cabinets	Interior eye-level display on rear wall for "at-a-glance" monitoring of safety parameters   Performance factor (PER) indicates: cabinet is safe, cabinet is safe but time for service, cabinet should not be used	On request
	Herasafe KSP Class II Biological Safety Cabinet	Independently tested and certified to EN 12469 standard for Class II biological safety cabinets by TÜV Nord / Cabinets with single-piece work-tops are independently tested and certified to the DIN 12980 standard "Safety Cabinets for Handling Cytotoxic Substances"	Display parameters include downflow air velocity, cabinet malfunction, time of day, operating time of optional UV-C lights, total operating hours	On request
	Maxisafe 2020 Class II Biological Safety Cabinets	Compliant with the most stringent regulatory standards in the world   Independently tested and certified to EN 12469 and to DIN 12980	Superior personnel and product protection with best-in-class air flow and triple-filter technology	On request
	MSC-Advantage Class II Biological Safety Cabinets	The MSC-advantage fully complies with the EN 12469 safety standard as independently tested and certified by TÜV Nord	Available in 90, 120, 150 & 180cm   With microprocessor control   Large front-panel display provides constant readout of downflow and inflow velocities and filter usage status	On request
	Safe 2020 Class II Biological Safety Cabinets	Cabinets can be used wherever protection is of paramount importance in safety levels I, II and III	Superior DC technology uses energy efficiently, emits less heat   Night-set-back mode saves energy   Supply/exhaust air filter: H14 HEPA EN 1822, 99.995% at the most penetrating particle size (MPPS)	On request