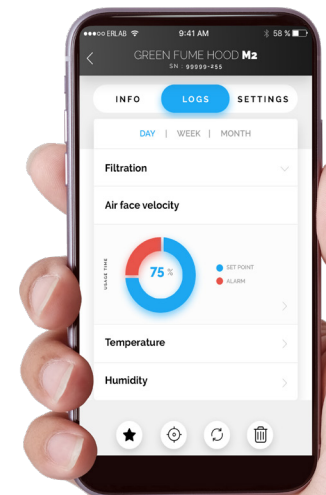




GreenFumeHood® 3 Technologies

Advanced filtering systems for fume hoods



The ERLAB company

ERLAB invented the first ductless enclosure in 1968. We are the specialist and leader in the field of zero-emission filtration hoods for the safe handling of chemicals.

The findings

In recent decades the global community has become increasingly aware of the impacts of human activity on health and the environment.

In 2003, **ERLAB** launched a new research program to rethink ways of protecting people from the dangers of handling chemicals and the consequences on the quality of the air they breathe in relationship to the environment both inside and out of laboratories.

GreenFumeHood®, a new class of fume hood

After 5 years of research, **ERLAB** launched the GreenFumeHood® (GFH®) in 2008, a new class of fume hood filtration with zero-emission, and filtration capable of competing with conventional, fixed, energy consuming and polluting fume hoods. GFH allows for energy savings of up to 96% while reducing infrastructure and maintenance costs by up to 70%.

GreenFumeHood® technology columns

In 2009, GreenFumeHood became an integrated fume hood filtration technology system known as **ERLAB ABOVE** and the most advanced filtered fume hoods in the world were created.

GFH technology columns do not emit any pollutants into the air. The fume hoods that are integrated with GFH do not exhaust any heated or conditioned air from the building. Laboratories can thus achieve substantial infrastructure and energy savings throughout their life cycle.

The third generation

The new **ERLAB GreenFumeHood® 3rd generation** technology columns continue to advance the limits of molecular and particle filtration. GFH3 enables the replacement of conventional ducted fume hoods by up to 90% while still meeting the current filtration and containment standards.

GreenFumeHood® is a proven technology with more than 500 installations globally. GFH is currently used in the fume hoods of more than 25 international partners of laboratory furniture selected by **ERLAB**.



From left to right:
Stéphane Hauville : Chief Executive Officer
Antoine Hauville : Chief Operational Officer

Filtration Technology ERLAB ABOVE

FILTRATION TECHNOLOGY ERLAB ABOVE is a seal of quality and a guarantee of safety, the result of more than 50 years of research and

innovation in the field of filtration technologies related to the protection of laboratory personnel.

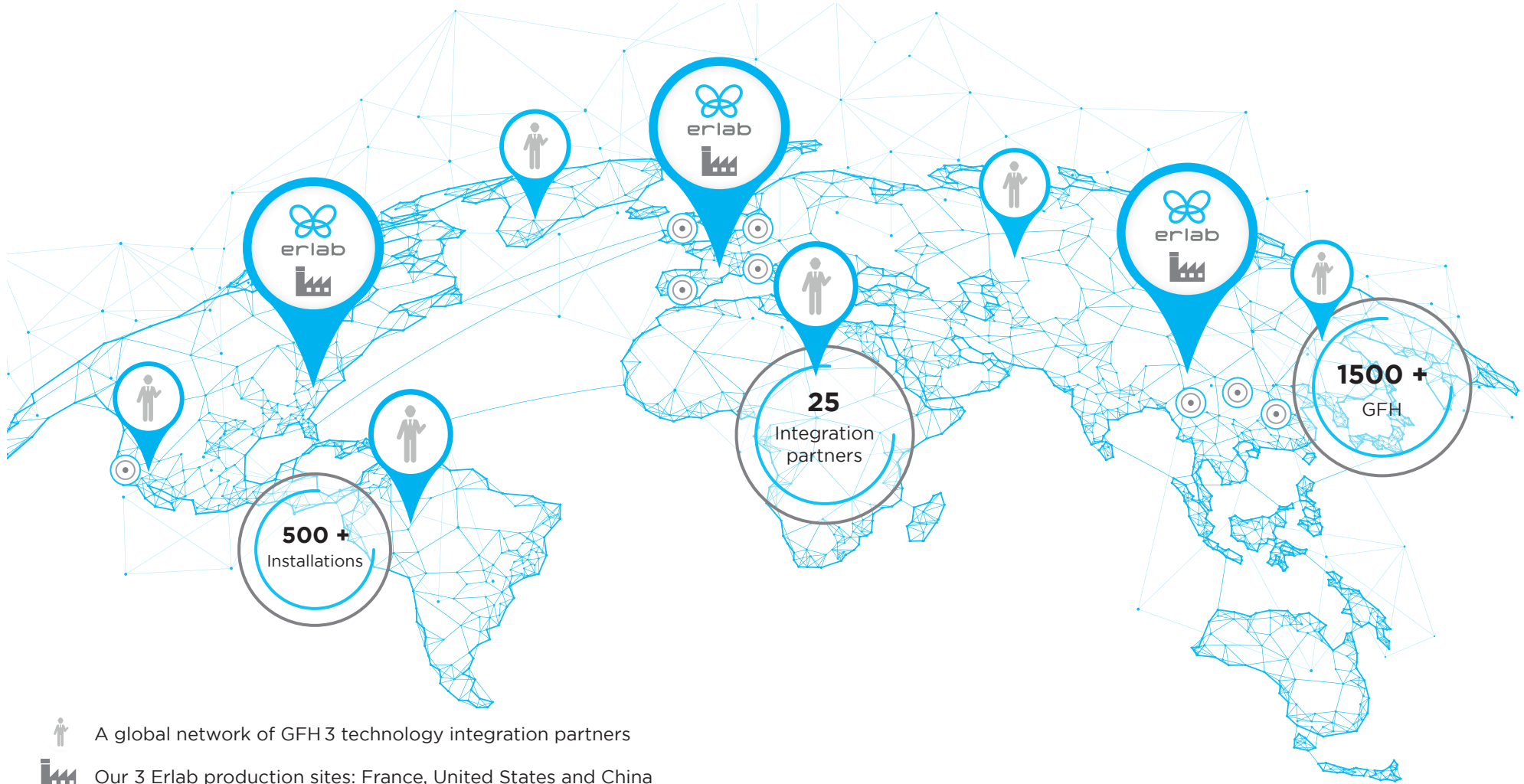
Our technological advances and know-how are the driving forces behind the solutions, turning the impossible into the possible.




ERLAB ABOVE is the invisible difference. It encompasses the technology of components that filter, detect, and communicate, making the laboratory air we breathe cleaner and safer both indoors and outdoors.

For your safety, demand the **FILTRATION TECHNOLOGY ERLAB ABOVE** label - a label that has proven itself since 2009.



GFH 3 technology is based on the expertise and experience of our integrator partners selected from the leading manufacturers of laboratory furniture in Europe and around the world.



-  A global network of GFH 3 technology integration partners
-  Our 3 Erlab production sites: France, United States and China
-  Representative offices Erlab



CONTENTS

THE BENEFITS	06
- Enhanced Safety	
- Reduced Costs	
- Reduced Environmental Impact	
- Flexibility + Adaptability	
- Simplified Laboratory Design	
STANDARDS	08
- Containment efficiency of the enclosure	
- Filtration efficiency according to the AFNOR NF X15-211 standard	
GreenFumeHood®3 TECHNOLOGY	10
Filtration	12
- Neutrodine® Unisorb	
- Revolving® Filter System	
- Composition of the GFH®3 filtration column	
- Filtration column that is adaptable according to requirements	
Detection	18
- Sensors	
Communication	20
- Smart Command	
- eGuard® app for GreenFumeHood®3	
GFH® 3 INTEGRATION TECHNOLOGY PACKS	22

THE BENEFITS

Filtration technology for fume hoods

Enhanced Safety

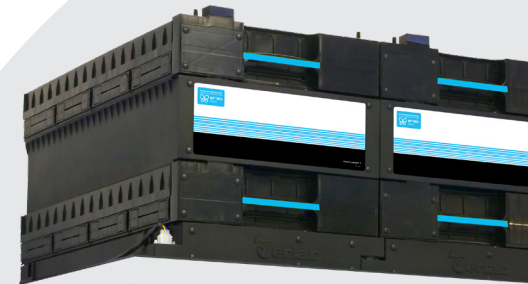
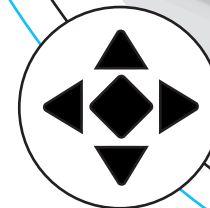
- Risk assessment: Chemical hazards are assessed by the Erlab laboratory to ensure the best filtration solution through our  **eValiQuest** service.
- High levels of filtration and containment, guaranteed by the most rigorous safety standards: **NF X15-211, ASHRAE 110 and EN 14175-3.**
- Splash protection with a vertically sliding front panel.
- Constant monitoring of safety settings with an integrated set of sensors and real-time smart alarm alerts through our  **eGuard APP**
- Monitoring of the fume hood throughout its service life with the Erlab Safety Program®  **ESP**

Reduced Environmental Impact

- Chemical pollutants captured at the source: no chemical emissions released into the atmosphere.
- Filters made from environmentally friendly raw materials and recycled through energy recovery.
- Low energy consumption.
- Reducing the environmental impact of buildings: indoors and outdoors.

Flexibility + Adaptability

- Versatile filters and sensors suitable for a wide range of laboratory operations.
- Plug & Play fume hood: ease of installation for immediate use with no impact on laboratory ventilation.
- Mobile equipment: to allow reconfiguration of the lab as desired.



GreenFumeHood 3

The very best Erlab technology, designed to protect you



Reduced Costs

- **Infrastructure costs:**
 - Recirculating standalone system.
 - No make-up air is required for the filtered fume hood to operate reducing costs from oversized air handling units and exhaust fans.
 - Smaller HVAC equipment requires less space and provides more assignable square footage.
 - Reducing the cost per square foot.
- **Operating Costs:**
 - Low energy costs: less than \$220. per year.
 - Filter service life: up to 48 months.
 - Sensor service life up to 7 years.



Optimization of Laboratory Design

- Standalone, ductless filtering fume hood that can be integrated at any time (during original design or future requirements).
- Simplification of the building's heating, ventilation and air conditioning (HVAC) system: less space required for technology, more space for work.
- Room configuration no longer constrained by exhaust ductwork: allows for process flexibility and adaptability.
- Ductless Fume hoods have no impact on the air balance in the building: all fume hoods can be used simultaneously.
- Ability to set up temporary swing space and mobile laboratories without any dedicated infrastructure.

STANDARDS

Compliance with safety standards

A high level of filtration and containment guaranteed by the most rigorous standards

Containment efficiency of the enclosure

The level of containment is defined by the capacity of the fume hood to keep pollutants within the enclosure, preventing their release into the laboratory environment.

Containment efficiency is proven by tests carried out by the following protocols outlined in the **ASHRAE 110:2016, AFNOR NF X15-211 (2009) and EN 14175-3 standards.**

The containment standards applicable to **GreenFumeHood 3** fume hoods are identical to those for fume extraction hoods.



European standard EN 14175-3



American standard ASHRAE 110:2016

Filtration efficiency according to the AFNOR NF X15-211 standard

Neutrodine® Unisorb filtration technology conforms to the **NF X15-211 standard**, the most rigorous industry standard for molecular filtration developed by a committee of independent scientists and specialist manufacturers. This standard establishes the specific performance criteria which impose a maximum release of 1% of the TLV (Threshold Limit Value) of the handled products.



Solvent test

Performance criterion met: <1% of the TLV



Acid test

Performance criterion met: <1% of the TLV



What is the AFNOR NF X15-211 standard?

It is currently the most advanced and rigorous industry standard to assess the safety of filtering fume hoods. The French Union of Mechanical Standardization, comprising a panel of experts (from the French National Research and Safety Institute, state bodies and professional unions), was appointed by AFNOR to establish the AFNOR NF X15-211: 2009 standard. This standard applies to filtering fume hoods (also known as recirculating fume hoods or ETRAF) designed for any laboratory work in research, analysis, teaching, etc. in which chemical agents subject to occupational exposure limits (TLV or OEL) are handled.

This standard sets out performance requirements related to:

- Filtration efficiency
- Containment efficiency
- Air face velocity

The classes set out by the standard are:

Class 1 : Filtering fume hood with safety reserve, one main filtration level and one safety filtration level.

Class 2 : Filtering fume hood without safety reserve and with one main filtration level.

GreenFumeHood®3 TECHNOLOGY

Erlab and our integration partners offer you an eco-friendly, turnkey solution for laboratories which meets all your advanced safety requirements. Using GFH®3 filtration technology, you benefit from comprehensive expertise in filtration and protective enclosure design provided by Erlab and our integration partners. To ensure the highest level of satisfaction, our Authorized Service Providers offer our customers local technical support and training on all filtration technologies in the Erlab ecosystem.

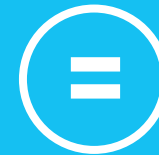
Enjoy optimum filtration capacity combined with revolutionary zero-emission technology:

- The most advanced filtration technology in the world which has already been integrated into the fume hoods of our 25 partners.
- Over 50 years of research expertise in the field of molecular and particulate filtration.
- Performance of the new generation of high-retention-capacity **Neutrodine® Unisorb** filters.
- Compliance with filtration and containment standards for your safety.
- Next generation of Smart Technology enables simpler and safe monitoring and control for optimum real-time safety.

Our world-leading integrated filtration technology for fume hoods



Our integration partners' expertise in the field of laboratory enclosures



An innovative, safe and environmentally friendly technological solution.

Filtration performance verification



Neutrodine® Unisorb filtration

Universal vapor filtration for general chemistry, with advanced retention capacity

Anemometer

Ensures a consistent air face velocity, a guarantee of effective protection

Tachometer

Real-time monitoring of fan operation

Temperature sensor

Humidity sensor

For sensing conditions within the hood



Smart Technology

A simplified operational interface that is focused on safety to ensure it is simpler and safer to use



FILTRATION

Expertise and technologies mastered by a leading R&D team

We provide technology to protect laboratory personnel from inhaling chemical substances

Our unique solutions allow pollution to be captured at the source before they are released into the clean air of the work environment. This universal filter utilizes a unique activated carbon capable of capturing acids, bases and solvents simultaneously, protecting personnel from inhaling substances.

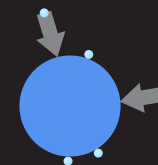
This is made possible thanks to the filtration technology Erlab's R&D Department has dedicated itself to improving for over 50 years.

Erlab has developed strict product specifications to select raw materials and develop technologies to tailor the porosity of our media. These specifications have increased the capacity to adsorb a very broad spectrum of molecules without risk of desorption, just like in military-style gas masks. Our filters are subject to the rigorous efficiency tests as specified in **AFNOR NF X15-211:2009** standard, the standard in the field of filtering fume hoods (as referenced by ANSI Z9.5 Standard for Laboratory Ventilation).

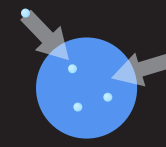


What is adsorption?

Adsorption is a group of physico-chemical surface reactions through which free molecules are condensed on the surface of a solid. They can take place in a liquid or gaseous medium. The phenomenon of adsorption has long been of interest for the capture of gaseous pollutants, particularly in gas masks or filtering fume hoods. Be careful, however, not to confuse adsorption with absorption.



ADSORPTION



ABSORPTION



■ Neutrodine® Unisorb

Neutrodine® Unisorb, a molecular filter for laboratory vapors and gases

The product of our latest research, **GFH®3**, is equipped with a next generation of filters: **Neutrodine® Unisorb**.

We have been developing this technology at our R&D laboratory for over 5 years. It has been tested hundreds of times, from the first attempts at formulating new filtration materials right up to the performance evaluation of these new filters in real-life situations.

Neutrodine® Unisorb greatly increases the retention capacity for the majority of vapors emitted from laboratory procedures. These improvements are significant for the molecules known to be the most difficult to retain with classic activated carbon filters, such as polar VOCs with low molar mass and boiling points.

Improved performance compared to conventional filters.

Cyclohexane

+50%

Acetone

+50%

Ethanol

+280%

HCl

+60%

Ammonia

+50%

Isopropanol

+90%

and over 600 other chemicals filtered!
Ask for our Chemical Listing



■ Neutrodine® Unisorb Filtration*

- Ability to simultaneously handle solvents, acids and bases with the same filter.
- Unprecedented retention capacity.
- Unique formulation without carbon blend.
- No heavy metal impregnation.

*Performance of **Neutrodine® Unisorb** filter tested against the **AFNOR NF X15-211** standard.

Patented innovation

- **Anti-pollutant release filter system:** US patent number 7,563,301
- **Neutrodine® Unisorb filter:** US patent application number 12/465,434

Versatility of Neutrodine® Unisorb filter

Neutrodine® Unisorb is the versatile filtration technology at the core of GreenFumeHood 3

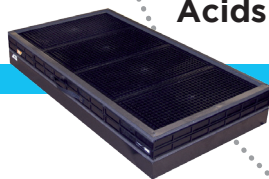
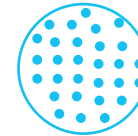
Simultaneous handling
of chemicals

Neutrodine® Unisorb
A single filter for un-
precedented
versatility



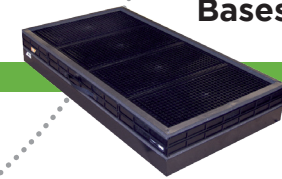
Solvents

Molecular filter
specifically for solvents



Acids

Molecular filter
specifically for acids



Bases

Molecular filter
specifically for bases

■ Revolving® Filter System

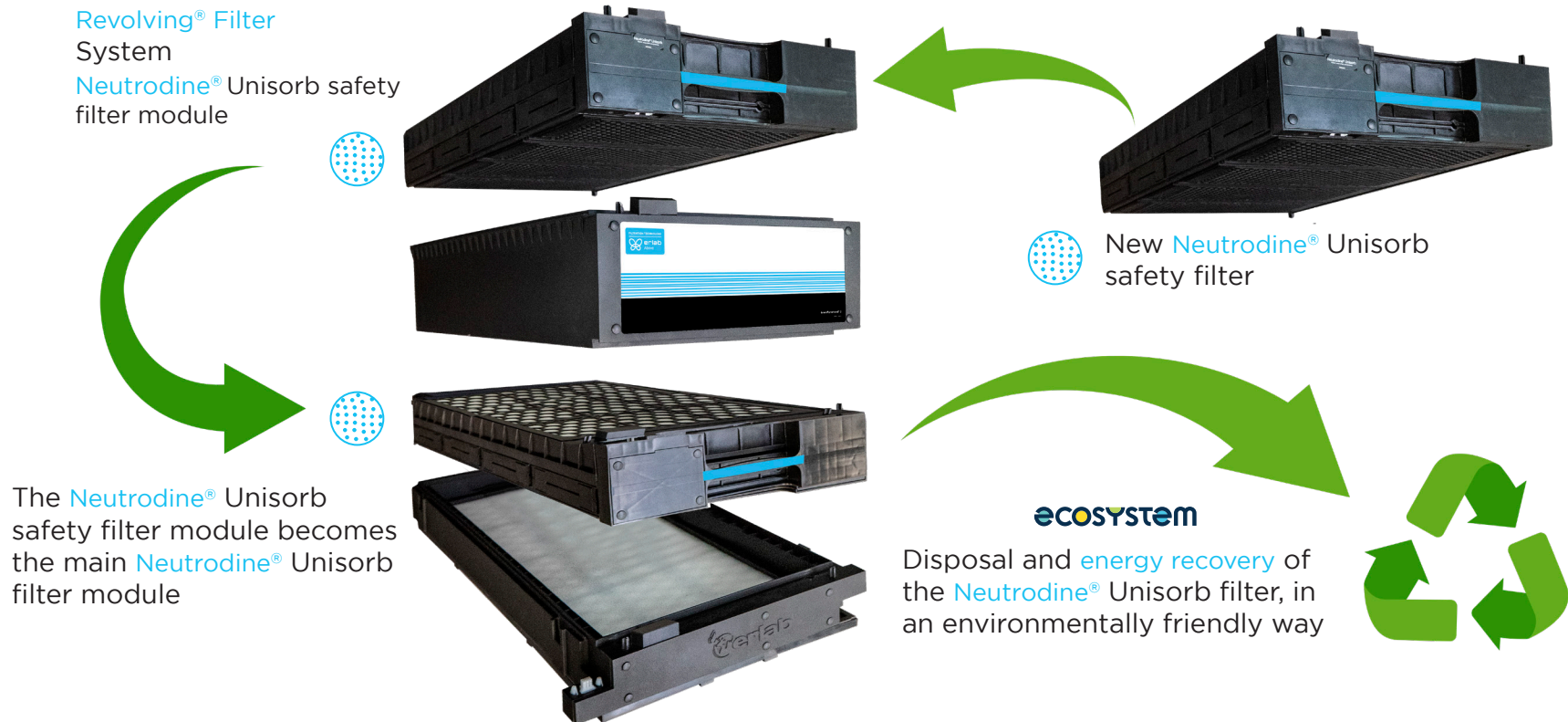
Optimization of the main filters' service life

NF X15-211 standard "Class 1" filtration column with two levels of filtration: **1 main module + 1 safety module.**

The **Revolving® system** allows you to replace one filter module at a time and optimizes the main filter's service life.

No pollutants released into the laboratory, even if the main filter is saturated.

When the main filter is saturated, molecules are directed towards the safety filter. The safety filter replaces the main filter when the latter reaches maximum capacity. A new filter is then installed in place of the safety filter.



■ Composition of the GFH 3 filtration column

A detailed look at GFH 3 technology, a modular filtration column adaptable to all present and future laboratory needs

Intelligent filter:

An embedded microchip enables its management to be optimized during use.

Filtration performance sensor:

Sensors: solvents, acids, formaldehyde.

Smart handles:

Automatic filter recognition and improved grip.

Blade/Gutter:

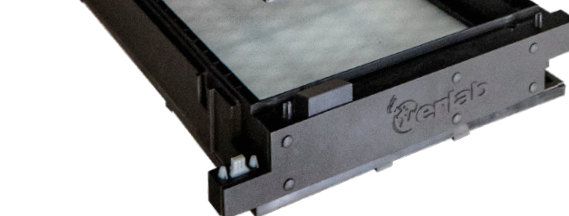
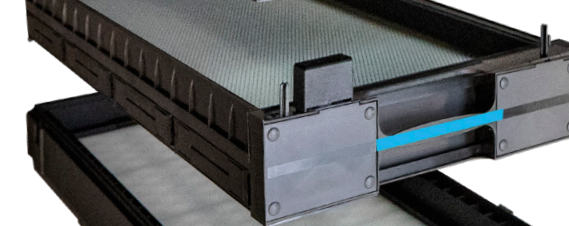
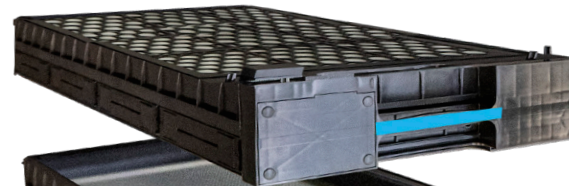
The blade/gutter system guarantees the perfect seal between the two filters.

Humidity/temperature sensor:

Detection of values in the enclosure.

Pre-filter:

Particulate and molecular pre-filter for improved retention.



Safety Neutrodine® Unisorb filter module

No release of pollutants into the laboratory, even if the main filter is saturated.

US Patent: 7,563,301

US Patent: 9,114,338 B2



Ventilation module

Ventilation regulation.
Low energy consumption.
Reduced noise level.



Main Neutrodine® Unisorb filter module

Increased filtration efficiency. Single filter for simultaneous handling: solvents, acids and bases. Unique formulation without carbon blend. No heavy metal impregnation.

US Patent: 7,563,301

US Patent: 9,114,338 B2



HEPA H14 particulate filter module

High-efficiency particulate filtration. Guaranteed overall filtration efficiency of 99.995% (particles greater than 0.1 micron).



Lighting module

Communicating base with daylight LED lighting module, temperature sensor and humidity sensor.

■ Filtration column that is adaptable according to requirements



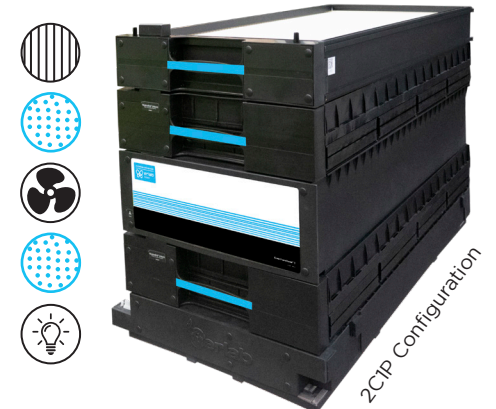
- Adaptable to the vast majority of laboratory procedures
- Able to handle liquids and powders
- Quick and simple reconfiguration of filtration columns to suit changing requirements



For handling liquids



For handling liquids + powders



For handling in clean-rooms



Molecular filter



Particulate filter



Fan + detection




Lighting module

DETECTION

Sensors

Exclusive filtration quality monitoring system

The exclusive **GreenFumeHood 3** detection system consists of a network of 3 sensors suitable for detecting a very broad spectrum of molecules. It allows users to monitor the **Neutrodine® Unisorb** filtration efficiency and performance.




The **GFH 3 technology columns** automatically include the *VOC* (Molecode S) sensor in each of the three possible configurations. The two other sensors, *Formaldehyde* (Molecode F) and *Acids* (Molecode A), will be integrated following the automatic online chemical hazard analysis via our  **eValiQuest** service.

The detection system has 4 other sensors which monitor the correct operation of your enclosure in real time. **You can find this information in the eGuard® app for GreenFumeHood 3.**




Technology GFH 3 packs:

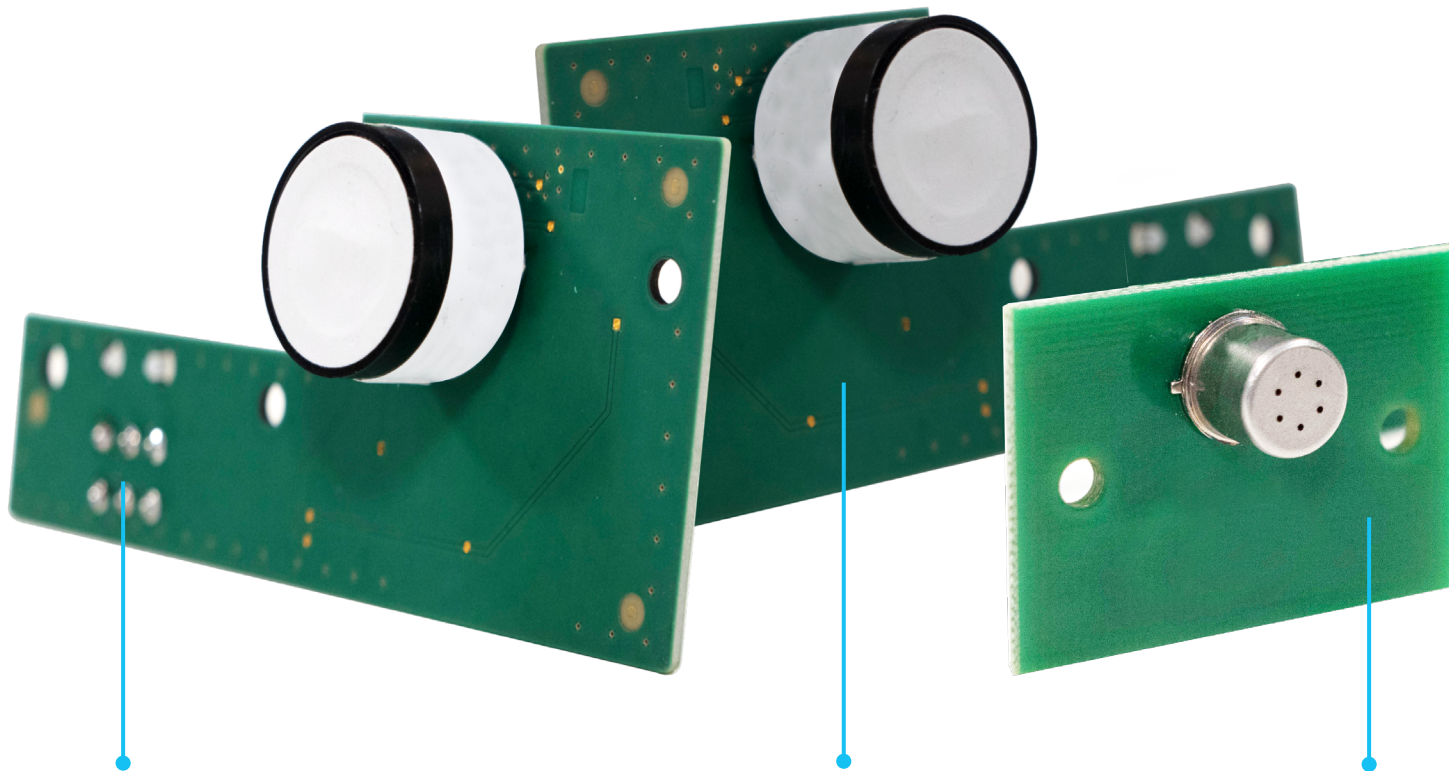
up to 7 sensors for optimum containment of the enclosure and total handling safety.

 Formaldehyde (Molecode F)	 Acids (Molecode A)	 VOC (Molecode S)	Temperature	Humidity	Anemometer	Tachometer
Filtration performance monitoring for formaldehydes	Filtration performance monitoring for acids	Filtration performance monitoring for VOC	Real-time monitoring of the temperature inside the enclosure	Real-time monitoring of relative humidity	Monitoring of air face velocity	Monitoring of fans
Included as per the eValiQuest assessment. (Automatic online analysis of chemical hazards)	Included as per the eValiQuest assessment. (Automatic online analysis of chemical hazards)	✓ Included	✓ Included	✓ Included	✓ Included	✓ Included



The panel in front of the fan can be fitted with a **Formaldehyde sensor** or **Acid sensor** according to the assessment carried out by our  **eValiQuest** service. Thanks to the **plug & play system** these can easily be interchanged, allowing the user to continue experimenting with new procedures while maintaining optimal safety.

3 sensors specifically adapted for the detection of a very broad spectrum of molecules:



Formaldehyde Sensor (Molecode F)

Electrochemical sensor for the detection of formaldehyde vapors.

Acid Sensor (Molecode A)

Electrochemical sensor for the detection of acid vapors.

VOC Sensor (Molecode S)

Automatically integrated in the pack.
Semiconductor sensor for the detection of volatile organic compounds.

COMMUNICATION

Optimization of the main filters' service life

Smart Command

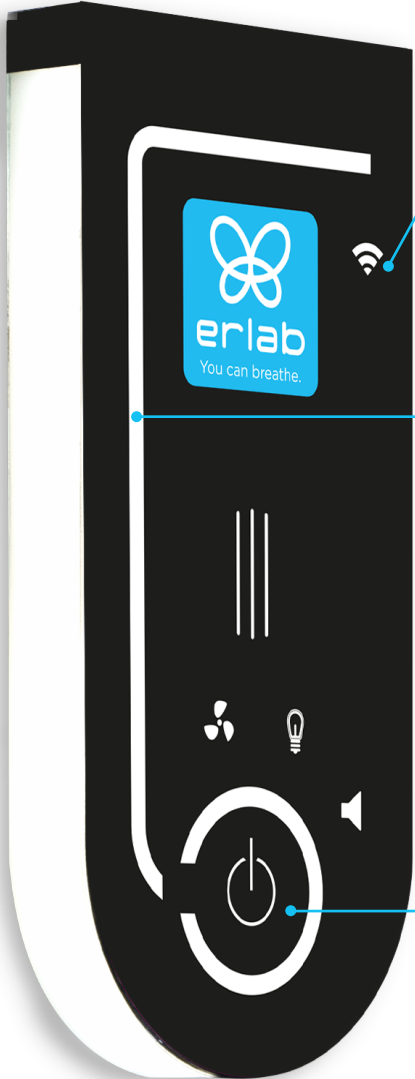
Free yourself from operational constraints with the new **Command Module**.

Activate the simple and intuitive power of **Smart Technology**.

Erlab has developed its protective technology so you can concentrate on what is important: chemical handling. **Smart Command**, included in all our **GreenFumeHood 3** filtration columns, will seamlessly alert you.

? **What is Smart Technology?**

Smart Technology is a simple and innovative method of communication for added safety. Through its simple and intuitive operation, this communication interface allows operators to focus all their attention on what is important: handling. Using light and sound signals, the technology indicates the fume hood's operating status.






Simplified access point (PC, tablet, or smart device, etc.)

Connection to command module via WiFi or Ethernet.

Simpler and safer Smart alert system

Alerts via light and sound pulses.
U.S. Patent: D10, 528, 014

-  Maintenance
-  Filtration fault indicator
-  Ventilation fault
-  Air face velocity

Simplified and intuitive commands

Touch screen icons.

■ eGuard® app for GreenFumeHood 3

The app allows remote monitoring of the device and increases the safety for all users.

Enhanced safety with the new eGuard® app for GreenFumeHood 3

Stay up to date, wherever you are, on your smartphone thanks to the inclusion of **eGuard® for GreenFumeHood 3** in each **GFH 3 technology pack**.

The eGuard® GFH app provides status on your smartphone allowing you to remotely monitor all your safety settings in real time.

The power of enhanced safety at your fingertips in real time.

Discover statistics through the app:

- **Filtration:** displays the number of events related to filtration quality.
- **Sash opening:** displays the sash opening percentage and the number of times the device is in containment alarm mode.
- **Temperature:** graph of temperature in the enclosure.
- **Humidity:** graph of humidity in the enclosure..

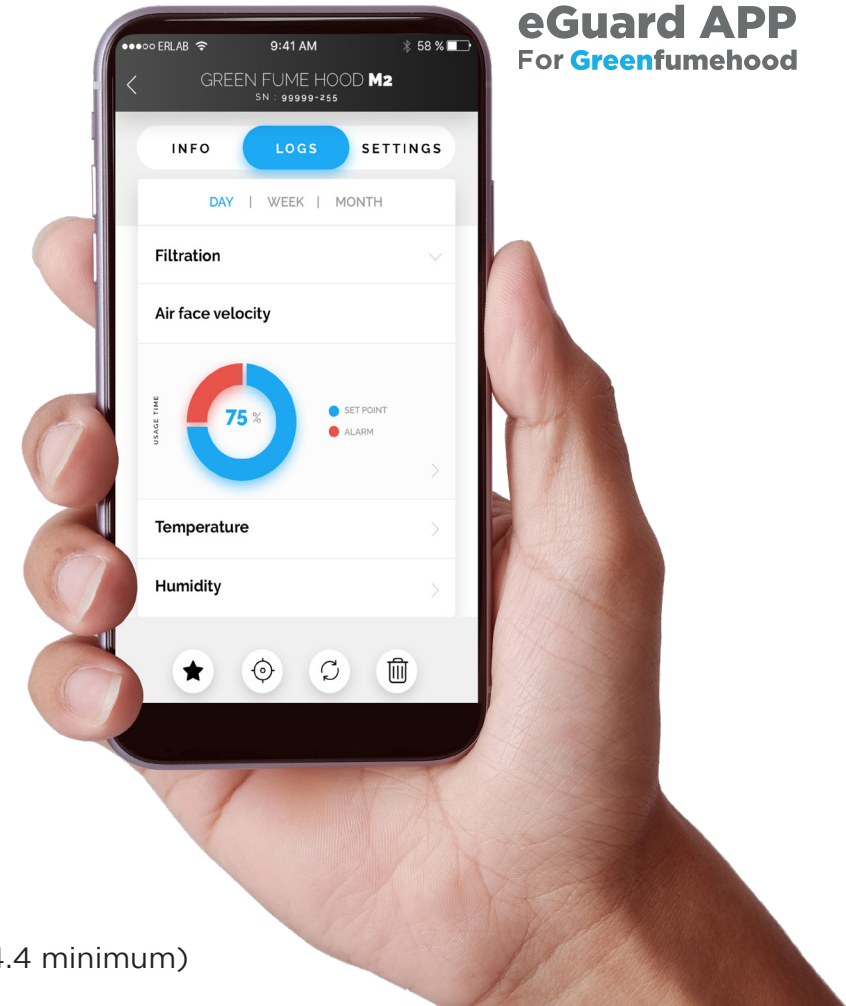


Download the eGuard® app for GreenFumeHood 3

Compatible with iOS (version 10.0 minimum) and Android (version 4.4 minimum)

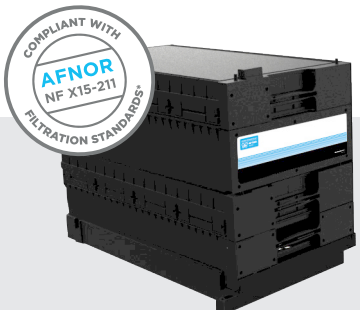


eGuard APP
For **Greenfumehood**



GFH 3 INTEGRATION TECHNOLOGY PACKS

Adaptable to the width of your enclosure



Enclosure width
≈ 3 feet

Treated air flow rate
130 CFM



75 W
Very low energy consumption



Enclosure width
≈ 4 feet

Treated air flow rate
260 CFM



140 W
Very low energy consumption



Enclosure width
≈ 5 feet

Treated air flow rate
390 CFM



200 W
Very low energy consumption



Enclosure width
≈6 feet

Treated air flow rate
520 CFM



280 W
Very low energy consumption



Enclosure width
≈8 feet

Treated air flow rate
650 CFM



340 W
Very low energy consumption

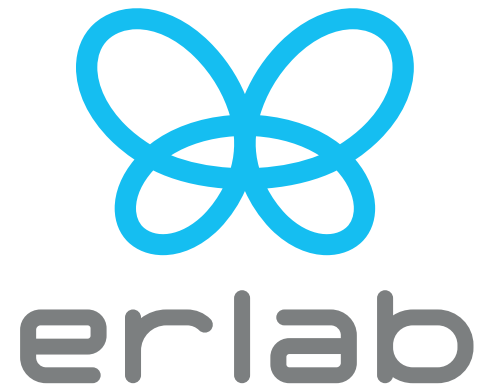


Enclosure width
≈10 feet

Treated air flow rate
780 CFM



400 W
Very low energy consumption



ERLAB, INC.
388 Newburyport Turnpike
Rowley, MA 01969
1 800.964.4434
1 978.948.3354
www.erlab.com