FLOW SCIENCES, INC.

GLOVEBOX WORKSTATION

LFBC™ LATERAL FLOW BIO CONTAINMENT ISOLATOR FOR HPAPI PROCESSING

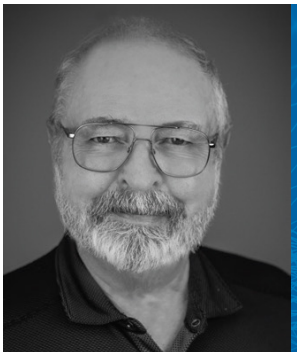
- Engineered for HPAPIs, ADCs, oncology, and more
- HEPA inlet filter provides internal ISO 5 cleanliness or higher
- Surrogate powder testing below 30 ng/m3, dependent on quantity and process

MADE IN THE USA

www.flowsciences.com · 1-800-849-3429 · Leland, North Carolina, USA

ISO 9001 2015 CERTIFIED

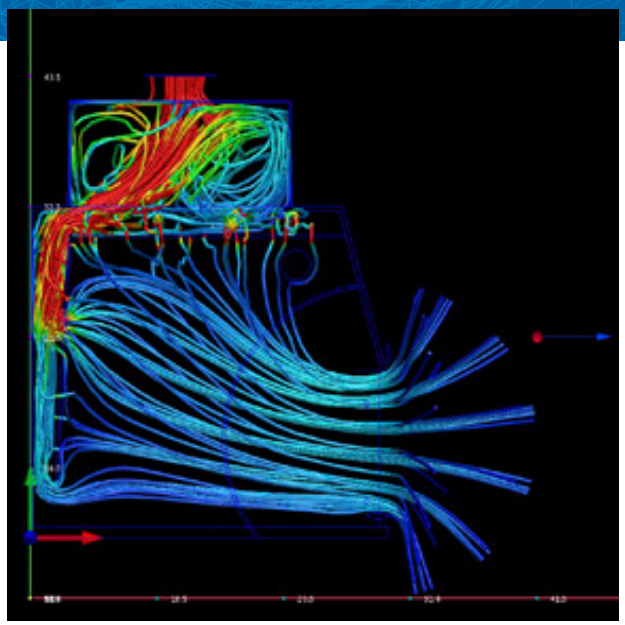
TABLE OF CONTENTS

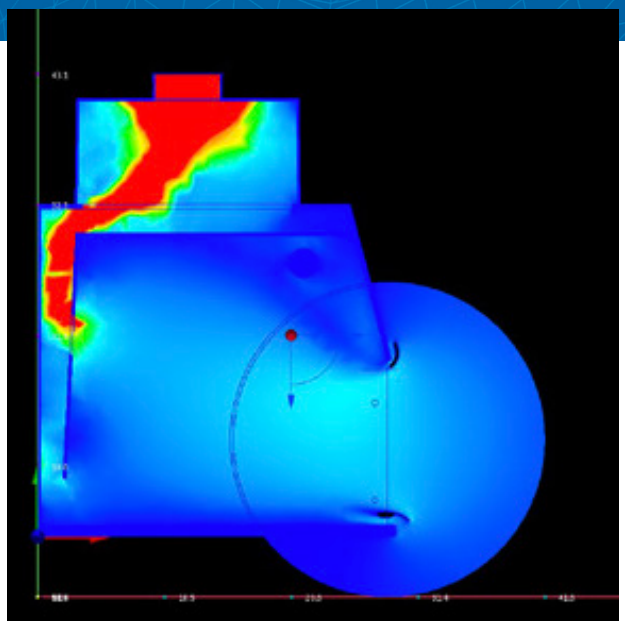


"Solutions to containment challenges come from understanding the relationship between equipment, operator, and process."

Ray Ryan, Flow Sciences Inc.
CEO/President

OUR DESIGN PROCESS





Computational Fluid Dynamics (CFD) is the study of fluid dynamics using sophisticated computing technology. Computational Fluid Dynamics uses or solves the governing equations of fluid or gas flows to predict the characteristics and the structure of a flow field. The most important feature or advantage of using CFD in the design process is the ability to see airflow.

CFD allows the user to see the results of engineering design more effectively than in the real world. The effects of minute features in the designing process can be seen and compared using CFD which cannot be done in an otherwise efficient manner. Another added advantage of using CFD is the repeatability of the results.

Flow Sciences uses CFD in the design process to concentrate and study the effects of changes in airflow (large and small) in the enclosure design. Any changes to an enclosure's design affect the airflow structure inside the enclosure and FSI's goal is to maintain stable airflow that improves containment while also providing a low turbulent atmosphere that allows sensitive equipment to perform properly and minimize any potential product loss.

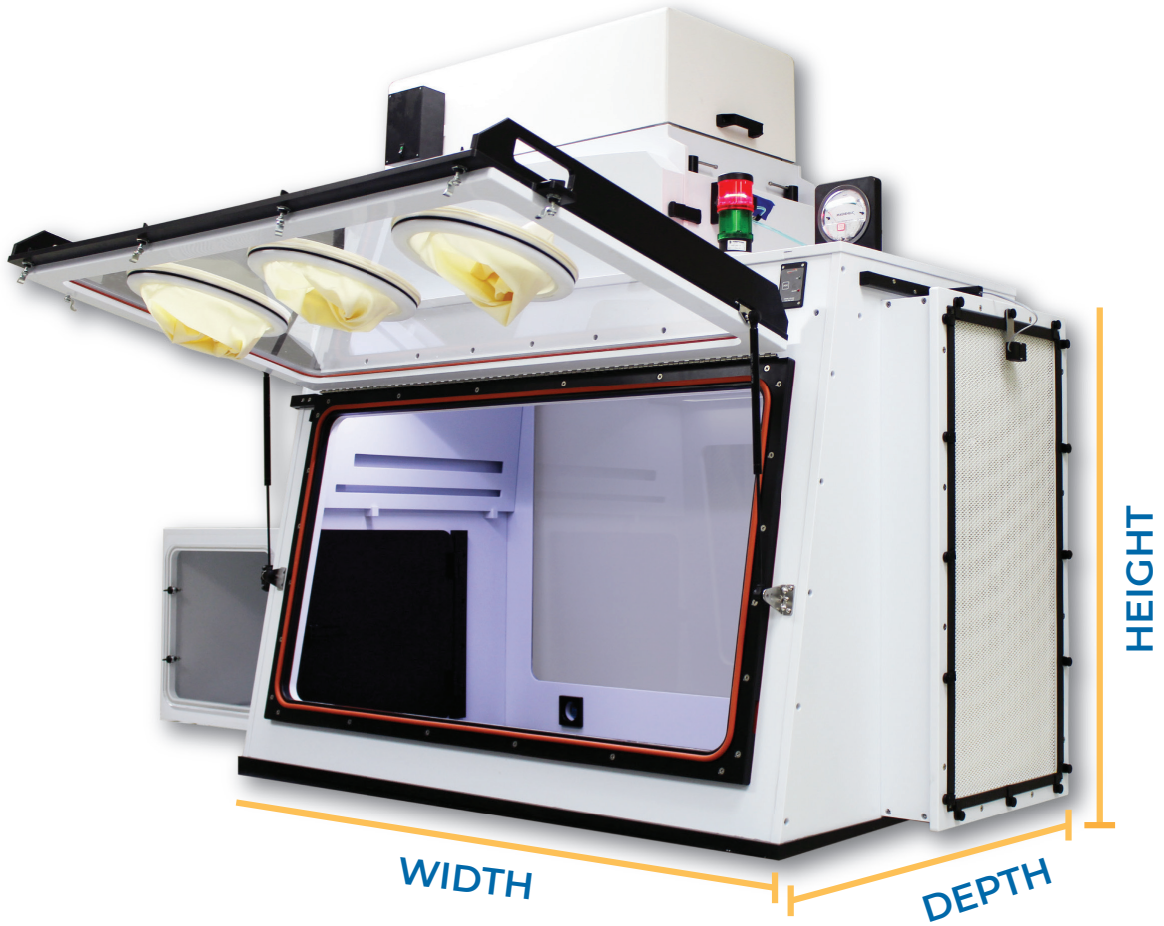
With CFD we have the advantage of evaluating the performance of the enclosure even before it is built, and then verify those results in our testing lab. This results in our clients receiving enclosures that have proven performance.

CONTAINMENT SOLUTIONS FROM RESEARCH TO PRODUCTION

Flow Sciences, Inc. provides engineered containment solutions from research to production. From Occupational Exposure Bands (OEB) 3 to 5, we build to suit your application. Whether in powder manipulation where balance stability is paramount, or using specific manufacturer equipment needing containment, or operating in a temperature and humidity controlled environment, Flow Sciences keeps your personnel and product safe.

GLOVEBOX DIMENSIONS

5’ GLOVEBOX WORKSTATION



SPACIOUS INTERIOR WORK SPACE			
EXTERIOR WIDTH	61”	INTERIOR WIDTH	59”
EXTERIOR DEPTH	34”	INTERIOR DEPTH	30”
EXTERIOR HEIGHT	42.25”	INTERIOR HEIGHT	37.25”

GLOVEBOX FEATURES

PROCESS

Weighing, dispensing, dissolution of powders and more with custom options.

CONTAINMENT

Nanogram levels below 30ng/m^3 depending quantity and process performed.

EQUIPMENT

Provides containment for equipment such as balances, ovens, FTIR, sieves, and more.

SAFETY

The Glovebox Workstation series provides containment for highly toxic applications using APIs that need more safety than an opened face enclosure. FSI engineering controls are built in to prevent loss of containment. Third–party testing has proven containment on these units to below 30ng/m^3 based on process and quantity.

ISO 5 CLEANLINESS

The HEPA inlet provides the interior with a laminar airflow. This HEPA clean environment meets or exceeds ISO 5 for clean processing of work while protecting operators from exposure.

SIDE/TRANSFER PORT

Side port with universal options including double-safe waste chute, continuous liner, RTP port, and more through customization. The side port and transfer port can be moved to either side. The transfer port provided ingress and egress of items into and out of the enclosure without exposing the operator or the interior environment to contamination.

CONSTRUCTION

This unit comes standard with either acrylic (EGP Series) or glass (EGG Series) viewing panels, as well as a dished phenolic resin base and polypropylene superstructure.

LED LIGHT

This enclosure features an internal white LED light for improved visibility inside of the enclosure with adjustable angle to direct light onto the application. Also available in Amber LED.

HEPA FILTRATION

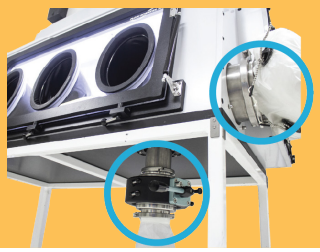
The Analytical Process Isolator is equipped with a 4” inlet HEPA filter and 2 primary and 2 secondary 4” HEPA filters that can be recirculated into the lab or sent directly to house exhaust.

FRONT LIFT DOOR

The glove ports sit in a front lift door that opens vertically to effectively load and unload equipment. This door is hinged for ease of use.

SANITARY FITTINGS FOR TRANSFER PORT OPTIONS

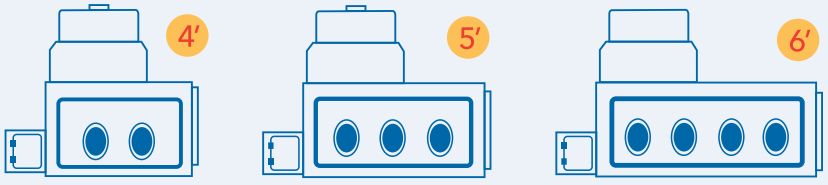
These units feature standard options for a 4” sanitary fitting in the base and an 8” sanitary fitting in the sidewall. This allows for coupling of powder transfer systems such as RTPs, continuous liners, split butterfly valves, and many more options.



GEA GETINGE ChargePoint TECHNOLOGY ROMMELAG ezidock ANDOCKSYSTEME

STANDARD SIZES

The Analytical Process Isolator is available in 5’, 6’, and 7’ foot standard width options. All units are 36” deep and 24” of internal height. Customization available.



EGP483024
EGG483024

EGP603024

EGP723024
EGG723024

STANDARD GLOVEBOX WORKSTATION ENCLOSURE SPECIFICATIONS (LEFT SIDE TRANSFER PORT)			
MODEL 110V MODEL 220V	GBWS48L1 GBWS48L2	GBWS60L1 GBWS60L2	GBWS72L1 GBWS72L2
NOMINAL SIZE	4’ (1.2 m)	5’ (1.5 m)	6’ (1.8 m)
OVERALL FOOTPRINT (W X D X H)	65” x 34” x 61” (1651 x 864 x 1549 mm)	77” x 34” x 61” (1956 x 864 x 1549 mm)	99” x 34” x 61” (2512 x 864 x 1549 mm)
TABLE/CART/ADA OPTIONS	– Fixed Height Table/Cart (36”) (915 mm) – Adjustable Height Table/Cart (31.75” - 43.5”) (806 x 1105 mm) (Both available in in stainless steel or powder coated carbon steel)		
EXTERNAL ENCLOSURE DIMENSIONS (W X D X H)	47.75” x 34” x 30” (1213 x 864 x 762 mm)	59.75” x 34”x 30” (1518 x 864 x 762 mm)	71.75” x 34”x 30” (1822 x 864 x 762 mm)
INTERNAL ENCLOSURE DIMENSIONS (W X D X H)	44” x 30” x 25” (1118 x 762 x 991 mm)	56” x 30” x 25” (1422 x 608 x 991 mm)	68” x 30” x 25” (1727 x 608 x 991 mm)
FSI RECOMMENDED 55 FPM (.28 M/S) AT CROSS-SECTIONAL PLANE	255 CFM Required	255 CFM Required	255 CFM Required
APPROXIMATE WEIGHT	375 lb (170 kg)	450 lb (204 kg)	550 lb (250 kg)
SUPERSTRUCTURE MATERIAL	White 0.375” Polypropylene		
BASE MATERIAL	Black 0.5" Phenolic Resin Base and Top, Routed to Fit Sidewalls for Containment of Spills		
MAIN DOOR OPENING DIMENSIONS (W X H)	39” x 18.5” (990 x 470 mm)	51” x 18.5” (1300 x 470 mm)	63” x 18.5” (1600 x 470 mm)
MAIN DOOR SUPERSTRUCTURE MATERIAL	Polypropylene & Trespa (Phenolic Resin)		
WINDOW MATERIAL	Transparent 0.375” Clear Acrylic		
GLOVE PORTS	(2) 10” Oval Glove Ports	(3) 10” Oval Glove Ports	(4) 10” Oval Glove Ports
TRANSFER PORT LOCATION	Left Side		
TRANSFER PORT INTERNAL (W X D X H)	12” x 12” x 12” (305 x 305 x 305 mm)		
TRANSFER PORT DOOR (W X H)	8” x 10” (203 x 254 mm)		
FAN (W X H)	Model FS4720 - 24” x 14” (610 x 356 mm)		
110-120V FAN SPECIFICATIONS	110-120 Volts AC | 270 Watts | 2.25 Amps | 50-55 dB at 3’		
220-240V FAN SPECIFICATIONS	220-240 VOLTS AC | 270 WATTS | 1.2 AMPS | 50-55 DB AT 3’		
OUTLET FILTER CONFIGURATION	Dual 99.99% Efficient 4” Pleated HEPA Filters - 24” x 14”		
INLET FILTER	(Right Side) 99.99% Efficient 4” Pleated HEPA Filter - 24” x 14”		
LED LIGHT SPECIFICATIONS	About 50,000 Hour Lifetime - 120 Degree Beam Angle - Minimum 1625 Lumens		
STACK LIGHT	Left Side Stacklight to Alert Open Door		
MINIHELIC GAUGES (FILTERS & MAIN CHAMBER)	(2) Differential Pressure Gauges (0-250 Pa, 0-1” W.C.)		
VELOCITY ALARM	Integrated Go/No-Go Velocity Alarm (0.2 Amps)		
CENTRALIZED CONTROL BOX	Controls Fan, Alarm, Stack Light, LED Light *Not CE Certified*		
NEMA RATED DUPLEX OUTLET	(2) Weather Proof Single Gang Outlets, (2) Roxtec Cable Pass-Thrus Factory Testing		
FACTORY TESTING (ASHRAE)	ASHRAE 110-2016 Containment of ≤0.050 PPM		
OPTIONAL ACCESSORIES	Ezi-Dock Transfer Systems - Continuous Liners - RTP (Rapid Tranfer Ports) - Others		

STANDARD GLOVEBOX WORKSTATION ENCLOSURE SPECIFICATIONS (RIGHT SIDE TRANSFER PORT)			
MODEL 110V MODEL 220V	GBWS48R1 GBWS48R2	GBWS60R1 GBWS60R2	GBWS72R1 GBWS72R2
NOMINAL SIZE	4’ (1.2 m)	5’ (1.5 m)	6’ (1.8 m)
OVERALL FOOTPRINT (W X D X H)	65” x 34” x 61” (1651 x 864 x 1549 mm)	77” x 34” x 61” (1956 x 864 x 1549 mm)	99” x 34” x 61” (2512 x 864 x 1549 mm)
TABLE/CART/ADA OPTIONS	– Fixed Height Table/Cart 36” (915 mm) – Adjustable Height Table/Cart 31.75”t – 43.5” (806 x 1105 mm) (Both available in in stainless steel or powder coated carbon steel)		
EXTERNAL ENCLOSURE DIMENSIONS (W X D X H)	47.75” x 34” x 30” (1213 x 864 x 762 mm)	59.75” x 34”x 30” (1518 x 864 x 762 mm)	71.75” x 34”x 30” (1822 x 864 x 762 mm)
INTERNAL ENCLOSURE DIMENSIONS (W X D X H)	44” x 30” x 25” (1118 x 762 x 991 mm)	56” x 30” x 25” (1422 x 608 x 991 mm)	68” x 30” x 25” (1727 x 608 x 991 mm)
FSI RECOMMENDED 55 FPM (.28 M/S) AT CROSS-SECTIONAL PLANE	255 CFM Required	255 CFM Required	255 CFM Required
APPROXIMATE WEIGHT	375 lb (170 kg)	450 lb (204 kg)	550 lb (250 kg)
SUPERSTRUCTURE MATERIAL	White 0.375” Polypropylene		
BASE MATERIAL	Black 0.5" Phenolic Resin Base and Top, Routed to Fit Sidewalls for Containment of Spills		
MAIN DOOR OPENING DIMENSIONS (W X H)	39” x 18.5” (990 x 470 mm)	51” x 18.5” (1300 x 470 mm)	63” x 18.5” (1600 x 470 mm)
MAIN DOOR SUPERSTRUCTURE MATERIAL	Polypropylene & Trespa (Phenolic Resin)		
WINDOW MATERIAL	Transparent 0.375” Clear Acrylic		
GLOVE PORTS	(2) 10” Oval Glove Ports	(3) 10” Oval Glove Ports	(4) 10” Oval Glove Ports
TRANSFER PORT LOCATION	Right Side		
TRANSFER PORT INTERNAL (W X D X H)	12” x 12” x 12” (305 x 305 x 305 mm)		
TRANSFER PORT DOOR (W X H)	8” x 10” (203 x 254 mm)		
FAN (W X H)	Model FS4720 - 24” x 14” (610 x 356 mm)		
110-120V FAN SPECIFICATIONS	110-120 Volts AC | 270 Watts | 2.25 Amps | 50-55 dB at 3’		
220-240V FAN SPECIFICATIONS	220-240 VOLTS AC | 270 WATTS | 1.2 AMPS | 50-55 DB AT 3’		
OUTLET FILTER CONFIGURATION	Dual 99.99% Efficient 4” Pleated HEPA Filters - 24” x 14”		
INLET FILTER	(Left Side) 99.99% Efficient 4” Pleated HEPA Filter - 24” x 14”		
LED LIGHT SPECIFICATIONS	About 50,000 Hour Lifetime - 120 Degree Beam Angle - Minimum 1625 Lumens		
STACK LIGHT	Right Side Stacklight to Alert Open Door		
MINIHELIC GAUGES (FILTERS & MAIN CHAMBER)	(2) Differential Pressure Gauges (0-250 Pa, 0-1” W.C.)		
VELOCITY ALARM	Integrated Go/No-Go Velocity Alarm (0.2 Amps)		
CENTRALIZED CONTROL BOX	Controls Fan, Alarm, Stack Light, LED Light *Not CE Certified*		
NEMA RATED DUPLEX OUTLET	(2) Weather Proof Single Gang Outlets, (2) Roxtec Cable Pass-Thrus Factory Testing		
FACTORY TESTING (ASHRAE)	ASHRAE 110-2016 Containment of ≤0.050 PPM		
OPTIONAL ACCESSORIES	Ezi-Dock Transfer Systems - Continuous Liners - RTP (Rapid Tranfer Ports) - Others		

PERFORMANCE

Performace is paramount, and through consistent quality design and expert manufacturing, Flow Sciences' units set the industry standard. With surrogate powder testing, both in our facility as factory acceptance testing and at the customer facility as site acceptance testing, Flow Sciences consistently exceeds our customers' expectations with containment targets and goals.

Containment Performance Target: **50 ng/m³**

Result: **4 ng/m³**

Equipment: **Balances**

Operation: **Weighing, Transferring, CIP**

Containment Performance Target: **5 ng/m³**

Result: **0.120 ng/m³**

Equipment: **Balances, Mortar & Pestle**

Operation: **Weighing, Grinding**

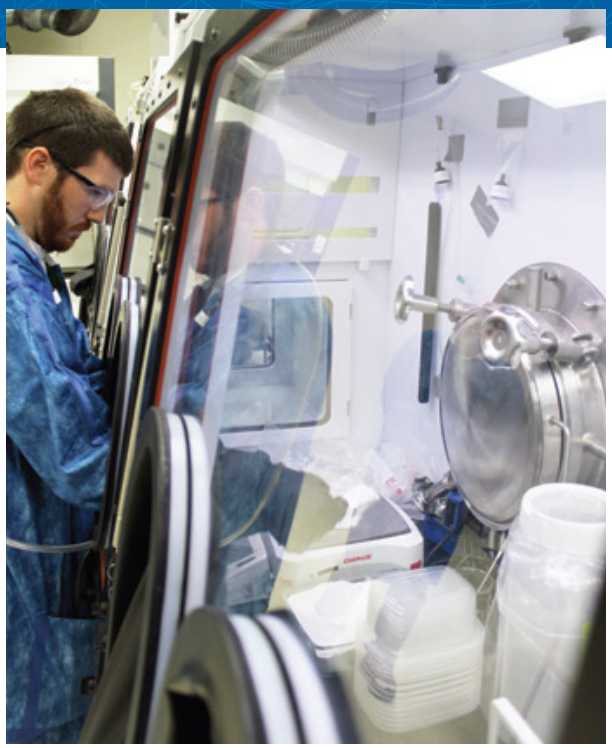
Containment Performance Target: **200 ng/m³**

Result: **9 ng/m³**

Equipment: **Balances, Mortar & Pestle**

Operation: **Weighing, Grinding**

LAB TESTING



Flow Sciences possesses a laboratory capable of testing products for conformance to the relevant standards (ie. ASHRAE 110–2016 Tracer Gas Testing). Every unique enclosure or hood that is manufactured in the facility is tested to these standards to ensure quality and performance to the ISO 9001:2016 standard.

Additionally, the facility can be used to perform further testing, using surrogate materials to determine expected enclosure containment capabilities. This factory acceptance testing using surrogate materials is often accompanied by a third–party industrial hygene group, as well as the customer. This helps to replicate the end process exactly, and also to suggest SOPs and GLPs for best use of the equipment.

GBWS BUILDS

HIGH POTENCY API PREP SYSTEM

High Potency API (HPAPI) Prep System LFBC™ is designed as an enclosure suite with 2 Hybrid Isolators and a Glovebox Workstation connected for processing. The system features a full transfer port system made of polypropylene for processing HPAPIs through the entire enclosure suite. The Glovebox Workstation features a lateral flow air filtration system with an ISO 5 or better interior environment. The Hybrid Isolators feature dual speed fans so the glove panels can be removed and operated with an open face as a modular feature. The dual speed fan automatically senses the removal or addition of the glove panel, and adjusts the fan speed accordingly to maintain proper face velocity. Size: 66” Exterior Width, 39” Exterior Depth, 31” Interior Height

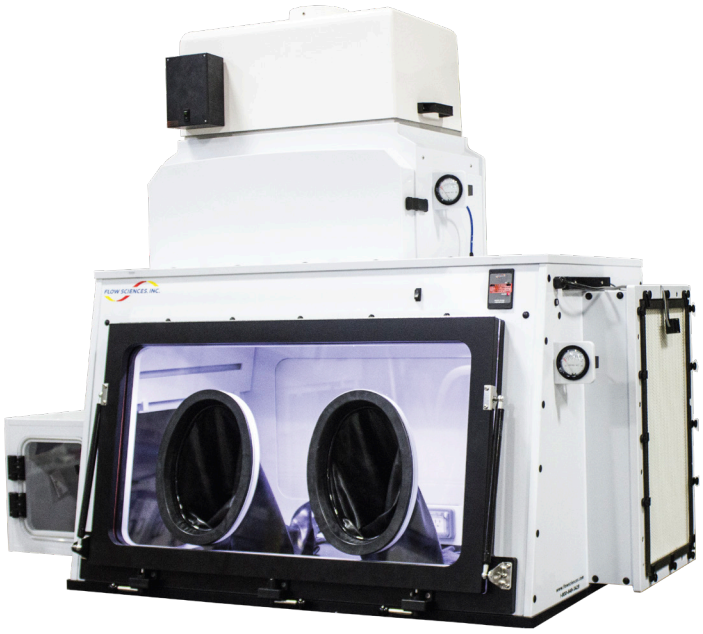
GBWS BUILDS

HPAPI GLOVEBOX WORKSTATION

HPAPI Glovebox Workstation LFBC™ is designed to house 2 balances and maximize both personnel and product protection while weighing powder and liquid APIs and HPAPIs. Units can be configured with many different transfer systems, including Ezi-Dock as shown here, as well at RTP ports from Getinge, continuous liners, and many more. 4 x 10” glove ports at the front of enclosure, pass through for data and power cables as well as access door to maximize operational flexibility. ISO 5 or better interior environment. Size: 80” External Width, 32” External Depth, 28” Internal Height

API WEIGHING & DISPENSING GLOVEBOX WORKSTATION (GBWS48L1)

API Weighing & Dispensing Glovebox Workstation designed to provide product protection while working with powder substances. The enclosure features include polypropylene frame, acrylic panels, black phenolic base, top mount fan, HEPA filtration with BIBO, HEPA inlet filter, hinged door style, left side pass through, minihelic gauge, and 2x 10” glove ports. Acrylic viewing panels and LED lighting maximize lighting across the workspace.



Flow Sciences' team of industrial engineers design workstations and enclosures that reduce product contamination and maximize protection for professionals who work with toxic substances and uncertain risks. All of our products are engineered and manufactured at our corporate headquarters in Leland, NC and are backed by our sophisticated design process and award–winning excellence in engineering, including 11 U.S. Government patents. We have worked with pharmaceutical companies, research and development laboratories, manufacturing, and production facilities for 30 years. Our task–specific designs are dynamic solutions that are adaptable to our clients' workflow and specific needs.

Flow Sciences was one of the first companies in the U.S. to use computational fluid dynamics (CFD) in drafting our enclosures to ensure optimum airflow. Our engineers use CFD algorithms to simulate fluid flows and interactions within contained spaces. This enables us to predict and control airflow through design, which we then test in our state–of–the–art laboratory. Working closely with our clients to mimic real–world applications, we develop testing protocols based on the intended use of our enclosures and measure them against industry–accepted standards to ensure proper containment. We have designed, manufactured, and tested over 13,000 enclosures, generating a wealth of data on situational flow dynamics, which allows us to control for consistency, safety, efficacy, and overall quality.