



## Hardwall & Softwall Cleanrooms

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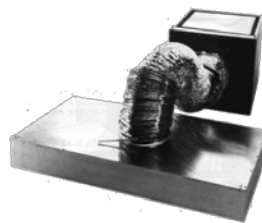
**MDR Series**  
Modular Downflow  
Cleanroom



**FDE Series**  
Softwall Cleanroom Fixed  
Downflow Clean Air Enclosure



**PDE Series**  
Softwall Cleanroom Portable Downflow  
Clean Air Enclosure



**TCS Series**  
Separate HEPA Filter & Blower  
Laminar Airflow T-Grid HEPA  
filtration Ceiling System



**Lo-Pro Series**  
Fan Filter Unit  
Motorized HEPA  
Filter Module

## MDR SERIES - Modular Downflow Cleanroom

### Applications:

Microelectronic Fabrication, Medical Device Manufacturing, QC Inspection, Sterile Filling & Packaging, Pharmaceutical Processing, Semiconductor Manufacturing

**DESCRIPTION:** MDR Series - Modular Hardwall Cleanrooms - vertical HEPA filtered airflow cleanroom providing an **ISO 5 / Class 100** condition or better; available in various sizes & configurations. The complete unit features durable modular Hardwall construction, using prefabricated walls with wiring posts every 4' (on center) for efficient installation. (Other Cleanroom Classes Available.).



### Specifications:

**Filters** - compact self-powered HEPA (High Efficiency Particulate Air) ceiling modules. 70mm filter pack. Minimum efficiency of 99.99% at .3 microns; 600 – 750 CFM, 55 dBA's, (ULPA filters available)

**Prefilters** - 1" bonded polyfiber minimizes surface-loading. 78 % arrestance – 56-57 ASHRAE.

**Airflow** - Average clean air velocity 90 fpm (+/-10 fpm). All measured values within +/- 20% uniformity.



### Construction:

- Modular Walls - available in various thicknesses – Polystyrene core (1 3/4" & 3" walls are most common).
- Wall Covering - various textures include painted Steel or Aluminum, Laminated woodboard & Vinyl covered.
- "U" Track - Base / Top cap with "H" wiring posts & pre-formed outside corners - Painted Steel or Aluminum.
- Cleanroom Doors - 1 3/4" Steel or Aluminum, pre-hung with 2' x 2' view glass - standard doors = 3'W x 7'H; (other doors are available including double doors, wider or higher than standard doors & also sliding doors)
- T-Grid Ceiling system - Anodized or Painted Aluminum – gasketed, Heavy duty 1 1/2" x 1 1/2"
- HEPA Fan Filter units, Cleanroom Lights & Cleanroom Ceiling Tile.
- I-beam support is provided, to allow structural & ceiling support (roof deck available)
- Cleanroom windows are available – full view or 1/2 view – safety glass or Polycarbonate

**Electrical & Power Requirements** - All electrical components are UL Approved / **NEC Electrical Code**. Standard 115V, 15 Amp, 1 pH, 60 Hz. Units supplied with harness wiring or electrical panel

**Motor/Blower Assembly** - High efficiency Lo-Pro motors to reduce electrical load. Thermally protected & self-lubricating High capacity metal backward curved impellers within direct drive external rotor motors to reduce wear. Statically balanced to maintain constant airflow. Units sit within ceiling grid.

**Lighting** - Recessed fluorescent "cleanroom" type sealed 4 bulb Lighting - 125 ft. candle +/- 20 ft. candles. Plastic prismatic lens cover maximizes light diffusion – Lights are drop-in style, sit within ceiling grid.

**Controls** - Solid state, adjustable airflow control, 70-120 fpm, 15A load capacity, switches for motor & lights.

**Drawings** – a complete set will be provided for all Cleanroom projects – Six Step Solution included – design assistance, project management, installation (LM Air's trained staff), maintenance

**Options:**

- Duct collars for Fan Units
- Seamless flooring
- Double doors
- Ionized system
- Magnehelic pressure gauge
- Electrical duplex receptacle
- Flow through cleanroom lights
- Cleanroom windows

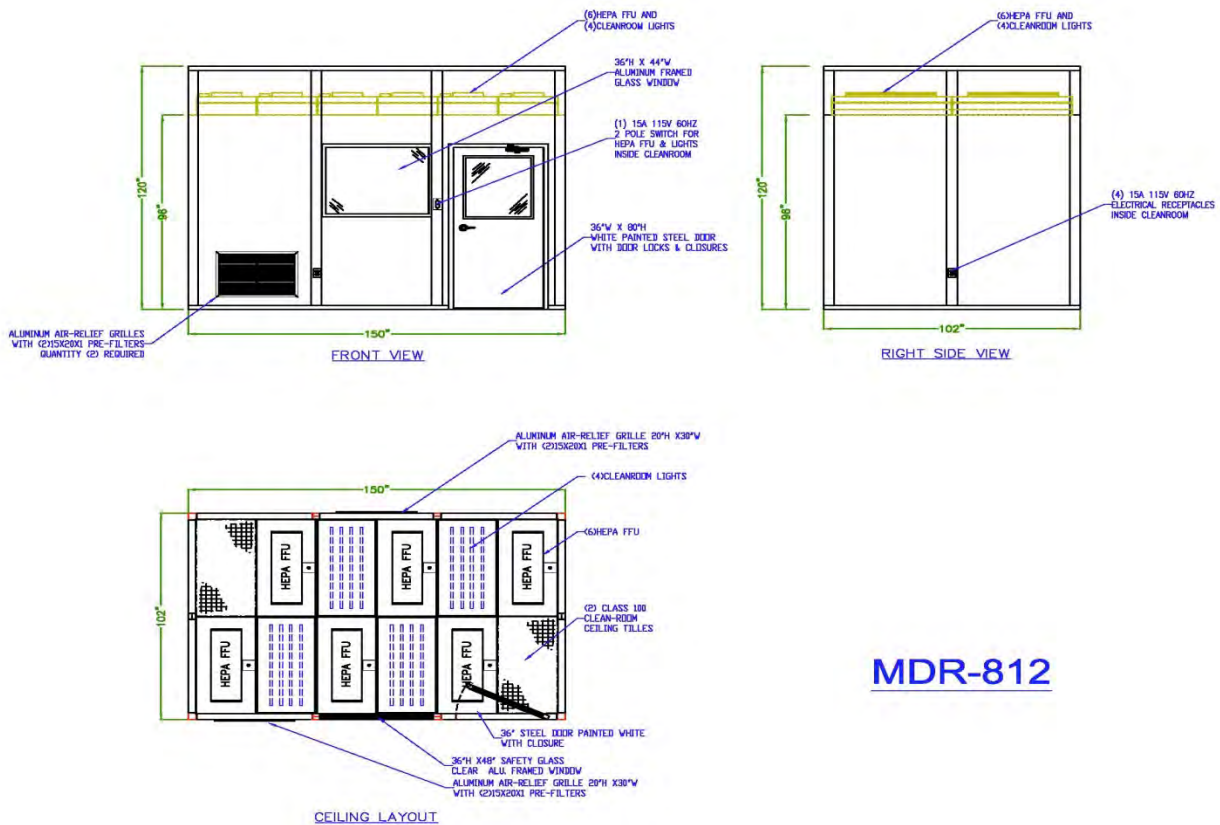
- Roof decking sealed plenum
- Control panel
- Sprinkler drop
- TCS blower/filter system
- Replacement pre-filter, 12/case
- Roomside replaceable HEPA units
- Single Pass or Recirculating Cleanrooms

Standard and Custom sizes / configurations available

**Model # / Dimensions:**

LM Air Model #	W	L	IH	OH	LM Air Model #	W	L	IH	OH
MDR-88	8'	8'	8'	10'	MDR-1216	12'	16'	8'	10'
MDR-812	8'	12'	8'	10'	MDR-1220	12'	20'	8'	10'
MDR-816	8'	16'	8'	10'	MDR-1224	12'	24'	8'	10'
MDR-820	8'	20'	8'	10'	MDR-1616	16'	16'	8'	10'
MDR-824	8'	24'	8'	10'	MDR-1620	16'	20'	8'	10'
MDR-1212	12'	12'	8'	10'	MDR-1624	16'	24'	8'	10'

**Sample Drawing:**



**MDR-812**

## FDE SERIES - Softwall Cleanroom Fixed Downflow Clean Air Enclosure

### Applications:

Microelectronic Fabrication, Medical Device Manufacturing, QC Inspection, Sterile Filling & Packaging, Pharmaceutical Processing, Semiconductor Manufacturing

**DESCRIPTIONS:** The Fan Filter Unit draws ambient air from above & generates a uni-directional vertical airflow pattern that exits beneath the vinyl curtain. Depending on the quantity of modules used and filter efficiency an **ISO 8 Class 100,000 to ISO 4 / Class 10** clean laminar airflow can be established inside the Softwall environment.

The FDE Series includes HEPA fan modules, cleanroom tiles, cleanroom light fixtures that provide 125 ft. candle coverage. The standard unit consists of tubular steel with a painted (or Stainless steel) finish, on isolation levelers. A solid clear vinyl curtain spaced above the floor allows a continuous downflow purge of clean air. Various configurations & Cleanroom Classes are available to meet your specific needs.



### SPECIFICATIONS:

**Construction:** 2" or 3" square (tubular - 11 gauge) welded frame - Painted or Stainless Steel with heavy-duty isolation levelers; Standard Inside ceiling is 8 ft. (others are available). Aluminum, gasketed, T-Grid ceiling system with 3/4" angle on perimeter. Pre-assembled at factory for easy installation. Gasketing ensures seal when installed. Solid, clear 40 mil vinyl curtain perimeter with overlapping entrance (or optional Polycarbonate walls).

**Electrical & Power Requirements:** All electrical components are UL Approved / NEC compliant. Standard 115V, 15A 1 Ph, 60 Hz., 15 ft. SJO power cord with 3-prong ground plug. 230V also available.

**Motor/Blower Assembly:** High efficiency Impellor motors reduce electrical load. Motors are thermally protected & self-lubricating. High capacity metal backward curved impellers within direct drive external rotor motors to reduce wear. Statically balanced to maintain constant airflow

**Lighting:** Recessed 2 pin fluorescent "cleanroom" type sealed 4 bulb lights - 125 ft. candle +/-20 ft. candles. Plastic prismatic lens cover maximizes light diffusion.

**Controls:** Solid state airflow control, 70-120 fpm. 15A load capacity. Individual switches for motor & lights.

**Drawings** – a complete set will be provided for all Cleanroom projects with an easy installation guide included OR take advantage of LM Air's – Six Step Cleanroom Solution – design assistance, project management, installation (LM Air's trained staff) and maintenance.

### Options:

Duct collars for Fan Units

Seamless flooring

Ionized system

Magnehelic pressure gauge

Electrical duplex receptacle

Flow through cleanroom lights

Control panel

Sprinkler drop

TCS blower/filter system

Replacement pre-filter, 12/case

Roomside replaceable HEPA units

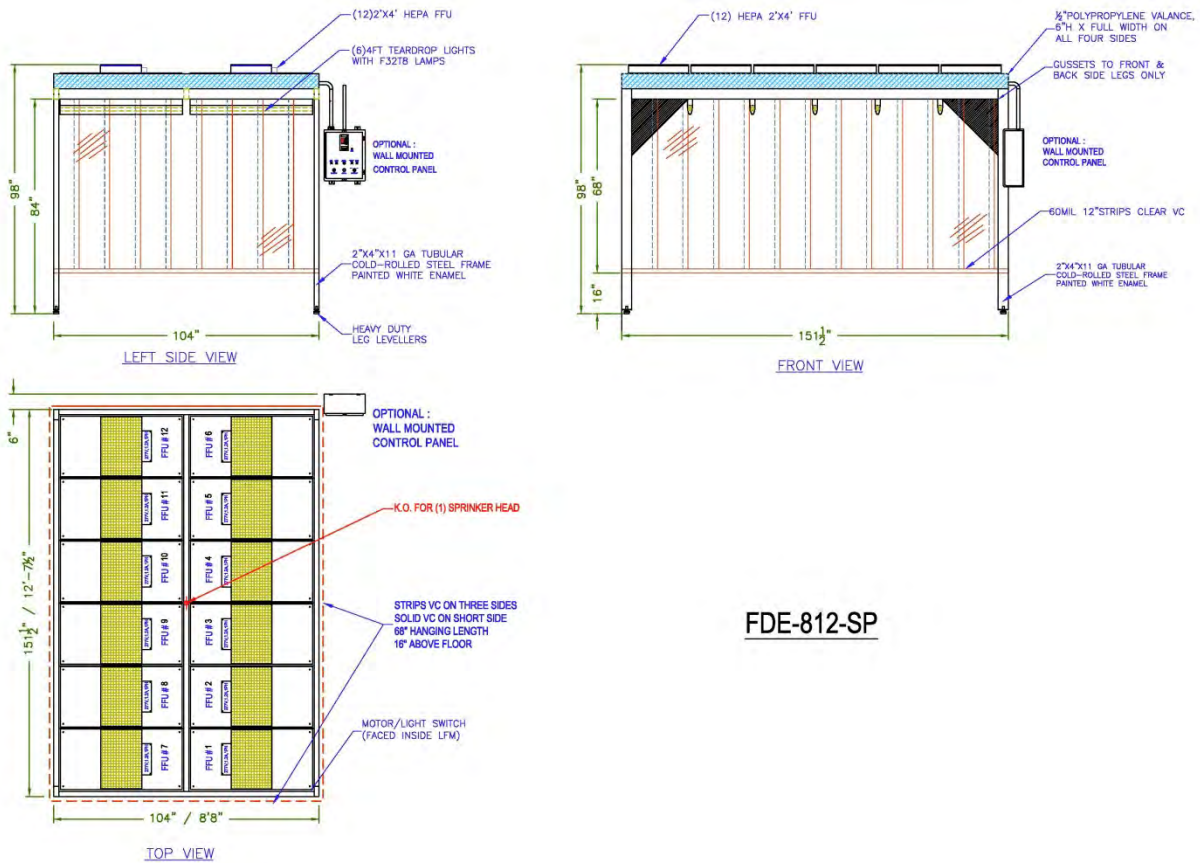


Standard and Custom sizes / configurations available

**Model # / Dimensions:**

LM Air Model #	Outside Width	Outside Length	Inside Height	Outside Height
FDE-88	8'6"	8'9"	8'	9'2"
FDE-812	8'6"	13'	8'	9'2"
FDE-816	8'6"	17'3"	8'	9'2"
FDE-820	8'6"	21'6"	8'	9'2"
FDE-1012	10'6"	13'	8'	9'2"
FDE-1016	10'6"	17'3"	8'	9'2"
FDE-1020	10'6"	21'6"	8'	9'2"
FDE-1212	12'6"	13'	8'	9'2"
FDE-1216	12'6"	17'3"	8'	9'2"
FDE-1220	12'6"	21'6"	8'	9'2"
FDE-1616	16'9"	17'3"	8'	9'2"
FDE-1620	16'9"	21'6"	8'	9'2"
FDE-1624	16'9"	25'9"	8'	9'2"

**Sample Drawing:**



**FDE-812-SP**

## **PDE SERIES - Softwall Cleanroom Portable Downflow Clean Air Enclosure**

### **Applications:**

*Microelectronic Fabrication, Medical Device Manufacturing, QC Inspection, Sterile Filling & Packaging, Pharmaceutical Processing, Semiconductor Manufacturing*

**DESCRIPTION:** The Fan Filter Unit draws ambient air from above & generates a uni-directional vertical airflow pattern that exits beneath the vinyl curtain. Depending on the quantity of modules used and filter efficiency an **ISO 8 Class 100,000 to ISO 5 / Class 100** clean random airflow can be established inside the Softwall environment.

The PDE Series includes HEPA fan modules, cleanroom tiles, cleanroom light fixtures that provide 125 ft. candle coverage. The standard unit consists of tubular steel with a painted (or Stainless steel) finish, on lockable casters for mobility. A solid clear vinyl curtain spaced above the floor allows a continuous downflow purge of clean air. Pre-designed for product isolation and spot coverage over process equipment. Units can be linked together to provide multiple configurations.



### **SPECIFICATIONS:**

**Construction:** 2" or 3" square (tubular - 11 gauge) welded frame - Painted or Stainless Steel with heavy-duty lockable casters; Standard Inside ceiling is 8 ft. (others are available). Aluminum, gasketed, T-Grid ceiling system with 3/4" angle on perimeter. Pre-assembled at factory for easy installation. Gasketing ensures seal when installed. Solid, clear vinyl curtain perimeter with overlapping entrance (or optional Polycarbonate walls).

**Electrical & Power Requirements:** All electrical components are UL Approved / NEC compliant. Standard 115V, 15A 1 Ph, 60 Hz., 15 ft. SJO power cord with 3-prong ground plug. 230V also available.

**Motor/Blower Assembly:** High efficiency Impellor motors reduce electrical load. Motors are thermally protected & self-lubricating. High capacity metal backward curved impellers within direct drive external rotor motors to reduce wear. Statically balanced to maintain constant airflow.

**Lighting:** Recessed 2 pin fluorescent "cleanroom" type sealed 4 bulb lights - 125 ft. candle +/-20 ft. candles. Plastic prismatic lens cover maximizes light diffusion.

**Controls:** Solid state airflow control, 70-120 fpm. 15A load capacity. Individual switches for motor & lights.

**Drawings** – a complete set will be provided for all Cleanroom projects with an easy installation guide included OR take advantage of LM Air's – Six Step Cleanroom Solution – design assistance, project management, installation (LM Air's trained staff) and maintenance.

### **Options:**

Seamless flooring

Ionized system

Magnehelic pressure gauge

Electrical duplex receptacle

Flow through cleanroom lights

Control panel

Sprinkler drop

TCS blower/filter system

Replacement pre-filter, 12/case

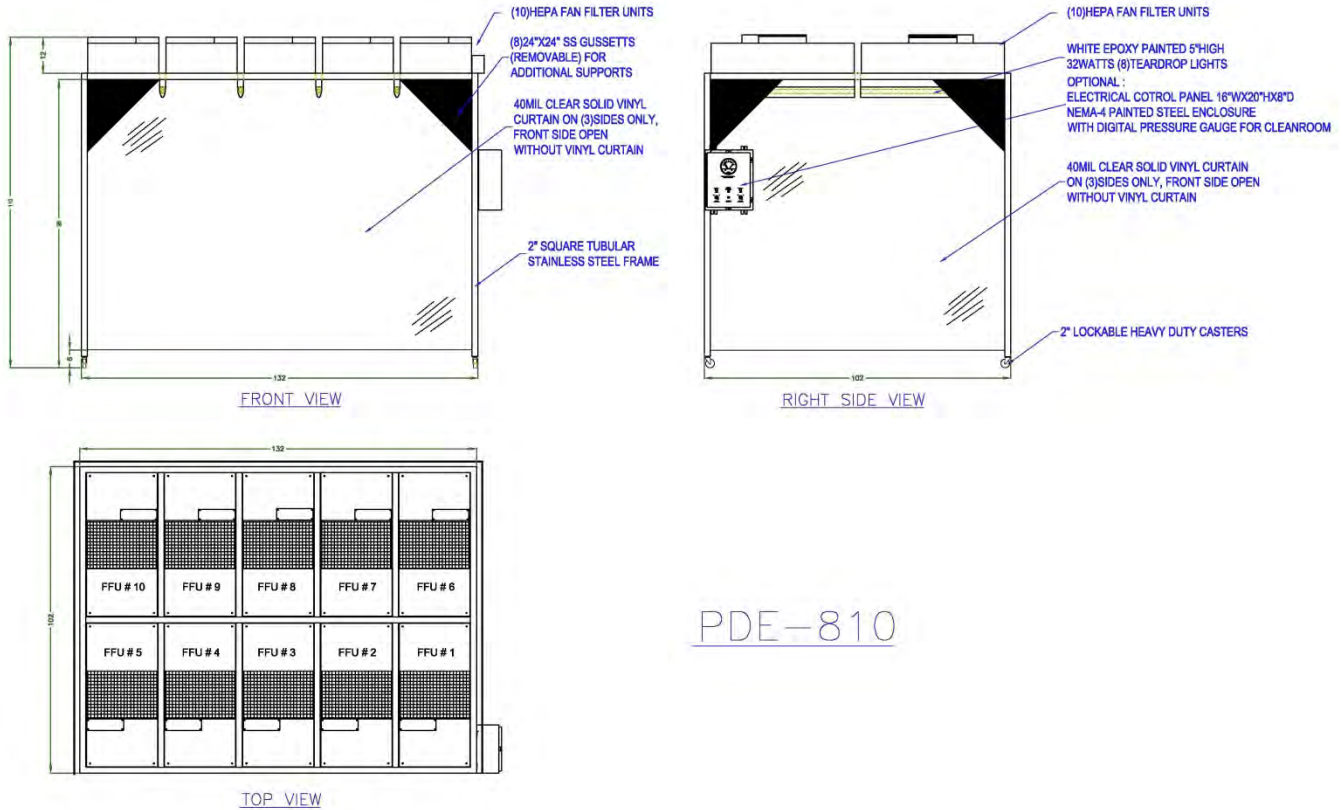
Roomside replaceable HEPA units

Standard and Custom sizes / configurations available

**Model # / Dimensions:**

LM Air Model #	Outside Width	Outside Length	Inside Height	Outside Height
PDE - 44	4'	4'	8'	9'1"
PDE - 46	4'	6'	8'	9'1"
PDE - 48	4'	8'	8'	9'1"
PDE - 410	4'	10	8'	9'1"
PDE66	6'	6'	8'	9'1"
PDE68	6'	8'	8'	9'1"
PDE88	8'	8'	8'	9'1"

**Sample Drawing:**





## Cleanroom Classifications / Design Guidelines

### **Description:**

Cleanrooms are rated for purity according to guidelines established in Federal Standard 209D and ISO standard 14644. Air cleanliness is specified in terms of the number of foreign particles per cubic foot (or cubic liter) of air, relating different combinations of particle size and particle count. **Lower classifications represent cleaner rooms (E.g.: Class 100 / ISO 5 is cleaner than Class 100,000 / ISO 8).** How particles are counted depends on particle size: air with smaller particles can have higher particle counts and still meet the class designation.

- Class 1 / ISO 3: only one particle per cubic foot – **More Clean environment**
- Class 10 / ISO 4: 10 particles per cubic foot
- Class 100 / ISO 5: 100 particles per cubic foot
- Class 1,000 / ISO 6: 1,000 particles per cubic foot
- Class 10,000 / ISO 7: 10,000 particles per cubic foot.
- **Class 100,000 / ISO 8:** 100,000 particles per cubic foot – **Less Clean environment**  
[particles measure 0.5 micron or less in diameter]

There are (2) distinct types of Hardwall Cleanrooms:

- **Single Pass Cleanroom** – usually a Cleanroom within a larger conditioned room. Air is taken in from above the Cleanroom ceiling thru HEPA fan units into the cleanroom - creating filtered (clean) air. Positive pressure forces the air out of the cleanroom into the main room thru exhaust grills, located just above the finished floor. Existing HVAC may be used for this option.
- **Recirculating Cleanroom** – usually includes a roof deck with recirculating wall(s). Air is ducted into the roof deck (2'H plenum), located above the Cleanroom ceiling. Motorized HEPA fan units move the air thru the HEPA filter & into the cleanroom - creating filtered (clean) air. Positive pressure forces the air out of the cleanroom into the recirculating walls, via return air grills – located above the floor. The air is then recirculated back to the plenum (above the Cleanroom ceiling). Less air volume is required for this type; dedicated HVAC supply & return air is required.

**Hardwall Cleanrooms** are designed to provide a Clean, Controlled Environment. Cleanroom levels are available from Class 100,000 to Class 1 (ISO Standards Class 1 thru Class 8),

The standard system consists of Panelized Cleanroom Walls, available in various thickness & textures. The system includes “H” post – wiring posts every 4’; the structural members that support the Roof and Ceiling system. Filtered air is provided by Self Powered Filter Units (HEPA filtered diffusers) mounted in Ceiling. These take outside air through Prefilters, delivering filtered air through a HEPA (or ULPA) filter into Cleanroom. Filtered air is exhausted from Cleanroom thru Exhaust Vents near Floor level. Clean levels vary depending on quantity and configuration of Filters. All components are prefabricated and completely Modular in design; modular rooms are considered Equipment, which may be a tax benefit.

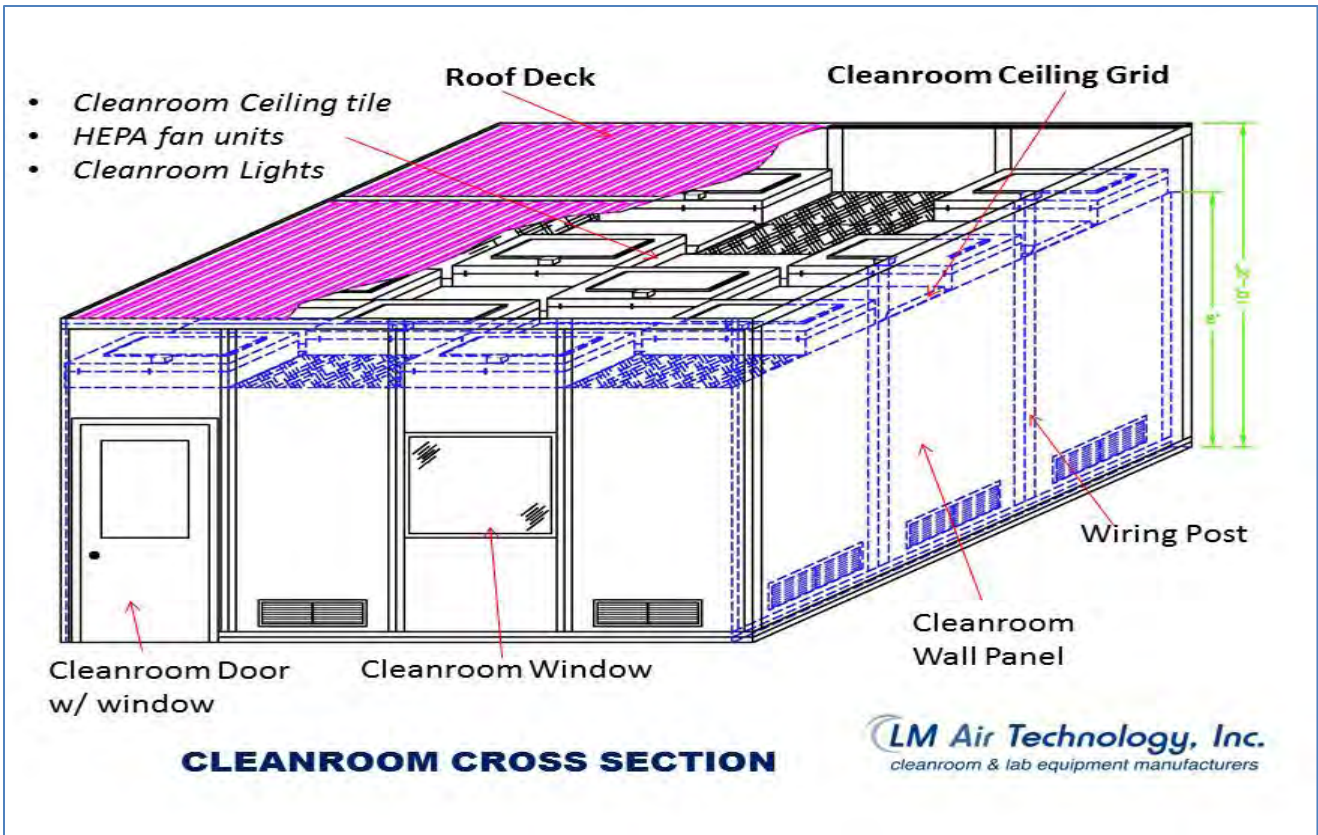
**Softwall Cleanrooms** are designed to provide clean environments from Class 100,000 to Class 10 (ISO Standards Class 3 thru Class 8).

This system consists of a Tubular Steel Frame Structure that supports the Ceiling Grid and Clear Vinyl Curtain Wall material. Filtered air is provided by Self Powered Filter Units mounted in-Ceiling that draw outside air thru a Prefilter and deliver filtered air through a HEPA filter into Cleanroom. Filtered air is exhausted from Cleanroom beneath the Curtain at Floor level. Clean levels will vary depending on quantity and configuration of Filters.

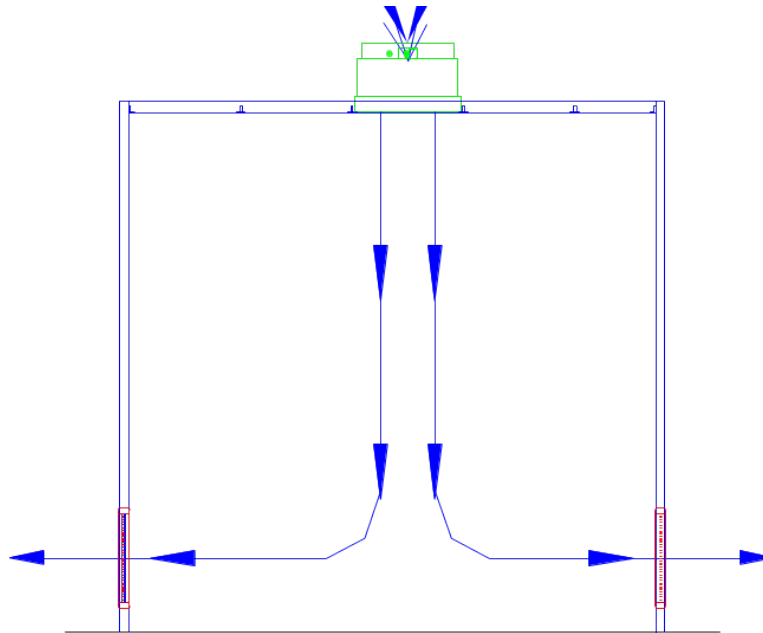
All components are pre-assembled and completely modular in design. Softwall Cleanrooms can be installed by End User or by our professional trained installers.

## Cleanroom Design Guide

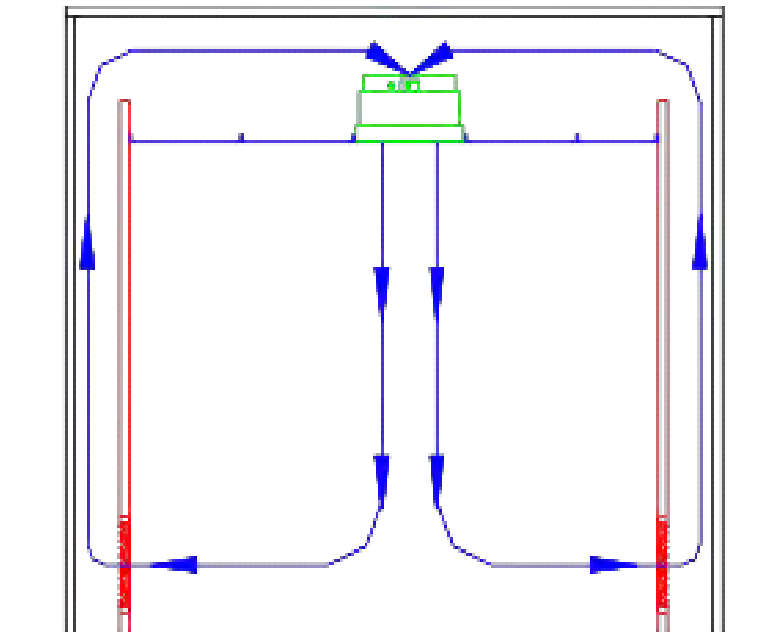
Description	ISO 4 / Class 10	ISO 5 / Class 100	ISO 6 / Class 1000	ISO 7 / Class 10,000	ISO 8 / Class 100,000
Air Changes per Hr Min	600 10	300 to 480 5 to 8	180 3	80 1	36 6
Filter Coverage - %	100	50 to 70	20 to 30	7 to 15	4 or 5
Type of Ceiling - Gasketed	2" Aluminum T-Grid	2" Aluminum T-Grid	1 1/2" Aluminum T-Grid	1 1/2" Aluminum T-Grid	1 1/2" Aluminum T-Grid
Light -Type	Tear Drop	2'x4' Cleanroom Fixture	2'x4' Cleanroom Fixture	2'x4' Cleanroom Fixture	2'x4' Cleanroom Fixture
Ceiling Panels	FRP Epoxy Painted	FRP, Mylar, Vinyl Rock	Mylar, Vinyl Rock	Mylar, Vinyl Rock	Mylar, Vinyl Rock
Wall System	Modular	Modular	Modular	Modular	Modular or Drywall
Floor Covering	Seamless Vinyl or Epoxy	Seamless Vinyl or Epoxy	Seamless Vinyl or Epoxy	Sheet Vinyl or VCT	Sheet Vinyl or VCT



**Cleanrooms - Single Pass vs Recirculating**



**Single Pass Cleanroom – Exhausting –**  
Air exhausts out into room via exhaust grills



**Recirculating Cleanroom –** Air is recirculated back to plenum above ceiling via return air grills & double wall

## *FULL SERVICE CLEANROOMS - Six Step Solution*

**LM Air** offers a full service approach to the cleanroom selection process. We offer a **Six-Step Solution**, allowing customers to feel confident that they will receive their specific requirements, within the specified time frame, at the quoted cost. Our design & manufacturing capabilities allow us to offer a complete solution to your cleanroom requirements for new construction or retro-fits (renovation of existing). **LM Air** can provide Hardwall & Softwall cleanrooms with various wall types/textures & dimensions.

1. **Initial Consultation** – We will provide a comprehensive evaluation of what is needed, the air quality level required & the system that is best suited for our customers.
2. **Engineering & Design** – Our highly experienced staff provide the necessary CAD drawings needed to satisfy our customers' requirements.
3. **Manufacturing** – Our manufacturing process and cost controls enable us to be very efficient. This allows **LM Air** to minimize the cost to our customers.
4. **Project Management & Installation** – **LM Air** will provide project management services & installation of the entire system. If our customer has the expertise to install the system, then we will provide them with the guidance needed for successful completion.
5. **Certification/Testing** – **LM Air** tests all our products to assure compliance with established government and industry standards, prior to shipping product. We will also coordinate on-site testing/certification.
6. **Maintenance** – **LM Air** will provide any maintenance that may be required. We will also offer annual maintenance contracts.

We value every relationship with our customers, vendors and employees and will provide the highest levels of quality, service and reliability.



## LO-PRO SERIES - Fan Filter Unit Motorized HEPA Filter Module

**Applications:**

Cleanroom Construction, Retrofit Existing Cleanrooms, Creating Clean Zones, Laser Optics, Semiconductor Tools, Pharmaceutical Manufacturing, Optical pre-filter assembly

**DESCRIPTION:** All aluminum construction. Two backward curved impeller motor / blowers for even and constant air distribution to the filter. The Lo-Pro FDE provides a ISO 5/Class 100 laminar flow air for new cleanroom construction, retrofitting other clean environments, and converting non-clean areas into working clean zones. Modules mount easily into standard T-grid ceilings. The totally self-contained unit is only 9" high; ideal for use in areas with tight ceiling restrictions. No special wiring is needed for installation.



**SPECIFICATIONS:**

- Airflow 70 - 120 fpm.
- 115V, 2 Amp, 1 Ph, 60 Hz power requirements on LP-24, 1 Amp on LP-22,
- 230V available. Only 2 Amps maximum load on LP-24; 1 Amp on LP-22

**Motor Blower Assembly:**

- High efficiency Impellers are thermally protected & self-lubricating.
- High capacity backward curved impellers
- Fans statically balanced to maintain constant airflow.
- Low energy consumption.

By grouping & suspending Lo-Pro modules, ISO 5 /Class **100** vertical laminar flow environment can provide spot coverage over process lines.

**OPTIONS:**

- |   |  |
|---|--|
| 115V, 5 Amp or 15 Amp Air-Flow Control    | 230V, 5 Amp OR 15 Amp Air-Flow Control |
| Prefilter assembly, LP-24                 | 10" two Duct collar, LP-24,            |
| Prefilter assembly, LP-22                 | 10" one Duct collar, LP-22             |
| LFM-24 Replacement HEPA Filter for LP-24  | Eight foot power cord                  |
| LFM-22 Replacement HEPA Filter for LP-22  | Eye hooks (set of 4)                   |
| LFM-24U Replacement ULPA Filter for LP-24 | Test ports in HEPA / ULPA (2), add     |
| LFM-22U Replacement ULPA Filter for LP-22 |  |

MODEL	LENGTH	WIDTH	HEIGHT	AMPS @ 115V	# Impellers	SHIPPING WEIGHT
LP-24	24"	48"	9"	2.0	2	55 lbs.
LP-22	24"	24"	9"	1.0	1	30 lbs.



## **TCS Series - Separate HEPA Filter & Blower Laminar Airflow T-Grid HEPA filtration Ceiling System**

**Applications** (Ceiling component filtration system for Cleanroom designs of):  
*Microelectronic Fabrication, Medical Device Manufacturing, QC Inspection, Sterile Filling & Packaging, Pharmaceutical Processing, Semiconductor Manufacturing, Medical Operating Rooms*

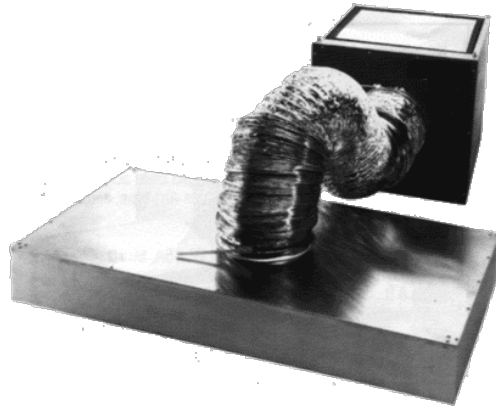
### **Specification** (see details)

The system's flexibility provides protection of specific priority areas when a patterned ceiling coverage is specified. The system will act as a HEPA filter source for Class 100 vertical laminar flow air when the building air system is not available.

System components are:

1. TFB: Remote T-Grid blower air handler with flexible duct.
2. TCD: T-Grid HEPA filter ceiling diffuser.

The blower unit can be suspended from the main ceiling or placed in a remote area. It can draw either ambient air from above the ceiling, or use inducted air supply. The duct connection size is 10" diameter. Six feet of connection duct is provided per outlet. Blowers are designed in two versions:  
One outlet: drives one HEPA filter at 800 CFM  
Two outlets: drives two HEPA filter at 1600 CFM



The filter diffuser mounts onto a standard 2' x 4' suspended T-Grid ceiling, and because of its shallow length (only 24" is required for filter and duct connection), any low ceiling height can be converted into a cleanroom. The diffuser's HEPA filter is enclosed in an aluminum housing. Space and weight saving separators are used to create the Mini-pleat microglass fiber filter media pack that is sealed to the housing with a urethane bonding agent. The diffuser has two ports for DOP testing and air balancing.

### **Specifications:**

#### **TFB Motor/Blower**

TFB-1, one 10" outlet, 3/4 H.P., 800 CFM capacity  
TFB-2, two 10" outlet, 3/4" H.P., 1600 CFM capacity  
Six feet of connecting flex duct provided for each outlet  
Eyebolts for ceiling suspension.  
All electrical components are UL approved / NEC code  
11 Amps, 1PH.60 Hz junction box on for hard wiring

#### **TCD**

Three inch mini-pleat media, aerosol challenged, zero-probed.  
Minimum efficiency 99.99% at .3 microns, Aerosol challenger intake port  
10" round duct intake port, Internal damper plate.

**Pre-filter:** 1" bonded polyfiber media positioned at intake of motor/blower

#### **Options:**

Extra 10" flexduct (up to 25')  
Airflow control  
ULPA filtration, .12 microns  
Replacement prefilters, 12/case

**TCS Series - Separate HEPA Filter & Blower Laminar Airflow  
T-Grid HEPA filtration Ceiling System**

**TFB Filter Blower Air Handler**

LM Air	Dimensions (inches)					Motor		Ship
Model	L	W	H	CFM	Qty	H/P	Amps	Lbs.
TFB-1	26	22	20	800	1	3/4	9.1	75
TFB-2	26	22	20	1600	1	3/4	9.1	75

**TCD T-Grid HEPA filter Ceiling Diffuser**

LM Air	Dimensions (inches)			Ship
Model	L	W	H	Lbs.
TCD-22	23 5/8	23 5/8	6	16
TCD-24	47 5/8	23 5/8	6	28