



A CLEAN ZONE

Cleanliness class 5 ISO 14644-1-99
 Assembly overall dimensions (LxWxH, mm)
 8910x4550x2865



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BENEFITS OF CLEAN ZONES FROM LAMSysteMS

Following current demand, modern high-tech enterprises deliberately introduce the new cleanliness standards. Therefore, demand for LAMSysteMS air purification equipment shows consistent growth in various industries.

Based on fifteen years of experience in creating complex engineering solutions for clean rooms and clean zones, the LAMSysteMS specialists are able to design air purification equipment taking into account operating specifics of each particular enterprise.

The cost of creating a clean room system can be efficiently reduced by zoning a clean room into local areas. They can differ in cleanliness class as well as in functionality (protection of the product only or both of the product and environment). Thus, clean zones above the places with key technologic manipulations can have a higher cleanliness class than the room they are located in.

Unique patented output design of the Filter Fan Unit (FFU) ensures uniform (laminated) downward airflow across the whole area of LAMSysteMS clean zone of any dimensions. The above mentioned characteristic is crucial for clean zones of ISO class 5 and cleaner.

The microprocessor control system monitors the contamination level of the filters installed in the FFU. If necessary, it automatically increases the speed of fan revolutions and prompts an operator to replace filter.

Thanks to its design, exhaust HEPA filter can be easily replaced. The process does not require any special skills and can be performed by one person.

Modular structure with tried and tested components of the clean zones allows finding various non-standard solutions of high quality in shortest time.

Thorough detalization of tasks at the design stage, high quality of manufacturing and installation, mandatory validation of the finished products on site, qualified staff – all of it allows LAMSysteMS to receive a large number of recurring orders from the most demanding customers.

WHAT IS A CLEAN ZONE?

A CLEAN ZONE is a local spatial structure built and used in a way that minimizes the influx, emission and retention of particles inside the zone.

The clean zone is structurally made as a standalone "room in the room" product.

MAIN PURPOSE OF CLEAN ZONES:

- maintaining the specified air environment parameters in the local workspace;
- protecting the product from the environmental exposure.



The air environment parameters (air cleanliness by both microbiological and mechanical particles) maintained in the zone workspace depend on the technologic process performed in the clean zone.

- A clean zone can be used in both a clean room and an ordinary room.
- Due to its compactness, a clean zone can be installed in almost any premises.
- In the level of air cleanliness, the clean zones correspond to clean rooms, but are much more cost-effective.
- The clean zones are mobile. They can be used where it is necessary at the moment (prefabricated module constructions).

Clean zones application is wide and nowadays covers many spheres of technology, human life and activity:

- Medicine
- Pharmaceutical production
- Medical equipment production
- Perfume and cosmetics production
- Food production
- Biotechnology and nanotechnology
- Electronics
- Semiconductors production
- Micromechanics
- Precision instruments industry and mechanics
- Production of high class optical elements
- Space and aircraft industry
- Precision products production and others



Clean zones in photo-lithography

Cleanliness class 5 ISO 14644-1-99

Assembly overall dimensions (LxWxH, mm) 1300x1300x1995



A clean zone for probing in a pharmaceutical enterprise

Cleanliness class 5 ISO 14644-1-99 or class A GMP

Assembly overall dimensions (LxWxH, mm) 1300x1300x2420
(material is stainless steel)

CLEAN ZONE OPERATION PRINCIPLE

The clean zone providing cleanliness class 5 (6) of ISO 14644-1-99 or class A(B) GMP has a ceiling made of a full set of Filter Fan Units (FFU) taking air out of the zone room.

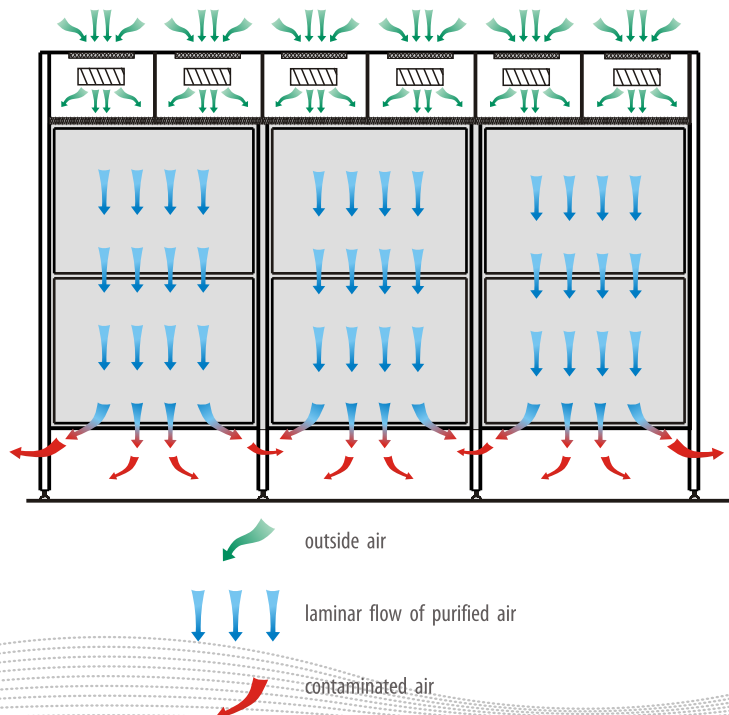
Cleanliness inside the zone workspace is provided by extruding the contamination by a unidirectional purified airflow (air piston effect).

Walling is fixed along the ceiling perimeter and can be made of:

- transparent tempered glass
- sealed metal panels with special surface coating resistant to disinfectants and ultraviolet irradiation exposure
- stainless steel sealed panels
- flexible walling

In cleanliness class 5 clean zones the walling does not reach the floor to allow free air passage inside the zone without its thickening. Thus, the quality characteristics of the laminar flow are enhancing.

All joints are sealed with a polyurethane sealant for clean rooms.



AIRFLOW SCHEME IN ISO CLASS 5(6) CLEAN ZONES

A clean zone of ISO cleanliness class 7 as per ISO 14644-1-99 and lower, or of GMP class C(D), has only several FFUs taking the air out of the room.

The number of FFUs is determined on the basis of the required air exchange multiplicity inside the zone taking into account its geometric dimensions.

Air is supplied by a weak turbulent flow, and the air environment cleanliness is achieved by dilution, concentration reduction and aerosol particles removal.

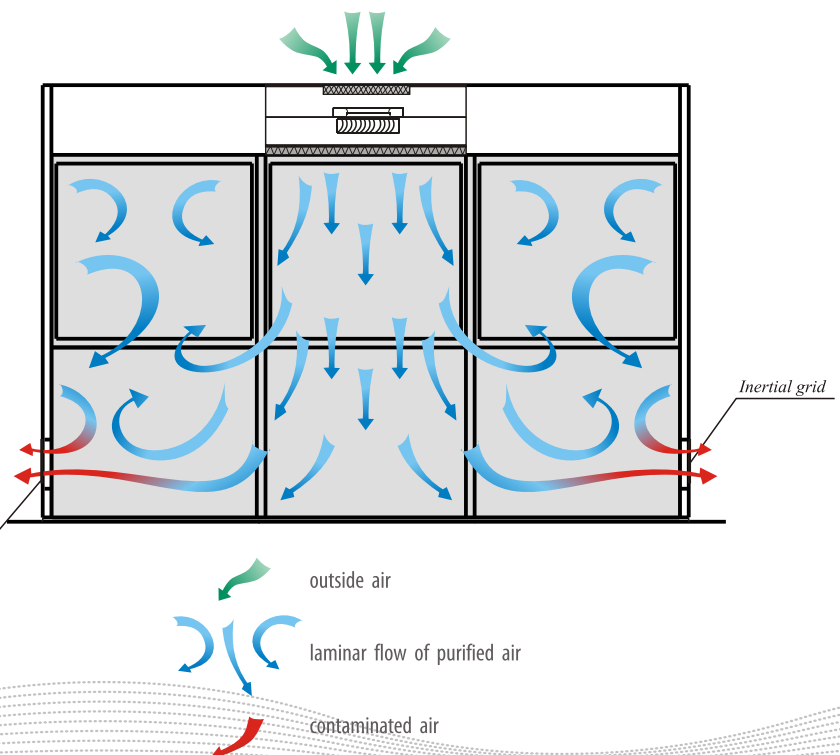
In such an approach, the zone ceiling is formed on a raster principle, filter fan units and lamps are put in their cells.

The rest of the area is closed by ceiling sandwich panels with the metal facing the clean zone.

The product working zone is formed by the enclosing structures fixed in the frame along the product perimeter. The enclosure reaches the floor and is made of transparent tempered glass or sealed metal panels with a special surface coating resistant to disinfectants and UV radiation.

To provide the overpressure inside the zone, inertial grids or diffusers are installed in the walling.

All joints are sealed with a polyurethane sealant for clean rooms.



AIRFLOW SCHEME IN ISO CLASS 7(8) CLEAN ZONES

CLEAN ZONE COMPOSITION

CLEAN ZONE COMPOSITION:

- FILTER FAN UNIT (FFU)
- WALLING OR GUIDE MEMBERS
- BEARING FRAME WITH SUPPORTS
- CONTROL SYSTEM
- ILLUMINATION SYSTEM
- ULTRAVIOLET TREATMENT SYSTEM (IF NECESSARY)

Clean zones can have the necessary number of doors for the operator's entrance and for transportation of some products or equipment that operator works with.

If necessary, all clean zones made by LAMSYSTEMS regardless of the cleanliness class can be equipped with air locks, pass windows and anterooms for the personnel to change into special clean room clothing.



A clean zone for pharmaceutical laboratory
Cleanliness class 5 ISO 14644-1-99 or class A GMP
Assembly overall dimensions (LxWxH, mm) 1905x1605x2580



**A clean zone for an extruder loading station
while manufacturing a high voltage cable**
Cleanliness class 7 ISO 14644-1-99
Assembly overall dimensions (LxWxH, mm) 10200x4200x3800

TYPES OF CLEAN ZONE DESIGN

The zone cleanliness class is defined in accordance with classification of air cleanliness as per ISO 14644-1-99 or GMP.

Structurally, clean zones can be made either as a part of the clean room ventilation system or as a stand-alone product.

The first method is used when the clean zones location is defined while designing a clean room and is not to be changed for the entire period of its operation, as well as if it is necessary to supply the conditioned air into the clean zone workspace.

The second method involves the possibility of changing the location of clean zones which gives more opportunities to change the technological process and modernize the equipment. In this case clean zones made as a stand-alone product can be either fixed to the load-bearing structures of the clean room or be mobile stand-alone products, with the ability to move within the clean room.

STATIONARY CLEAN ZONE

Clean zones can be made in the stationary version when their structures are rigidly fixed to the floor, walls, ceiling or other bearing structures of the room.



A clean zone for the production of special cleanliness materials

Cleanliness class 5 ISO 14644-1-99 or class A GMP

Assembly overall dimensions (LxWxH, mm) 7480x3815x3190

MOBILE CLEAN ZONE

The clean zones can be produced in a mobile version when they are necessary to be relocated. Most often these are cleanliness class 5(6) zones.



A clean zone for operation with optical products

Cleanliness class 5 ISO 14644-1-99

Assembly overall dimensions (LxWxH, mm) 1300x2600x2515

CLEAN ZONE POTENTIAL CAPABILITIES

The clean zone operates on the principle of air circulation in the room where it is installed. Thus, the clean zone not only creates air environment of the guaranteed cleanliness class in it but also effectively cleans the air in the room. Often in such cases additional engineering systems are not required for maintaining the room cleanliness class.



Clean zone "Laminar-S" for a biological research laboratory
Cleanliness class 5 ISO 14644-1-99 or class A GMP
Assembly overall dimensions (LxWxH, mm) 4300x1600x2577

Under certain conditions, the clean zone can be modernized to a clean room with a microclimate inside the zone. For this purpose it is necessary to equip it with an air system supplying conditioned outdoor (street) air.

The process equipment can be integrated into a clean zone completely (picture 1) or partially (picture 2, picture 3).



**A clean zone above the filling line
in pharmaceutical production**

Cleanliness class 5 ISO 14644-1-99 or class A GMP

Assembly overall dimensions (LxWxH, mm) 3105x3105x2420



**A loading door of a freeze-drying is integrated
into the clean zone**

Cleanliness class 5 ISO 14644-1-99 or class A GMP

Assembly overall dimensions (LxWxH, mm) 3105x3105x2420



**A dry heat sterilizer is integrated
into the clean zone**

Cleanliness class 5 ISO 14644-1-99 or class A GMP

Assembly overall dimensions (LxWxH, mm) 3105x3105x2420



To create workplaces of a higher cleanliness class, laminar hoods and fume hoods can be set in clean zones.



The fume hood in the clean zone
Cleanliness class 7 ISO 14644-1-99
Assembly overall dimensions (LxWxH, mm): 4910x4310x2515



A clean zone for control of special cleanliness materials
Cleanliness class 5 ISO 14644-1-99 or class A GMP
Assembly overall dimensions (LxWxH, mm): 7480x3815x3190



A clean zone for medical equipment assembly
 Cleanliness class 5 ISO 14644-1-99 or class B GMP
 Assembly overall dimensions (LxWxH, mm) 8500x4300x2915



A clean zone for a ready medicine laboratory
 Cleanliness class 5 ISO 14644-1-99 or class A GMP
 Assembly overall dimensions (LxWxH, mm) 1905x1305x2515



A clean zone with an anteroom of clouded glass installed in a non-category room
 Cleanliness class 7 ISO 14644-1-99
 Assembly overall dimensions (LxWxH, mm) 4943x4305x3515

CLEAN ZONE CERTIFICATION

Being installed at the Customer's premises, all clean zones manufactured by LAMSysteMS are to be certified according to ISO 14644-3:2005

The certification of clean zones is carried out in the presence of the Customer's representative by specialists of LAMSysteMS who have been trained and qualified and have experience in clean rooms and clean zones certification in electronics and pharmaceutical industries.

The purpose of certification is:

1. Testing the proper clean zone performance and functioning in accordance with operational documents.
2. Testing the integrity of HEPA filters installed in the clean zone and their sealing places.
3. Testing the clean zone performance on fresh air and the ventilation rate.
4. Testing the stated cleanliness class in the working zone of a product according to ISO (ISO 14644-1:1999).

For conducting certification, the professionals of LAMSysteMS have all necessary measuring instruments and equipment.

According to the tests and inspections results, reports and qualification protocols of acceptance tests are made. These documents shall be included by the Customer into the enterprise production certification documentation, and they can also be used to develop corrective measures if the characteristics of the process equipment installed in the clean zone do not meet the cleanliness requirements.

The final stage of this work is training and consulting the maintenance personnel of the Customer to operate the clean zone properly.



STAND-ALONE FILTER FAN UNIT

MAIN PURPOSE:

The active Filter Fan Unit (FFU) is designed for efficient cleaning of the air from aerosol contamination.

**APPLICATION:**

FFU equipped with laminarization screen is used to create a laminar flow and installed over the critical areas that require a high degree of air cleanliness.

FFU equipped with a turbulence stimulator is used to create a higher cleanliness class in the room where they are installed.

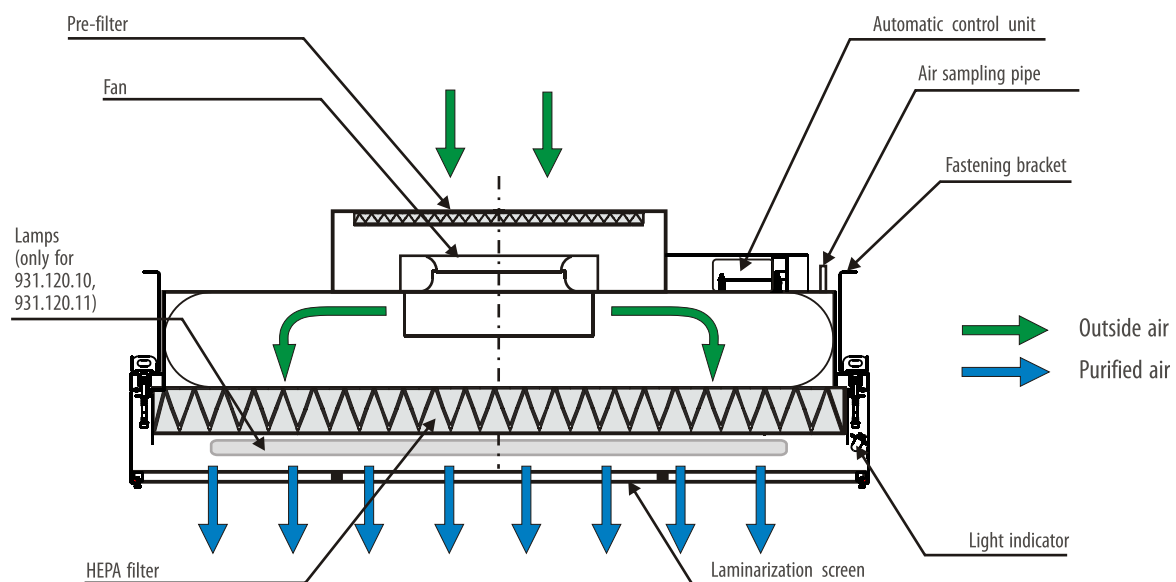
STAND-ALONE FFU CONTENT:

1. Fan with EC-motor (motor with electronic commutation).
2. Pre-filter G4.
3. Class H14 fine HEPA filter.
4. Brackets for hanging to the ceiling and fastening FFUs together.
5. Automatic control unit ensuring the constant airflow velocity, FFU activation and deactivation, operating mode LEDs control, switching to an external computer, if necessary.
6. Light indicators showing modes of FFU operation and emergencies (filters contamination).
7. Laminarization screen made of polymer mesh or turbulence stimulator.
8. Illumination lamps (if necessary).

TECHNICAL CHARACTERISTICS OF STAND-ALONE FILTER FAN UNIT

STAND-ALONE FFU 1.2	931.120.00	931.120.01	931.120.10	931.120.11
FFU material	POWDER ENAMELED STEEL	STAINLESS STEEL	POWDER ENAMELED STEEL	STAINLESS STEEL
The FFU overall dimensions (WxDxH), mm, not more	1200 x 600 x 415			
Weight, kg, not more	35			
Performance of air coming in the room, m ³ /hour	1040-1170			
Power consumption, W, not more	140		218	
Airflow velocity at the exit of FFU, m/s	0,4 - 0,45			
Pre-filter class	G4			
End HEPA filter class	H14			
Filtering module lighting parameters				
- number of lamps, pcs	—		2	
- power of one lamp, W	—		39	
Air supply method	100% recirculation from the room where the FFU is installed			
FFU continuous operation time	No limitations			

AIRFLOWS SCHEME OF FFU



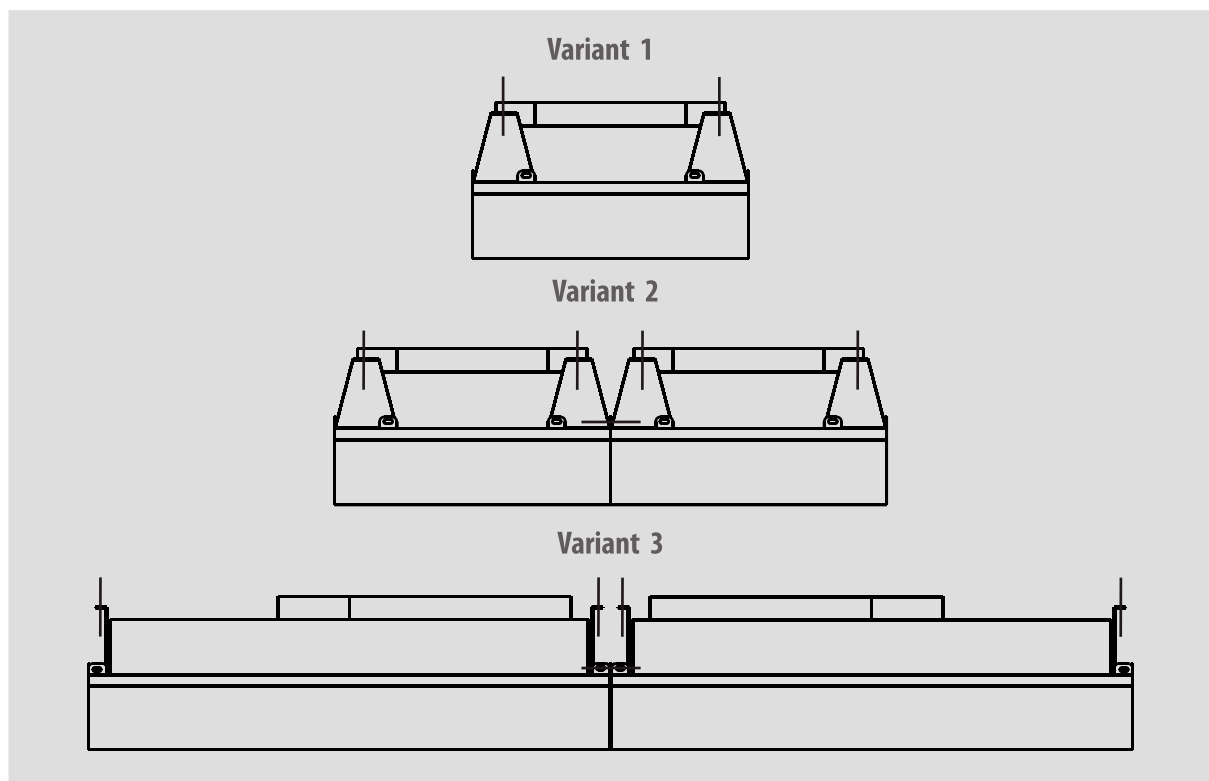
STAND-ALONE FILTER FAN UNIT INSTALLATION

The Filter Fan Unit (FFU) can be installed both separately and together with other FFU (see picture 1).

To fix the FFU to the ceiling, enclosing structures or among themselves, fastening brackets are provided.



Picture 1. **Options of the FFU Installation:**









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