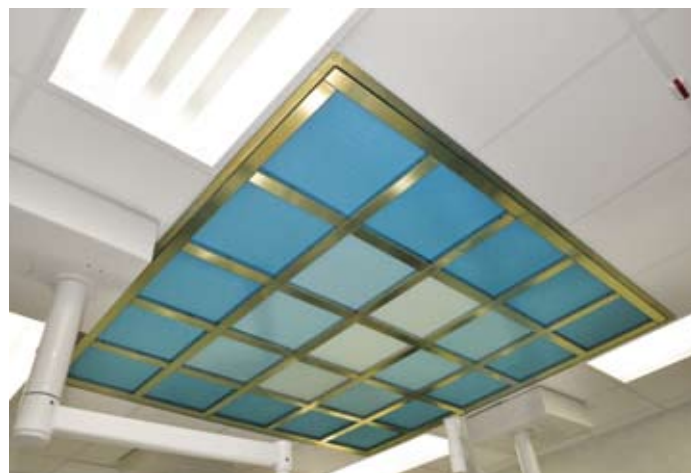


think green.

**SagiCofim**



**DIF O.T.**  
Ceiling filtration system  
for operating theatres

# Air filtration and distribution for operating theatres

The operating rooms are the hospital areas where it is required the most accurate control of the environmental sterility. As the highest source of bacteria is coming from the medical staff during the operation, the highest concentration of contaminants is located around the surgery table, increasing the risk of wound infections. The concentration of microorganisms is taken as an index of sterility of the environment and it is expressed in number of particles carrying microorganisms.

The choice of the air filtration and distribution system for surgery rooms plays a decisive role in creating and maintaining the necessary level of sterility on the operating table, protecting the wound from airborne particles that could contaminate it directly or

indirectly, via contamination of the equipment. To this end it is necessary not only to provide an absolute filtration of the supply air but also to guarantee that it has the right velocity (minimum 0.24 m/s) to ensure the removal of bacteria. At the same time it is mandatory to provide adequate comfort conditions (in terms of temperature, air velocity and noise level) for the surgical team.

In operating rooms for critical surgery, where it is necessary to ensure the highest standards of sterility, studies and research on field have shown that the air should be supplied through a low turbulence unidirectional flow which requires very high air flow rate, up to 50 vol/h. The filtering ceiling developed by SagiCofim is able to handle these high flow rates ensuring air quality and comfort conditions.



## Main requirements for operating rooms

Airborne particles control with protection of the operating table  
Good thermal comfort conditions for the surgical staff  
Efficient anaesthetic gas removal  
Fast particle decontamination rate  
Easy integration with lighting systems  
Assembling flexibility  
Ease of installation

## International Standards

Italian Standard Draft E02058560  
Italian ISPEL Guidelines, 2009  
Italian Legislation DPR n.37, 14/1/1997  
European Union: ISO 14644-1  
France: NF S 90 351  
Germany: DIN 1946-4  
Switzerland: SWKI 99-3  
Austria: ONORM H 6020-1  
Russia: GOST R 52539  
United Kingdom: HTM 2025

# The best solution: DIF-O.T.



The DIF-O.T. ceiling filtration system is the result of the know-how developed by SagiCofim in the techniques of air filtration and distribution for operating rooms.

This system, thanks to H14 efficiency absolute filters, allows a controlled air distribution above the operating theatre and represents the best choice to control the contamination levels.

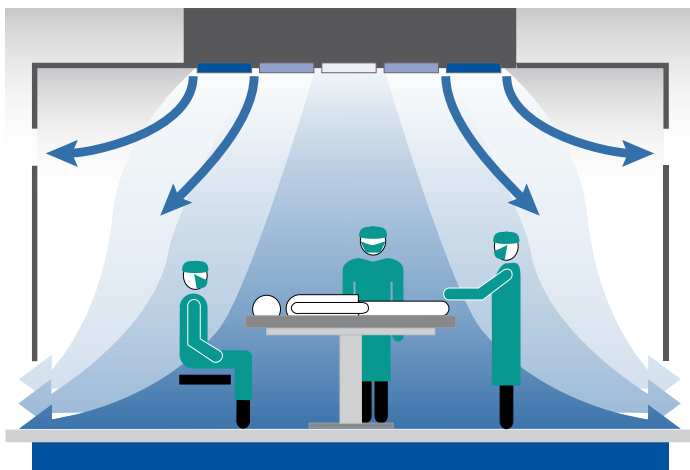
Its peculiarity is the capability to guarantee the sterility levels in **ISO Class 5 Operational Simulated**, i.e. during the intervention, with the surgical team fully operative.

This result is achieved thanks to a sophisticated supply air concept based on unidirectional airflow with differential velocities. The system is designed to provide differential airflow velocities decreasing from the centre towards the perimeter. In this way, thanks to a constant, effective and precise washing of the most critical area above the surgery bed, it is possible to guarantee the most aseptic conditions. The lower perimetrical velocity avoid air induction and prevents contaminated air from entering the operating area, also providing high comfort level to the surgical team.

One of the unique features of this system is the possibility to obtain the requested ISO class with fast particle decontamination time (Recovery Time), also by reducing the airflow rates and, therefore, the energy consumption.

These results are obtained without the use of potentially restrictive physical barriers or air curtains to control the flow: this makes the installation easier and the use of electromedical equipment simpler.

The ceiling is fitted with a reverse liquid seal system around the edge of the filters to provide an effective and reliable airtight seal, without any risk of by-pass between filters and housing, which is the critical point to ensure high classes of sterility. Furthermore, this kind of sealing allows a fast and easy filter replacement. Thanks to these exclusive features, the DIF-O.T. system keeps being used in the major health facilities in Italy and abroad.



## Profilo dei flussi d'aria differenziati

Si identificano 3 aree funzionali a criticità decrescente:

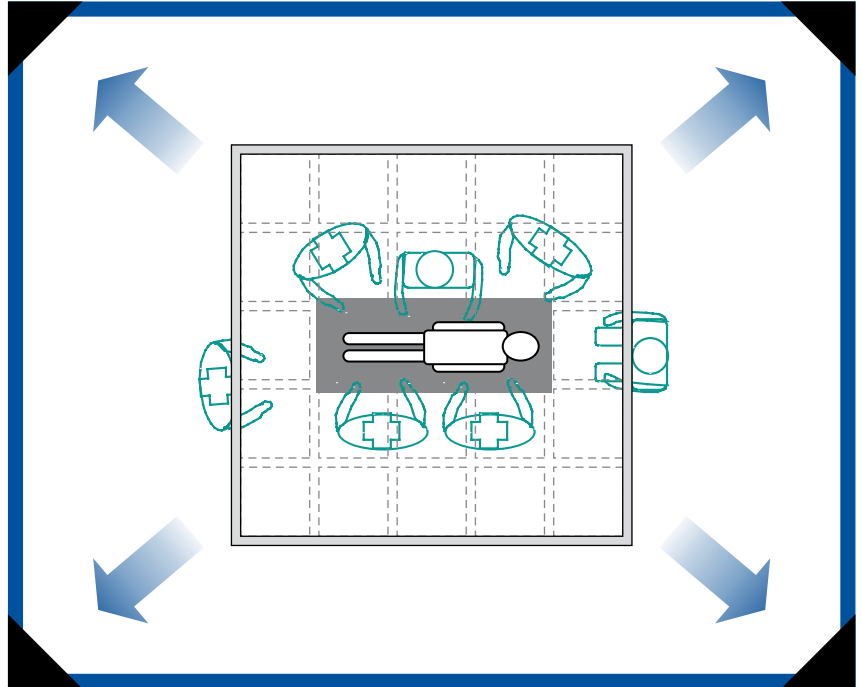
1. Area a maggior criticità: tavolo operatorio.
2. Area occupata dall'equipe chirurgica.
3. Area di transito.

## References

City Hospital - Policoro  
Policlinico San Donato (Milano)  
Fidenza Hospital (Parma)  
San Gerardo Hospital, Monza  
Santa Chiara Hospital, Trento  
Mellina Mellini Hospital, Chiari (Brescia)  
Health Care Facility Santa Rita, Milano  
Health Care Facility Bernardini, Taranto  
Health Care Facility Villa Fiorita, Prato  
City Hospital - Prato (Firenze)  
City Hospital - Taranto  
City Hospital - Courgnè (Torino)  
City Hospital - Cannizzaro, Catania  
City Hospital - S. Giuseppe Vesuviano (Napoli)  
City Hospital - Barcelona (Spain)  
Hospital Pontresina (Switzerland)  
Hospital Neuchâtel (Switzerland)

# Key Success Factors

- Unidirectional airflow from the ceiling with differential velocities
- Air filtration through absolute HEPA filters
- No physical guides or air curtains are required.
- No uncomfortable drafts in the occupied zone
- No contaminated air induction in the critical zone
- **Class ISO 5 “Operational simulated”** guaranteed, during the surgical room operation, certified according to the Swiss Standard SWKI 99-3.
- Perfect tightness by means of a reverse liquid seal around the edge of the filters
- Modular version also available for easy transport and site assembling

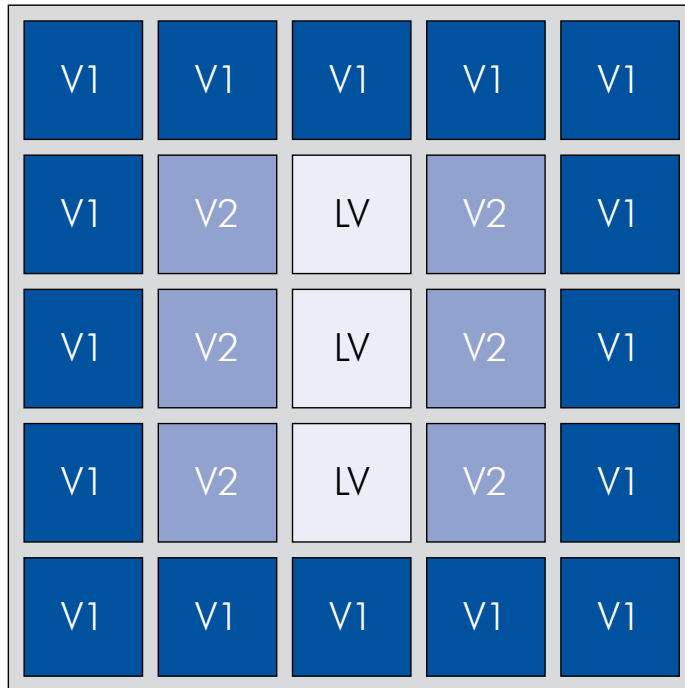


Air return grilles are located in the four corners of the room in two locations: at the floor and at the ceiling level.

# Ceiling structure

- Complete system for ceiling air filtration and distribution, factory assembled and tested.
- Standard dimensions: 3,2 m x 3,2 m x 0,4 m, nominal air flow 9.500 m<sup>3</sup>/h \*
- Holding structure, filter frames and top plenum made of AISI 304 stainless steel.
- HEPA filters, H14 efficiency, with different performance and colours (V1, V2, LV) designed to obtain a decreasing air velocity from the centre towards the perimeter of the surgical theatre.
- Patented flow equaliser to achieve uniform and constant air distribution over the whole surface even with low velocities.
- Perfect tightness guaranteed by a reverse liquid seal around the edge of the filters

\* Models with different dimensions and air flows are available following specific design requests.



## Filters

HEPA filter model MAB rls LV (H14 efficiency, individually scan tested, according to EN 1822).

Uniform air flow over the whole surface ( $\pm 5\%$  relative to the average flow velocity).

No additional flow stabilisers are necessary.

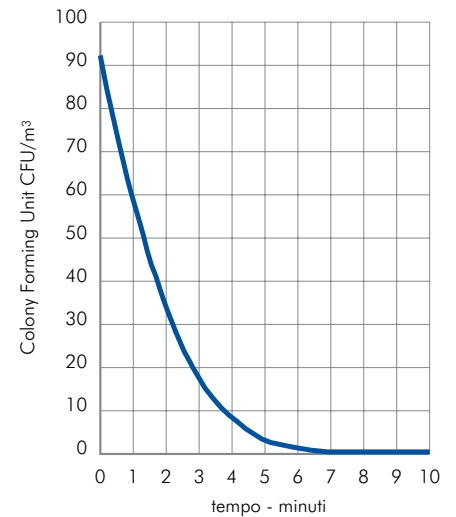
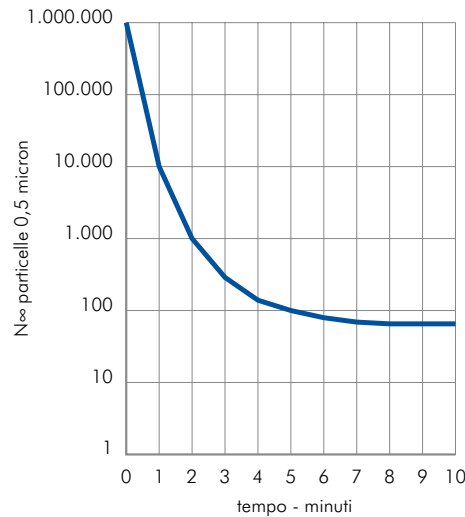
Very low pressure drop through the clean air distributor

No micro-turbulence in the laminar flow area as with conventional filter outlets or perforated plates

# High performance system

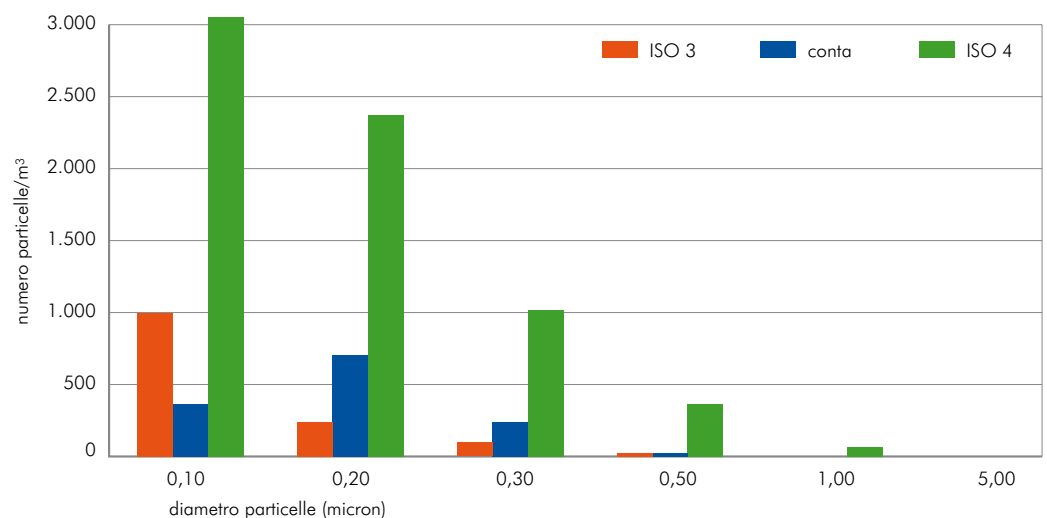
## Fast recovery time

A DIF-O.T. fitted in SagiCofim mock-up room was tested by specialised personnel using an OPC (Optical Particle Counter) and a biological concentration counter. The diagrams show the test results in terms of 0,5 micron diameter particles and CFU (Colony Forming Units). These data were confirmed during the tests carried out on site and certified by independent laboratories.

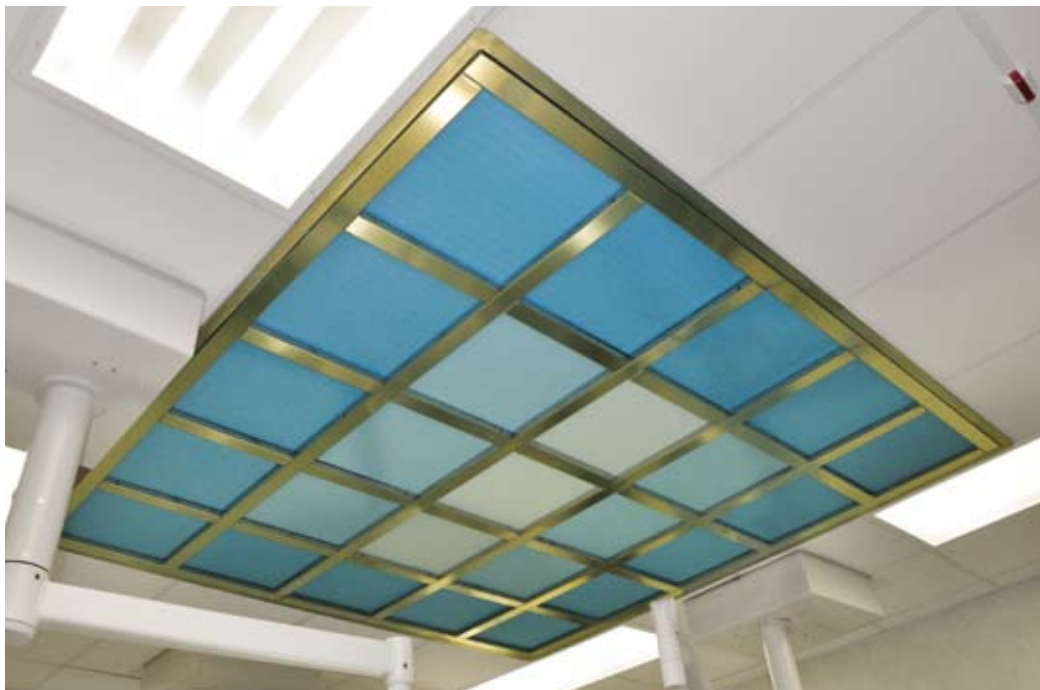


## Low Particle Concentration

The diagram shows the results of the particle count above the operation table. The test has been conducted using an OPC following the ISO 14644-1 procedures. The results refer to tests in "at rest" situation in operating theatres for real operating conditions. The particle count concentration values fall between ISO Class 3 and 4.



# Design description



## Standard size

3,2 m x 3,2 m x 0,4 m

## Rated data

Nominal airflow: 9.500 m<sup>3</sup>/h  
Initial pressure drop: 80 Pa  
Final pressure drop: 350 Pa

## Performance

ISO 5 Operational simulated according to the Standards SWKI 99-3 (2004), VDI2167(2004) e DIN 1946-4 (2008)

Ceiling filtration system for operating theatres with unidirectional airflow with differential velocities, decreasing from the centre towards the perimeter, to provide a dynamic barrier between the operating table and the outer zone.

Class ISO 5 according to ISO 14644-1 "Operational simulated" during the surgical room operation, certified according to the Swiss Standard SWKI 99-3.

Holding structure, filter frames and top plenum made of AISI 304 stainless steel.

Air filtration with absolute HEPA filters, H14 efficiency, with patented flow equaliser allowing to achieve uniform and constant air distribution over the whole surface even with low velocities.

Perfect tightness provided by a reverse liquid seal around the edge of the filters

Aerosol sample point before the filter section in order to conduct the integrity test of filtration system according to ISO 14644-3.

## think green.

Following an approach based on sustainability, SagiCofim is committed to developing and offer the market a full range of product and solutions for comfort and process applications, to meet our customers' needs, without compromising the current and the future environment and to allow next generations to meet their own needs. Through the years our mission has always been the same: provide health, comfort and energy saving, by developing integrated high tech solutions for air filtration, treatment and distribution.

For us, sustainability is a powerful energy management concept to improve the financial and environmental performance of the Company's practices, products and services. Our commitment means a 360° approach: environmentally friendly product design, Life Cycle Cost improvement, manufacturing, packaging and technical advice to our customers, helping them to choose the right solution. For them and for our Planet. Our Company's environmental management system has been certified according to ISO 14001.



## A complete range

Air filtration is the most effective way to guarantee Indoor Air Quality both for the people and for the preservation of materials and equipment. SagiCofim filters include a complete range of product with every level of efficiency for all kind of civil and industrial applications.

- Filter panels, bag filters and compact filters, Class G - F
- Mini pleated and deep pleated high efficiency or absolute filters, Class F - E - H - U
- Gas-phase filtration
- Industrial filtration
- Hospital applications

All solutions are developed in order to obtain the best performance in terms of:

- High efficiency
- Low pressure drop
- High dust holding capacity for a longer filter life
- Use of recyclable and incinerable materials
- Reliability and certified performance

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Ecoefficiency for Indoor Air Quality

