OVERVIEW

CLEANROOM DIFFUSERS

Where the demands on the indoor climate are high

Swegon

Where the demands on the indoor climate are higher than usual

Some environments place greater and more varied demands on the indoor climate. These environments can require significantly higher air flow and have extremely high demands on air cleanliness, at the same time as systems are to be easily cleaned and silent.

Example of environments that have extra high demands:

- Operating theatres- Extremely clean air conditions are critical so that patients are not exposed to harmful particles or bacteria, at the same time the indoor climate must be pleasant and quiet so that staff are able to perform their work.
- Cleanrooms - Rooms where extra high demands are made on the air and low levels of contamination such as dust and chemical vapours, to reduce the staff's exposure to contamination or protect the manufacturing process. For example, laboratories, production of electronics and pharmaceuticals.

There are different procedures to measure the quality and cleanliness of the air. ISO 14644 is a standard used to measure air cleanliness. According to this standard, particles and their size are measured per cubic metre of air.

In a cleanroom the air is kept particle-free by using an air filter in the ventilation system, usually a HEPA filter. A HEPA filter ensures that the air supplied to the room is clean and free of contamination and at the same time creates the prerequisites to be able to control and satisfy the set cleanliness requirements.

HEPA filters are available in 5 different filtration classes where the designation refers to the filtration capacity, i.e. how many particles that the filter can capture per litre of air. HEPA 14 lets through max 5 particles per litre air, which corresponds to 99.99% of all particles. This makes the filter suitable for ventilation systems in cleanrooms.

ISO 14644-1 Classification of air cleanliness by particle concentration

Class	Max particles/m³					
	=0.1 µm	=0.2 µm	=0.3 µm	=0.5 µm	=1 µm	=5 µm
ISO 1	10	2				
ISO 2	100	24	10	4		
ISO 3	1,000	237	102	35	8	
ISO 4	10,000	2,370	1,020	352	83	
ISO 5	100,000	23,700	10,200	3,520	832	29
ISO 6	1,000,000	237,000	102,000	35,200	8,320	293
ISO 7				352,000	83,200	2,930
ISO 8				3,520,000	832,000	29,300
ISO 9				35,200,000	8,320,000	293,000

Infection sensitive surgery

Air in typical urban environments

Swegon has solutions for an optimal and clean indoor climate

Operating theatre

Efficient ventilation is critical during an operation! It is essential to distribute clean air into the operating theatre to, among others, the spread of infection, at the same time it must be pleasant for both patients and healthcare personnel who occupy the room. The supply air diffuser OPL is especially designed for the air flow required in an operating theatre.

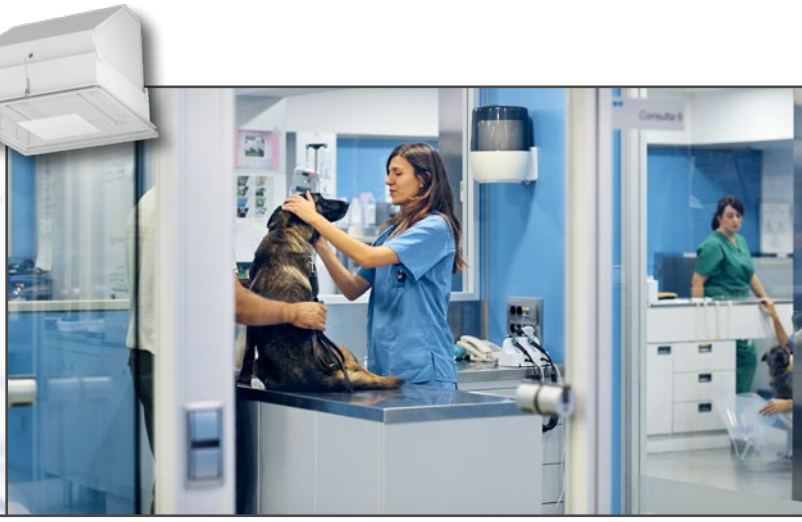
Laboratory

Laboratories are important facilities that can be found at research institutes, universities, within industries and in hospitals. Here it is important that all work is performed under controllable conditions including air. Here the ceiling diffuser CONDOR is very well suited with its capacity and adjustable distribution pattern.

Industry/R&D

A controlled manufacturing process is essential in many industries. This can result in demands on minimum levels of airborne particles and maximum control of the temperature, humidity and differential pressure.

Electrical components are for example sensitive to dust particles, airborne microbes and chemical vapours. Therefore an absolute clean environment is required, which CDH/CLH provides.



Clean zones

For example, preparation room where all implements for the operation are prepared. Here there is a great demand on clean air, CDH/CLH with its microfilter makes sure that the air does not contain contamination or bacteria that can attach to implements.

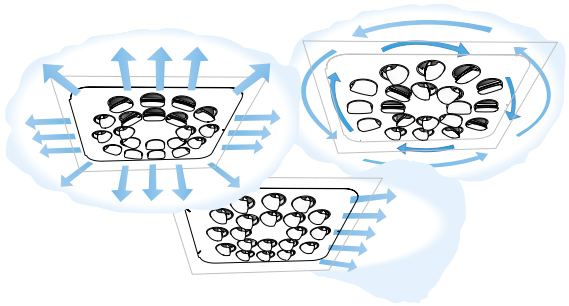
Swegon's cleanroom diffusers

Here we have collected our diffusers that are specially designed to meet the requirements placed on the air in cleanrooms.

CONDOR

Nozzle ceiling for big air volumes in small areas

- **100% flexible distribution pattern with nozzles**
  When premises are rebuilt or the need in the cleanroom changes, even the air distribution needs to be changed. The limitation on these occasions is reduced with the help of the nozzles in CONDOR and they make it easier to adjust the distribution pattern to suit the new conditions. In just a few minutes, you have adapted the distribution pattern by adjusting the nozzles without the need of rebuilding the ventilation system.
- **Substantial induction capacity**
  Air induction - With supply air, fresh air is induced (mixed) in the room air and CONDOR with nozzles in a rotation pattern has the capacity to effectively mix the supply air with the existing room air.
- **Cleanable**
  The most important thing in a cleanroom can be heard in the name: cleanliness. However, it's not sufficient to only keep the room clean, it is just as important to be able to clean the ventilation system and the air diffuser. With CONDOR no tools are required to reach the duct system and clean, while it's easy to clean the front.

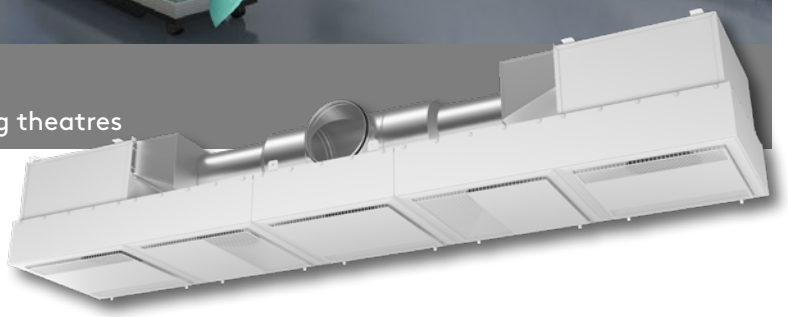


Air flow - Sound pressure room (Lp10A) *)		
CONDOR Size	30 dB(A)	
	l/s	m³/h
1200-600-250	140	504
1800-600-315	200	720
2400-600-315	245	882
3000-600-400x 250	310	1116
1200-1200-315	260	936
1800-1200-600x 200	360	1296
2400-1200-600x 300	490	1764
3000-1200-800x 250	570	2052

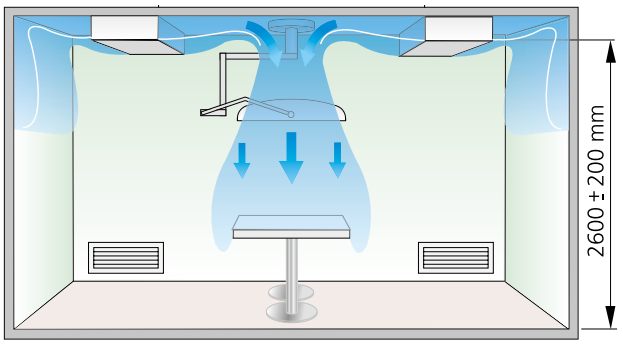
*) Lp10A = Sound pressure incl. A-filter with 4 dB room attenuation and 10 m² room absorption area.

OPL

Supply air ramp with micro-filter for operating theatres



- **Especially adapted air flows for operating theatres**
  High demands are placed on the air in operating theatres to prevent the spread of infection. The different flow directions from the air diffuser sections ensure a clean zone with filtered air.
- **Suitable for general surgery**
  Different types of surgery place different demands on the cleanliness of the air. OPL is suitable for general surgery where the CFU content can be between 50-100 particles/m³. (CFU = number of bacteria-bearing particles per cubic metre).
- **Pressure socket for filter monitor**
  Measurement tapping for DOP test*) and pressure measurement across the filter.
  *) Test of leakage on the product and check of the filter's particle separation efficiency with DOP testing.
- **Openable for cleaning**
  Cleaning and sterilisation of operating theatres are performed daily, after each operation. OPL is fully openable, making it easy to access and clean areas that otherwise would be hard to reach. It is also an important part to clean the ventilation system as dust and dirt can collect and contribute to impaired functionality.
- **Equipped with micro-filter H14**
  Filtering class that captures up to 99.99%.



Air flow – Pressure drop – Sound level – Air velocity		
OPL Size		Speed across filter
		0.45 m/s
3500 (x2)	q (l/s)	650
	q (m³/h)	2340
	Pt (Pa)	110
	Lp (dB(A))	35

Data applies for a complete installation with two ramps.

CDH/CLH

Ceiling diffuser with micro-filter for cleanrooms

- Rectangular or circular duct connection
- Size CDH/CLH 60 designed for suspended ceiling systems 600x600 with visible T-bars
- Equipped with micro-filter H14 with gel (CLH) or rubber seal (CDH)
- **Painted inside for easy cleaning**
  Cleaning is important in a cleanroom, therefore CDH/CLH is painted internally to allow it to be wiped off and cleaned without particles fastening in uneven surfaces.
- **Pressure socket for filter monitor**
  Measurement tapping for DOP test*) and pressure measurement across the filter.
  *) Test of leakage on the product and check of the filter's particle separation efficiency with DOP testing.
- **Perforated diffuser face or 100% flexible distribution pattern with nozzles**
  With nozzle modules it is simple to adjust the distribution pattern to meet new conditions, for example, after rebuilding or if the need in the cleanroom changes.
- **Simple filter access**
  To replace the filter regularly is important. Over time particles will accumulate, which in turn will result in lower air flow through the filter. CDHL/CLH provides easy access to the filter so that replacement can be done effortlessly.

Suitable for:

Clean zones within healthcare, for example, sterile pack store and preparation rooms. Manufacturing industry with special demands on cleanliness: pharmacology, electronics and food technology.

Airflow - Pressure drop - Sound level*					
CDH/CLH		Velocity across the filter at 0.45 m/s			
		Air flow q		Pressure drop Δp Pa	Sound level LpA dB(A)
Size	Type	l/s	m³/h		
33-160-1	Perf.	41	148	150	<15
	Nozzle	41	148	170	<20
60-315-1	Perf.	116	418	40	<15
	Nozzle	116	418	55	<25
66-315-1	Perf.	167	601	145	<15
	Nozzle	167	601	170	35

*Upper limit for the air flow is equivalent to 0.58 m/s across the filter's nominal gross area. Data applies to 4-way horizontal spread pattern.

References

SANDVIK COROMANT (Gimo, Sweden) Industry with CDH nozzle diffuses in cleanroom R&D

SUNDERBY HOSPITAL (Luleå/Boden, Sweden) Hospital with perforated CDH in the emergency department

Photography: Anders Alm

VÅRDA
(Stockholm, Sweden)
Eye clinic with CDH nozzle diffuser in the operating theatre.

SOPHIAHEMMET
(Stockholm, Sweden)
Hospital with OPL in the operation theatre.

MEDSYN
(Stockholm, Sweden)
Eye clinic with CDH nozzle diffuser in the operating theatre.

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Feel good **inside**

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