



**WE BUILD  
YOUR  
EXPERTISE**

ENGINEERING

NUCLEAR AND  
ENERGY

AEROSPACE

PHARMA-  
CEUTICAL

SEMI-  
CONDUCTOR

FOOD  
INDUSTRY

MECHANICS

ELECTRONICS

DEFENSE

HEALTHCARE

**PROFESSIONALS IN MODULAR  
CLEANROOM TECHNOLOGY**



**PROCLEANROOM**  
BUILD YOUR EXPERTISE

# Welcome to ProCleanroom



As a commercial-technical engineer I am naturally fascinated by advanced technologies and the speed at which technology changes our world. Technological developments are affecting our daily life, often without us noticing.

Some decades ago, cleanrooms and flow units were inconceivable for most companies. Over the years, the necessity for, and the use of cleanrooms and flow units has increased dramatically. More and more processes are taking place in a clean environment.

At ProCleanroom we want to enable companies and research institutes to develop their field of expertise by supplying professional, affordable, modular cleanrooms, flow units and special enclosures. Our ambitions are high and every day we work on delivering on our promise with a passion. We guarantee the most effective cleanrooms and flow units with the lowest cost of ownership, something we pride ourselves on. Over the years we have welcomed leading companies and research institutes at ProCleanroom. We are happy to welcome you and help build your expertise.

## Niels Ferguson

*Director ProCleanroom*

1997

*Frank Ferguson founded engineering agency Fergutec B.V, focussed on advising research institutes and hi-tech companies on business-critical vacuum processes and the supply of key high vacuum components and systems.*

2005

*Due to increasing demands from our customers for clean environments, Fergutec B.V., added cleanrooms to its portfolio to support critical vacuum processes.*

2009

*To serve an increasing diversity of sectors even better and to develop further, ProCleanroom was established, a professional in the sector, founded by and run by top-class technicians.*

2016

*Introduction of our unique modular cleanroom concept. From the 1st of September, Niels Ferguson, who has been working with the firm for over 11 years, will be owner and general manager.*

## ProCleanroom strengths

At ProCleanroom we believe that the best cleanrooms and flow units are built around the developments taking place within these environments. We take the critical processes of our customers as the starting point for the development of our modular cleanrooms and laminar flow units.

With our knowledge and experience we analyse the critical processes and define the requirements our products need to meet. In this way we always create an optimal solution that seamlessly fits your needs.



CLEANROOM  
EXPERT

## Lasting partnership

At ProCleanroom we supply the best quality products and as a result of our knowledge, experience and innovative character, we are an industry leader in the world of clean-tech. Due to lasting partnerships with companies in the tech industry, we are the flexible professional partner for modular cleanrooms and laminar flow units for projects in The Netherlands as well as abroad. We serve tech-companies and research institutes in a wide range of markets, such as the high-tech, pharmacy, health care, aerospace industry, precision mechanics and the electronics branch.

## Customisation and in-house design

ProCleanroom has its own design where qualified engineers work on tailored solutions and new innovations. We have developed a unique concept that sets it apart from others due to high efficiency levels. The technology in our cleanrooms and flow units ensure the lowest energy consumption in the market. Besides class leading efficiency, our in-house design department offers more; tailored solutions and custom designs.

## ProCleanroom stands for:

- Personal, lasting relationships
- Customisation and in-house design
- The best quality
- Lowest cost of ownership

# ProCleanroom

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## **Ensuring the best quality**

ProCleanroom knows the processes of its customers and the expertise required. Because quality and precision are prerequisites, ProCleanroom continuously looks to improve the quality of its products and processes. The professional engineers of ProCleanroom (qualified according to the standards of the international Cleanroom and Certification Board) are accredited to perform validation to ISO14644-1/3 standard.

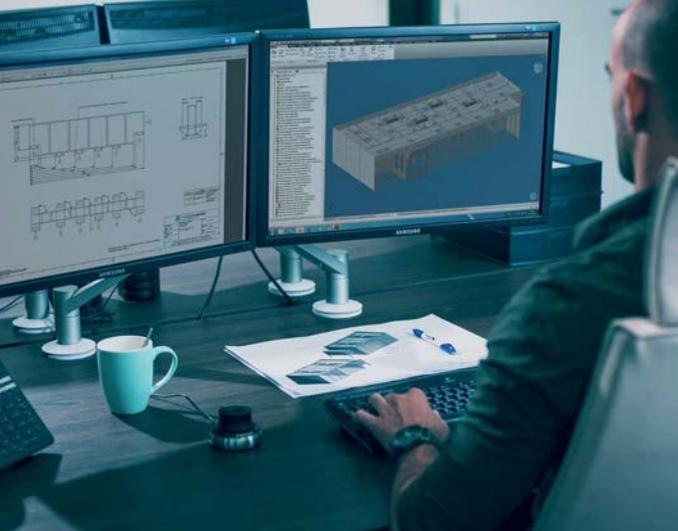
The engineers at ProCleanroom are VCA qualified to ensure a safe working environment and -conditions. Furthermore, ProCleanroom is a member of the VCCN (Association Contamination Control Netherlands). All cleanrooms and flow units are CE marked and thus comply with CE directives.

## **Lowest cost of ownership**

The clean air solutions of ProCleanroom are energy-efficient and have the lowest operational costs in the market (cost of ownership). ProCleanroom supplies the most efficient energy concept by use of air filtration systems with the lowest energy consumption.

At ProCleanroom we think ahead. Our cleanrooms and flow units are designed in such a way that they can be cleaned easily. In addition, delivery and installation is performed smoothly, due to pre-assembly. This way business processes are interrupted as little as possible, and when coupled with short delivery times, ensure cost savings.





## Our benefits



Most efficient energy concepts



Quality



ISO class 3 - 9



> 18 years of experience



Installed in every space



Fast delivery



Lowest cost



Flexible design



Permanent and mobile

## Experience ProCleanroom

ProCleanroom is your partner for clean air solutions. From design, manufacturing, installation to validation of cleanrooms, flow units and customised solutions. We supply cleanrooms with dimensions of 1 m<sup>2</sup> to more than 2000 m<sup>2</sup>. Moreover, our cleanrooms can easily be extended as required, or even adjusted and are easy to relocate. This way we can provide a solution for any situation.

## Visit us

Curious about the products by ProCleanroom? Come visit our showroom in Valkenswaard. Ask for a demonstration of our ISO Class 7 cleanroom and ISO class 3-5 down- and crossflow units. You can experience first-hand what ProCleanroom has to offer.



**PROCLEANROOM**

BUILD YOUR EXPERTISE

# Cleanrooms

Build your expertise with a cleanroom by ProCleanroom - your partner for the supply of a clean working environment that complies with the laws and regulations within your industry. Through years of experience and specialist knowledge, ProCleanroom ensures an ultra-clean environment and the lowest cost of ownership by using the most energy efficient components and concepts. So quality custom work at the best price.

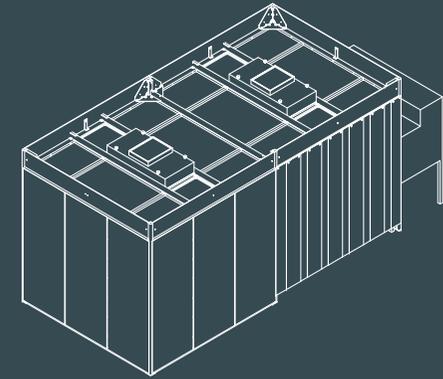


## Why a modular cleanroom?

In today's economy, new technological developments follow each other rapidly. Because of changes in regulations or processes, the requirements for clean environments for process and product protection also change. ProCleanroom provides cleanrooms that can easily adapt to the dynamics in your market.



The modular construction system of ProCleanroom is flexible, portable and can be easily expanded. ProCleanroom provides hardwall cleanrooms, softwall cleanrooms and mini environments.



## CLEANROOM EXPERT

### Benefits

Modular cleanrooms have a number of advantages over traditional cleanroom construction. Because of pre-assembly, modular cleanrooms have a shorter delivery time and can be efficiently installed on site. In case of changing needs in business or process, modular cleanrooms can be easily expanded, reduced in size, reorganised or moved.

The initial investment for a modular cleanroom is significantly lower than for traditional construction. The above properties result in time savings, flexibility and cost savings.

### Experience ProCleanroom

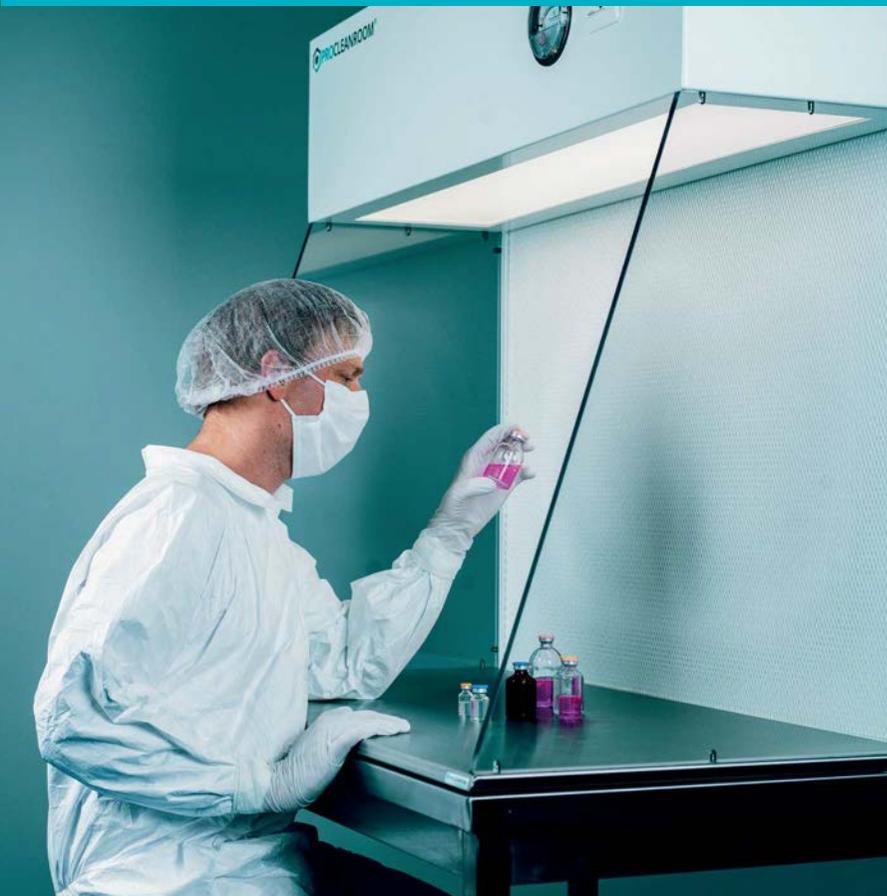
Curious about the products by ProCleanroom? Come visit our showroom in Valkenswaard. Ask for a demonstration of our ISO Class 7 cleanroom and ISO class 3-5 down- and crossflow units. You can experience first-hand what ProCleanroom has to offer. Do you want to know about our projects, then view the case studies in this brochure.

### The cleanrooms by ProCleanroom:

- Lowest operational cost in the market
- Efficient and functional design
- Both custom and standard solutions possible
- According to cleanroom standard ISO14644-1/3
- Easy to clean and innovative flush ceiling
- Free-standing cleanroom self-supporting frame
- Programmable controller
- Fan Filter units with EC (DC) motors

# Flow units

When you require a clean environment workstation, ProCleanroom offers a solution with its laminar flow units. Through unidirectional airflow, a particle free environment is created that allows critical processes to run according to the highest standards. The air in the LAF unit is free from particles and micro-organisms and protects against harmful product and process contamination.



## What is unidirectional airflow?

Unidirectional airflow represents an air flow in one direction without interruption by turbulence. In a LAF unit, the air flows in a unidirectional pattern from the HEPA or ULPA filter surface. This may be a horizontal flow (crossflow) or a vertical flow (downflow).

## Downflow or Crossflow?

Laminar flow units are available as:



**Crossflow units** providing a horizontal air flow over the working area (back to front)



**Downflow units** providing a vertical air flow over the working area (top to bottom)



EXPERT IN  
FLOW UNITS



### **VLFU and HLFU series**

The VLFU series by ProCleanroom is a standard range of vertical laminar flow cabinets (downflow). The HLFU series is a standard range of horizontal laminar flow units (crossflow). Within both series we provide various standard sizes. Depending on the application, downflow may have advantages over crossflow or vice versa. Contact us to discuss your application and we will help you make the right choice.

### **Customisation**

A lot of applications are unique and ask for special attention. ProCleanroom has its own engineering and CAD department and can offer a custom solution. The downflow and crossflow customised solutions are fully tailored to the needs and requirements of the client. As a skilled specialist, ProCleanroom is your partner for advice and expertise. Are you curious about the possibilities? Then visit our demo area. Do you want to know about our projects, then view the case studies in this brochure.

### **The flow units of ProCleanroom**

- Fan filter unit with DC (EC) motor
- Lowest power consumption in the market
- Lowest operational cost in the market
- Heat load is nil
- User-friendly and reliable
- Ergonomic design and easy to clean
- On-site installation and validation possible



# Validation

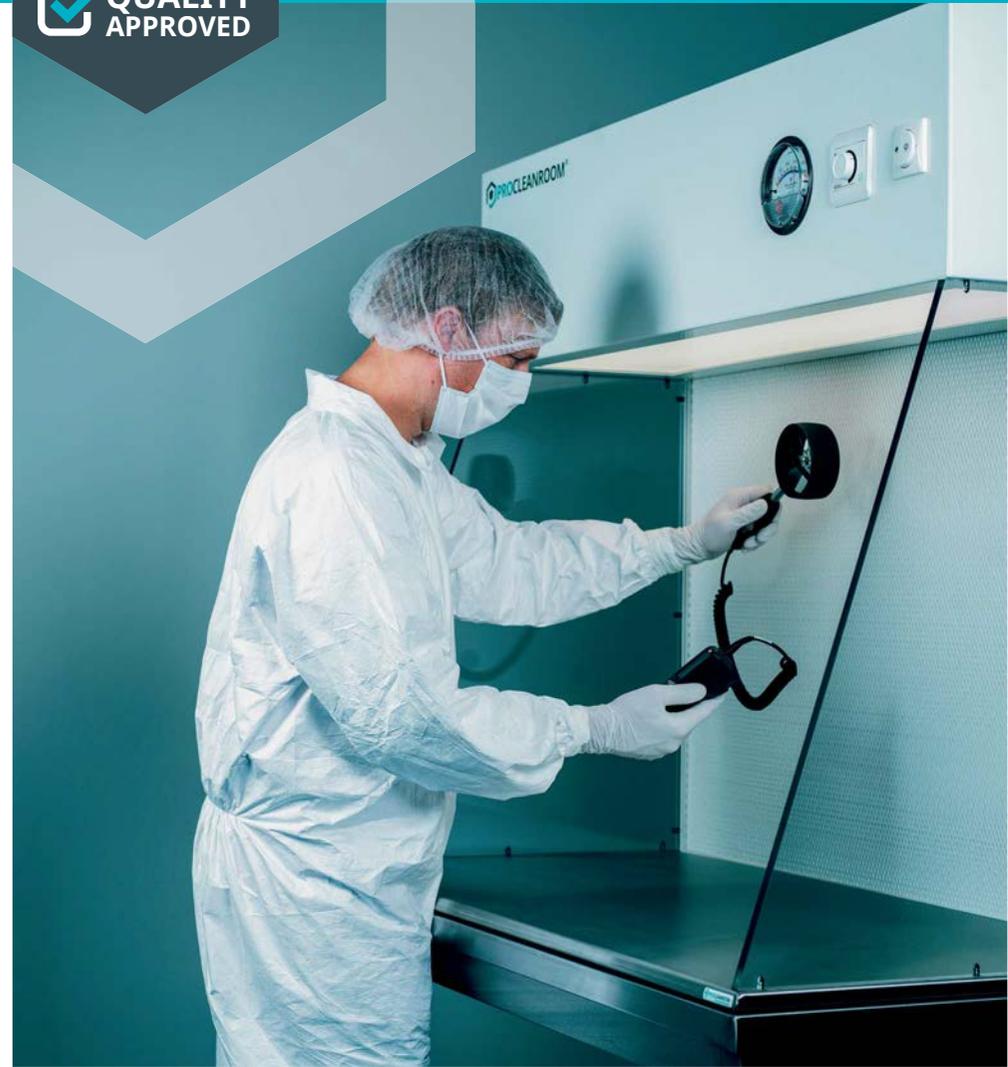
Are you looking for an expert to validate your cleanroom or flow unit, then ProCleanroom is the partner you need. ProCleanroom provides validations according to the international standard (ISO14644-1:2015). Validation is done according to a predetermined validation protocol.

Upon completion of a new cleanroom or flow unit by ProCleanroom, you will receive an interim validation report. The comprehensive, definitive validation report will be in your possession within a couple weeks. ProCleanroom also provides periodic validations for its customers. This way, quality is ensured. Besides its own cleanrooms, ProCleanroom also validates third-party cleanrooms and flow units.

## Validation interval

According to ISO14644-1:2015, cleanrooms and flow units have to be validated in accordance with a maintenance and validation programme tailored to the individual process. In practice, this usually leads to a validation interval of 12 months of cleanrooms with ISO class 6 or higher. For cleanrooms or flow units with ISO class 5 or lower, the validation interval is usually 6 months. Do you want a cleanroom or flow unit that continues to perform according to the specifications? Then make a validation appointment with a qualified ProCleanroom CTCB-I engineer.

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### Validation tests:

- Particle counts (concentration of airborne particles)
- Air velocity
- Light intensity (Lux)
- Air changes (circulation rate)
- Pressure difference
- Recovery time
- Aerosol smoke visualisation
- Sound pressure level (dB(A))
- Temperature and humidity
- HEPA or ULPA filter integrity (DOP test)

# Accessories

ProCleanroom is a one-stop supplier of cleanroom furniture, accessories and consumables. Are you looking for a handheld or a remote particle counter for cleanroom testing or general air quality monitoring? Or are you looking for the right furniture and clothing for your cleanroom? ProCleanroom offers an excellent programme for this. Please contact us for the current offer and to discuss the application. Together we will select the right product.

## Particle counters

Available at ProCleanroom:

- Handheld particle counters
- Remote particle counters
- Air quality monitors



Apart from purchasing a particle counter, you can also rent a particle counter or air quality monitor per day or per week. Together we will select the right product for your measurement/process and offer adequate support where required.



## Furniture

Stainless steel or HPL cleanroom furniture in standard sizes or custom. For example: tables, workbenches, step-over benches, trolleys, racks, chairs and stools. With or without wheels.



## Components

As spare parts or for self-assembly. For example: HEPA or ULPA fan filter units, pre-filters, transparent strips, pressure gauges or speed controllers.



## Clothing

Overalls, coveralls, lab coats, glasses, face masks, footwear, shoe covers, caps, etc. The clothing provides protection and comfort. The fabric is anti-static, lint-free and free of silicone.

# Case studies

Are you building your expertise, then choose ProCleanroom cleanrooms and flow units and excel in your field. The people of ProCleanroom have the knowledge about your sector and the critical processes with regard to cleanrooms and flow units. After years of experience they can call themselves experts in the clean air solution sector.



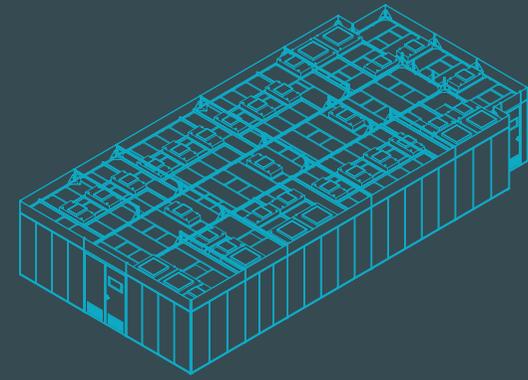
## ProCleanroom case studies

The ProCleanroom products meet the highest requirements and standards. The ISO-certified products can be arranged entirely to the demands and wishes of the internal organisation as well as your sector. ProCleanroom supplies customised solution and facilitates users in their quest for innovations and breakthrough technologies. ProCleanroom is the technical sparring partner for customers in The Netherlands, Benelux, Europe and the rest of the world.

**View our case studies for an overview of several realised cleanroom and flow unit projects.**

# Hardwall cleanroom

## Solar cell manufacturing



### The project

ProCleanroom has supplied a hardwall cleanroom with different zones and classes, for the application of a pilot production line for the manufacturing of solar cells. The plant in Scandinavia covers the production of nanotubes and nanowires and is unique in the market. Due to the distinct process the user has a leading position in the market and will contribute to the ability to produce very effective solar cells at a lower cost in the near future. The cleanroom was provided as a turnkey solution including validation and report.

### Benefits for the user:

- Advanced controller for maximum control and flexibility
- Extending and relocation possibilities
- Lowest cost of ownership

### Specifications at a glance:

- Total surface: 130 m<sup>2</sup> - ISO class 5 to 8 in different zones
- Equipped with hardwalls, swing doors and local softwall strip curtains
- Completely free-standing and self-supporting construction
- Energy efficient fan filter units with nil heat load



# Special enclosure

## Laser-safe machine enclosure



### The project

A manufacturer of high-quality measuring systems was faced with a challenge: to safely house an optical measuring system, and to protect it against particles. This means combining a very clean ISO class 5 down-flow with a laser-safe machine enclosure. As soon as a door, panel or cable tray is opened or removed, the validated interlock system ensures that the user's setup is made laser safe. Because of the technical knowledge, high degree of flexibility and short communication lines, ProCleanroom was chosen as the supplier for this special enclosure.

### Benefits for the user:

- Fully custom-designed cleanroom machine enclosure
- Laser safe solution through innovative design and integrated safety system
- Flexible and mobile

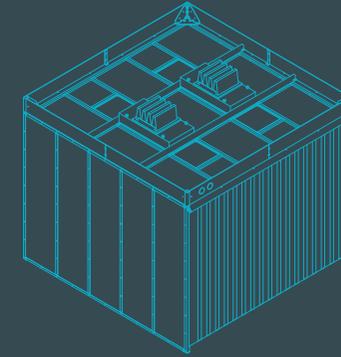
### Specifications at a glance:

- Internal dimensions: 1.2 x 1 x 2.2m (WxDxH), ISO class 5
- HEPA H14 filter with uniform airflow
- Double door for maximum access
- Removable rear panels and laser safe cable tray



# Softwall cleanroom

## Tech industry



### The project

The user is a multinational manufacturer of compressors and vacuum pumps in small and very large sizes. This ISO class 8 cleanroom is used to create a clean environment for high-quality industrial application. In the cleanroom, the user assembles special compressors in which high concentrations of oxygen can be present. In this procedure, there is a need to limit the number of particles to a minimum to reduce risk of explosion. This so-called hybrid cleanroom is placed in a manufacturing hall and is composed of three solid walls and a softwall side with a net opening to bring products into the cleanroom.

### Benefits for the user:

- Possible to be darkened for quality inspection with UV light
- Easy to clean and remains clean due to unique ceiling
- Molecular filtration through activated carbon filter

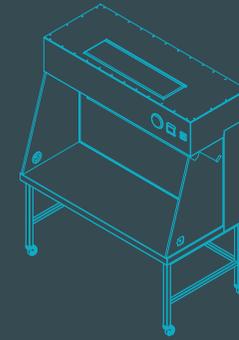
### Specifications at a glance:

- Total surface: 16 m<sup>2</sup> – ISO class 8
- Automated cleanroom controller
- HEPA H14 filter system with alarm signalling
- Unique flush ceiling with integrated LED panels



## Crossflow unit

# Display assembly and repair



### The project

Particles are a potential problem for displays. Particles in displays are very tricky to remove and they usually lead to product rejection. A leading manufacturer in automation solutions for metal processing machinery uses this crossflow unit for ESD compatible assembly and repair of industrial displays. The ISO class 5 work environment is equipped with a horizontal unidirectional airflow, causing dust particles to be removed directly from the cabinet. The ionisation bar eliminates any static charge from the airflow and from any products contained in the crossflow unit.

### Benefits for the user:

- Very clean working environment through horizontal laminar flow
- ESD safe working through fitted ionisation bar
- Quiet and nil heat load through modern motor technology

### Specifications at a glance:

- Very clean working environment, ISO class 3 to 5
- High uniformity at filter surface
- Airspeed adjustable over large range
- Movable by wheels



# ISO 14644-1: Cleanroom standard

The definition of a cleanroom according to the current ISO standard ISO 14644-1:

“Cleanroom – Room in which the concentration of airborne particles is controlled and classified, and which is constructed and used in a manner to minimize the introduction, generation and retention of particles inside the area.”

**Selected Airborne Particulate Cleanliness Classes** for cleanrooms and clean zones shown in ISO 14644-1:2015

**Maximum concentration limits** (particles/m<sup>3</sup> of air) for particles equal to and larger than the considered sizes shown below

ISO Classification number	≥0.1µm	≥0.2µm	≥0.3µm	≥0.5µm	≥1.0µm	≥5.0µm
ISO Class 1	10	-	-	-	-	-
ISO Class 2	100	24	10	-	-	-
ISO Class 3	1.000	237	102	35	-	-
ISO Class 4	10.000	2.370	1.020	352	83	-
ISO Class 5	100.000	23.700	10.200	3.520	832	-
ISO Class 6	1.000.000	237.000	102.000	35.200	8.320	293
ISO Class 7	-	-	-	352.000	83.200	2.930
ISO Class 8	-	-	-	3.520.000	832.000	29.300
ISO Class 9	-	-	-	35.200.000	8.320.000	293.000

**Cross reference to other standards and advised air changes per class**

Cleanroom Standard	Cleanroom Classification					
ISO 14644-1	Class 3	Class 4	Class 5	Class 6	Class 7	Class 8
Federal Standard 209E	1	10	100	1.000	10.000	100.000
EU GGMP	-	-	A/B	-	C	D
Air changes per hour	360-540	300-540	240-480	150-240	60-90	5-48

# Get in touch

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## Want to know more? Get in touch.

Follow us on our social media channels, sign up for our newsletter and stay informed about the latest news and developments in the area of clean air solutions.

In addition, ProCleanroom frequently provides white papers and application notes to share their knowledge with users and interested persons from the industry.

If you would like more information about our products and services, then check our product brochure or contact us. View our website, send us an email or visit our demo area in Valkenswaard.

## Let us share our expertise and build the best!

[www.procleanroom.com](http://www.procleanroom.com)



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