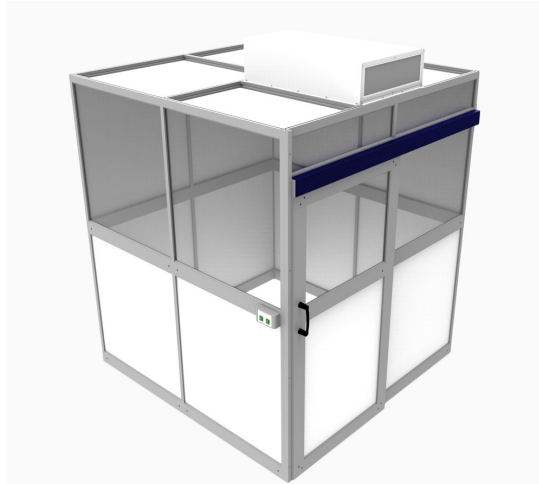# Integrity Modular Cleanroom

Cleanrooms Overview

Typically used in manufacturing or scientific research, a cleanroom has a controlled level of contamination that is specified by the number of particles per cubic meter at a specified particle size.

Cleanrooms are used in practically every industry where small particles can adversely affect the manufacturing process. They vary in size and complexity and are used extensively in industries such as semiconductor manufacturing, pharmaceuticals, biotech, medical device and life sciences, as well as critical process manufacturing common in aerospace, optics and military.

A cleanroom is any given contained space where provisions are made to reduce particulate contamination and can (if necessary) control other environmental parameters such as temperature, humidity and pressure.

The key component is the High Efficiency Particulate Air (HEPA) filter that is used to trap particles that are 0.3 micron and larger in size. All of the air delivered to a cleanroom passes through HEPA filters, and in some cases where stringent cleanliness performance is necessary, Ultra Low Particulate Air (ULPA) can be used.

A cleanroom is only as good as the management of the room and the persons within. Personnel selected to work in cleanrooms should undergo training in contamination control and they must wear special clothing designed to trap contaminants that are naturally generated by skin and the body.
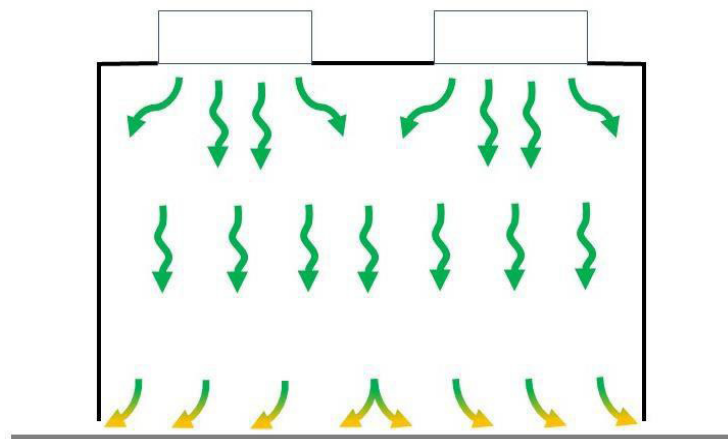
Depending on the room classification or function, personnel gowning may be as limited as lab coats and hairnets, or in extreme cases as extensive as fully enveloped in multiple layered suits with self-contained breathing apparatus.

Cleanroom clothing is used to prevent substances from being released from the wearer's body and contaminating the environment. The cleanroom clothing itself must not release particles or fibres to prevent contamination of the environment by personnel.

Cleanroom garments include boots, shoes, aprons, beard covers, mob caps, coveralls, face masks, frocks/lab coats, gowns, glove and finger cots, hairnets, hoods, sleeves and shoe covers.

The type of cleanroom garments used should reflect the cleanroom and product specifications. A process specific risk assessment should be performed to ascertain clothing and personnel requirements in your cleanroom.
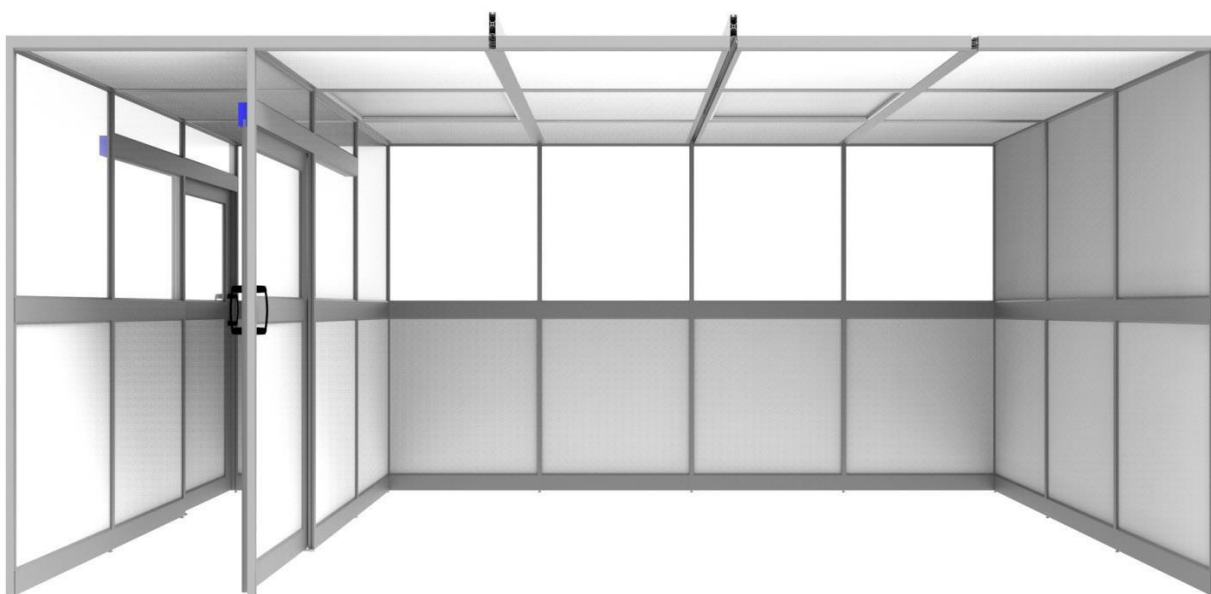
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Cleanroom Air Flow Principles

Cleanrooms maintain particulate-free air through the use of either HEPA or ULPA filters employing laminar or multi-directional air flow principles. Laminar, or unidirectional, air flow systems direct filtered air downward in a constant stream. Multi-directional airflow systems are generally used in ISO Class 6 rooms and above whilst uni-directional laminar air flow systems (with 100% ceiling filtration) are typically combined with a ventilated floor to maintain constant, uni-directional flow in ISO Class 4 cleanrooms and better.

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Cleanroom Classification and Validation

Cleanrooms are classified by how clean the air is. In the current standard 'Cleanrooms and associated controlled environments BS EN 14644-1 (2015)', the number of particles is measured in one cubic metre of air, and this count is used to classify the cleanroom. The sizes of particles measured (typically the critical particle sizes are only measured), the number of measurements in a room and the location of these measurements need to be agreed (and annotated for future validation and reference) during the design phase of the room.

Typically, during validation of the cleanroom, only the critical particle sizes are measured. For example:

- If validating an ISO Class 7 and the user process specifies that the critical particle size is 5 microns and above, then you would validate by counting the 5 micron particles only and ensure the count per m^3 is less than the required 2,930 as stated in the table below.
- If validating an ISO Class 6 room, the user specification may require monitoring of the 0.3 micron and 1 micron particles. Successful validation will show counts below 102,000 and 8,320 particles per m^3.

ISO 14644-1 (2015) Cleanroom Standards

Class	Maximum particles/m3						FED STD 209E equivalent
	>=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	-	Class 1
ISO 4	10,000	2,370	1,020	352	833	29	Class 10
ISO 5	100,000	23,700	10,200	35,200	8,320	293	Class 100
ISO6	1,000,000	237,000	102,000	35.200	8,320	293	Class 1,000

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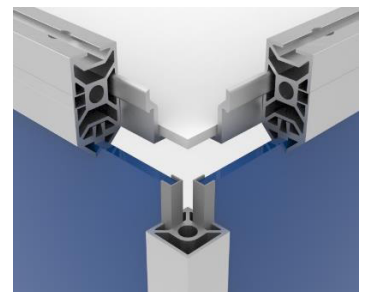
Cleanroom Specification

This modular system is extremely adaptable made from a combination of 30x30mm, 30x50mm and 30x100mm aluminium profiles to provide a full framework. The aluminium profiles themselves are extremely strong utilising 2mm thick walls around a 14mm central box core.
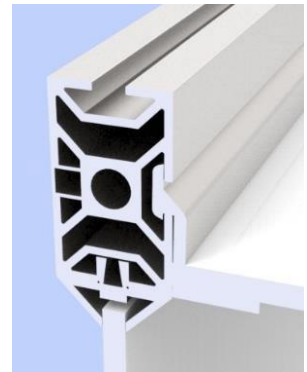
They have been specifically designed for cleanroom construction with a smooth wipe clean anodised finish, tight fitting joints and in particular no horizontal ledges to attract dust, dirt or particulate.

A combination of 6mm white faced aluminium composite & 6mm clear polycarbonate infill panels are used as walls, window and ceiling panels to complete the construction. Alternative panels and/or materials can be provided/utilised if preferred.

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Fan Filter Units Included in Package: Clean Air Module

FFU is the most popular air filtration system. The unit can either be a drop-in ceiling mounted module or as an alternative, a wall mounted module. Either way, the unit will provide up to 2250m^3 of ultra clean HEPA filtered air per hour.

Designed to sit within a 970 x 970mm ceiling frame or hole, the FFU uses H14 HEPA filters rated at 99.997% efficient at 0.3 microns which in turn are proceed by twin deep pleat pre-filters which are angled on the top of either side of the unit.

Control Element

To alert the user to maintenance requirements, the FFU is fitted with a low airflow sensor that will offer both audible and visual alarms should the operation parameters not be met.
The system is provided with a wired remote control panel, which controls the power to the main unit and an unlimited number of connected subsequent slave units (using standard RJ45 connection cables). Also controlled are the optional lighting units and the low airflow alarm that alerts the user to any maintenance requirement.

Lighting

The Cleanroom can be provided with Flush Mounted LED Panels. In standard operation the lights will provide > 900LUX.

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PRODUCT CODE	CLEANROOM SIZE (m)	CLEAN AIR MODULE	ISO CLASS
615-0510	2 X 2 X 2.35M	1 x 1000	ISO Class 8
615-0511	3 X 2 X 2.35M	1 x 1000	ISO Class 8
615-0512	3 X 3 X 2.35M	1 x 1000	ISO Class 8
615-0513	4 X 3 X 2.35M	1 x 1000	ISO Class 8
615-0514	2 X 2 X 2.35M (with 1 x 2m Changing Atrium)	1 x 1000	ISO Class 8
615-0515	3 X 2 X 2.35M (with 1 x 2m Changing Atrium)	1 x 1000	ISO Class 8
615-0516	3 X 3 X 2.35M (with 1 x 2m Changing Atrium)	1 x 1000	ISO Class 8
615-0517	4 X 3 X 2.35M (with 1 x 2m Changing Atrium)	1 x 1000	ISO Class 8
615-0500	2 X 2 X 2.35M	1 x 1000	ISO Class 7
615-0501	3 X 2 X 2.35M	1 x 2250	ISO Class 7
615-0502	3 X 3 X 2.35M	1 x 2250	ISO Class 7
615-0503	4 X 3 X 2.35M	1 x 2250	ISO Class 7
615-0504	5 X 3 X 2.35M	2 x 2250	ISO Class 7
615-0505	2 X 2 X 2.35M (with 1 x 2m Changing Atrium)	1 x 1000	ISO Class 7
615-0506	3 X 2 X 2.35M (with 1 x 2m Changing Atrium)	1 x 2250	ISO Class 7
615-0507	3 X 3 X 2.35M (with 1 x 2m Changing Atrium)	1 x 2250	ISO Class 7
615-0508	4 X 3 X 2.35M (with 1 x 2m Changing Atrium)	1 x 2250	ISO Class 7
615-0509	5 X 3 X 2.35M PLUS (with 1 x 2m Changing Atrium)	2 x 2250	ISO Class 7

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