

Specifying Luminaires For Highly Specialized ISO-Rated Spaces



SEALED ENCLOSURE



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By Kevin Dahlen, Director of Design and Development, Kenall Lighting

Cleanrooms are facilities dedicated to specialized industrial manufacturing or scientific research. Typical cleanroom owners produce pharmaceuticals, integrated circuits, and LED monitors and televisions. Food processing facilities are highly driven by the need to keep food free from contamination, so cleanrooms are often utilized for these applications.



Specialized ISO-Rated Space

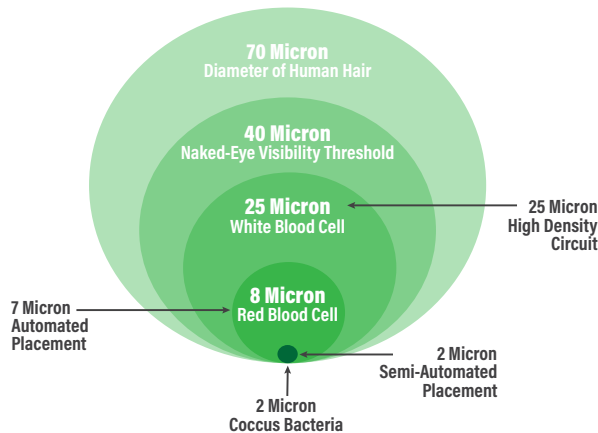
ISO Cleanroom Ratings: A Primer

Cleanrooms are categorized by their ability to clean particulates in a specific area. Based on the room's ability to keep the air clean, the International Standards Organization assigns an ISO Cleanroom Rating. The room is cleaned by turning the air over via a high efficiency particulate

air (HEPA) filtration system, which filters the air in per cubic meter as it flows through the system (particles/m³). Cleanrooms are classified by the number of particles of each size that are allowed to penetrate into the room as follows:

ISO Class	Maximum concentration limits (particles/m ³ of air) for particles equal to and larger than the size listed below					
	0.1 micron	0.2 micron	0.3 micron	0.5 micron	1 micron	5 micron
ISO 1		2				
ISO 2		24	10	4		
ISO 3	1	237	102	35	8	
ISO 4	10	2,370	1,020	352	83	
ISO 5	100	23,700	10,200	3,520	832	29
ISO 6	1,000	237,000	102,000	35,200	8,320	293
ISO 7	10,000		1,002,000	352,000	83,200	2,930
ISO 8	100,000			3,520,000	832,000	29,300
ISO 9	(1.0 × 10 ⁹)				8,320,000	293,000

The graphic below demonstrates the relativity of particle sizes:



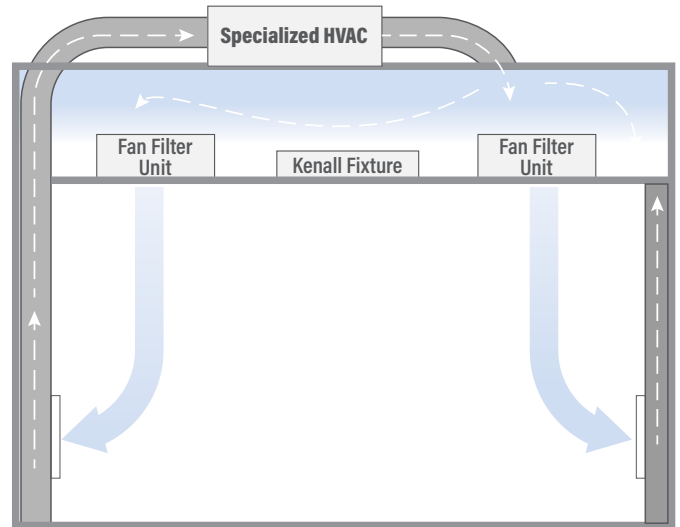
Specifying Lighting for ISO Rated Spaces

ISO 1 and ISO 2 Cleanrooms are extremely specialized and rare. So rare, in fact, that very few exist in the world, and as a result, very few lighting manufacturers build luminaires suitable for these applications. Kenall manufactures lighting products suitable for most cleanroom applications (shown in Table 1).

Full integration into the cleanroom requires the following specialized lighting capabilities:

1. Luminaire to seal to the cleanroom ceiling
2. Luminaire to withstand the HVAC air pressure without bleeding air into the room prior to traveling through the HEPA filtration system (fan filter unit/FFU)
3. Luminaire to be maintained without breaking the seal created in #1 above. Generally, this is solved by using an ingress barrier door, which allows access to the inside of the luminaire via stainless steel fasteners, avoiding the need for room recertification

The diagram below demonstrates how Kenall luminaires integrate into a cleanroom environment:



While luminaires themselves do not carry ISO ratings, they are designed with specific features that support the stringent requirements of ISO rated spaces. When specifying lighting for these spaces, their design must support the specific ISO rating of their intended application. The following is a general guideline of ISO rated applications (Table 1):

ISO 3 and 4	ISO 5, 6, 7 and 8	ISO 9
<ul style="list-style-type: none"> ▪ Semiconductor manufacturing cleanroom (photolithography) ▪ Medical device manufacturing cleanroom (final clean and packaging) ▪ Pharmaceutical cleanroom - Aseptic filling ▪ Aerospace – NASA satellite assembly, component manufacturing ▪ R&D cleanroom (Universities and Federal National Laboratories) ▪ Hard disk manufacturing and repair ▪ Pharmaceutical compounding ▪ ULSI Water fabrication ▪ Photo mask ▪ Photo resist 	<ul style="list-style-type: none"> ▪ Ion lithium battery ▪ Solar, medical device ▪ Film/packaging ▪ Fine chemical ▪ ULSI Assembly Test ▪ Liquid crystal displays ▪ Transistors ▪ Pharmaceutical cleanrooms ▪ Medical device cleanrooms ▪ Biotech cleanrooms ▪ Life-science cleanrooms ▪ ULSI Assembly Test ▪ Silicon ingot ▪ Computer disk assembly ▪ Optical fiber ▪ Miniature bearings ▪ Optics for precision equipment ▪ Precision measuring ▪ Chemicals for ULSI manufacturing ▪ Hybrid integrated circuit ▪ Photo films 	<ul style="list-style-type: none"> ▪ Printed circuit boards ▪ Precise printing ▪ Dust free garment cleaning ▪ Food processing

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10200 55th Street
Kenosha, WI 53144
262-891-9700
www.kenall.com
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