Humidity in Clean Rooms

Clean rooms in general

A clean room is a manufacturing environment that has a low level of environmental pollutants such as dust, airborne microbes, aerosol particles and chemical vapors.

The air inside is constantly recirculated through High Efficiency Particulate Air (HEPA) filters. Some clean rooms are entire manufacturing facilities and can cover thousands of square meters.

Clean rooms are used extensively by semiconductor manufacturers. Today, more and more biotechnology, life sciences and other fields that are sensitive to environmental contamination also use clean rooms.

Clean rooms are classified according to the number and size of particles permitted per volume of air.

The ISO 14644-1 is the official metric standard, which specifies the number of particles (0.1 µm or larger) permitted per cubic meter of air.

The previous standard FED STD 209E was used up to 2001 and indicated the maximum of particles (0.5 m or larger) permitted per cubic foot of air.

	Number of rooms	Average room size (thousands of sq. ft.)
Aerospace	218	10.00
Bioclean	3,120	0.50
CR supplies	7,460	0.50
Disk drives	1,151	10.00
Flat panels	363	15.00
Food	12,629	0.70
Hospital	21,780	0.50
Medical Devices	7,850	0.80
Other electronics	19,029	0.70
Other industries	18,257	0.70
Pharmaceutical	26,750	0.80
Semiconductor	2,405	6.00
World	**121,012**	

Facts & Figures

- About 23% of clean rooms are used for pharmaceutical and biotechnology.
- The most common standards are ISO 5 – ISO 8 class.
- Almost half of all clean rooms are based in China.

Both standards, old and new, assume relationships between particle size and particle concentration.

Why the need to measure humidity?

Clean rooms are used in various industries: pharmaceutical, semiconductor, aerospace, food, laser and optic.

Many different parameters are measured (particles, air flow, pressure…). The effects caused by humidity can be expansion, contraction, hardening and softening of materials, viscosity change of liquid, growth of microbes, and increase in static electricity, corrosion and rust.

All applications have different specifications for temperature and humidity. An abnormal level of these parameters can have a significant impact on product quality and production efficiency (perhaps even loss of production).

High humidity and/or temperate can cause some instruments go out of specification.

Low humidity can generate static electricity which can then destroy the production batch as well as expensive measurement equipment.

Pharmaceutical manufactures control and record temperature and humidity according to GMP and internal quality guidelines.

The semiconductor and electronics manufacturing process require vary accurate control in their clean rooms.

In the food industry it is important that the relative humidity stays under 40%: this restricting growth of bacteria and germs.

Humidity control is also important at liquid crystal display plants and paint plants. In this case, the durability and accuracy of the humidity sensor is very important. These plants generate various gases, which can affect sensor elements

ISO 14644-1 Cleanroom Standards

Class	maximum particles/m³						FED STD 209E equivalent
	≥0.1µm	≥0.2µm	≥0.3µm	≥0.5µm	≥1µm	≥5µm	
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	83		Class 10
ISO 5	100,000	23,700	10,200	3,520	832	29	Class 100
ISO 6	1,000,000	237,000	102,000	35,200	8,320	293	Class 1000
ISO 7				352,000	82,200	2,930	Class 10,000
ISO 8				3,520,000	832,000	29,300	Class 100,000
ISO 9				35,200,000	8,320,000	293,000	Room air

135 Engineers Road, Hauppauge, NY 11788
Tel. 631-427-3898 • Fax. 631-427-3902 • sales@rotronic-usa.com

rotronic
MEASUREMENT SOLUTIONS