

## Humidity in clean rooms

### Facts & figures:

About 23% of clean rooms are used for pharmaceutical and biotechnology.

The most common standards are ISO 5 - ISO 8 class.

Almost the half of all clean rooms are based in China.

	Number of rooms	Average room size (thousands of sq. ft.)
Aerospace	218	10.00
Bioclean	3,120	0.50
CR suppliers	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
<b>World</b>	<b>121,012</b>	

Number of clean rooms and average size by industry

Source: [www.cleanrooms.com](http://www.cleanrooms.com), Sep 2008

### 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 manufactures. 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.

Nowadays 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 (0.5µm or larger) permitted per cubic foot of air.

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

Source: [www.iso.com](http://www.iso.com)



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	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	83,200	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

### Why the need to measure humidity?

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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, 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 temperature 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.

## What solution can Rotronic offer?

In a clean room, it is important that there be as fewer places possible where dust can collect. As most transmitters could be a possible collection point, it would be best to have the probe remote to the transmitter and

the transmitter installed outside the clean room.

As the entire Rotronic product range offers probe interchangeability, it is possible to place an extension cable between both the probe and

transmitter. Extension possibilities:

- 1,2 or 5 meters.
- Up to 100 meters with the signal booster.

## Rotronic products:

### Humidity and temperature probes:

- **HC2-IS25**
- **HC2-IT25**  
-40...85°C,  
0...100%rh,  
Ø26mm,  
±1.5%rh and ±0.1K...
- **HC2-S**  
-50...100°C,  
0...100%rh,  
Ø15mm,  
±0.8%rh and ±0.1K...
- **HC2-IM102**  
-100...200°C,  
0...100%rh,  
Ø15mm,  
±0.8%rh and ±0.1K...

### Transmitter:

- **HF5 series**  
For interchangeable probes,  
2 or 3/4 wire configuration,  
Various analogue and digital outputs,  
Display,  
All psychrometric calculations available...
- **HF8 series**  
Two Interchangeable probes  
-100...200°C,  
3/4 wire configuration,  
Various analogue outputs,  
Relay and data logging  
All psychrometric calculations  
Display...

### Filters and pore size:

- Polyethylene grey 20µm
- Polyethylene white 40µ
- Wire-mesh 20...25µm
- Teflon 10µm
- MFD (fleece)
- Polypropylene 150µm

### Protection caps

- Protection-HC2
- Protection-Filter
- Protection E2/E3



**HF5 transmitter**  
with protection-filter cap (red)



**HF5 transmitter**  
with protection-HC2 (transparent)



**Mounted HC2-IT25 probe**  
Left : with protection cap

## Customer benefits:

### Accuracy:

A precise humidity measurements has direct influence to the energy consumption of a clean room. The sooner any power consuming unit is switching off, the less power will be consumed.

The better the environment is controlled the less the deviation in product quality. The consequence will be lesser deviation in result of bioassays, less deviation in integrated circuited manufacturing and in food production less growth of microbes.

The outstanding accuracy and long-term stability of our probes does ensure a constant and stable environment that is directly linked to the product quality

### The HC2-IT25 & HS2-IS25 probes:

The button probes are designed for integration into walls, collect hardly any dust and are easy to clean.

The HC2-IT25 is delivered with a Teflon filter whereas HC2-IS25 comes with a steel sinter filter. Both are delivered with a protection cap

that come useful when the clean room undergoes cleaning.

### Other protection caps:

We, offer for the HC2 probes, two different protection caps. The red "protection-filter" cap replaces the HC2 filter.

The transparent "protection-HC2" can be used for all 15mm probes.

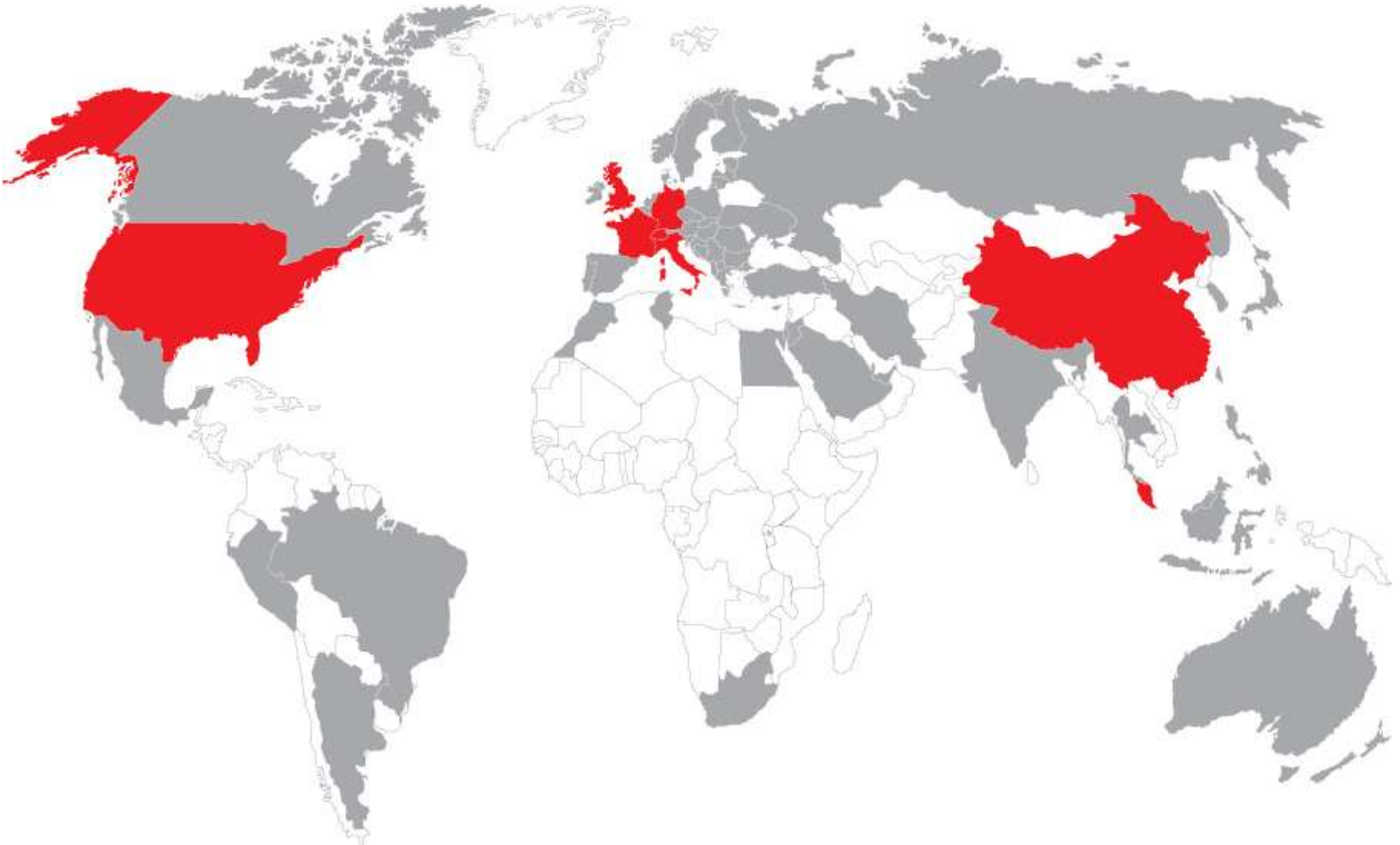
To protect the probe connector we also offer a transparent cap: the "protection E2/E3".



**Protection E2/E3**  
transparent

## Contact us:

Rotronic is represented in more than 40 countries around the world. An up to date list of all our partners is available at [www.rotronic-humidity.com/international](http://www.rotronic-humidity.com/international)



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