

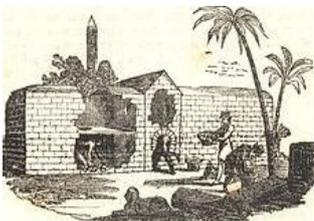
## Incubators

### Facts & figures:

India's poultry industry has to expand from 2010 until 2013 annually by 12-15% to fulfil local demand only.

The average chicken weight doubled since 1934 and is now around 2.5kg.

The US chicken consumption grew from 22kg per capital in 1980 to 39kg in 2011.



Egyptian egg oven

### Incubators in general

Right from the point when human beings started to cultivate land they were strongly dependant on external influences. So, the given levels of rain, sunshine, CO<sub>2</sub> as well as soil quality defined the success rate of plant growth. Like plants, every organism has its specific requirement for an optimal reproduction. To be able to artificially

generate an organism's ideal environment, an incubator is used. Even the ancient Egyptians learned that the rate of successfully hatched chickens increased drastically when they put the fertilized eggs in a big oven built out of bricks that was permanently slightly heated. Although in that case, only the temperature was "controlled". The Egyptian egg oven can be considered the earliest incuba-



tor. But hatching eggs is only one application where incubators are used. Other important usages are the growth of bacteria, viruses and spores for research or diagnostic analyses.



### Why the need to measure?

Various elements need to be measured in order to provide an ideal environment for organisms to reproduce.

#### Temperature

For incubators that are used for chicken hatching temperatures from 37.2°C to 37.7°C are ideal for incubators with fan circulation. If the incubator has no fan 38.8°C is recommended for best results.

Most bacteria for example grow best at 35°C.

#### Humidity

For growing bacteria, high levels of humidity are required, the majority need 90%rh or higher. For example the widely

known food poisoning bacteria "Salmonella" only grows at 95%rh and above.

For most moulds 80%rh is already sufficient to promote growth.

Humidity is also extremely important when hatching chicken eggs. Within the egg is a tiny air bubble that gets bigger during the growth of the embryo but if the humidity level is too low the fluids that are essential to the final growth of the embryos are lost too quickly. A humidity level between 50-60%rh is considered ideal.

#### Carbon dioxide

In nature the CO<sub>2</sub> level in a chickens nest is around 0.4% or 4000ppm compared to the surrounding air that has only 400ppm. Keeping the CO<sub>2</sub> level in an incubator between 4000ppm to 6000ppm is necessary for a normal development. Especially in the late development of the eggs, the embryonic production of CO<sub>2</sub> increases as incubation proceeds and therefore should be removed from the environment to keep the CO<sub>2</sub> at a safe level.

Also in the research of cross-breeding or genetically modifying plants, a controlled CO<sub>2</sub> environment is key to speed up the development process.

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## What solution can Rotronic offer?

Rotronic offers a wide range of products for controlling and monitoring incubators. The range starts from various humidity and temperature transmitters respectively probes or even customized OEM transmitters specifically designed to fit the individual

incubator designs. All the humidity measurement equipment comes with the industrial capacitive foil sensor HygroMer IN-1 and uses the new AirChip3000 technology with its advanced features. Rotronic also provides various options for

controlling CO<sub>2</sub> levels. Our CO<sub>2</sub> transmitters are based on the non dispersive infrared technology. The typical lifespan of 15 years guarantees a long use of the incubator and underlines the high quality of the transmitter.



HF 5 wall mount transmitter

## Rotronic products:

### Humidity and temperature probes:

- **HC2-IM102**  
-100...200°C,  
0...100%rh,  
Ø15mm,  
±0.8%rh and ±0.1K...
- **HC2-IC102**  
-100...200°C,  
0...100%rh,  
Ø15mm  
±0.8%rh and ±0.1K...
- **HC2-IC102-A**  
-100...200°C,  
0...100%rh,  
Ø15/25mm,  
±0.8%rh and ±0.1K...

### Transmitter rh & °C:

- **HF5 series**  
For interchangeable probes,  
Various analogue and digital  
outputs, Display,  
All psychrometric calculations  
available...

- **HF7 series**  
Stainless steel probe,  
-100...200°C,  
3/4 wire configuration,  
Various analogue outputs,  
Optional display...

### Transmitter CO<sub>2</sub>:

- **CF5 series**  
0...2'000 ppm,  
± 30 ppm  
0...50°C  
± 2°C  
24 VDC/VAC power supply,  
2 analogue outputs,  
0...10 VDC or 4...20mA, Op-  
tional display...
- **CF8 series**  
0...40'000 ppm,  
± 200 ppm  
With or without temperature  
measurement,  
24 VDC/VAC power supply,  
2 analogue outputs,  
0...10 VDC or 4...20mA,  
Different relay options  
Temperature range: 0...50°C,  
Display,  
Various mounting possibilities...



HC2-IC102 probe



CF8-W-Disp-GH



CF8-D/W-Disp-IN

## Customer benefits:

### Accuracy:

Choosing Rotronic gives you the best accuracy on the market. So, it doesn't matter what you are monitoring or controlling you can always rely on the measured data.

### Long term stability:

Apart of the exceptional long term stability of our IN-1 hu-

midity sensor, that is better than 1%rh per year, Rotronic also selects only high quality state of the art sensors for other parameters. This ensures that we provide long living reliable products.

### Communication:

With all of the different communication methods, from

conventional analogue output signals to RS-485, Wireless or Ethernet RJ45, Rotronic can provide the individual solution for each installation.

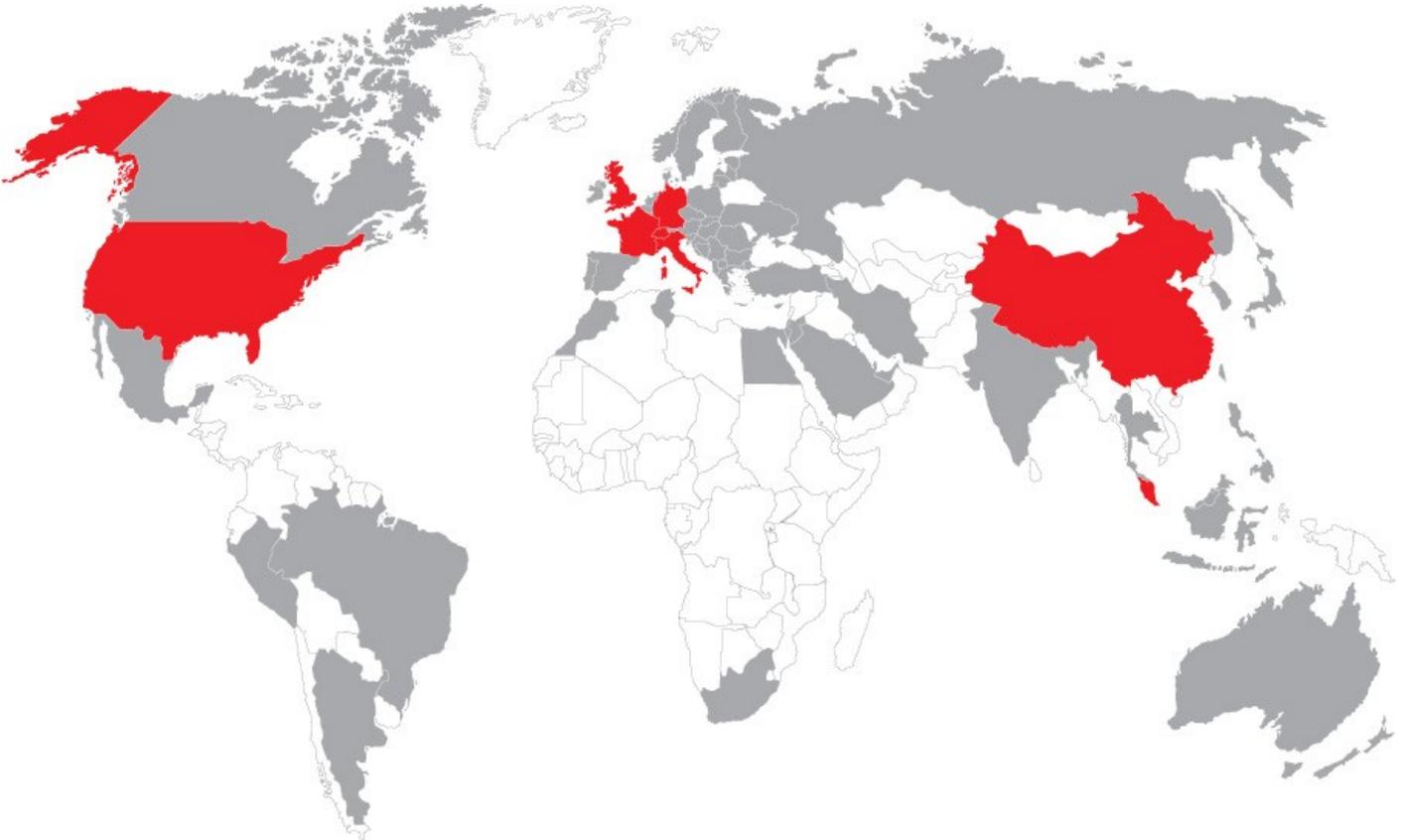
### Easy to handle:

Since our HW4 software is used for almost all of our devices, it is extremely con-

venient to reconfigure or adjust the units. And it does not end there! With the HW4 software it is even possible to build up a professional validated monitoring system that fulfils all the requirements according to FDA 21 CFR Part 11.

## 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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MEASUREMENT SOLUTIONS