

ROTRONIC APPLICATION NOTE

Application note: N°F051

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Baking

Facts & figures:

Records show that as early as 2600-2100 B.C. bread was baked by Egyptians, who it is believed had learned the skill from the Babylonians.

On average, every American consumes around 53 lb (24 kg) of bread per year.

The "pocket" in pita bread is made by steam. The steam puffs up the dough and, as the bread cools and flattens, a pocket is left in the middle.

US Farmers receive just 5 cents (or less) for each loaf of bread sold.



Baking in general

Most of us have a never ending choice of the most delicious breads, cakes and pastries to please both the palate and the eyes. We have become so used to this diverse range of bread and baked products, yet we know almost nothing about how they come into existence.

The interesting history of what is now called the "staff of life", bread, and the making of it, started in comparatively recent times.

At the very beginning of recorded history there was the discovery of fire making, thus along with light, heat could be generated. Then it was found that different grasses and their seeds could be prepared for nourishment.

Later, with the combination of grain, water and heat, it was possible to prepare a kind of broth. Hot stones were covered with this broth or the broth was roasted on embers and "hey presto" the first un-

soured flat bread was created. This ability to prepare stable food radically changed the eating habits and lifestyles of our early ancestors. They progressed from being hunters to settlers.



Dough prover

Why the need to measure humidity?

The production of baked goods such as bread, cakes, biscuits and pastries requires a number of processing steps in which humidity and temperature play an important role.

After **mixing**, it is typical to divide the dough into pieces and allow it to **rest** for a few minutes so that the gluten network in the dough can relax allowing easier **moulding**, which is the next step.

If at that stage, the temperature is too hot the dough will be too sticky and cannot be easily processed further, if too cold the dough can become damaged during moulding

which leads to holes forming in the bread. If the humidity level prior to the moulding process was too low a skin of dry dough can form on the dough surface. This makes it harder for the dough to increase its volume during the next process step called proving.

Proving is the professional term for the final dough-rise step before baking, where 90% of the bread volume is achieved. To achieve consistently good dough rising results special chambers are used. These chambers can maintain the ideal environment for the yeast to grow. Depending on

the yeast and flour used, temperatures between 38...42°C and humidity levels between 70...80%rh are considered ideal.

In summary, the use of quality ingredients and careful handling throughout the various stages of production will not result in a quality product unless the dough temperature, and the temperature and humidity of the bakery are carefully regulated. Modern day bakeries use custom ventilation systems that are controlled by precision humidity and temperature sensors.

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What solution can Rotronic offer?

The heart of the latest humidity measurement products is the Rotronic capacitive sensor: HygroMer IN-1. This thick-film sensor, with the best long term stability on the market is ideal for

applications where probes typically don't get calibrated frequently.

All products with this logo contain an AirChip3000.



AirChip3000:

- Relative humidity, temperature and dew point outputs
- Can store 2,000 data points
- Sensor self-test function



HF1 duct mount transmitter

Rotronic products:

Humidity and temperature probes:

- **HC2-S**
Standard humidity sensor
-50...100 °C,
0...100 %rh,
±0.8 %rh and ±0.1 K
- **HC2-IC402**
-100...200 °C,
0...100 %rh,
Ø15 mm
±0.8 %rh and ±0.1 K
- **HC2-IC402-A**
-100...200 °C,
0...100 %rh,
Ø15/25 mm,
±0.8 %rh and ±0.1 K

Transmitters:

- **HF7 series**
Stainless steel probe,
-100...200 °C,
3/4 wire configuration,
Various analogue outputs,
Display...
- **HF5 series**
For interchangeable probes,
Various analogue and digital
outputs, Display,
All psychrometric calculations
available...
- **HF1 series**
0...50 °C, 5...95 %rh
±3 %rh and ±0.3 K
Various analogue outputs,
Display...

Handheld instruments:

- **HP22**
For interchangeable
probes,
High accuracy relative
humidity and tempera-
ture measurement,
Dew point and other
psychrometric calcula-
tions, Display
- **HP23**
Same functionality as HP22
plus: two interchangeable probe
inputs, 20,000 data point
memory with real-time clock,
Data capture of 250 data points
each for up to 8 defined
locations



HF7 duct mount transmitter



HF5 wall transmitter in combination with probe / extension cable

Customer benefits:

Accuracy:

Choosing Rotronic products gives you the best accuracy on the market.

Precise humidity measurement enables the control units to work at their maximum performance

Communication:

Networking with Rotronic is an easy affair! With the wide range of communication interfaces available, from conventional analogue out-

put signals to USB, RS-485, Wireless and Ethernet RJ-45, Rotronic can be relied upon to provide the interface to your DDC control system, or any third-party monitoring system.

Long term stability:

With long term sensor stability of under 1 %rh per year (depending on the environment), Rotronic offers the possibility to "plug & play": install the device and leave it. We would recommend

regular spot checks between multipoint calibrations.

Calibration:

Rotronic offers a factory calibration certificate, and SCS certificate if required. The portable HygroGen2 temperature & humidity calibrator as well as traceable unsaturated humidity salts are available for on-site calibration. All HygroClip2 probes can be set with two fixed %rh / °C values to validate the loop to the controller.

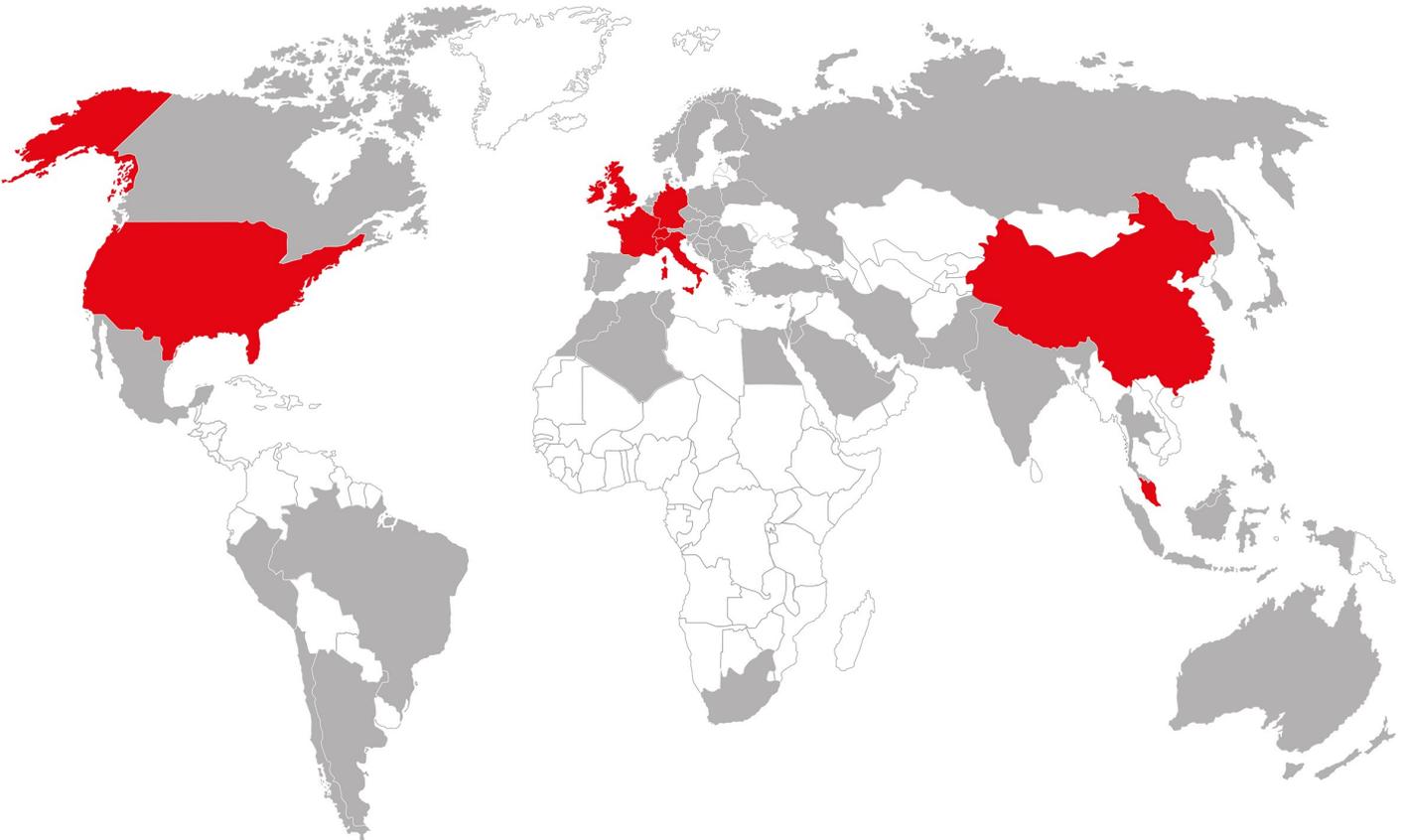


HC2-IC302 probe

HC2-IM302 probe

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.com/international



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