

Seed storage

Facts & figures:

The oldest seed that has grown into a viable plant was a Judean date palm seed that was about 2,000 years old.

The Millennium Seed Bank Project in the UK is the biggest seed bank in the world. Currently they store 31'880 species and 1'907'136'030 seeds.

China, with 197 million metric tons, is the world's biggest rice producer.



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Seed storage in general

Around 10'000 years ago, the first humans stopped hunting and gathering wild plants and instead started to cultivate on farms, preserving and storing seeds became important.

There are various reasons to store seeds, starting from simply preserving grain for consumption later in the year or as sowing for the next season. A little more complex is the collection and preservation of seeds for a longer period of time. This is for example done

to protect species from extinction or to ensure genetic variety for future generations. Another cause is, to have a backup source in case of catastrophic events like natural disasters, outbreaks of diseases. This type of long term storage is usually done in well protected storage buildings called seed banks.

Inside each seed is a living plant embryo that even in a state of dormancy breathes through the exchange of

gases and is constantly undergoing metabolic processes also known as aging. The natural lifespan of a seed is influenced by several factors including: permeability of the seed coat, dormancy and seed physiology. But one of the most important factors is the external environment the seed is exposed to. Temperature and humidity play a key role in the storage capabilities of seeds.



Why the need to measure humidity?

As mentioned above, controlling the environment in seed storage is essential for maintaining the germination capacity or simply the food quality.

Generally

Every 1% decrease in the moisture content will double the storage life. The same applies for every 5°C decrease of the storage temperature. Rule of thumb is, the sum in degrees F and % relative humidity should be less than 100 for good storage conditions.

Storage conditions

Proper storage conditions maintain relative humidity lev-

els between 20% and 40%, giving corresponding seed moisture contents between 5% - 8%, depending on the type of seed. This range is safe for most seeds. When seed moisture content drops too low (<5%), storage life and seed vigor may decline. When seed moisture content raises above 8%, aging or seed deterioration can increase. Deterioration involves cell membrane integrity, along with other biochemical processes, all resulting in loss of vigor and viability. Seeds with a moisture contents above 12% will promote growth of fungi and insects. Most seeds cannot germinate

until seed moisture content is above 25%.

Seed preparation for long term storage (Seed bank)

The seeds first get put in to a drying room where temperature and humidity is carefully kept at 15°C and 15% relative humidity. Under these conditions the seeds gradually dry out. (environment like a typical long-haul flight) They are then cleaned, counted and put into airtight containers, before being placed in the seed bank at -20°C. The seeds are then tested for viability on a regular basis.

What solution can Rotronic offer?

Rotronic offers a wide range of products to ensure good storage conditions for seeds.

The product range starts from AW meters to determine the free water in the seed which then, via a sorp-

tion isotherm curve, can provide information regarding moisture content. With the Rotronic transmitters the HVAC system can be ideally regulated and the Rotronic loggers monitor °C + %rh to verify the storage condi-

tions. All the products are based on the industrial HygroMer IN-1 sensor which, in combination with the Air-Chip3000 provides outstanding results.



HP23-AW-A with the HC2-AW and HC2-P05 for on site water activity analyses

Rotronic products:

Humidity and temperature probes:

- **HC2-AW**
Water activity probe,
-40...85°C,
0...1AW,
±0.008AW and ±0.1K...
- **HC2-P05**
Insertion probe,
-40...85°C,
0...1a_w,
Ø5mm x 200mm,
±0.015a_w and ±0.3K...
- **HC2-S**
-50...100°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...

Dataloggers:

- **HL-20D logger**
0..100%rh, ±0.8 %rh / ±0.2 °C
FDA 21 CFR Part 11 / GAMP 4
Adjustable log interval
Memory: 20'000 data records

Water activity:

- **HygroLab C1**
4 probe inputs,
Display,
AW Quick function,
Storage options...
- **HP23-AW-A**
Hand held device,
2 probe connections,
Data logging,
Display,
AwE & AwQuick
Buzzer...



HygroLab C1 laboratory AW meter



HL20 Logger for validation of storage environments

Customer benefits:

Accuracy:

Choosing Rotronic gives you the best accuracy on the market.

Precise humidity measurements enables the HVAC controller to maintain a constant and stable climate. Due to the fast reaction time of our sensor, the humidifier or dehumidifier is only working for the minimum time needed to establish the desired environment. In addition to a stable and not overshooting system, your energy consumption, to main-

tain the room climate, will decrease significantly.

Communication:

Networking with Rotronic is an easy affair! With all of the different communication methods, from conventional analogue output signals to RS-485, Wireless or Ethernet RJ45, Rotronic can provide the needed interface to your DDC that controls the storage conditions.

Long term stability:

With a long term 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 frequent spot checks in-between calibrations.

Calibration:

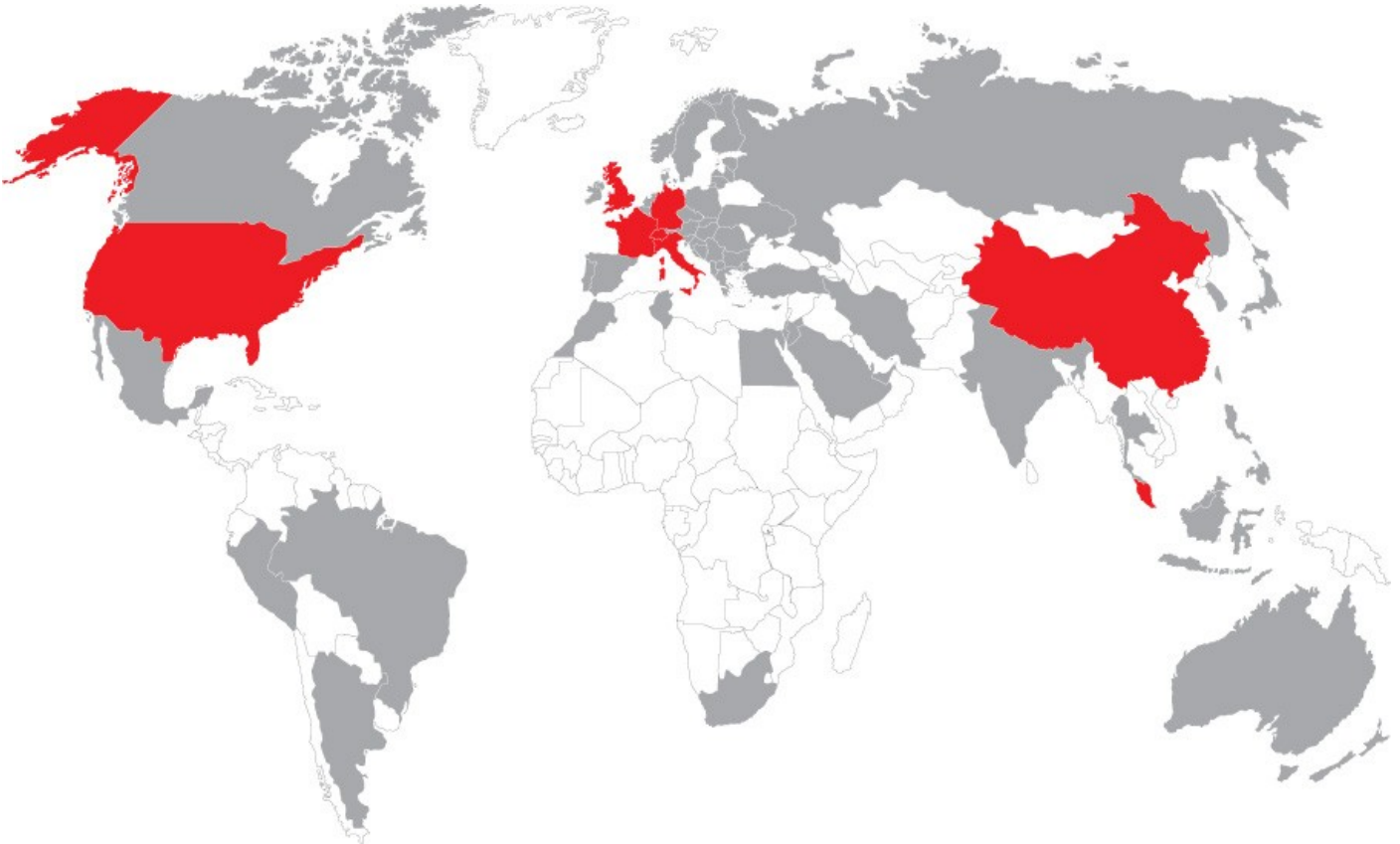
In order to calibrate humidity measurement devices, we can offer a factory calibration certificate or even an SCS certificate if this is required. We can also supply a humidity and temperature generator, the HG2-S as well as unsaturated salts for on-site calibration.



HF5 transmitter combined with the HC2-S probe for storage control

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/



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