Application note: N°F050

July 2014

Temperature and Humidity Monitoring in Data Centers

Precise temperature and humidity with Rotronic's high precision, fast responding sensors

Definitions

Relative humidity (%RH) is the amount of water vapor in the air, expressed as a percentage of the maximum amount that the air can hold at the given temperature.

Absolute humidity: also known as water vapour density is the amount of water vapor (kg) contained per unit volume (m^3) of the gas mixture. In a gas mixture the water vapor generates a certain partial pressure that is part of the total barometric gas pressure. The vapor pressure can only rise to its saturation limit, which is determined by the temperature. Thereafter water is given off in liquid form (dew). The maximum pressure is called saturation pressure and is temperature dependent. The temperature dependenca is, however, not included in the term of absolute humidity.

Discussed in this edition:

Over the years there has been a rapid increase in large stand-alone data centres housing computer systems, hosting cloud computing servers and supporting telecommunications equipment. These are crucial for every company for IT operations around the world.

It is paramount for manufacturers of information technology equipment (ITE) to increase computing capability and improve computing efficiency. With an influx of data centers required to house large numbers of servers, they have become significant power consumers. All the stakeholders including ITE manufacturers, physical infrastructure manufacturers, data centers designers and operators have been focusing on reducing power consumption from the non-computing part of the overall power load: one major cost is the cooling infrastructure that supports the ITE.

Too much or too little Humidity can make one uncomfortable. Similarly, computer hardware does not like these extreme conditions any more than we do. With too much humidity, condensation can occur and with too little humidity, static electricity can occur: both can have a significant impact and can cause damage to computers and equipment in data centers.

It is therefore essential to maintain and control ideal environmental conditions, with precise humidity and temperature measurement, thus increasing energy efficiency whilst reducing energy costs in Data Centers. ASHRAE *Thermal Guidelines for Data Processing Environments* has helped create a framework for the industry to follow and better understand the implications of ITE cooling requirements on the data center and vice versa. There is a growing concern about energy efficiency, particularly the cooling component.

Rotronic's high precision, fast responding and long-term stability temperature and humidity sensors are regularly specified for monitoring and controlling conditions in data centres.

Why the need to measure temperature and humidity?

Maintaining temperature and humidity levels in the data center can reduce unplanned downtime caused by environmental conditions and can save companies thousands or even millions of dollars per year. A recent whitepaper from The Green Grid ("Updated Air-Side Free Cooling Maps: The Impact of ASHRAE 2011 Allowable Ranges") discusses the new ASHRAE recommended and allowable ranges in the context of free cooling.

The humidity varies to some extent with temperature, however, in a data center, the absolute humidity should never fall below 0.006 g/kg, nor should it ever exceed 0.011 g/kg.

Maintaining temperature range between 20° to 24°C is optimal for system reliability. This temperature range provides a safe buffer for equipment to operate in the event of air conditioning or HVAC equipment failure while making it easier to maintain a safe relative humidity level. In general ITE should not be operated in a data center where the ambient room temperature has exceeded 30°C. Maintaining ambient relative humidity levels between 45% and 55% is recommended.

Additionally, data centre managers need to be alerted to change in temperature and humidity levels.

Rotronic temperature and humidity probes with suitable transmitters or loggers are most suitable for monitoring & controlling conditions in data centres due to their high precision and fast response with long-term stability.

With Rotronic HW4 Software a separate monitoring system can be implemented. This enables data center managers to view measured values and automatically save the measured data. Alarm via email and SMS, with report printout allow data integrity guaranteed at all times.

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What solution can Rotronic offer?

Rotronic has the possibility to offer a complete system for environmental control of temperature and humidity in data centers.

With Rotronic instruments offering the combination of both analogue outputs, controlling the like current loop, voltage and relay contact allow for easy adaptation to every application such as controlling the air-conditioning.

Rotronic instruments with digital outputs can link up to the Rotronic HW4 software for monitoring/ data measurement. It makes it easier to control the environment and analyse the data.

HF5 series humidity & temperature 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-C05***
  -40...85°C, 0…100%rh, Ø5mm, ±1.5%rh and ±0.3K…

Transmitter:

- ***HF5 series***
  For interchangeable probes, Various analogue and digital outputs, Display, All psychrometric calculations available...
- ***HF3 series***
  -40...60 °C, 0...100 %rh ±2 %rh and ±0.3 K Various analogue outputs, Display…
- ***HF1 series***
  0...50 °C, 5...95 %rh ±3 %rh and ±0.3 K Various analogue outputs, Display…

Dataloggers:

- ***HL-NT range***
  For interchangeable probes (up to 7 probes with docking station) 128 MB flash card, Display,
- ***HL-20***
  20'000 measurement pairs, Display, ±0.8%rh and ±0.2K
- ***HL-1D***
  16'000 measurement pairs, Display, ±3.0 %RH and ±0.3 °C

HL-NT humidity & temperature dataloggers

Customer benefits:

Accuracy:

Choosing Rotronic gives you the best accuracy on the market.

Precise humidity measurements can be obtained: meaning that the control of the environment will remain out-standing with regards to the relative humidity and temperature requirements.

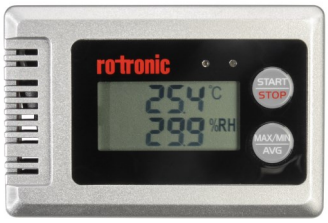
Additionally the accuracy will lead to lower electricity costs.

Communication:

With all the different communication methods, from RS-485, Wireless to Ethernet RJ45, Rotronic can provide the solution for each installation.

Calibration:

All of the Rotronic products are digital so the whole calibration procedure can be done via a PC, or directly from the device with the help of the Rotronic humidity standards. Rotronic can also offer an ISO-17025 calibration.



HL-1D Datalogger

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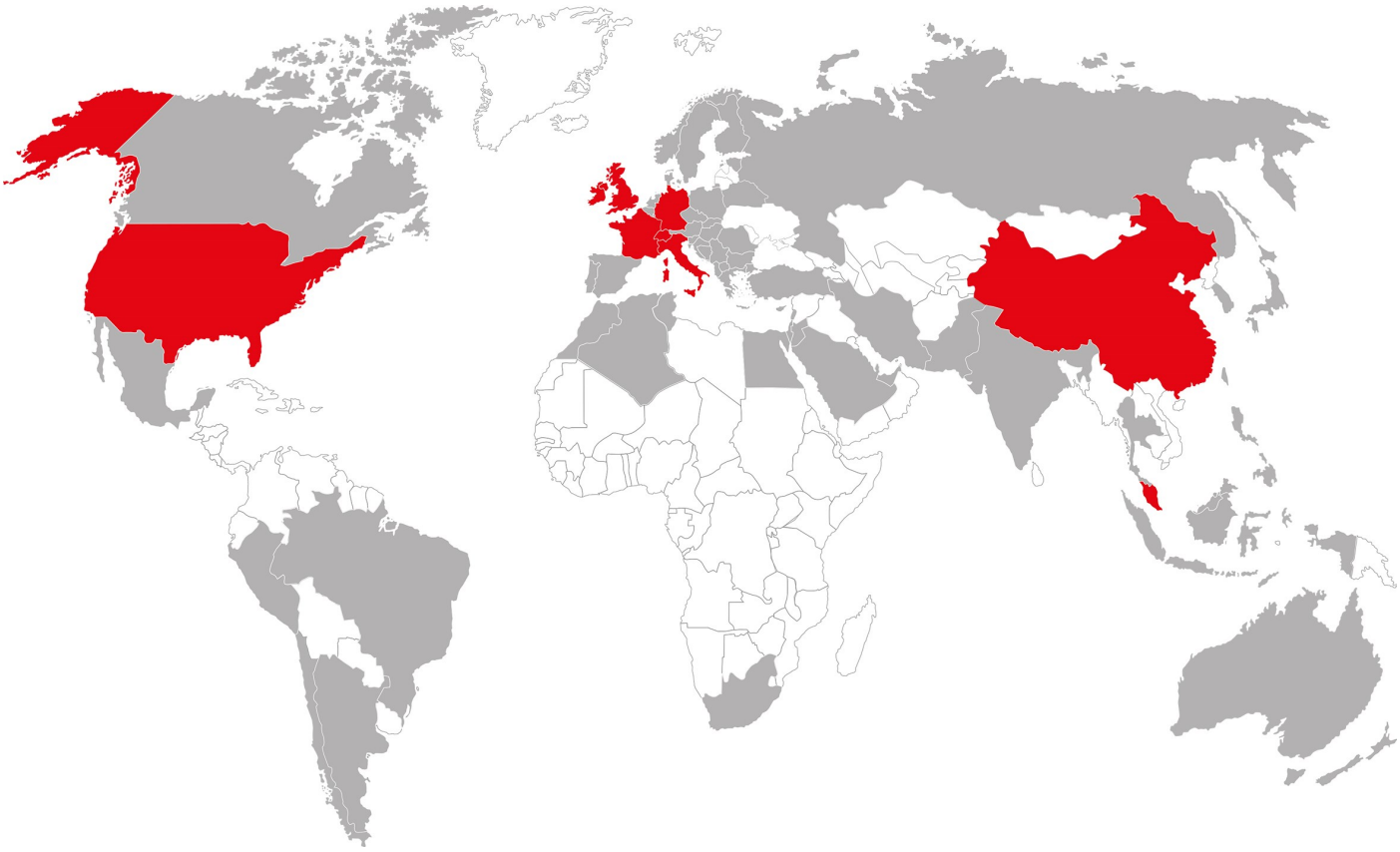
rotronic MEASUREMENT SOLUTIONS

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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