



Sensors & Sensibility: Inside Thermometers, Hygrometers and Thermo-Hygrometers

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By Andre Rebelo

Temperature and humidity. These two parameters are tremendously important variables in an unimaginable array of applications. It's no wonder that Extech has so many different meters to track one or both of these variables. We have heard from customers ranging from a sweets confectioner who needs chocolate to stay at the right temperature to make candies to a helicopter assembly plant that developed an emergency response plan when static hazards were present.

If you need to measure temperature or humidity, think about *what's inside* the meters you're considering, particularly the sensors.

Humidity

For humidity, there are two types of humidity sensors found in today's hygrometer/psychrometer market: capacitive and resistive. Be sure you select a hygrometer with a **capacitive** sensor. This type of sensor will offer the best accuracy, and will improve the meter's accuracy overall.

There are also humidity meters with **resistive** sensors. Generally, these suffer in accuracy without a trade for some other advantage. For a number of years, Extech has opted for capacitive sensors which means better accuracy and better meters for our customers. Be sure to ask about which type of sensor is inside a hygrometer before clicking "Buy" or heading to the checkout counter.

Temperature

Temperature meters, or more commonly called thermometers, are probably the most ubiquitous test instruments in the world and in history--second to clocks or chronometers perhaps. In many applications, a few degrees of deviation can mean quality problems in a production line, failed crops, or could signal a fatal hazard for farmers or summertime athletes.

You can see the importance of temperature measurements in Extech's catalog. We carry many, many different models suitable for different jobs. Because temperature is so pervasive, you'll also find temperature capabilities built into a wide range of meters that you wouldn't expect to measure temperature, like clamp-on current meters, tachometers, even vibration meters!

There are two main types of temperature meters: **non-contact** and **contact**. Non-contact models use infrared technology to measure heat on a surface. Doing this safely from a distance can be important if temperatures are high or if hazards like moving parts or energized electrical components are nearby. Look for the model's distance-to-spot ratio. This tells you how far away you can be while still getting an accurate temperature average for a 1" surface spot.

Non-contact thermometers use a sensor that is placed in or on an environment being measured, be it a liquid, a solid surface or air. Different sensors are used to measure temperature: thermocouples, RTD (resistance), and thermistors. In the case of temperature, each sensor type has merits for different applications.

Thermocouples tend to be the most affordable and most durable. When it comes to response time, they're fast but tend to suffer in accuracy, stability and sensitivity. Another thing to remember is that thermocouples work by reading the relative difference in temperature between the tip and the leads. On the other hand, RTDs and thermistors are able to measure absolute values for temperature.

For repeatable results, **RTD's** may be ideal. They stand out as more stable and offering more accuracy. A downside is that they are the tortoises of the group, with a slower response time. They also need a source of current, and as a result, there is a small degree of self heating to factor.

Lastly, we have **thermistors**. They are quick and can be pretty affordable. But let's say they're the "sensitive sensors:" That is, they're fragile. Like RTDs, they need a current source which means self heating is a factor, more so than RTDs. Expect a narrower measurement range as well.

In some instruments, you'll find hybrid sensors measuring multiple parameters. Some Extechs use an innovative sensor made by Sensirion that is a combination of a capacitance and thermistor on one small IC chip. Most multifunction meters leverage this technology.

When you need to choose a thermometer or humidity instrument (hygrometer, psychrometer), look out for sensors playing a big role in the one that's best suited for you.

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