

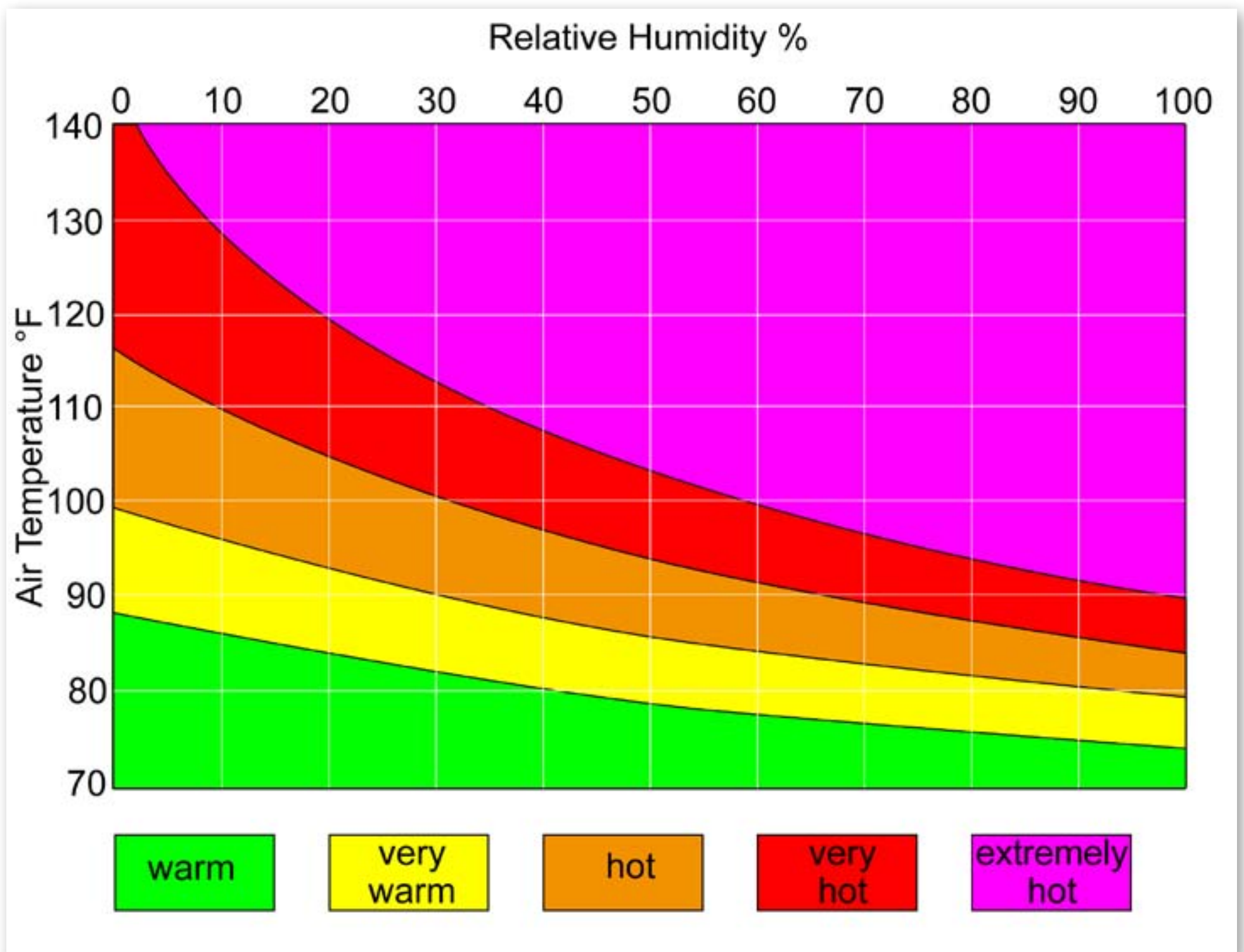
Thermal Comfort

(Head Index / Apparent Temperature)

Relative humidity is the ratio of steam at a certain temperature relative to the maximum water-vapor content in a given volume of air. Relative humidity is expressed in percent. Thus, 50% relative humidity means a 50% saturation of air. But what does this mean for people in everyday life? There is a difference between actual temperature and felt temperature due to relative humidity. How can we measure the relative humidity?

Whether a person feels warm or cold, for example, depends on the rate of evaporation of moisture on a person's skin. On a humid summer day we feel uncomfortable because the air is so highly saturated with moisture, that there is slow to no evaporation of humidity from our skin surface. If, however, the air is dry, a faster evaporation on our skin is possible. This makes us feel cooler.

In winter, the air which surrounds us in our homes is often very dry - rapid evaporation takes place on our skin and we feel cooler. It can also be very warm in the room, about 77°F; if this warm air is very dry, indicating low water vapor content, our body emits humidity through the skin into the room fast and we feel cooler. If the opposite happens we will feel warmer. Below is a graph showing at which room temperature, we should have which ideal relative humidity level. How do we reach a comfortable climate? This is an important question not only for our personal comfort but also in terms of energy consumption.



In Northern latitudes, the winter time poses a significant problem. Low humidity is usually present outside and in heated homes, hence, we feel cooler. Most of us automatically turn on the heating system in these cold situations. However, this will not achieve the wanted effect: not only do we not feel the rapid and extreme heat we desire, but the room relative humidity will drop even further. In addition, we create two further disadvantages:

1. We will unnecessarily increase energy consumption to very high levels.
2. By having further reduced relative humidity in the home we increase the risk of disease. Why do we increase this risk? By irritating and drying out our sensitive nasal mucous membranes, they lose their ability of being the first line of defense against infection.

Many companies are already responding to this issue by regulating the indoor climate in the company buildings to conserve energy and maintaining the good health of their employees, especially in the winter time.



Proper room ventilation is the simplest method of regulating room humidity without actively manipulating the room humidity via an external or internal cooling or heating system. „Normal“ heating and ventilation, intermittently, will save energy, and contributes to the achievement of a feel-good climate. It also prevents moisture in walls, or wall surfaces which can lead to mold formation, and jeopardize the integrity of wall coverings. Make sure that the room temperature is about in the range of $66^{\circ} \geq 72^{\circ}\text{F}$; dormitories should be tempered lower; at about $61^{\circ} \geq 65^{\circ}\text{F}$. The room humidity should always be between 40 ... 60% relative Humidity.

Ok, the temperature can be easily controlled by thermostats, but what to do in order to achieve the proper humidity? A small, commercially available hygrometer already helps to determine which values are present. Do you need more humidity in the air? Is the presence of humidity too low? One simple solution to increase the humidity level is to fill an open container with tap water and place it on your radiator or stove. You will notice how quickly the water from this container evaporates and passes as a vapor into the air. Of course buying a humidifier will achieve the same

task at a higher cost.

The best solution is a hygrometer – a measuring and control system in combination with a ventilation or air conditioning system. For residential homes the hygrometer may be an expensive option, but for the commercial and industrial sector this option is ideal to lower energy costs – obviously, the larger the facility the more necessary it becomes. This is not only important for a comfortable climate for employees to work, but of course also to comply with quality criteria for products in warehouses, in the production process itself or in transport. For companies with large data centers, the computers also need good indoor air quality as long as possible to work efficiently. The ventilation system fulfills significant tasks: heating, cooling, dehumidifying, and humidifying, and usually also filtering the air for best air quality.

In the construction sector for new homes one can observe the phenomenon of high humidity and its harmful effects. High ambient humidity levels combined with very low outside temperatures can cause condensation in the room. The point of condensation is the Dew Point or Dew Point Temperature. Condensation is a breeding ground for harmful, usually visibly hidden molds.

Using a hygrometer, the measures of relative humidity and temperature are detected and, depending on the model, dew point temperature can be calculated. PCE Instruments offers devices which are used, depending on the claim of accuracy or representation of measurement results, in the private sector, but also in industry or in research.



Measuring Instruments:



Analog Style Hygrometer
Domatic



Handheld Hygrometer
PCE-WB 20SD



Wall Hygrometer
PCE-G1