



## ESC White Paper Series:

### Understanding Temperature / Humidity Set Point & Range

The selection of the best Heating / Ventilation / Air Conditioning (HVAC) Systems require for your Cleanroom or Critical Environment, can vary with the requirements:

#### **Temperature - Set Point:**

Temperature Ranges for associate comfort are normally between 64°F (18°C) to 70°F (21°C) Temperature Ranges for associate comfort is normally between 64°F (18°C) to 70°F (21°C). Cleanroom Gowning does not "breathe" like our street clothing, so our bodies require lower temperatures while gowned to regulate our body temperature.

Temperature Set Points outside of these Cleanroom Temperatures are usually a requirement of the process, and must be know during design.

#### **Temperature - +/- Range:**

The "+/- range" or allowable fluctuation in temperature is again normally a function of the process in the Cleanroom. If a close tolerance is not a process requirement, a typical set point could be 68°F (20°C) with a +/- range of 3°F (1.5°C). This allows a window of operating temperature between 65°F (18.5°C) and 71°F (21.5°C).

#### **Temperature - Variable Set Point:**

If a variation of the set-point temperature is required it should be noted as an additional requirement. An example would be a research lab or test cell, where an experiment may require different temperature set points throughout a prescribed period.

The high or low end of the range is important, as this may be where your space will operate when outdoor conditions are at the extremes. The tighter the tolerance, the more you will invest in infrastructure to maintain these conditions.

#### **Humidity - Set Point:**

Humidity Ranges for user comfort are normally between 35% to 55%. Humidity is usually a requirement of a process or regulations

#### **Humidity - Range:**

The range or fluctuation in humidity is normally a function of the process in the space. If close tolerance is not a process requirement, a normal set point could be 35%, with a +/- Range of 20%. This allows a window of operating humidity between 15% and 55%. Mould growth is accelerated in areas of humidity above 60%.

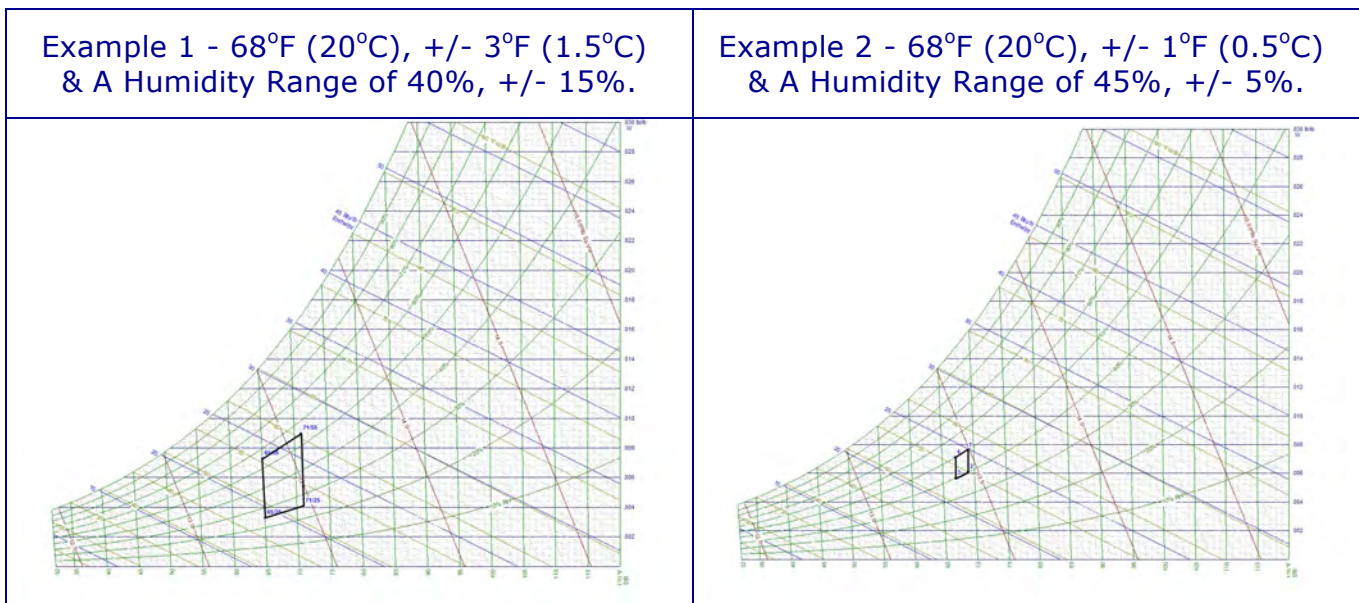
We have worked with requirements from below 8% (Electronics) to 90% (Mushroom Production and Test Cells).

Understanding  
Temperature / Humidity  
Set Point & Range

**Cost Considerations**

Ranges for Economical Temperature / Humidity Control are 68°F (20°C), with a +/- Range of 3°F (1.5°C) & A Humidity Range of 40%, with a +/- Range of 15%.

The Psychometric Charts below represent the relationship between temperature and the humidity in the air. The larger the "Window" or +/- Range, the easier it is to control the space, and the less the energy cost for operation.



As you can see the "Window" or +/- Range in Example 2 is quite small compared to Example 1, therefore the cost of the mechanical equipment and the controls and sensors required will be higher.

There is a very close relationship between Temperature and Humidity; The Psychometric Chart shows that as the Temperature Increases the Humidity will decrease typically at normal room temperatures for every 1°F (0.5°C) by 1½%.

Because of this relationship the +/- tolerances required for humidity must be 2% or greater for every 1°F (0.5°C) in temperature range. For example the Temperature Range for a +/- of 4% in Humidity must be no greater than +/- 2°F (1°C).

For more information or a clarification on this paper, please do not hesitate to contact us.