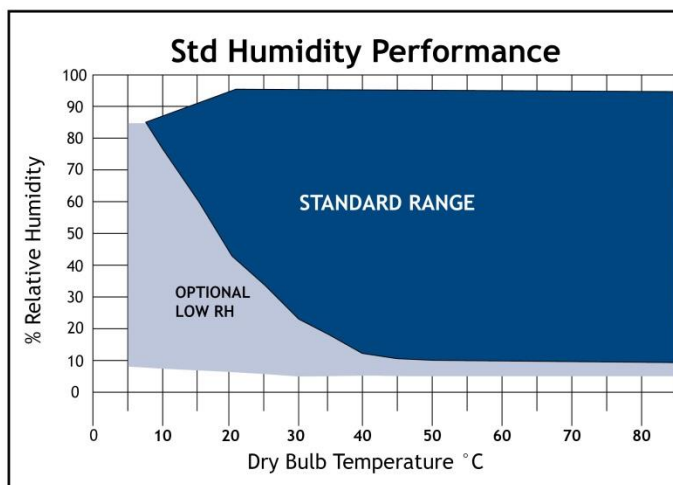


Understanding Humidity in Environmental Test Chambers

Humidity is probably one of the most misunderstood topics when it comes to environmental test chambers. This is due to the fact that Relative Humidity percentage is temperature specific. For example, the amount of moisture in the air at 20°C (68°F) and 50% RH is not the same as 10°C (50°F) and 50% RH. As the temperature of air is reduced its ability to hold moisture is also reduced. Thus, for a given amount of water vapor in the air - the lower the temperature, the higher the RH.

The standard controllable temperature/humidity range for most manufacturers is 5°C (41°F) to 85°C (185°F) with 10% to 98% RH, limited by a 7°C (44°F) dew point. The limitation of a 7°C (44°F) dew point can be very confusing. Since the amount of moisture varies at every temperature, the chamber manufacturers use dew point to describe the RH limitation. Inside the chamber there is a refrigerated coil that is controlled at a temperature very close to the freezing point, i.e. 0°C (32°F). Moisture in the chamber will be attracted to the cold surface and condense, but not freeze. The accumulated water is drained out of the chamber thereby lowering the relative humidity. The

refrigerated coil is never below freezing so frost will not develop. The best way to understand this is to refer to the graph below. If you follow the bottom line of the standard range section of the graph, those temperatures and humidities represent the 7°C dew point. For example, the lowest humidity level achievable at 20°C is 43% RH with a dew point very near the 7°C lower limit. At 50°C the chamber will be able achieve 10% RH. The chamber must be operated within the limits set by the manufacturer. Damage to the refrigeration system can occur if points outside of the standard range are attempted.



Types of Humidity Systems

There are various types of humidity systems used on test chambers today such as a water bath, boiler/steam generator and atomizing system.

- Water Pan - Very stable, but slow response
- Boiler - Standard on most CSZ chambers. The advantages of this system are that it can attain 98% humidity and has large capacity to work in any size unit. The disadvantages of this system is that live load from boiler can cause problems at lower temperatures when the DUT generates heat.
- Atomizer - This system sprays very fine drops of water into the air stream. The advantages of this system are that it provides good control with live loads. CSZ typically uses this type of humidity systems for devices under test that are over 500 watts, with the exception of larger chambers.



Low Humidity (Dew Points below 7°C)

To achieve lower humidity levels down to 5% RH most manufacturers offer a low RH package. It normally includes a dry air purge system and refrigeration valves to allow the refrigerated coil to go below freezing. However, the dry air purge helps to offset this by maintaining a positive pressure in the chamber and sublimating some of the accumulating frost off the coil.

Humidity Water

De-ionized (DI) water is recommended for use with our humidity systems. Water should be provided within 0.05 to 2MΩ resistivity. Distilled water or reverse osmosis (RO) water exceeding of these limits may cause corrosion.

For customers using tap water an optional Demineralizer Filtration System should be used to remove water impurities and minerals that can harm your test chamber. This is not needed for those customers that already have a de-ionized water supply.

A Re-circulating Humidity Water Supply System is also available for customers without a plumbed water supply to the chamber. You can keep this filled with tap water along with a DI filter or you can fill it with DI water. This system is also collects condensate from the chamber, filters it, and stores it in a reservoir for reuse. Note: If products being tested emit a harmful vapor or other contaminates, these can be picked up by the condensate and reused by the re-circulating system. This may damage your device under test.

Note: If using a city water line, a water pressure regulator is highly recommended to lower the water pressure to 25 PSIG for steam generator/boiler systems and 10 PSIG for atomizing humidity systems. High water pressure may cause the top or bottom cap (white) on the water filter to crack. This may result in water leakage that can damage the unit and/ or customer property. Water regulators are available through CSZ.

If your water supply has a lot of particulate matter you may need an additional inline pre-filter such as a 5 or 25-micron polypropylene pre-filter. Other filters are recommended if your water source has a lot of organic, free chlorine and chloramines, phosphate complexes such as a roughing filter (US Filter Model: Absorber). Be sure to occasionally check your water supply for contaminants and resistivity

