

## Watch out for condensation - especially in hot ambient temperature.

Most CO2 laser tubes require water cooling during operation.

In a hot and humid environment, condensation is easily formed inside laser equipment, affecting the performance of the tube, or even causing serious damage.

Condensation refers to the phenomenon that when water vapour in the air reaches a saturated state, if the ambient temperature drops, the water vapour condenses into water and precipitates - like rain.

So, when the temperature of the tube drops below the "dew point" of the environment (the temperature at which the air around the object precipitates), water dew will precipitate on the surface of the object.

If you wear glasses, you will have noticed that when leaving an air-conditioned room or car, your glasses tend to "fog up". Or leave a bottle of cold drink that has been in the fridge on the counter ...

With a laser - especially a glass tube laser, the effect is similar. Optical components (and the tube which requires water cooling during operation) working in a hot environment, may show condensation on the surface. This increases the likelihood of tube or lens/mirror failure, as the tube uses very high Voltage which will be more inclined to arc in wet conditions, and lenses and mirrors are more likely to be damaged when wet by the intense heat of the laser beam.

When the laser equipment is not operating, the chiller should be kept switched off to reduce the chance of condensation caused by excessive cooling for an extended period.

If you are in a hot and humid area, add airconditioning to the room, or at least get a de-humidifier and fan - it will be better than nothing. Try to keep the ambient temperature in the laser room between 15°C and 30°C if possible.

You can also set your chiller on constant mode to be higher than the corresponding dew point temperature (but lower than the maximum temperature that the tube requires). If the cooling water temperature is too low, condensation will form on the tube, causing arcing and breakdown of the tube, which will not be covered by any warranty.

If high-voltage arcing is left to happen, it will cause damage or even complete failure of the laser tube. It will also greatly increase the risk of damage to other laser parts, such as power supplies, machine controllers and other electronic control components.

The paradox is, as well as preventing condensation, we must also ensure that the temperature of the cooling water is not too high. Excessively high cooling water temperature will prevent the laser from being properly cooled during operation, resulting in reduced laser cutting ability, and increased risk of laser equipment damage.

Although specific tubes have their own temperature requirements, in general, the temperature of the cooling water should be kept at 18 ~ 25°C, and the maximum should never exceed 30°C. And remember, the temperature difference between the laser's operating environment and its cooling temperature must be minimized.



If your tube has condensation on the outside, shut off the laser to prevent damage, check the temperature settings on your chiller, and after a few minutes wipe down any traces of condensation - also checking your lens and mirrors.

