



ISO9001 & AS9100
Certified

ADVANCED COOLING TECHNOLOGIES, INC.

Innovations in Action

Ammonia Isothermal Furnace Liners and Heat Pipe Blackbody Cavities

Ammonia Isothermal Furnace Liners (IFLs) and Ammonia Heat Pipe Blackbody Cavities (HPBCs) are used for precise temperature uniformity and control in the temperature range of -40 to +40°C. Typically, these IFLs and HPBCs are manufactured in an annular geometry. The inner tube is where the calibration, testing or materials processing is performed. The space between the inner and middle tube is where the heat pipe wick structure and the ammonia working fluid are contained. The space between the middle and the outer tube is filled with a circulating coolant such as Sil 100 that is warmed or cooled by a refrigerated bath. Smaller units can be designed and manufactured using thermoelectric coolers and resistance heating elements.

A dry nitrogen or argon purge gas is used to minimize condensation or freezing to the inner tube working space. The purge gas is routed through a small diameter tube wound in the shape of a spiral and placed inside the annulus that contains the circulating chiller fluid. Therefore, the purge gas is essentially the same temperature as the working space when it reaches the working space, and will not adversely affect the thermal stability. Thermocouple wells and grounding straps or studs can be added for custom designs.

Ammonia IFLs and HPBCs are manufactured using stainless steel as the heat pipe material. Stainless steel is compatible with ammonia and is capable of safely containing the high pressure ammonia vapor. The inner tube surface has a special coating to provide a stable, uniform, high emissivity surface useful for blackbody cavity calibration instruments.

ACT manufactures both stand alone IFLs or HPBCs and custom designed turnkey systems including the IFL or HPBC, heating or cooling mechanisms, temperature and fluid controls, and safety measures. Custom features, such as thermocouple wells, grounding studs and mounting flanges, are easily accommodated and can be incorporated to achieve a significant increase in value. An example of a custom turnkey system is shown in the picture below.



Ammonia HPBC installed in an enclosure with controls, purge gas regulator, and selectable aperture plates. The taller unit on the right is the refrigerated bath used to heat/cool the HPBC.