

NOTE #01-02

Helium Leak Testing and Proof Testing of Pressurized Parts

SCOPE

This application note covers production helium leak testing of products that also require a high pressure proof test to meet UL, ASME, or other test requirements.

BACKGROUND

Some products, including refrigeration compressors and coils, require a high pressure gas proof test in addition to a leak test. For example, pressure proof testing is required for UL 207 Standard for Refrigeration-Containing Components. Similarly, under ASME Boiler and Pressure Vessel Code an optional gas pressure proof testing can be used in place of a hydrostatic test method. If desired, a proof test of pressurized parts can be conducted on the same equipment that leak testing is performed. Dry compressed air or nitrogen is often used as the test gas. Extreme caution and appropriate safety guidelines should be employed when pressurizing any vessel or component with gas for proof testing

DESCRIPTION

Products that require a pressure proof test may have a wide range of leak testing requirements. The helium sniffing (detector probe) method is often employed on large parts where the leak rate limit is near 1×10^{-5} atmcc/sec and larger. When sniffing is employed it is often desirable to have a dedicated helium charge station that is designed to perform the following steps:

- Pressure proof test
- Gross pressure decay test
- Helium charge (for sniffing)
- Helium evacuation with optional recovery
- Backfill with low pressure nitrogen (optional)

Due to the high pressures often used in proof testing safety precautions should be taken to protect personnel from failure of the part during the proof test step. A safety interlock can be employed which may insure a safety door or shield is in place prior to filling the part to the proof pressure.

If the test part requires a global leak test or a tighter leak rate, a helium hard vacuum chamber method can be employed. In this case the test part is placed inside a vacuum chamber and a charging process similar to what is described above is employed. The vacuum chamber is evacuated and connected to the helium leak detector at the appropriate time to perform the leak test. When performing chamber leak testing, precautions should be employed that relieve gas pressure from the vacuum chamber in a safe manner in case of a part failure. Considerations should also be made for the possibility of shrapnel from a failed part. This might require thick wall or cladding on the vacuum chamber, or installing the vacuum chamber in a protective room.

RELATED PRODUCTS

LACO Technologies engineers custom equipment to implement all of the above leak test methods, including:

- Turn-key, automated hard vacuum leak testing systems including the fabrication of leak test vacuum chambers.
- Helium Sniffer Leak Detectors (Alcatel ASM142S, Inficon P3000)
- Helium Charge Systems (HCS) for proof testing and charging parts with tracer gas for sniffing applications.

SUMMARY

When properly designed, a pressure proof test can be safely integrated into a helium leak test, whether using the sniffing or the helium hard vacuum method.

REFERENCES

- UL 207 Refrigerant-Containing Components and Accessories, Nonelectrical
- Technical Note A: Production Leak Testing: What, Why, and How