

## LEAK TESTING OF COOLING COMPONENTS

# How to find leaks on coolant distribution units (CDUs)

As liquid cooling becomes increasingly critical for high-density electronics and data-intensive applications, the coolant distribution unit (CDU) has emerged as a key component for stable thermal performance. By regulating coolant temperature, pressure, and flow, the CDU directly affects system reliability and efficiency. Any loss of integrity—especially leaks—can lead to equipment damage, reduced uptime, or safety risks.

## Application

CDUs are built in several mechanical configurations depending on system requirements and cooling capacity. While their internal architecture may vary, most units incorporate a combination of **pumps, valves, heat exchangers, sensors, and distribution manifolds** that must work together under controlled pressure and temperature conditions. Since these components routinely handle circulating coolant—often at elevated pressures—any leak risk poses a serious threat to both the cooling loop and the equipment being protected. This document explains how leak testing on CDUs is typically performed, and outlines the advantages of using tracer gas sniffers, such as the Sentrac or the XL3000flex leak detector from INFICON, to verify CDU integrity for final validation.

## Traditional Leak Testing Methods

Every joint, weld, or seal is a potential leak point. In order to meet the strict tightness requirements, modern CDUs are leak tested to very low leak rate thresholds, typically in the range of  $10^{-5}$  to  $10^{-7}$  mbarl/s. Typically, leak testing methods applied across CDU components and assemblies include:

- pressure decay:** used on CDU parts before final assembly. Parts are pressurized with air or inert gas, then isolated and monitored for any pressure drop over time. A decrease in pressure indicates the presence of a leak. The method is cost-efficient and easy to implement, but it is sensitive to temperature variations and large internal volumes, lacks the sensitivity required to detect small leaks, and does not indicate the leak position.
- vacuum leak testing:** used for sealed parts such as housings and casings. It is less sensitive to environmental changes than pressure decay and measures pressure rise under vacuum, providing stable results. However, it requires pump-down time (longer in the presence of moisture), carries higher investment costs, and does not pinpoint the leak.
- leak detection sensors** can be integrated during functional validation. They detect the presence of conductive coolant and confirm no leaks occur during active flow tests.
- tracer gas sniffer leak testing** involves pressurizing the CDU parts with a tracer gas (typically helium or forming gas) and scanning joints, welds, and fittings with a handheld sniffer probe. This method offers high sensitivity, reaches the low leak rates required for modern liquid cooling systems, and—unlike pressure decay or vacuum testing—allows for precise localization of individual leaks.



Prototype of in-row CDU in data center environment.  
Image generated by AI

### LEAK SPECIFICATIONS (TYPICAL)

mbarl/s	$1 \cdot 10^{-5} - 1 \cdot 10^{-7}$
atm cc/s	$\approx 1 \cdot 10^{-5} - 1 \cdot 10^{-7}$
cm <sup>3</sup> /min	$\approx 6 \cdot 10^{-4} - 6 \cdot 10^{-6}$
Pa m <sup>3</sup> /s	$1 \cdot 10^{-6} - 1 \cdot 10^{-8}$

## Final leak testing with sniffer leak detectors from INFICON

A final test of the fully assembled system is necessary to ensure coolant stays completely contained once the CDU is installed. As for the test of individual CDU parts, the final test with sniffing involves filling the system with forming gas (5% hydrogen in nitrogen) or helium tracer gas. A brief pre-evacuation can be carried out before filling the unit with tracer gas, in order to remove any "air pockets" and ensure an even tracer gas distribution. Following this, the CDU is inspected for leaks. For users who prefer cost-effective forming gas, the [Sentrac leak detector](#) provides reliable detection across a wide range of leak sizes. For applications requiring helium as a tracer gas, the [Protec P3000 leak detector](#) enables highly sensitive measurements down to  $1 \times 10^{-7}$  mbarl/s. The [XL3000flex](#) offers maximum flexibility, supporting both helium and hydrogen tracer gases with comparable sensitivity.

All leak detectors use a handheld sniffing probe that is moved manually (or robotically) along seals, joints, welds, and other critical areas. Escaping tracer gas is detected instantly, triggering visual and acoustic alarms when the preset reject threshold is exceeded. This allows precise localization and quantification of leaks. Detected leak sites can then be repaired and eventually tested again before validation.

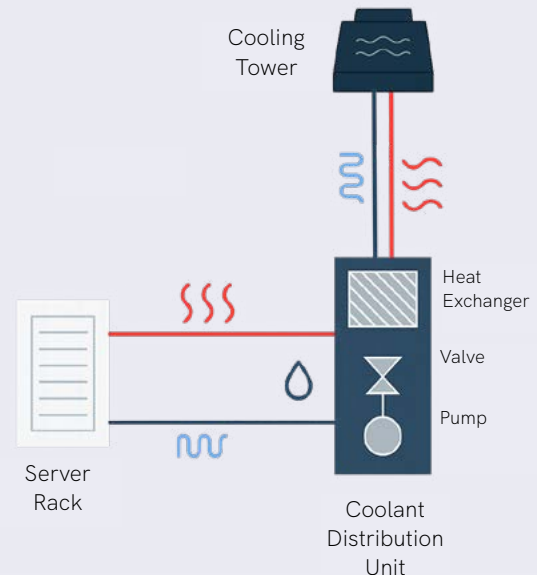
## Advantages of leak testing with helium or forming gas

- Reliable and repeatable measurements
- Highly sensitive, detects even the smallest leaks
- Allows test on parts that do not tolerate vacuum (such as soft plastic housings, rubber gaskets, or delicate electronic assemblies)
- Independent of moisture or temperature variations
- Dry, non-corrosive test
- Immediate leak locating

For more information → [inficon.com](https://inficon.com)

The high-performance sniffer leak detectors from INFICON are designed for highly accurate industrial leak testing and include among others the **XL3000flex helium and hydrogen leak detector**, for full-time sniffing in demanding production environments, and the **Sentrac hydrogen leak detector**, with its unique ability to handle small and large leaks, both in production and repair lines.

### SCHEMATIC OF A CDU



*Simplified illustration of heat management in a liquid-cooled data center system with coolant flow between the server rack, CDU, and cooling tower.*



Watch our sniffing leak testing video!



XL3000flex Helium and Hydrogen Leak Detector



Sensistor Sentrac Hydrogen Leak Detector