



## Leak Detection of Automotive Components



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# Leak Detection of Automotive Components

## Today's Demanding Requirements

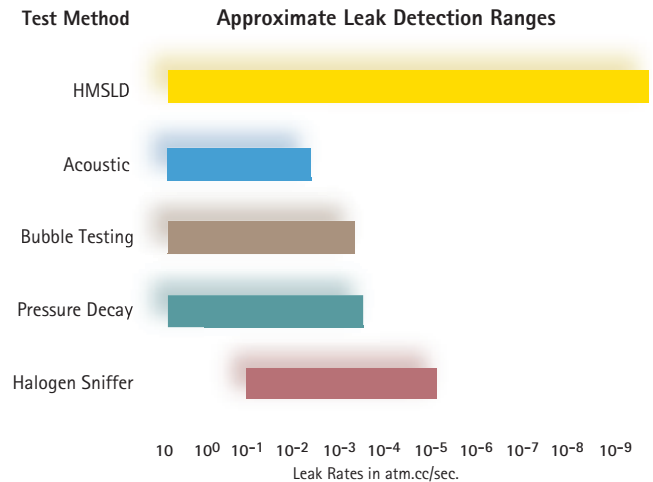
More stringent leak test requirements are forcing manufacturers of automotive products to introduce more sophisticated leak detection technologies. Widely used test methods such as pressure decay and bubble testing technology are insufficient, unreliable, and very slow processes.

In contrast, Helium Mass Spectrometer Leak Detection (HMSLD) enhances sensitivity and productivity and also allows precise measurement to NIST traceable standards. HMSLD uses helium as the tracer gas, which is:

- Non-toxic
- Non-flammable
- Environmentally friendly

As the table on the right shows, HMSLD:

- Is a clean, dry test method
- Provides 100 times greater sensitivity
- Can be used to locate and/or measure leaks
- Is not temperature dependent



### Wheels

Typical parts	Wheel rims
Leak specification	1 psi/30 days or 1 atm/yr
Helium equivalent	$3 \times 10^{-4}$ atm cc/sec at 40 psi (3 atm) delta P



### Air Conditioning Components

Typical parts	Compressors, condensers, evaporators, accumulators, transfer lines
Leak specification	0.1 oz (2.8 grams)/year
Helium equivalent	$1.8 \times 10^{-5}$ atm cc/sec



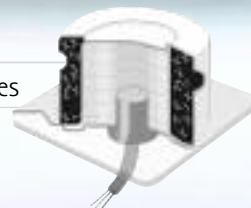
### Engine Cooling Components

Typical parts	Radiators, Heater core, oil and transmission coolers
Leak specification	Bubble test, pressure decay.
Helium equivalent	$10^{-3}$ , $10^{-4}$ atm cc/sec



### Air Bag Inflation Modules

Typical parts	Air bag inflation modules
Leak specification	$10^{-6}$ to $10^{-8}$ atm cc/sec helium

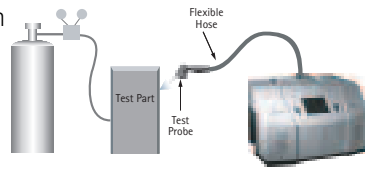


## Locating and Measuring Leaks

Various leak detectors may be employed in any of several ways to find or measure leaks.

### Locating Leaks

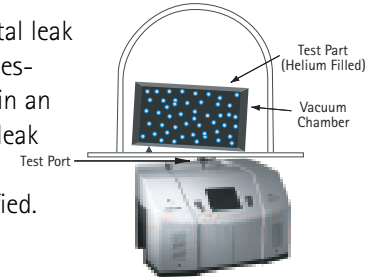
The most common method used with parts that are pressurized is to scan them with a Sniffer Probe attached to the inlet of the leak detector, paying special attention to areas prone to leaks, such as welds, seams, seals or feedthroughs. When a leak is encountered, helium is captured through the probe and detected by the sensor. Leak sites are identified quickly thanks to fast response time.



Locating leaks using Sniffer Probe

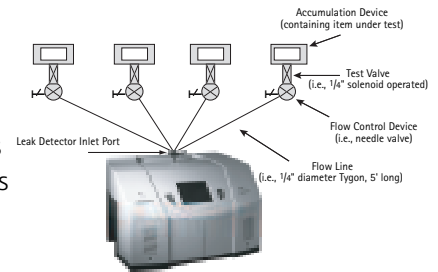
### Measuring Leaks

When it is necessary to quantify the total leak rate of potential leak sites, parts are pressurized with helium, and enclosed within an envelope connected to the inlet of the leak detector. In this configuration, helium can be effectively collected and quantified.



Measuring leaks in enclosure

The Accumulation Method is used to automate the sniffing process and uses fixturing to collect helium from leak sites. Fixtures that have multiple parts or potential leak sites can be isolated sequentially to locate leaks. Accumulation is advantageous, because it does not require evacuation of the outside of the part as depicted above and does not depend heavily on the operator's exact use of the sniffer probe.



Accumulation Method

### Drive Train Components

**Typical parts** Torque converters, transfer cases, rear axles

**Leak specification** 0.5 to 3.0 cc/min at working pressure

**Helium Equivalent**  $8 \times 10^{-4}$  to  $5 \times 10^{-3}$  atm cc/sec

### Fuel Delivery Systems

**Typical parts** Fuel rails and lines, fuel injectors, sender units

Leak specification	LEV II	PZEV
<b>Helium equivalent</b>	10 <sup>-3</sup> (liquid)	10 <sup>-4</sup> (liquid)
	10 <sup>-4</sup> (vapor)	10 <sup>-5</sup> (vapor)



### Fuel Storage Components

**Typical parts** Gas tanks, filler neck assemblies, carbon canisters, gas caps, rollover valves

**Leak specification** 15-20 micron hole at 2 psi (0.1 atm) pressure differential

**Helium equivalent** 10<sup>-3</sup> (liquid) 10<sup>-4</sup> (vapor) atm cc/sec

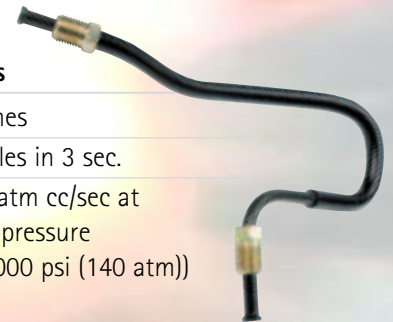


### Brakes

**Typical parts** Brake Lines

**Leak specification** No bubbles in 3 sec.

**Helium Equivalent**  $5 \times 10^{-2}$  atm cc/sec at working pressure (up to 2000 psi (140 atm))



## VARIAN'S HELIUM LEAK DETECTION TECHNOLOGIES

Varian has been in the forefront of helium leak detection for 30 years. Our helium leak detectors, manufactured in Lexington, Massachusetts are available in mobile or workstation units, as well as component models for integration into automated production lines. Varian leak detectors have been successfully used and integrated in the following automotive applications: fuel delivery, air conditioning, torque converters, brakes, wheels, air bags, headlights, electronic packages, gas tanks, heat exchangers, and many others.

**To receive a copy of the Varian Leak Detection Catalog, contact us at 1-800-8VARIAN.**



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