

Leak Detection of Automotive Components

Helium leak testing for the automotive industry





Today's Demanding Requirements

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

Enhanced sensitivity and productivity

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 and environmentally friendly.

Typical range of leak detection methods

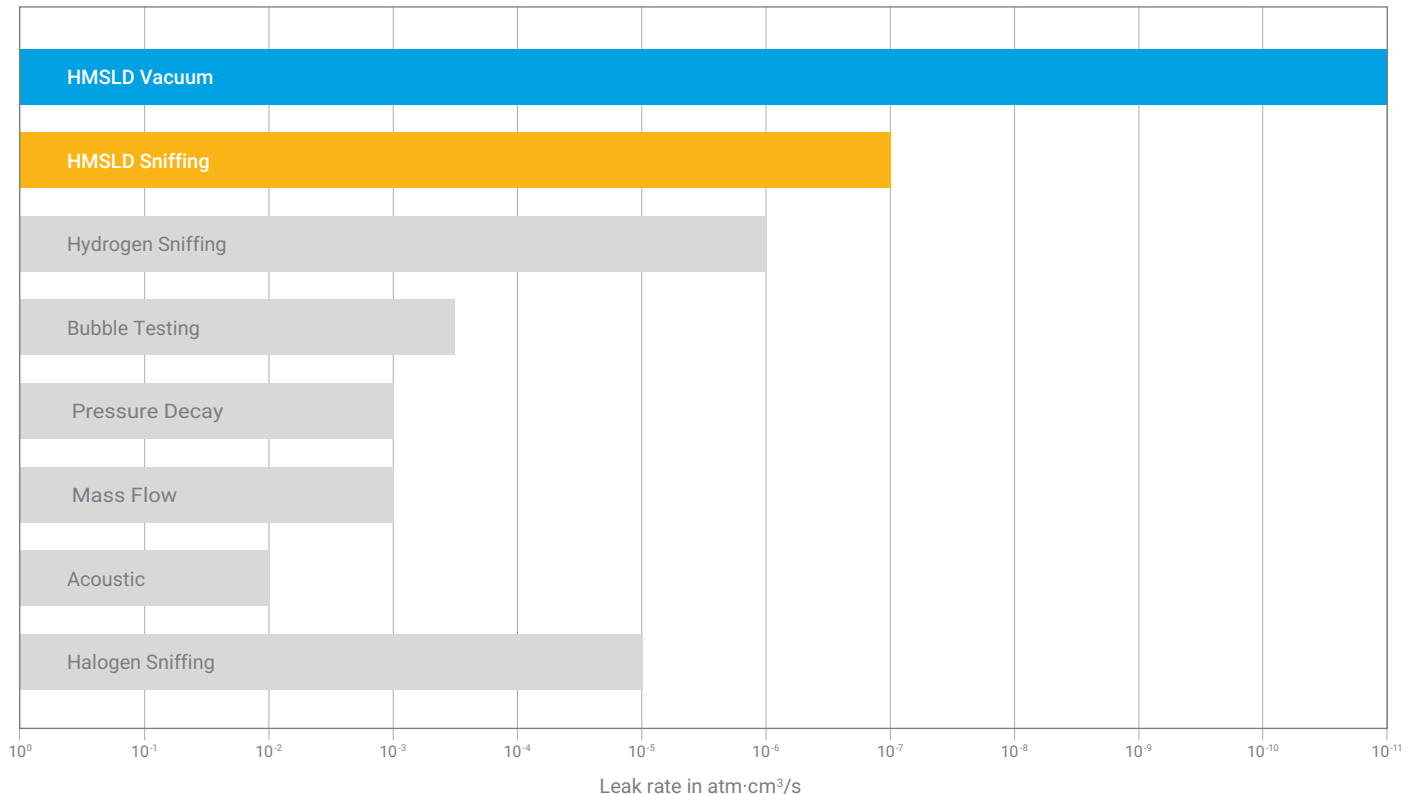
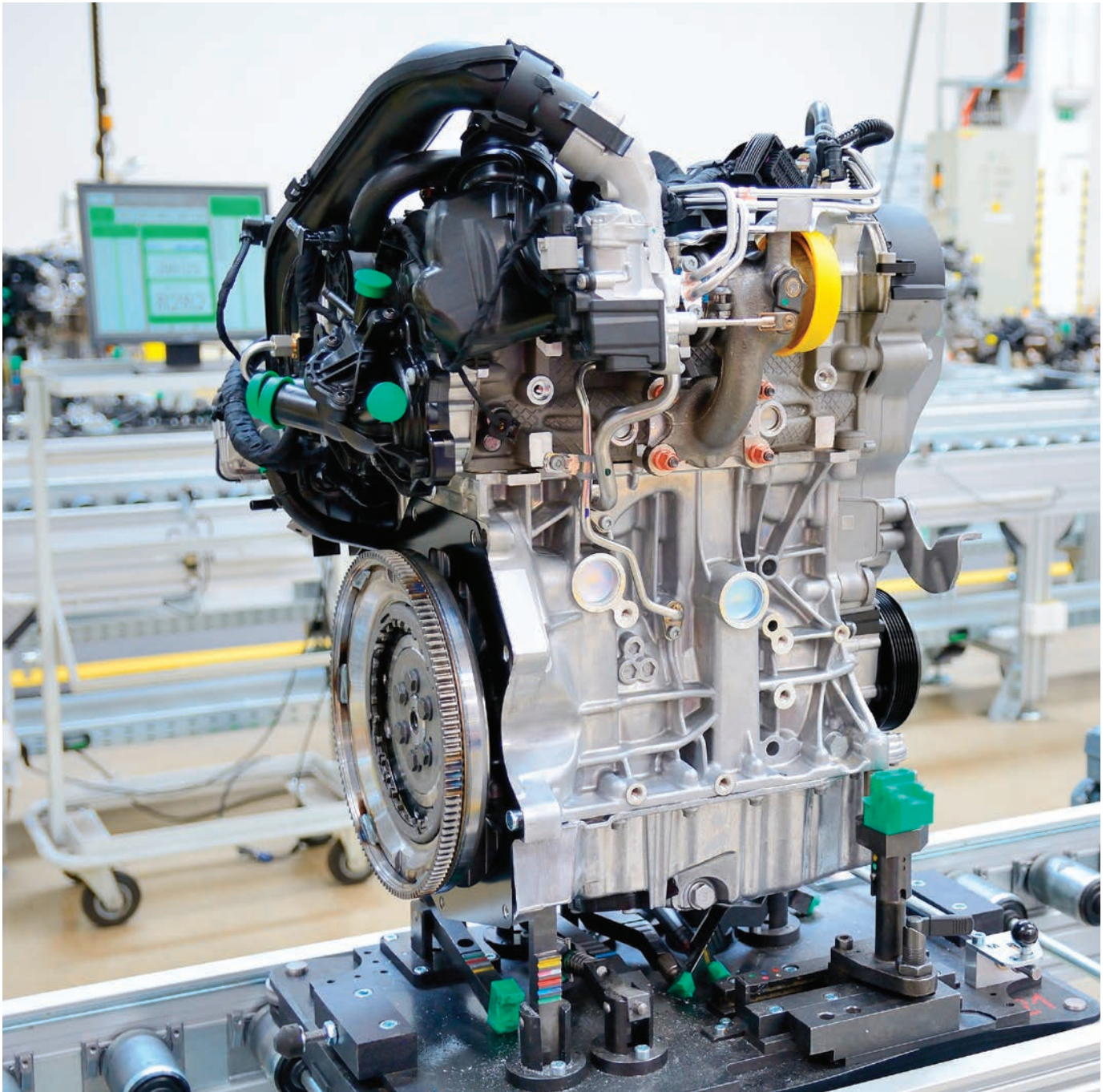


Figure 1. HMSLD is a clean, dry test method. It provides 100 times greater sensitivity, can be used to locate and/or measure leaks, and is not compromised by temperature fluctuations.

Automotive Leak Detection Applications

Superior performance for any application

Helium leak testing is suitable for almost every automotive component or system that must be leak-tight. Regardless of the test method or production requirements, from R&D to full-scale production, our instruments can be configured for your application. No other technology offers a better combination of speed, sensitivity and flexibility.





Air conditioning

Compressors, condensers, evaporators, accumulators, and transfer lines

Leak specification:

2.8 to 7.0 grams/year

Helium equivalent:

10^{-4} to 10^{-5} atm·cm³/s



Engine and transmission

Engine blocks and transmissions

Leak specification:

10^{-2} to 10^{-6} atm·cm³/s

Helium equivalent:

10^{-2} to 10^{-6} atm·cm³/s



Wheels

Wheel rims

Leak specification:

1 psi/30 days or 1 atm/year

Helium equivalent:

3×10^{-4} atm·cm³/s at 40 psi delta P



Drive train

Torque converters, transfer cases, and rear axles

Leak specification:

0.5 to 3.0 cc/min at working pressure

Helium equivalent:

8×10^{-4} to 5×10^{-3} atm·cm³/s



Fuel delivery systems

Fuel rails and lines, fuel injectors and sender units

Leak specification:

15 to 20 micron hole at working pressure

Helium equivalent:

10^{-3} (liquid) 10^{-4} (vapor) atm·cm³/s



Fuel storage

Gas tanks, filler neck assemblies, carbon canisters, gas caps and rollover valves

Leak specification:

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

Helium equivalent:

10^{-3} (liquid) 10^{-4} (vapor) atm·cm³/s



Engine cooling

Radiators, heater core, oil and transmission coolers

Leak specification:

Bubble test, pressure decay

Helium equivalent:

$> 10^{-4}$ atm·cm³/s



Brakes

Brake lines

Leak specification:

No bubbles in 3 sec

Helium equivalent:

5×10^{-2} atm·cm³/s at working pressure (up to 2000 psi (140 atm))



Electric vehicle (EV) batteries

Rigid cells, flexible pouches and polymer cases

Leak specification:

No loss of electrolyte, no moisture ingress

Helium equivalent:

10^{-6} to 10^{-8} atm·cm³/s

Locating and Measuring Leaks

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

Sniffing method

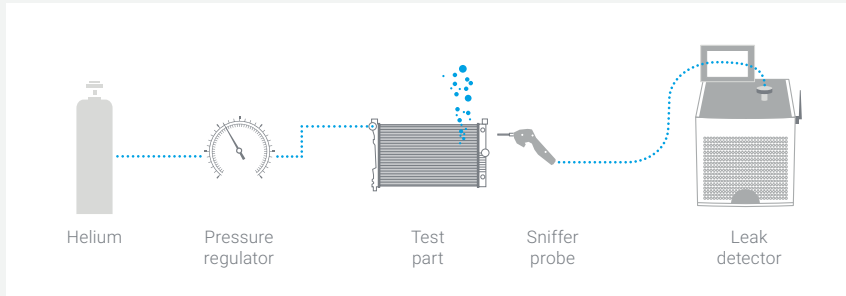


Figure 2. When a leak is encountered, helium is captured through the probe and detected by the sensor. Leak sites are identified quickly thanks to fast response time.

Locating leaks

The most common method for locating leaks 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 feed throughs.

Vacuum method

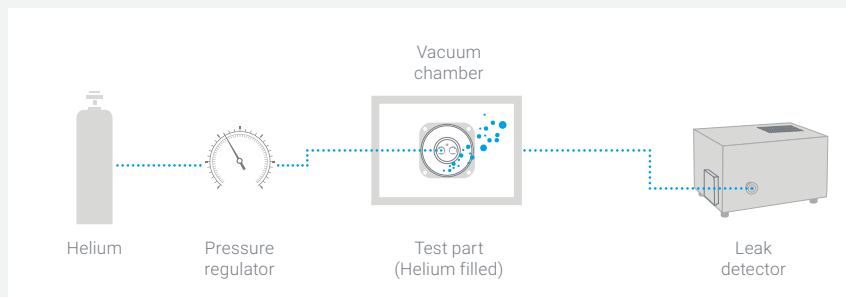


Figure 3. In this configuration, a cumulative leak rate can be determined quickly and accurately.

Measuring leaks

When it is necessary to quantify the total leak rate, parts are filled with helium, and enclosed in a vacuum chamber which is evacuated and analyzed by the HMSLD.

Accumulation method

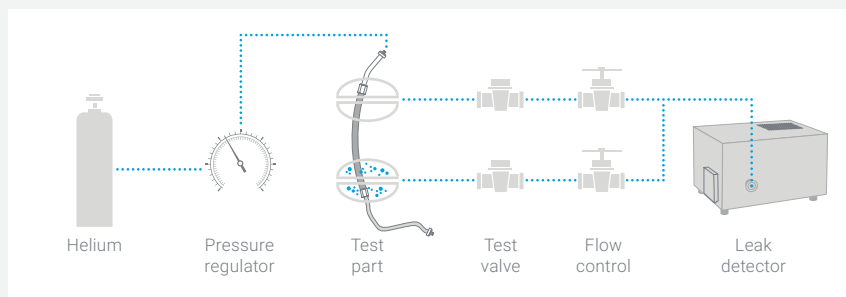


Figure 4. Accumulation is advantageous because it does not require evacuation of the outside of the part as depicted above and does not depend heavily on the operator's precise use of the sniffer probe.

Accumulation method

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.



Let us help you achieve your goal

Whether your goal is to reduce your cycle time, improve your production yield, or meet your regulatory or certification requirements, Agilent delivers the guidance, equipment and support that you need to reach your goals.

An Innovative Leak Test Solution

Agilent's Helium Leak Detection Solutions

We have been at the vanguard of helium leak detection technology for over 35 years and offer a complete range of leak detection solutions: mobile, workstation, and component-type for automated production lines.

Automotive applications in which Agilent leak detectors are used:

- Air conditioning
- Drive train
- Engine cooling
- Engine and transmission
- Wheels
- Fuel delivery systems
- Fuel storage
- Brakes
- Electric vehicle (EV) batteries

Agilent experience and support

Sales and application support

Agilent's team of field sales and applications engineers are available worldwide to assist you in creating the best solution adapted specifically to your production requirements.

Service and technical support

Our global support network backs your solution with highly experienced service and technical support.

Training

To guarantee and maintain your systems optimal performance, Agilent offers comprehensive, industry-leading training on leak detection, maintenance and vacuum practice.



The Agilent HLD Leak Detector uses a mass spectrometer tuned to detect helium, which is used as a tracer gas to locate and/or measure very small leaks in enclosed devices or systems. The mobile HLD is both a precise instrument and a robust workhorse, featuring an easy-to-use touch screen interface and menu structure that quickly connect users to powerful leak detection capabilities.



The Agilent C15 Component Leak Detector offers a robust design, simple integration and multiple communication options to seamlessly integrate with any automated production test system.

Learn more:

www.agilent.com/en/products/vacuum-technologies/leak-detection/helium-leak-detection

For information on leak detection instruments:

www.agilent.com/en/product/vacuum-technologies/helium-leak-detectors

Get answers to your technical questions and access resources in the Agilent Community:

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