

Helium leak test: process reliability in series



Helium leak test under vacuum	
Detection limit of a mass spectrometer	10^{-12} mbar · l/s
Usual working range leak testing system	10^{-3} – 10^{-7} mbar · l/s
Helium leak test under atmosphere	
Detection limit of the sensor	10^{-6} mbar · l/s
Usual working range leak testing system	10^{-2} – 10^{-4} mbar · l/s

The helium leak test is one of the established and most accurate leak test methods, both in a laboratory and in series production. In addition to the helium leak test under vacuum, which is based on vacuum creation in the test part and the test vacuum chamber, the helium leak test under atmosphere (accumulation) is also used.

Both leak test methods can be fully automated. A leak test system can either be fully automated using e.g. robot handling or the parts handling can be done manually by an operator. In both cases, the leak test itself is automated.

Your benefits at a glance:

- Objective leak test under vacuum or under atmosphere
- Short cycle times
- Reliable testing results in the low leakage range
- Single or multi-chamber testing system
- Fully automated testing process
- No parts drying required
- Helium recovery or gas mixing systems
- Article recording for other product variants
- Cycle time reduction through additional test chamber

Ultrasonic leak test: The new dimension of gas bubble detection



With the ultrasonic leak test, the worker-dependent water bath leak test becomes an objective semi- or fully automatic ultrasonic leak test system. In this way, a leak can not only be detected, but also localized. This is possible up to a leakage rate of 10^{-5} mbar · l/s and therefore applicable to various components. The process can be used universally in industrial series production in numerous sectors.

Your benefits at a glance:

- Objective and transparent leak test
- Testing of several parts in one basin possible
- Direct localizing measurement method
- Low test gas costs due to the test gas air
- Semi- or fully automated system
- Maintenance-free ultrasound system
- No periodic calibration required
- No vacuum components
- Low operating costs
- Article fixtures for other product variants

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Leak testing in hydrogen technology

Bipolar plates for fuel cells

Green hydrogen will be a key element of the energy and mobility transition, as the molecule offers a multitude of possibilities and opportunities both in the transport and automotive sector as well as in energy storage and sector coupling.

Battery solutions are expected to be the leading power-train for the majority of passenger cars, but fuel cells and the use of hydrogen in powertrains will also play a major role in the future. The fuel cell drive is a real alternative, especially in heavy load, commercial vehicles, shipping, the aviation sector and local public transport. Short loading times and sufficient ranges per storage cycle are the main advantages of this concept.

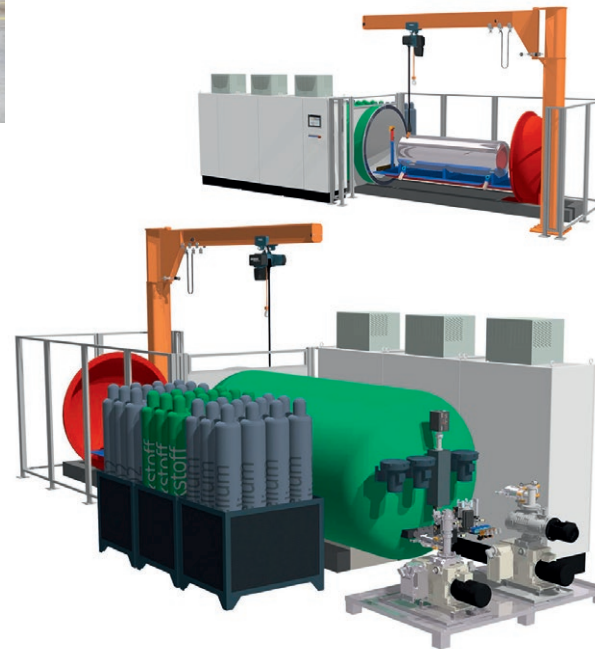


The fuel cell generates the required electrical power. Their essential components are the bipolar plates. They must be tight so that no gas can bypass the desired process through leaks. There are also other components such as buffer batteries, electric motors, compressors, cooling units and piping systems, most of which also have to be checked for leaks in order to meet quality standards and to ensure durability and reliability.

MACEAS offers an innovative and reliable helium leak test for the so-called single plates and the bipolar plates. The different circuits of the bipolar plates are leak tested against each other within the test cycle.

Helium leak test of bipolar plates:

- Effective cycle time: 12 s
- Capacity: 300 parts / h
- Test gas: 10% helium / 90% air
- Leak rate: $4,8 \cdot 10^{-5}$ mbar · l/s (with 10% helium)



Cryogenic hydrogen tanks (LH₂)

Liquid hydrogen can be stored in cryogenic tanks at low pressure for a longer period of time. The insulation of the tank is crucial because liquid hydrogen has a boiling point of approx. -253 °C and it turns into a gaseous state at higher temperatures. An essential requirement for maintaining this low temperature is that the hydrogen tank and the surrounding insulation layer have the lowest possible leakage rate. For this purpose, the components are tested in a helium leak test device.

Testing device for cryogenic tanks

With the testing device developed by MACEAS, cryogenic tanks can be checked for leaks and tests on evacuation behavior can be carried out. The fixture with the tank is pushed into the vacuum chamber on a rail system and docks automatically to the supply facilities. After closing the chamber, the testing process starts.

Service laboratory testing

MACEAS offers its customers the option of buying this device or using the system for project-related preliminary tests and test series at our headquarters in Barßel. Especially in the prototype phase, this can be a cost-effective way to gain initial insights for further development and optimization for series production.

H₂

Leak testing in battery technology

Whether hybrid or fully electric – the battery-electric drive is becoming more and more popular and is experiencing exponential growth. The following applies: to meet the specified quality requirements, all batteries – not just those used in e-mobility – must be tested for leaks.

Our leak test systems enable the detection of very low leak rates – from battery housing to end-of-line testing of the finished battery cell.

Various methods are available here, for example the helium vacuum leak test of the battery cell housing and cooling elements. Or the automatic sniffing of the battery packs with helium as a tracer gas.

Suitable for leak testing of

- Battery cells
- Battery cell housings
- Battery modules
- Battery packs
- Cooling elements

End-of-line leak test

A battery cell that has been filled with electrolyte and completely sealed can no longer be checked for leaks using the helium vacuum method at the end of the manufacturing process! The end-of-line leak test reduces this quality risk to a minimum: the battery cell is tested for leaks in a vacuum chamber. This is done with the help of the direct detection of solvents escaping in the gaseous state from a possible leak.

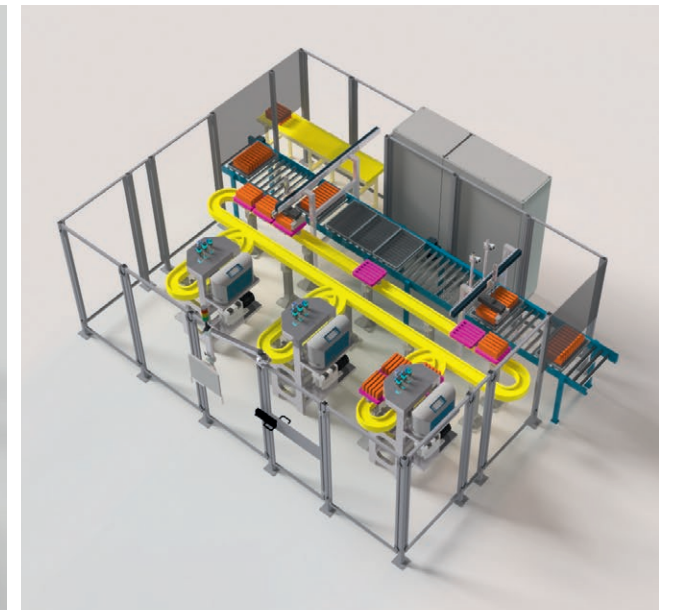
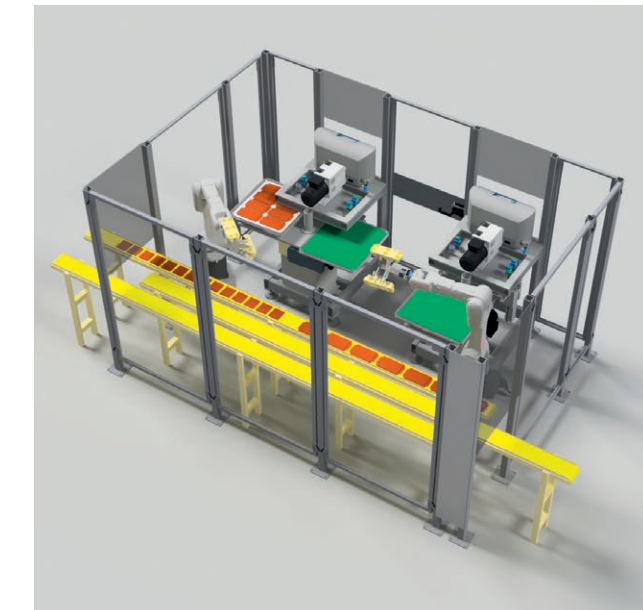
Your benefits at a glance:

- Objective leak test under vacuum
- Single or multi-chamber testing system
- Fully automated testing process
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End-of-line leak test – your benefits at a glance:

- Detection of the most common solvents: DMC, DEC, EMC and PP
- Smallest detectable leak rate = $1 \cdot 10^{-6}$ mbar · l/s (helium equivalence)
- Short cycle times
- Traceable and reliable leak test results
- High level of safety and service life of a battery cell

Customized battery cell leak test



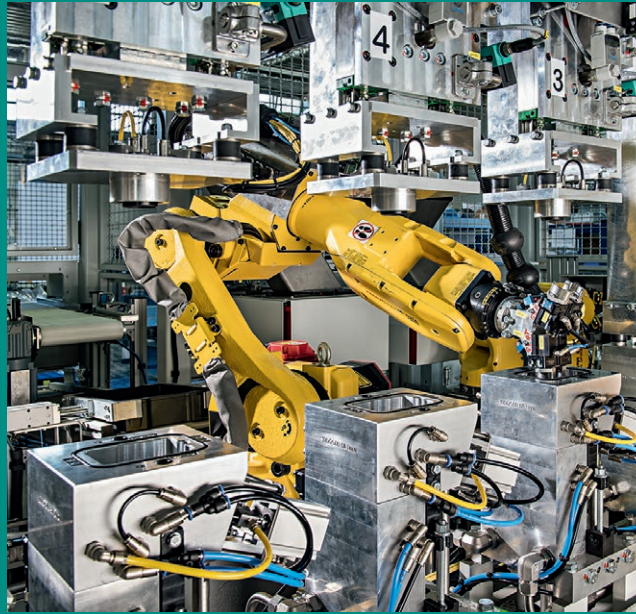
Fully automated and customized end-of-line leak test for battery cells

LEAK TESTING BY EXCELLENCE

Leak testing for your quality assurance

Leak testing is a crucial part of the quality assurance for many industrial products. This applies from the automotive sector to thermal or medical applications. In particular, the automated leak test in series production is of great importance.

By means of smart integration of fully automated processes cycle times can be shortened, efficiency can be increased and finally costs can be reduced.



We offer our customers both standardized and customized solutions with different leak test methods.

We are concentrating on our core competencies in leak testing with helium and the ultrasonic gas bubble detection in a water quench. Extended and completed by customer-specific automation solutions. We are therefore a crucial part of the quality control and ensure that industrial series production runs smoothly.

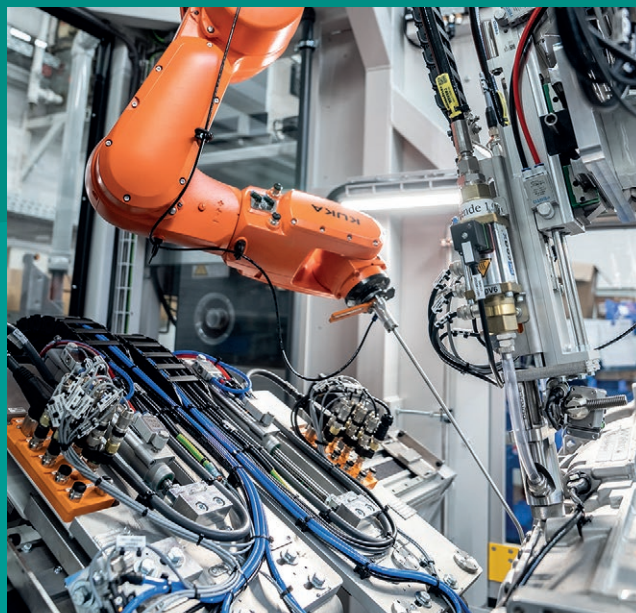


Helium leak test

With the fast and process-reliable semi-automatic or fully automated test method, even very small leaks can be reliably detected and localized – both in a laboratory and in large-volume series production.

Ultrasonic leak test

The new dimension of gas bubble detection in a water quench: An objective, worker-independent, semi-automatic or fully automated leak test method for industrial series production including leak localization.



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Automation and special purpose machinery – from a single source for your application



Example: production line for SCR-tanks

Our core competencies lie in mechanical engineering, for example for a large number of customers in the automotive sector. When it comes to treatment and processing as well as testing, e.g. of fuel tanks, we offer our customers all process steps – from loading the blow mold to sequencing and "just in time" provision of the products in the production line.

The manufacture of complex products often requires the linking of different devices to form a production line. Various interfaces and the material flow between the devices must be efficiently planned and implemented. We achieve this goal with our complete solution from a single source.



Example: manufacturing cell for cooling housings

Your benefits at a glance:

- One contact person for the entire line
- Lower project planning capacity required by the customer
- Minimum number of interfaces
- No isolated solutions
- Optimal distribution of work content across the entire line
- A uniform concept for the material flow of the entire line
- Ensuring conformity
- Consistent visualization and operation
- Unified maintenance concept



Quality-conscious · Reliable · Individual



Complete solutions for your leak testing and automation application



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