GAUSSTEC Ingenieurbüro GmbH
Baselstrasse 1, 4534, Flumenthal
Tel: +41 32 682 15 65
www.gausstec.ch

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# LEAK TEST, DETECTION OF MICROSCOPIC LEAKS

Leaks in plastic parts are still a permanent topic today. Why this is so is related to their manufacture and the functions that each injection mould must fulfil. Elimination is not required for demoulding edges and injection points. In addition, there are other characteristics such as flow seams, burrs on the ejector, rough surfaces, demoulding marks and scratches that increase over time. All these characteristics are causes for leakage in vessels, screw connections, pipette tips, lids, etc.
The testing technology responds with sophisticated and expensive measuring devices such as cameras, laser scanners, electrical breakdown test, differential pressure measuring devices, laboratory scales and gas sniffers. Depending on the solution, these test systems can lead to erroneous decisions, changes in surface polarity, contamination, ignorance of the real leakage characteristics and long measurement times.

The type of test method chosen can usually be seen from the leakage specification, such as pressure drop per time, for differential pressure gauges. The measuring time is sometimes minutes to hours.

$$\dot{V} = \frac{dV}{dt} = \frac{\pi * r^4 * \Delta p}{8 * \eta * l}$$

To convert such a specification into a leakage current, one would apply the above equation according to Hagen-Poiseuille and can then measure with the KENSLER much faster, more precisely and more gently.

Measuring with KENSLER V1.02

The KENSLER V1.02 system is the result of years of experience in finding the cause of leaks in screwed connections, rubber septums, push-in closures, containers, drinking bottles, etc. The test system is based on direct leakage current measurement [nl/s]. It detects leaks from 3µm diameter with 0.4mm wall thickness within 2s. *Abbildung 1* shows us how the KENSLER V1.2 reacts to a leak of this magnitude. For this purpose we open a leak of Ø3µm for a period of 7s.
At point (1) there is still pressure equalisation. When the leak is opened we immediately see an increase in the leak signal (2) and after 2s (3) the sensor already delivers a signal of 124nl/s. For another 5s we leave the leak open and then create pressure compensation (4). The integral (area) under the hump corresponds to a total volume of 1ul gas.

Where is the KENSLER V1.02 used?

At Gausstec we use the measuring device in a laboratory environment to investigate the causes of leaks. The fact that we can vary the test pressure and the measuring time is extremely short is particularly helpful here. We therefore have immediate information about the condition of a sample. In many cases we change the condition of the samples and record these changes simultaneously with the leak signal.
However, the system can also be used in quality assurance and is suitable for both sampling and 100% inspection. Thanks to its high sensitivity, it is possible to test in cascades, i.e. to run several samples in parallel over one sensor in order to continue at sample level in the event of a positive leak.

What are the advantages?

The big advantage is that we measure exactly what we are interested in in the leak test, namely the leak. In doing so, we receive continuous signals which we can record simultaneously with other variables, such as the angle of rotation or torque when screwing a lid on. A measurement with negative pressure as well as with positive pressure is possible. False positive results are almost impossible with the KENLSER.

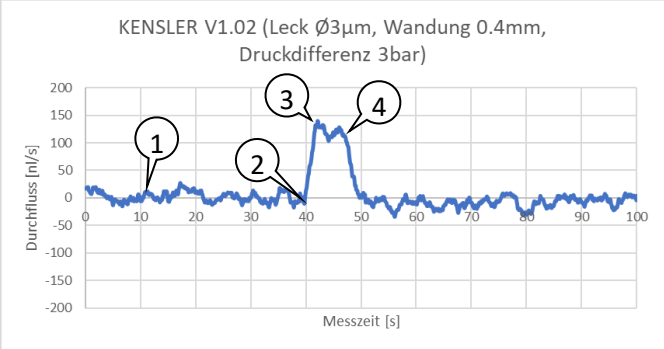


*Abbildung 1: Leak signal of a Ø3µm Leak*

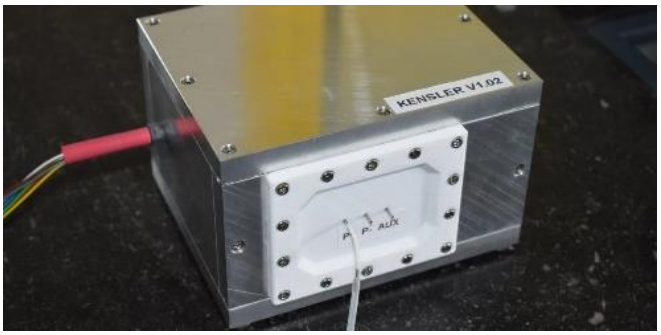


*Abbildung 2: KENSLER V1.02*

**Services of Gausstec**

*We are happy to support you in the testing of products and assemblies of any kind, we have special experience with plastics and plastic assemblies.*
*You can find further services here*

**Equipment in the labratory of Gausstec**

Gausstec has qualified facilities for investigating micro-leaks and finding the cause of leaks: KENSLER V1.02, digital microscope, etc.

**We look forward to your suggestions on the subject of leak testing. Simply call us or come by to discuss your tasks.**

Tel: +4132 682 15 65
Web: www.gausstec.ch

**Questions and suggestions:**
**Can the system be used for 100% leak testing of blisters for medical pills?**
Yes, this would be feasible, but there are probably two important questions that we have to answer. How big can the leak be and how much time do we have for the measurement. The blisters with aluminum film are approx. 0.05mm thick and a leak of 3um would deliver a signal level of about 260nl/s at 0.8bar. In the application, we would have to hermetically seal the blister in a chamber, apply a constant negative or positive pressure and then measure the leakage current. The manual process of opening, moving, enclosing, sealing, etc. would probably be too time-consuming. We would have to find another solution. Let's talk on the phone!

Yes, as I said. Now, if I understand correctly, these are such tablet blisters and I think here there are a number of other solutions that we should discuss.

*Abbildung 3: Blister*