Relative Pressure Method

The term ‘relative pressure method’ (also known as absolute pressure method or differential pressure method) is derived from pressure measurement relative to ambient pressure.

If the pressure is measured absolutely, i.e., relative to absolute vacuum, the term ‘absolute pressure method’ is also used.

Various manufacturers use the terms ‘pressure change method’ or ‘differential pressure method,’ which, however, do not clearly define the applied measurement method.

Method:

The test specimen is sealed, and the test chamber, consisting of the test specimen, test fixture, connecting lines, and the test device, is pressurized or evacuated with air, or less commonly with nitrogen or other gases, and then sealed off. The pressure change caused by a leak is measured and evaluated.

Test medium:

Compressed air or nitrogen or vacuum

Detectable leak rates:

Volume and pressure-dependent >1 cm^3/min

Advantages:

- Test devices using the relative pressure method have a simple design, making them cost-effective and robust.
- Thanks to the test sequence defined with precise timings in the test device and the pressure monitored in all test steps, all tests are conducted under reproducible conditions.

- The evaluation is operator-independent.
- Test devices using the relative pressure method are usually equipped with interfaces that enable integration into an automated process.
- The precise measurement of the pressure change allows for the quantification of the leak rate. This enables the utilization of permissible tolerances.
- The test results can be automatically documented, provided the devices are equipped with a suitable interface.

Disadvantages:

- Temperature changes during the actual measurement period cause a pressure change that influences the test result.
- For elastic test specimens, the pressure change caused by leakage can be partially compensated by the specimen’s elasticity.
- The measuring range of the pressure sensor in a relative pressure test device covers the entire test pressure range. This limits the resolution of the smallest pressure changes.

Notes:

- Test pressure changes are directly proportional to the test volume at a constant leak rate. When testing large-volume parts, leaks therefore cause only small pressure changes, the detection of which can be difficult using the relative pressure method. Therefore, efforts must be made to keep the test volume as small as possible.
- A test setup using the relative pressure method should be checked at regular intervals for the plausibility of the measured values, using a known part or a dummy.