Pressure Rise Method

The pressure rise method is often employed when direct measurement in the test chamber is not feasible or is metrologically unfavorable. This may occur, for instance, with a large test volume or very high test pressure. In such cases, a closely fitting bell jar is placed around the test specimen, and the pressure change within the bell jar is measured.

Method:

The test specimen is sealed, filled with the test pressure or evacuated, and enclosed by a tightly sealing bell jar. The pressure change within the bell jar is measured and evaluated. This change serves as a measure of the test specimen’s leakage.

The measurement can be carried out using both the relative pressure and differential pressure methods.

Test medium:

Compressed air, less commonly nitrogen or other gases. (Overpressure or vacuum)

detectable leak rates:

> 0.1 cm^3/min, depending on the measurement method, test pressure, and test volume

Advantages:

- A rapid test sequence is possible, as measurement can commence while the test specimen is being filled. For dimensionally stable test specimens, the stabilization time can be omitted.
- At very high test pressures, the thermodynamic influences on the surrounding test bell volume are significantly lower than on the actual test volume.

- Often, a more favorable test volume can be created with closely surrounding bell jars than when measuring inside the test specimen.
- 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.
- Integration into an automated process is possible.
- 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:

- Sealing the test specimen under a test bell jar, which itself must be sealed against the environment, entails significant mechanical effort. Furthermore, considerable effort is required for potential fault diagnosis on leaky test specimen adaptations.
- 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.

Notes:

- In test setups employing the pressure rise method, it must be ensured during each test run that the test bell jar is sealed against the environment. This can be achieved, for example, by filling the test specimen with relative overpressure while maintaining a vacuum in the bell jar. Another method is to create a slight overpressure inside the bell jar by closing it. By

monitoring the vacuum or pressure within the bell jar, its seal against the environment can be verified.

- Test pressure changes are directly proportional to the test volume at a constant leak rate. Even with the pressure rise method, efforts must be made to keep the test volume as small as possible.
- A test setup employing the pressure rise method should be regularly checked for the plausibility of its readings using a known reference part.