

Mass Flow Testing Method

Mass flow testing is applicable in a comparatively wide range of applications. However, it should be noted that this wide range can only be covered by devices with multiple measuring ranges. A single sensor ideally has a measuring range of 1:100.

The main application area of this method is in the leak testing of small and medium leaks. This method offers the advantage of direct measurement of the flow rate. Mass flow testing devices are independent of the test pressure, so mass flow testing devices are preferred over volumetric flow testing devices in higher pressure ranges, although they are slightly more expensive.

Method:

The test specimen is sealed, filled, and kept under constant pressure. The amount of air flowing out through the leak is replenished and measured. For large-volume components, a pre-filling process is performed, during which the test specimen is filled via a bypass line. The measurement is usually performed using a thermal mass flow sensor.

Test medium:

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

detectable leak rates:

> 0.1 cm³/min

Advantages:

- Provided sufficient cycle time and perfect shielding against external effects, the direct measurement of the mass flow enables the measurement of small and medium

leaks, even on large-volume components.

- 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.
- Mass flow testing devices are usually equipped with interfaces that enable integration into an automated process.
- The test results can be automatically documented, provided the devices are equipped with a suitable interface.

Disadvantages:

- Temperature changes during the actual measurement time cause a pressure change, which affects the replenishment of air and thus the test result.
- Depending on the design of the testing device, there may be a susceptibility to interference in the case of gross leaks.

Notes:

- Especially during the measurement time and with smaller measuring ranges, precise pressure regulation is very important, as any regulation fluctuation leads to an increased or decreased flow while the pressure difference between the pressure source and the test volume equalizes. Manufacturers of testing devices often take very different approaches here.
- Certain mass flow testing devices can be temporarily impaired by over-flowing, i.e., by significantly exceeding the measuring range, for example, due to operating errors or gross leaks. They then require a regeneration time of several minutes, during which they do not measure reliably and the measured values significantly deviate from the sensor specifications.

- Even with mass flow measurements, pressure changes that occur in the test chamber during the actual measurement time directly introduce errors into the test result, because the flow at the mass flow sensor directly depends on the differential pressure between the pressure source and the test chamber.