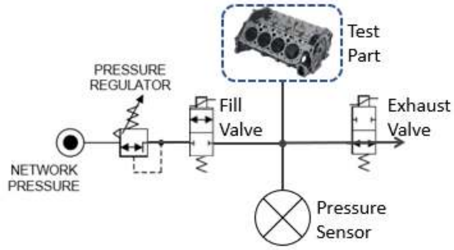
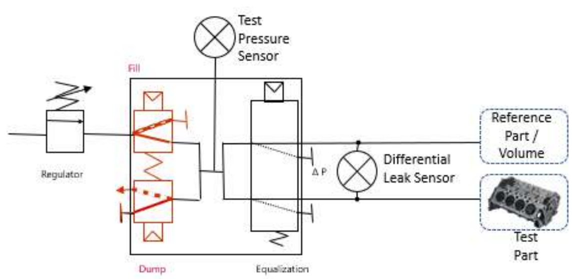
Air Decay



Uses a single pressure sensor to measure the test pressure and pressure drop from a leak. The sensor must be sized for the test pressure; therefore, the sensor's range must be >= the test pressure. E.g. a 100 kPa test pressure requires at least a 100 kPa full scale sensor (1000 mbar). The part is filled and stabilize to the pressure, then the test pressure is tared at the beginning of the test time. The leak is measured as the drop in the test pressure over time multiplied by the parts volume.

Best suited for testing leaks that have a pressure drop per second larger than the accuracy of the sensor. E.g. a 1000 mbar sensor with 0.05% accuracy, could be used to test a 30 sccm max. leak from a 1-liter part or 0.5 mbar/second (50 Pa/s). Measuring the leak or pressure drop for 10 seconds would cause a 5-mbar (500 Pa) pressure drop that is 10 times the sensor's accuracy. A 2000 mbar (200 kPa) test pressure would double; the test time or the max. sccm leak rate or would require the test volume to be reduced by half.

Differential Air Decay

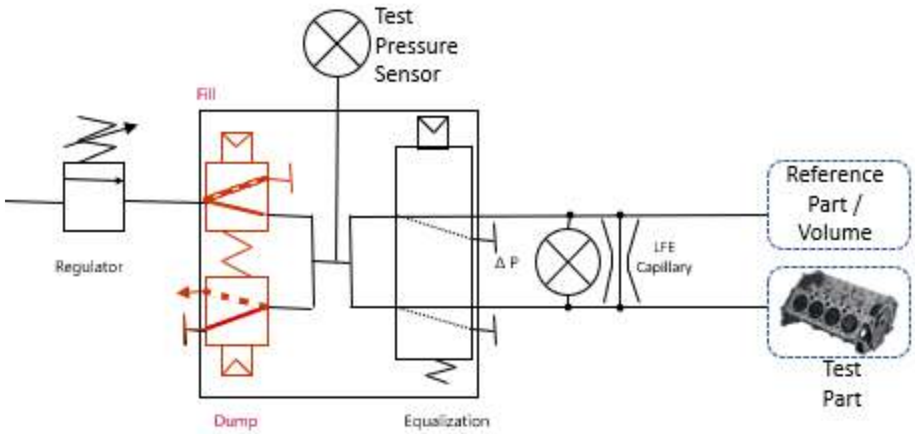


Uses two pressure sensors, one to measure the test pressure and a second to measure the differential pressure drop from a leak. The pressure is equalized on both sides of the differential pressure sensor during the fill and stabilize steps. The test step isolates the test from reference to measure the leak as a differential pressure drop over time multiplied by the parts volume.

The range/accuracy of the differential pressure sensor is independent from the test pressure. E.g. a 100 kPa or 200 kPa test pressure could use the same 0.05 kPa (50 Pa) full scale differential pressure sensor.

Best suited for testing leaks that have a pressure drop per second larger than the accuracy of the differential pressure sensor and > 0.03 mbar/second (3Pa/s). E.g. a 0.05 mbar (50 Pa) differential pressure sensor with accuracy of 2% of reading + 1% of full-scale, could be used to test a 2 sccm max. leak from a 1-liter part, 0.033 mbar/seconds (3.3 Pa/s). Measuring the leak as a pressure drop for 2 seconds would cause a 0.067 mbar (6.7 Pa) pressure drop that is >10 times the sensor's accuracy.

Differential Mass Flow



Uses two sensors, one to measure the test pressure and a second sensor measuring the air moving through the mass flow sensor or Laminar Flow Element (LFE). The pressure is equalized on both sides of the mass flow (LFE) sensor during the fill and stabilize steps. The test step isolates the test from reference to measure the leak as the flow to maintain the pressure. The time for the flow to ascend to the test part leakage is dependant on the volume of the test part. After this delay the sccm leak through the mass flow meter will equate to the test part's leakage. E.g. a 1 sccm leak may require 1 seconds to ascend to 1 sccm on a 1-liter part, however ascending to a 10 sccm leak on a on a 10-liter part may require 10 seconds.

Best suited for testing leaks that have a pressure drop per second > 0.005 mbar/second (>0.5Pa/s) and able to respond to 100% of the test leak <30 seconds. The accuracy of the mass flow sensor should also be 10 times better than the sccm part leak. Note mass flow sensors may attain their accuracy at the expense of response, therefore both must be considered.

All leak testing is governed by the formula below, derived from the Ideal Gas Law.

$$\frac{\textit{sccm Leak rate}}{\textit{volume in Liters}} = \frac{\textit{mbar}}{\frac{\textit{minute}}{(60\ \textit{seconds})}} = \text{mbar/second}$$