

Helium Leak Testing of Automotive Plastic Fuel Pipes

TQC designed and manufactured 2 helium leak test systems for the automatic testing of plastic fuel pipes. The systems included bespoke tooling to accommodate 2 variants of fuel pipe.



The helium leak test machine is split into three modules:

- A **Centre Module** containing the primary controls (Touch screen HMI), vacuum pumps, mass-spectrometer, electrical cabinet, bar code printer and scanner.
- Two **Test Modules**, each containing pneumatically sealing test chamber and localised control and monitoring equipment.



The components are loaded independently into each test chamber, attaching onto the pneumatically expanding seal connector. As each component has three entry points, all of these must all be sealed prior to commencing testing using:

A **threaded sealing plug**. This is screwed into the threaded insert within the fuel pipe assembly prior to loading the component into the test chamber.

A **mechanically operated expanding seal**. This is fitted into the breather pipe within the fuel pipe assembly prior to loading the component into the test chamber. Ensure orientation does not restrict the location of the test component.

A **pneumatically operated expanding seal**. This forms the primary insertion point/datum with the rubber hose on the fuel pipe assembly fitting over it. The seal is expanded automatically using an integrated pneumatic piston as part of the test cycle.



Once the part is sealed correctly, it is placed into the test chamber and over the pneumatically operated expanding seal. The lid is then pulled down over the test chamber to the closed position and the cycle start button operated for that chamber on the centre module HMI.

The part is sealed from the chamber and the chamber is sealed from atmosphere. The component is then evacuated to a pre-set level and held there for a time interval to monitor for any large leak created by the pressure differential (termed '**Gross Leak**'). A fail at this point will reset the cycle.

If the test is passed then both the component and the chamber are evacuated to a lower pre-set level. A fixed volume of Helium is then injected into the component producing a 140mBar pressure differential between the component and chamber. The chamber vacuum line is switched to the mass-spectrometer which monitors for helium leakage from the component into the chamber (termed '**Fine Leak**').

A label printer will dispense the appropriate label based upon the data entered by the operator if the test was successful. This is scanned using a hand-held barcode reader for verification.

Any components that fail due to gross or fine leaks are held for leak location.

The leak location test requires the component to be evacuated, then filled with Helium at 1140mBar Absolute (to produce the 140mBar pressure differential above atmospheric) A hand-held probe connected to the mass-spectrometer is then used to manually locate helium concentrations indicating leaks in the test component.

