

Leak Test Injection Calibration

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6/26/15

Purpose

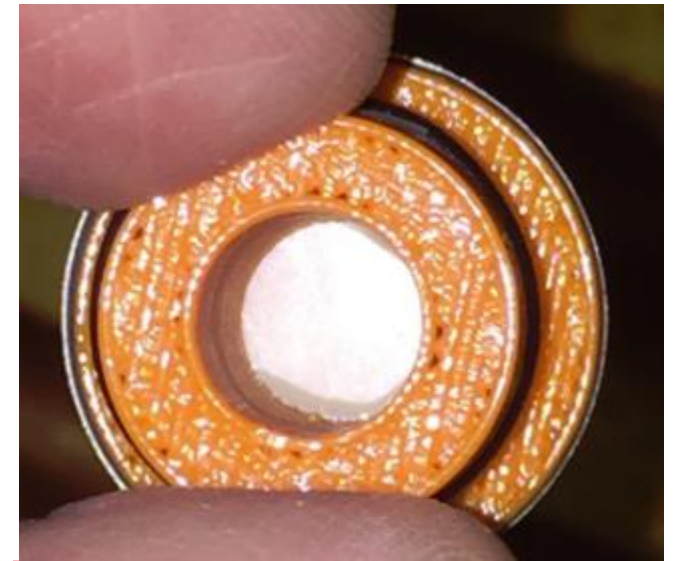
- These slides are made to give a quick overview of the getting chamber volume from the “injection method”

Items needed

- Leak test Chamber
- Arduino and leak testing code
- End plug(septum, 3D printed part, O-ring)
- Injector (1 ml syringe, Long needle)
- CO₂ gas(could be argon/CO₂ mix) for injection
- Nitrogen gas for flushing system

Plug setup

- Plug has 3 parts
- Septum is glued onto the 3D part. Use DP-190 and let sit overnight. Make sure glue does not cover the septum exit in back.
- Put O-ring in groove. Test that a snug seal is made with the chamber. (if too loose, wrap part in Teflon tape until seal is tight, if it won't fit, file down ring groove symmetrically until it fits.)



Procedure

- In external chamber mode, Flush chamber with Nitrogen gas, at 3 scfh for 1 minute.
- Switch to internal chamber mode. Disconnect Nitrogen gas.
- Insert plug into chamber, open valve.
- Take 5-10 minutes of baseline data.
- Put needle into open end of CO₂ source. Pump syringe 3 times to ensure any excess gas is removed. Fill syringe to 0.1 ml beyond intended injection amount.
- (If possible this is where we would turn off fan but not detector)
- Quickly move syringe into septum and chamber and inject amount leaving 0.1 ml in syringe. Remove syringe, septum will self heal injection point.
- Close valve.
- Turn on fan and take data for 10 minutes.
- Repeat process if desired.

Interpreting data

- We see an example of 3 different injections on the right.
- Fit each plateau with a straight flat line.
- From one measurement we should get the volume of the chamber

$$PPM = \frac{V_{CO_2}}{V_{chamber}} \times 10^6$$

- However a more accurate measurement can be had from injecting different amounts of CO2 and plotting CO2 injection vs. ΔPPM

Example data

