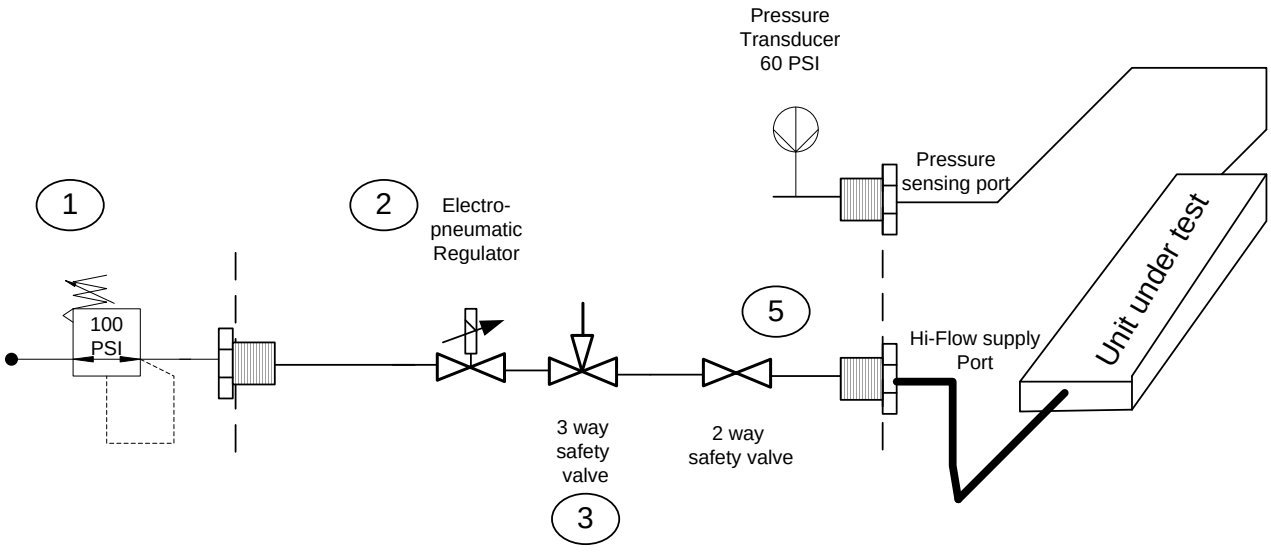
Tech Note – Electronic Regulator Feedback Control

This document is to help explain the operation of the Isaac Pressure decay tester. The Model Isaac APD employs the optional Electro-Pneumatic Controlled Regulator (E/P). The system comprises of an E/P solenoid valves and high accuracy pressure sensor.

Shown below is a system diagram with key components. Item 1 is the pre-pressure regulator, a manual pressure reducing regulator to lower the supply pressure upstream to the Electro-pneumatic regulator (E/P). Item 2 - E/P, a pressure regulator which receives feedback from the pressure sensor monitoring the pressure as it is occurring in the unit under test. The sensor connection must be maintained during test or the system may over pressure and become damaged. Item #3, a three way valve used to ensure decoupling of the pressure supply from the path to item #5, the two way valve during test. Furthermore, venting upstream of the two way helps from masking a leak, if item #5 (trap valve) is contaminated from venting products after tests via the 3 way valve



Setting Test Pressure:

There are two modes of operation for the electronic regulator. The first is an auto feedback algorithm with an adjustable delay. The delay allows the regulator to reach a steady state before fine tuning to minimize the chance for oscillation. The delay can be set from 1 to 99% of the fill timer (typical values <25%). The value entered is for the allowed time for the feedback algorithm to engage. (eg. With a fill time of 4 seconds and a feedback value of 25%, The fine tuning would start at the final 1 second of the fill time).

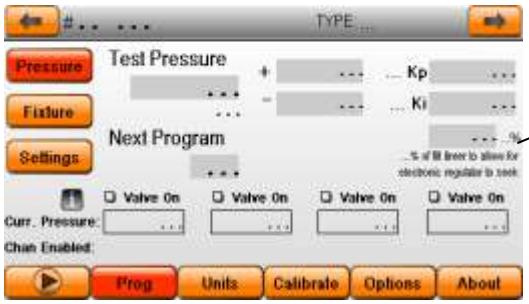
The second mode is a continuous feedback with control constants (similar to a PID control). Setting the feedback percentage to 100% will enable the Kp and Ki control constants. The Kp and Ki functions will allow the fill curve to be shaped according to the application needs. (Speeding up the fill or no overshoot on the test pressure)

The Kp is used as the drive, the larger the number the more the regulator is driven to the set test pressure. If the constant is to large it will cause an oscillation.

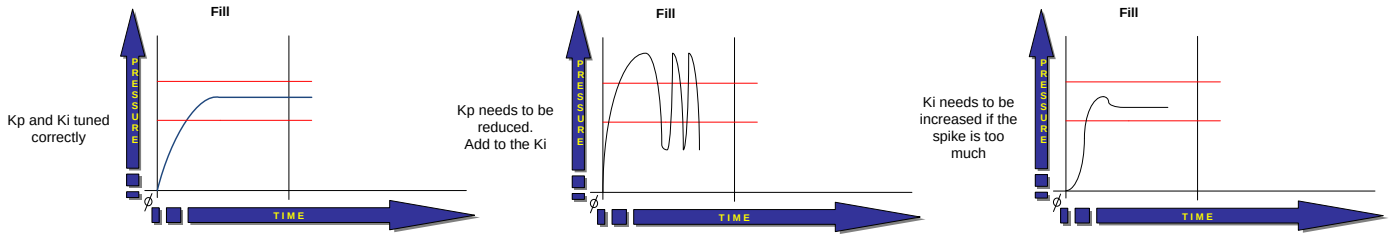
The Ki is the correction factor, as the Kp drives the pressure towards the set point the Ki will correct the feedback to reach the target. To large of a value will cause wild corrections and oscillations.

To reach 50psi in 6 seconds, your test part was tested with the following values:

Kp = 1.00 and the Ki = 0.085.



Feedback percentage



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