

Calibrating the FBV actuator coil

by David F. Nelson

This is my setup for actuator calibration. The micrometer spindle does not rotate so the coil just moves vertically. The magnet assembly is placed on the scale and the tare weight removed so the scale reads zero. Current in the coil will either add force to the scale or reduce it depending on the current direction. The long brass rod separates the magnetic micrometer from the magnet to avoid error from the magnet being attracted to the micrometer.

The force constant is then ---- Indicated weight difference in grams / coil current in mA $\times 9.8 \text{ M/S}^2 =$ Newtons per Ampere.

(note 1 gram = 1Kg/1000 and 1 mA is 1 Amp/1000 so the units are correct) 1 Newton = 1 Kg M/sec²

This is the coil for my new design . This coil in this configuration is only 1/4 inch wide with 550 turns #34 for a force constant of 13.1 N/A. There is room for 650 turns which will produce ~15.6 N/A.

If the force constant is too high the sensitivity of the instrument in V/M/S will be low.

The initial measurement should be made with the depth as close as possible to the actual operating position and then plus or minus ~ 1mm to see if there is any significant non linearity. I usually use 10 to 50 ma as a current and get similar constants . You can also check both polarities. I get about 15 N/A for the coil with 770 turns of # 32. I test a couple of different currents to produce 10 to 30 grams of scale indication. I test over ~ the expected range of the coil motion just to verify the force is constant.



