

## Objective

This lab is a straightforward exercise in calibration of pressure transducers. The primary instrument to be calibrated is a Setra differential pressure transducer, having Full Scale Range<sup>1</sup>  $\pm 1''$  H<sub>2</sub>O, where from the formula

$$\Delta p = \rho g h \quad (1)$$

with  $\rho = 1000 \text{ kg m}^{-3}$  it follows that the pressure differential equivalent to ( $h =$ ) one inch of water is  $p = 249.2 \text{ Pa}$ . The Setra produces a voltage signal varying approximately from 0 – 5 volts across the Full Scale Range in pressure, and this will be measured on a digital multimeter. You will also calibrate an inclined manometer, and a Dwyer Magnetoheliometer.

The pressure signal is produced in the air column above a column of water, when a hydraulically connected column is raised by winding a screw. That signal is conveyed by tubing to the high pressure side of each of the transducers, and to the calibration standard.

The calibration standard is the Dwyer Microtector, simply a U-tube manometer that is equipped with a sensitive length detector. When the electrically conductive fluid touches the  $h$ -sensing needle, current is able to flow giving an indication of contact. Each full turn of the screw moves the

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<sup>1</sup>Although “inches of water” is not an MKS unit, it remains popular. One inch (of length) is equivalent to 2.54 cm.

needle in the vertical by distance  $\Delta h = 0.025''$ . It may be helpful to think of the Dwyer calibrator in terms of its ability to detect that  $h < 2h_{set}$ , where  $2h_{set}$  is the target pressure difference.

## Procedure

Having familiarized yourselves with the operation of the equipment, proceed as follows

- Zero: Loosen off the locking screw on the length detector. Set the scale to zero, and adjust the needle height until it is just touching the liquid ('on'). This is fiddly, and you may prefer to note and use a zero offset
- For a suitable number of negative and positive pressure differences, calculate the corresponding  $h/2$ , and back off the needle to that setting
- wind on the desired pressure difference, allowing for lag in the system due to friction... as you approach the target pressure (displacement) make your rate of adjustment suitably slow
- when the Microtector current switches on, record the readings from the Setra, the Dwyer guage, and the inclined manometer

## Analysis

Provide  $x - y$  graphs of output-versus-input for each transducer.