

Pitot tubes are the simplest velocity head sensors. Models can be specified for a variety of difficult fluid services that include high temperature and high pressure. The sensor probes are often designed to be inserted into conduits without process shutdown.

One fundamental problem with the pitot tube is that velocity measurement is made at only one point in the flow stream rather than providing integrated volumetric flow measurement. The probes must be traversed across the pipes or the velocity profiles known in advance to calculate the average flow rate. For high accuracy and consistent results, the pitot should be preceded by 50 or more diameters of straight smooth pipe. If a sufficient straight run of pipe is installed ahead of the pitot tube, an approximate average velocity reading will be obtained at a location approximately 30% of the pipe radius from the pipe wall. The basic pitot tube configuration is shown below in Figure 5.

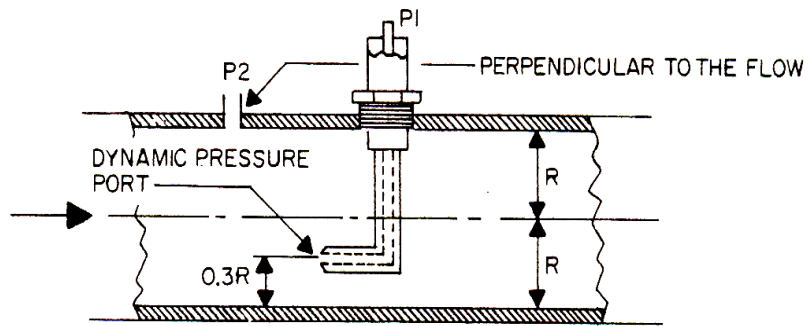


Figure 5 – Basic Pitot Tube Configuration

One port is placed in the flowing fluid, facing upstream, and is connected through internal tubing to one side of the secondary element. This port registers the total dynamic head in the stream since the velocity is zero at the sensing tip. The static pressure is obtained from a port which faces perpendicular to the flow and is usually located in the pipe wall.

Errors are introduced in pitot tube measurements because the total and static pressures are not measured at the same point in the flow profile. This problem is eliminated in pitot static tubes, shown below in Figure 6.