

It is frequently important to be able to measure the mass flow \dot{m} of a gas in a pipe (e.g. to measure the airflow into an engine).

A possible *low speed* air mass flow measurement system is proposed, which consists of a slight constriction, together with two pressure gauges and one temperature gauge, delivering the quantities p , p_c , and T . Also known are the area of the pipe A , and the area of the constriction A_c .

Determine the equations necessary to determine \dot{m} from these known or measured quantities. Clearly state the assumptions associated with each equation.

Note: You will also need to invoke one or more relations from Thermodynamics, as well as known thermodynamic constants for air.

