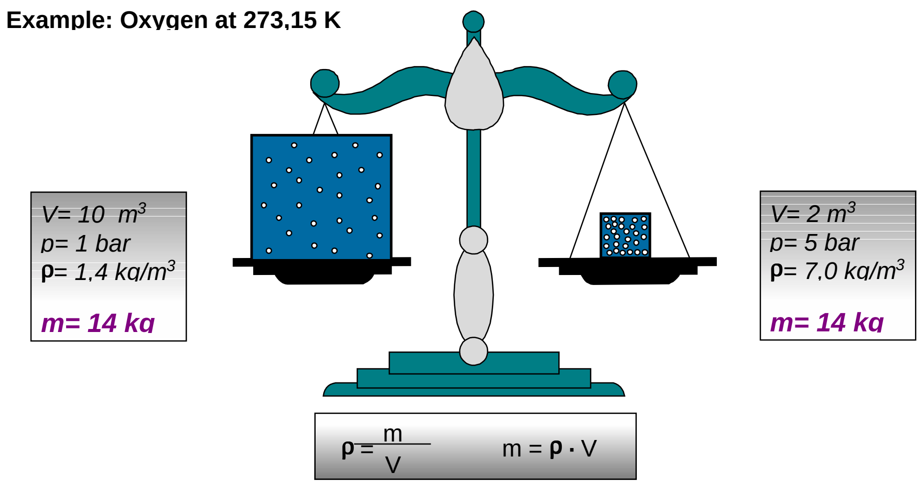
Measuring principle of Sensyflow thermal mass flow meters



Most of the conventional flow meters determine volumetric flow rate. In this case, it is necessary to correct the density of the mass flow through additional measurement of pressure and temperature.

These corrective actions make measurements more expensive and they reduce the overall accuracy of the measuring system. Sensyflow measuring systems provide the mass flow rate directly, i.e. without further measurement or correction. Flow rates, based on units of mass, are a requirement of almost all technical applications. In view of the close relationship between mass and amount of substance, mass flow is used as an assessment factor in chemical reactions, e.g., to set the stoichiometric relationship between the reaction partners exactly.

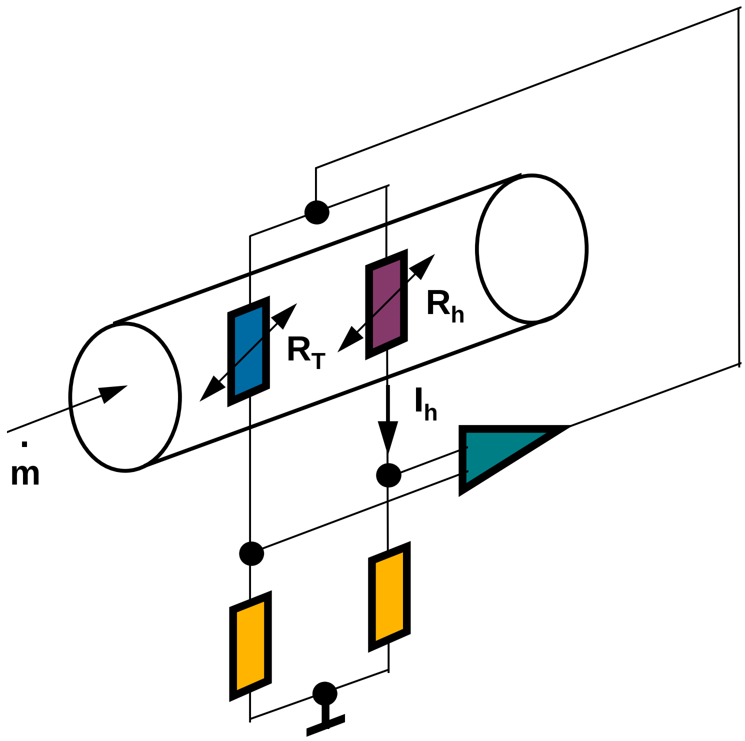
Example:
If 10 m^3 of oxygen is to be compressed from 1 to 5 bar at a constant temperature, the volume or volume flow will change to 2 m^3, although the amount of substance and the mass are still the same (14 kg). In this case, a volume flow meter will only indicate 20 % of the original volume flow.
As a result, a volume flow measurement for gases without correction of pressure and temperature is without any meaning. The mass flow meter directly determines the mass per unit of time of a flowing medium; a measured value in kg/h is displayed.
Parameters such as volumetric flow rate (referred to the standard state) can be calculated directly from the standard density of the medium:

$q_n = q_m / \rho_n$ in e.g. m^3/h-qn with
q_n = volume flow rate as a function of the normal flow rate (e.g. 0 ºC and 1013 hPa)
q_m = mass flow rate
ρ_n = density as a function of the normal status

(e.g: 0 ºC and 1013 hPa)

Measuring principle

Sensyflow operates according to the principle of the hot-film anemometer. This method of measurement is based on the abstraction of heat from a heated body by an enveloping gas flow. The "flow-dependent" cooling impact is used as the measuring impact. The gas stream flows past two temperature-sensitive resistors R_h and R_T, which are part of an electrical bridge circuit. Due to the chosen resistance ratio $R_h << R_T$, R_h is heated by the current I_h, and R_T adopts the same temperature as the gas. The current I_h is preset by the electronic control circuit to produce a constant temperature difference between the heated resistor R_h and the temperature of the gas.



The electrical power generated with resistor R_h exactly compensates its loss of heat to the gas flow. As this loss of heat is dependent on the kind and quantity of particles that collide with the surface of resistor R_h, I_h represents a measure of the mass flow rate.

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