The calorimetric measuring is using the transport of warmth from a warmed body to the surround medium (e.g. air or water).

The transport of warmth is basically affected by two things:

1. The velocity of the medium. (distance per time, terms e.g. m/s)
   For example: refrigeration with ventilator.
   Streaming air will be felt cooler. (Windchill-Temperatur)
2. The density of the medium. (mass per volume, terms e.g. $g/cm^3$ or $kg/m^3$)
   For example: water will be felt much cooler at same temperature (e.g. 20°C) than air.

The second point is very important for the calorimetric principle in using for compressed air consumption measuring.
A calorimeter determined by transported warmth and the inner pipe diameter:

1. The mass flow (e.g. in kg/h) and
2. The norm volume flow (e.g. in $m^3/h$).

The density is in the result of the mass flow already implicit included, so the additional measuring of pressure and temperature is not needed.

For velocity measuring of the operating volume flow a measuring of the density is needed. The density could calculated by a signal of an additional pressure sensor, the temperature measuring is an included function of the calorimeter.

For water the measuring of density normally is not necessary, it is about 1 $g/cm^3$ and it is changing slightly under influence of different temperature and pressure. But it could be important, when buying fuel oil, specially in the summer. The measuring on the tank car is normally a volumetrically system, so in fact of lower density at higher temperature you get a lower amount of oil (mass in Kg) than in winter with the same volume. But I hope for you, that the provider will correct this error.

When using air, the influence of density is much higher. Air is compressible, water not. For this reason it is necessary, when measuring mass and volume flow to know the norm density.

Norm conditions (standard density) as per ISO2533: 20°C and 1.01325 bar. Under this conditions the density of air is 1.2 $Kg/m^3$.

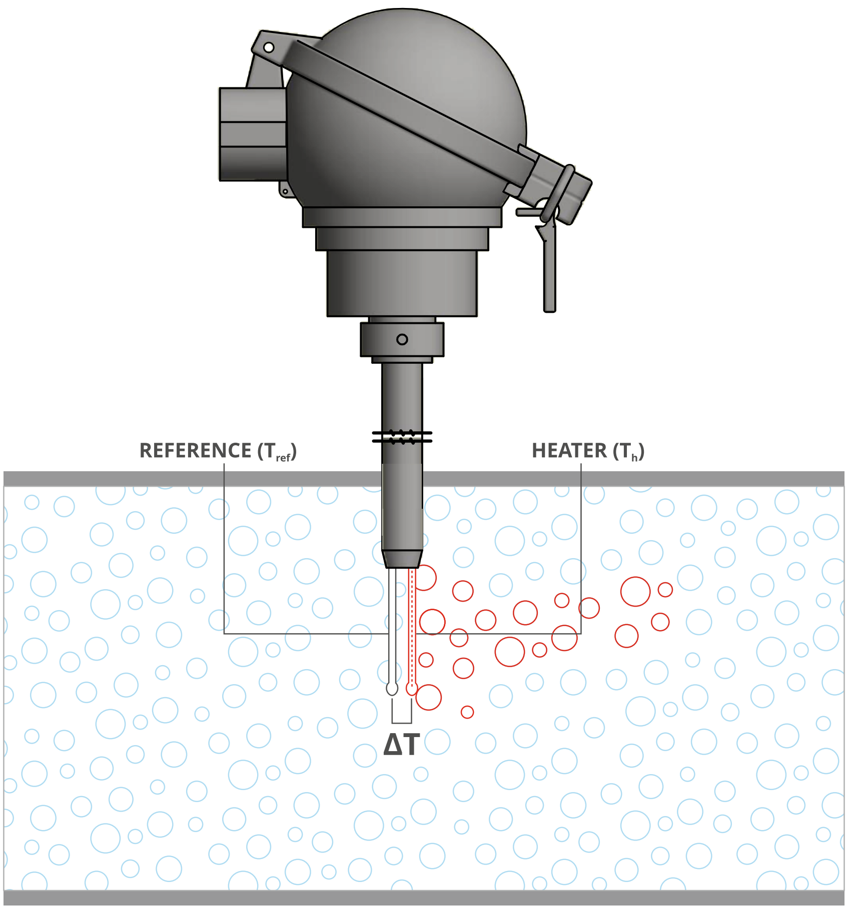
Norm conditions as per DIN1343: 0°C and 1.01325 bar. Under this conditions the density of air is 1.293 $Kg/m^3$.

The calorimetric measurement based on the physical principle of heat transfer from a heated element to the ambient medium (example: air). This is affected by the velocity, density (temperature and pressure) and by the characteristic of the medium.

The amount of needed energy is a function of the temperature difference $\Delta t$ and the mass flow.

LEOMI 586/587 Thermal Mass Flowmeter is using the following method:

The temperature difference (over temperature) $\Delta t$ between the reference sensor (medium temperature) and the heater sensor is controlled electrical constant by analogue / digital controller together with high power operational amplifier enables a very fast absolute precise adjustment of the needed power for keeping the over temperature constant.




Constant Temperature Anemometry (CTA)
(Digital controlled Circuit not Wheatstone bridge)

**LEOMI INSTRUMENTS PVT. LTD.**

E-17/5, Electronic GIDC, Sector-26, Gandhinagar-382027, Gujarat, INDIA.

+91 79 23287899, +91 90547 50586 sales@leomi.in www.leomi.in