

THERMOCOUPLE VACUUM GAGES

A thermocouple gage is used for monitoring pressures below atmospheric pressure (vacuum) in the range from 2 to 10^{-3} torr. A gage consists of a filament heated by a constant-current source and a thermocouple attached to it to monitor its temperature. The filament and the thermocouple are housed in an enclosure with an opening connected to the vacuum chamber whose gas pressure is to be measured. A schematic diagram of the TC gage is shown in Fig. 5.32.

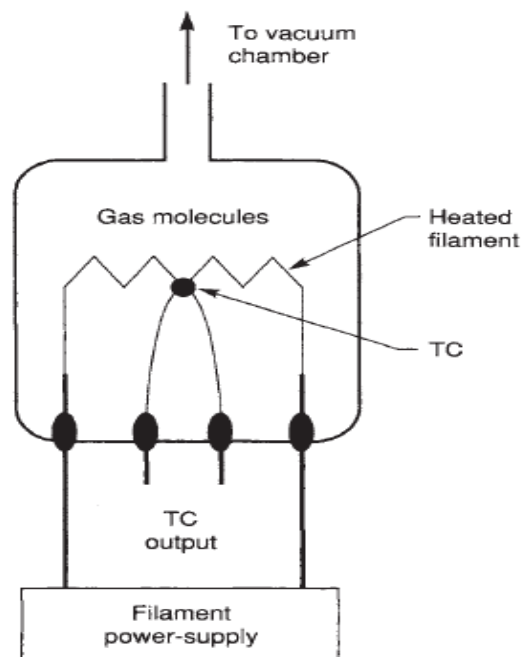


Fig5.32 Thermocouple vacuum gauge.

The basic transduction mechanism can be described as the loss of heat caused when the surrounding gas molecules impinge on the heated filament and take heat away from it, resulting in a decrease in its temperature.⁷⁹ As the pressure decreases, a smaller number of molecules impinge on the filament, and consequently its temperature rises. This rise in temperature is indicated by the electrical output of the thermocouple and is proportional to the pressure (vacuum). In order to improve the lower limit of 10^{-3} torr, several TCs are connected in series as is done in a thermopile.

The Pirani gage also operates on the same basic transduction mechanism. The changes in temperature of its tungsten filament are measured as changes in its resistance with a Wheatstone bridge. The out-of-balance voltage is proportional to the vacuum level. The range of the Pirani gage is around 10^{-3} to 100 torr.⁸⁶ The Convector is a Pirani gage with improvements in its accuracy, repeatability, and response time. The upper limit extends to 1000 torr.

Source: <http://mediatoget.blogspot.in/2012/07/thermocouple-vacuum-gages.html>