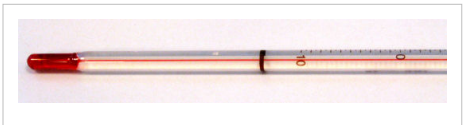
Alcohol thermometer



The **Alcohol thermometer** or *spirit thermometer* is an alternative to the mercury-in-glass thermometer, and functions in a similar way. But unlike mercury-in-glass thermometer, the contents of an alcohol thermometer are less toxic and will evaporate away fairly quickly. An organic liquid is contained in a glass bulb which is connected to a capillary of the same glass and the end is sealed with an expansion bulb. The space above the liquid is a mixture of nitrogen and the vapour of the liquid. For the working temperature range, the meniscus or interface between the liquid is within the capillary. With increasing temperature, the volume of liquid expands and the meniscus moves up the capillary. The position of the meniscus shows the temperature against an inscribed scale.

The liquid used can be pure ethanol or toluene or kerosene or Isoamyl acetate, depending on manufacturer and working temperature range. Since these are transparent, the liquid is made more visible by the addition of a red or blue dye. One half of the glass containing the capillary is usually enamelled white or yellow to give a background for reading the scale.

The range of usefulness of the thermometer is set by the boiling point of the liquid used. In the case of the ethanol-filled thermometer the upper limit for measurement is 78°C, which makes it useful for measuring day and night-time temperatures and to measure body temperature, although not for anything much hotter than these. The ethanol version is the most widely used due to the low cost and relatively low hazard posed by the liquid in case of breakage.

Ethanol-filled thermometers are used in preference to mercury for meteorological measurements of minimum temperatures and can be used down to -70°C.[1]

History

The alcohol thermometer was the earliest, efficient, modern-style instrument of temperature measurement. As is the case with many early, important inventions, there are several people credited with its invention. These include Ferdinando II de' Medici, Grand Duke of Tuscany, who in 1654 made sealed tubes part filled with alcohol, with a bulb and stem, depending on the expansion of a liquid, and independent of air pressure.[2] Other sources, including the Encyclopædia Britannica, credit German scientist Daniel Gabriel Fahrenheit with inventing the alcohol thermometer in 1709.[3] Fahrenheit was a skilled glassblower and his alcohol thermometer was the world's first reliable thermometer.[4]

References

[1] British Standard 692:1990 *Specification for Meteorological Thermometers*

[2] R. P. Benedict (1987) Fundamentals of Temperature, Pressure, and Flow Measurements, 3rd ed, ISBN 0-471-89383-8 page 4

[3] Encyclopedia Britannica "Science & Technology: Daniel Gabriel Fahrenheit" (http://www.britannica.com/EBchecked/topic/200226/Daniel-Gabriel-Fahrenheit)

[4] Encyclopedia of World Biography "Gabriel Fahrenheit" (http://www.notablebiographies.com/Du-Fi/Fahrenheit-Gabriel.html)

- Instrumentation Services (http://www.instrumentationservices.net/downloads/Thermometer_Filling_Liquids.pdf) Thermometer filling liquids

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