

Glass Thermometers: A Degree of History

Ever since the early 1600s, when Galileo invented the first crude instrument, called a thermoscope, to show changes in temperature, the thermometer has evolved to become a crucial instrument for determining temperature in a multitude of laboratory and industrial applications.

The earliest thermometers, considered a curiosity by many people, were used for medical and meteorological purposes and shared basic features. All were glass tubes open at one end, partially filled with air, set in a basin of water and graduated with primitive notches or dials.

It wasn't until 50 years later that the first closed-glass liquid thermometer was developed in Italy by Leopoldo, Cardinal dei Medici, a co-founder of the Academia de Cimento. Known as Florentine thermometers, they were graduated into 50, 100 or 300

degrees and roughly standardized by the heat of the sun and the cold of ice water, and filled with distilled colored wine. Mercury and water thermometers were also tried by the Florentines but their expansion was too small. This problem was later overcome by making thermometers with finer bores, thereby increasing their sensitivity. By the middle of the eighteenth century, mercury thermometers had superseded all others because of their more uniform expansion.

Today the glass thermometer is available in a variety of calibrations, immersion styles, versions, lengths, divisions and backings and in °F and °C versions with columns filled with mercury or safety liquid.

Lodged as a staple in laboratories and industries worldwide, the glass thermometer is an enduring symbol for the advancement of knowledge.

OMEGA introduces its new line of glass thermometers for laboratory and industrial applications. Accurate, economical instruments, glass thermometers measure the temperature of many fluid types—liquid or gas. OMEGA offers precision ASTM-designated thermometers in accordance with strict performance specifications.

Care and Use of Glass Thermometers

Glass thermometers must be handled with care. Avoid tapping a glass thermometer against a hard surface to prevent small fractures, which could affect accuracy. A glass thermometer should never be subjected to extreme temperature changes. For example, removing a glass thermometer from a boiling water bath and immediately immersing it in an ice bath may cause the thermometer to break or the liquid filling to separate. With proper care, a glass thermometer can be a useful instrument for years.

Column Separation

Occasionally, a thermometer arrives with a separation of the mercury column due to rough handling in transit. A column will reunite if: 1) the bulb is cooled in brine/ice solution, or 2) the bulb is cooled in an alcohol/dry ice solution, or 3) the separation is slowly heated into the expansion chamber.

Immersion Styles

A total immersion thermometer is designed to indicate temperatures correctly when the bulb and the entire liquid column are immersed in the substance being measured. A minimal length of the thermometer must be visible.

A partial immersion thermometer has a line around it indicating maximum immersion depth.

For maximum accuracy, select the proper thermometer. A total immersion style offers the best accuracy when used properly. A partial immersion style is appropriate for use when immersion depth is limited. When used correctly, either type will yield reliable results.

A total immersion thermometer can be used accurately at partial immersion if the following correction is applied:

$$(T-t) 0.000089^{\circ}\text{F} \times N$$

$$(T-t) 0.00016^{\circ}\text{C} \times N$$

T = temperature of the bath

t = average temperature of stem

N = number of degrees emergent

Parts of a Glass Thermometer

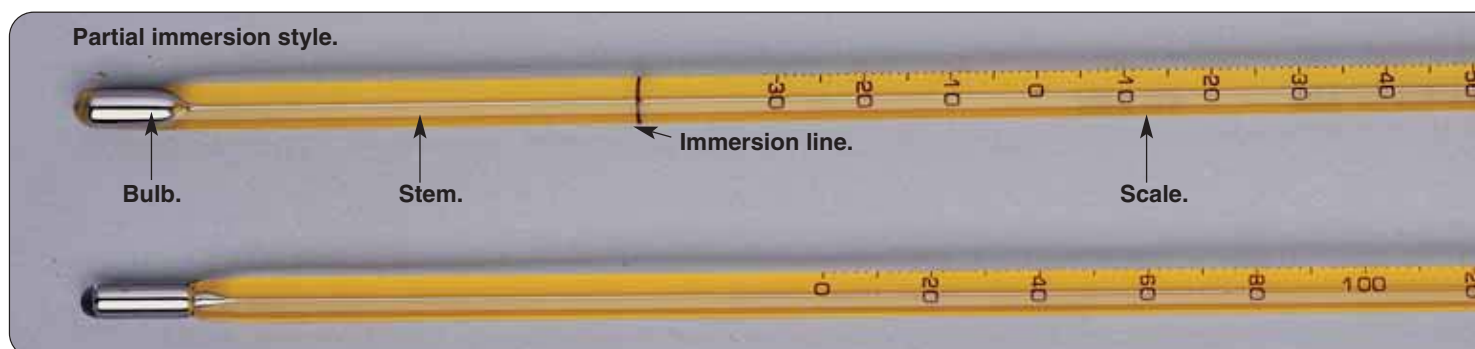
Bulb – reservoir for the thermometric liquid

Stem – glass capillary tube through which the mercury or organic liquid fluctuates with changes in temperature

Scale – the scale is graduated in degrees, fractions or multiples of degrees

Contraction Chamber– an enlarged capillary bore which serves to reduce a long length of capillary, or prevent contraction of the entire liquid column into the bulb

Expansion Chamber– an enlargement of the capillary bore at the top of the thermometer to prevent build up of excessive pressures in gas-filled thermometers





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