Bimetallic Thermometers
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1. Scope and Purpose

1.1 This standard applies to Bimetallic Thermometers for industrial use.

1.2 The purpose of this standard is to establish uniformity of terminology (including symbols) definitions, and dimensions for Bimetallic Thermometers.

1.3 A further purpose is to promote interchangeability of Bimetallic Thermometers by establishing a series of preferred bulb dimensions. These dimensions will permit interchangeability of Bimetallic Thermometers. Resistance Thermometers, Filled System Thermometers and Thermocouple Thermometers in the Bushings and Wells defined in "Bushings and Wells for Temperature Sensing Elements”.

Note: Bulbs are dimensioned only to the extent necessary for physical interchangeability in the Bushings and Wells defined in SAMA RC17.

1.4 The listing of a size does not imply that it is suitable for all purposes. Consult manufacturers for limitations on Immersion Length.

2. General Definitions

2.1 Bimetallic Thermometer. A Bimetallic Thermometer is a temperature measuring instrument comprising an indicating pointer and appropriate Scale in a protective Case and a Bulb housing a temperature sensitive Bimetallic Element. (See Fig. 1.)

2.1.1 Case. The Case is a protective housing within which the graduated Scale and indicating pointer are mounted. The Case is designed to permit viewing of the pointer position with reference to the graduated Scale and is usually furnished with a transparent window.

2.1.2 Scale. The Scale is a member having graduations and numerals by means of which the position of the pointer is translated into degrees of temperature.

2.1.3 Bulb. A Bulb is composed of a Bimetallic Element, Sensitive Portion and an Extension which includes a threaded connection when such means for mounting is used. The commonly used Bulbs are Plain, Fixed Thread, and Union Connected. (See Fig. 2.)

![Figure 2, Types of Bulbs](image)

2.1.3.1 Bimetallic Element. The Bimetallic Element is that portion of a Bulb which is a temperature responsive member composed of two or more metals mechanically associated in such a way that relative expansion of the metals, due to temperature change, produces motion. (See Fig. 1.)
2.1.3.2 Sensitive Portion. A Sensitive Portion is that portion of a Bulb enclosing the temperature sensitive Bimetallic Element. (See Fig. 2.)

2.1.3.3 Extension. An Extension is that portion of a Bulb extending from the Sensitive Portion to the Case or connecting unit, and enclosing the shaft connecting the Bimetallic Element to the indicating pointer. (See Fig. 2.)

3. Definitions of Case Forms

3.1 Case Form. The Case Form of the thermometer is determined by the orientation of the Bulb with respect to the Case front.

3.1.1 Straight Form. A Straight Form thermometer is one in which the Bulb projects from the bottom of the Case in a line parallel to the face of the thermometer. (See Fig. 3.)

3.1.2 90° Back Angle Form. A 90° Back Angle Form thermometer is one in which the Bulb projects from the back of the Case at a 90 degree angle. (See Fig. 3.)

3.1.3 Right Side Angle Form. A Right Side Angle Form thermometer is one in which the Bulb projects from the right side of the Case, as viewed from the front. (See Fig. 3.)

3.1.4 Left Side Angle Form. A Left Side Angle Form thermometer is one in which the Bulb projects from the left side of the Case, as viewed from the front. (See Fig. 3.)

4. Definitions of Bulbs and Fittings

4.1 Plain Bulb. A Plain Bulb is one not provided with a threaded connection or other means of attachment to a vessel. (See Fig. 2.)

4.2 Fixed Thread Bulb. A Fixed Thread Bulb is one having a rigidly attached threaded connection for pressure-tight attachment to a vessel directly, or by use of a Bushing, Flange, or Well. (See Fig. 2.)

4.3 Union Connected Bulb. A Union Connected Bulb is one using a jam nut and seating part for connecting the thermometer to a Bushing, Flange, or Well. (See Fig. 2.)

4.4 Bushing. A Bushing is a fitting provided with external threads for attachment to a vessel and with internal threads and seating means for mounting a temperature sensing element therein. A Bushing does not have a pressure-tight sheath below the external threads. (See Fig. 4.)

4.5 Flange. A Flange is a fitting provided with a flanged surface for attachment to a vessel and with internal threads and seating means for mounting a temperature sensing element therein. A Flange does not have a pressure-tight sheath below the flanged surface. (See Fig. 5.)
5. Definitions of Dimensions

5.1 Stem Length. The Stem Length (Symbol C) of a Fixed Thread Bulb is the length from the free end of the Bulb to the underside of the hexagon portion on the threaded connection. (See Fig. 2.)

Note: The term "Stem Length" does not apply to Plain or to Union Connected Bulbs.

5.2 Bulb Length. The Bulb Length (Symbol L) of a Plain Bulb is the length from the free end of the Bulb to the connecting unit or to the Case directly, if no connecting means is used. The Bulb Length (Symbol L) of a Union Connected Bulb is the length from the free end of the Bulb to the underside of the seating part. (See Fig. 2.)

Note: The term "Bulb Length" does not apply to Fixed Thread Bulbs.

5.3 Sensitive Portion Length. The Sensitive Portion Length (Symbol X) is the length of that section of the Bulb enclosing the temperature sensitive Bimetallic Element. (See also 5.6 Immersion Length.) (See Fig. 2.)

5.4 Insertion Length. The Insertion Length (Symbol U) is the length from the free end of the Bulb or Well to, but not including, the external threads or other means of attachment to a vessel. (See Figs. 4, 5, and 6.)

5.5 Lagging Extension Length. The Lagging Extension Length (Symbol T) is the length from the lower end of the external threads of a Bushing or Well to the upper end of the portion intended to extend through the lagging of a vessel, less one inch allowance for threads. (See Figs. 4, 6 and 7.)

Note: For purposes of uniform dimensioning of Bushings and Wells having Lagging Extensions, the allowance for thread length is one inch, regardless of pipe thread size.

5.6 Immersion Length. The Immersion Length (Symbol R) is the length from the free end of the Bulb or Well to the point of immersion in the medium, the temperature of which is being measured. (Physically this point may be indistinguishable, but is important for proper accuracy.) (See Fig. 5.)

5.7 Bulb Diameter. The Bulb Diameter (Symbol Y) is the outside diameter of the Sensitive Portion. (See Fig. 7.)
BIMETALLIC THERMOMETER BULBS
(1/4 & 3/8 DIAMETER)

C = T + U + 1/2
STEM LENGTH (FIXED THD)

A = U + T + 1/4
BULB LENGTH (UNION CONNECTED)

T LAGGING EXTENSION LENGTH
1" THREAD ALLOWANCE

C = T + U + 1/2
STEM LENGTH (FIXED THD)

A = U + T + 1/4
BULB LENGTH (UNION CONNECTED)

T LAGGING EXTENSION LENGTH
1" THREAD ALLOWANCE

NOTE 1. BULB TO PASS THROUGH RING GAGE 10" LONG OF .252 OR .377 I.D.
NOTE 2. FOR BUSHING AND WELL DIMENSIONS SEE SAMA RC 17.

45° CHAMFER FIRST THD. BOTH ENDS

1/8 HEX.

5/16 STRAIGHT PIPE THD ASA NPSM

NOTE THE OPTIONAL SEATING MEANS

FIG. 7
6. Dimensions

6.1 Bulb Diameter. The Bulb Diameter (Symbol Y) shall be 1/4 or 3/8 inch and capable of passing through a ring gauge 10 inches long of .232 or .377 inch inside diameter respectively. (See Fig. 7.)

6.2 Insertion Length. The Insertion Lengths of Bulbs (Symbol U) when used with a Bushing or Well shall be 2 1/2, 4 1/2, 7 1/2, 10 1/2, 16 and 24 inches with tolerances as shown in Fig. 7.

Note: A Bulb designed for a given Insertion Length, when used with a Bushing of a given Lagging Extension Length, will fit a Well of the same nominal diameter, the same Insertion Length and Lagging Extension Length. Also, two Bulbs designed for the same total of T + U will be physically interchangeable and usually identical, i.e., a Bulb designed for 4 1/2 inch U Length and 3 inch T Length will fit a Well of 7 1/2 inch U Length and zero T Length. Caution is advised when this interchangeability is done in reverse sequence to be sure that the Immersion Length is adequate for proper accuracy.

6.3 Stem Length. The nominal standard Stem Lengths (Symbol C) for Fixed Thread Bulbs shall be 2 1/2, 4, 6, 9, 12, 17 1/2, and 25 1/2 inches.

6.4 Threaded Connection. The threaded connection of a Fixed Thread Bulb shall be 1/2 inch NPT (American Standard Taper Pipe Thread). (See Fig. 7.)

6.5 Jam Nuts and Seating Parts. Dimensions of jam nuts and seating parts shall be as shown in Fig. 7. Dimensions not specified above nor shown in Fig. 7 are not essential for interchangeability and are at manufacturer’s option subject to ordinary engineering considerations, such as strength and suitability for purpose.

6.6 Bushings and Wells. Dimensions for Bushings and Wells for use with Fixed Thread and Union Connected Bi-metallic Thermometer Bulbs and other types of temperature sensing elements are given in "Bushings and Wells for Temperature Sensing Elements"
# TABLE 1

**USABLE COMBINATIONS OF BULBS AND WELLS**

<table>
<thead>
<tr>
<th>Insertion Length U</th>
<th>Lagging Extension Length T</th>
<th>Bulb Length A Union Connected Bulb</th>
<th>Stem Length C Fixed Thread Bulb</th>
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<td>-</td>
<td>-</td>
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**Notes:**

1. Bulb Length (Symbol A) is listed to indicate interchangeability, not as a dimension for ordering. Specify Well, or Bulb to be used with Bushing or Well, by Insertion Length (Symbol U) and Lagging Extension Length (Symbol T).

2. Stem Length (Symbol C) is listed to indicate interchangeability, not as a dimension for ordering except for Bulbs to be installed without Well or Bushing. For Fixed Thread Bulbs to be used with Well or Bushing, order by Insertion Length (Symbol U) and Lagging Extension Length (Symbol T).

3. The 2 1/2" Stem Length is included here for completeness but is not intended for use with Bushing or Well.