Bushings and Wells for Temperature Sensitive Elements
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BUSHINGS AND WELLS FOR TEMPERATURE SENSING ELEMENTS

1. Scope and Purpose

1.1 This standard applies to Bushings and Wells for use with temperature sensing elements for industrial use.

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

1.3 A further purpose is to promote inter-changeability by establishing a series of preferred sizes with dimensions and tolerances such that Bushings and Wells of the same nominal dimensions are completely interchangeable. Dimensions given in this standard provide Bushings and Wells suitable for Bimetallic Thermometers, Resistance Thermometers, Filled System Thermometers and Thermocouple Thermometers which are in accordance with Standards.

Note: Well hole sizes (internal diameter of Sensitive Portion) are dimensioned with close enough limits to insure good heat transfer if used with temperature sensing elements of suitable construction, dimensions and tolerances.

1.4 The listing of a size does not imply that it is suitable for use with all types of primary elements. Consult manufacturers for available sizes and for limitations on immersion length.

2. Terminology and General Definitions

2.1 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. 1)

2.2 Well. A Well is a pressure-tight receptacle adapted to receive a temperature sensing element and provided with external threads or other means for pressure-tight attachment to a vessel. (See Fig. 2)

2.2.1 Lagging Extension. A Lagging Extension is that portion of a Bushing or Well, above the external threads, intended to extend through the lagging of a vessel. (See Figs. 1 and 2)

2.2.2 Lagging Extension Length. The Lagging Extension Length (Symbol T) is the length
2.2.4 Well Sensitive Portion. The Well Sensitive Portion is that portion of the Well which is designed and dimensioned to fit closely to the sensitive portion of the temperature sensing element. (See Fig. 2)

2.2.5 Well Sensitive Portion Length. The Well Sensitive Portion Length (Symbol \( W \)) is the length from the inside of the closed end to the start of the external threads or to the point at which the inside diameter is enlarged, whichever is shorter. The inside of the closed end is the furthest point to which a plug gauge with square end of correct size for the particular well can be inserted. (See Figs. 2, 4, 5, and 6)

2.2.6 Immersion Length. The Immersion Length (Symbol \( L_I \)) is the length from the free end of the temperature sensing element 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. 3)

2.2.7 Insertion Length. The Insertion Length (Symbol \( U \)) is the length from the free end of the temperature sensing element or Well to, but not including, the external threads or other means of attachment to a vessel. (See Fig. 3)

3. Dimensions

3.1 Insertion Lengths. The Insertion Lengths (Symbol \( U \)) of Wells shall be 2 1/2, 4 1/2, 7 1/2, 10 1/2, 16 and 24 inches, with tolerances as shown in Figs. 4, 5, and 6.

Note: A temperature sensing element having a given Insertion Length, when used with a Bushing of a given Lagging Extension Length, will fit a Well of the same Insertion Length and Lagging Extension Length. Two Wells having the same total of \( T \) and \( U \) will accept the same temperature sensing element. Exceptions: Bushings for 1 1/4 and 3/8 inch bulbs having the Lagging Extension Length equal to zero are lengthened 5/16 inch to provide adequate strength. This reduces the Insertion Length a corresponding amount.

3.2 Internal Diameter of Well Sensitive Portion. Wells shall be suitable for temperature sensing elements having nominal sizes of 1/4, 3/8, 5/16, 11/16 and 7/8 inch. Internal diameter dimensions and tolerances for the Well Sensitive Portion are as shown in Figs. 4, 5, and 6.

3.3 Lagging Extension Length. The Lagging Extension Length (Symbol \( T \)), if used, shall be 3 inches, except 2 inch Lagging Extension Length shall be used with 2 1/2 inch Insertion Length.

Note: Ordinarily, no Lagging Extension is used, i.e., \( T \) equals zero.

3.4 External Threads for Bushings or Wells. External threads for Bushings or Wells for 1/4 and 3/8 inch temperature sensing elements shall be 1/2 or 3/4 inch NPT; for 9/16 inch elements shall be 3/4 inch NPT and for 11/16 and 7/8 inch elements shall be 1 inch NPT.

3.5 Other Dimensions. Other dimensions of Bushings or Wells shall be as shown in Figs. 4, 5, and 6. Dimensions not specified above nor shown in Figs. 4, 5, and 6 are not essential for interchangeability and are at the manufacturer's option subject to ordinary engineering considerations, such as strength and suitability for purpose.

Note: It is recognized that special process conditions may require Wells that do not conform to some of the standard dimensions, i.e., use of welding neck or flange instead of pipe thread. In such cases, it is recommended that the standard internal dimensions be retained to permit use of standard elements.
INTERNAL DIMENSIONS ON BUSHINGS SAME AS ON WELL BELOW

BUSHING WITH 1/2 NPT AND LAGGING EXTENSION

BUSHING WITH 3/4 NPT AND LAGGING EXTENSION

BUSHING WITH 1/2 OR 3/4 NPT AND NO LAGGING EXTENSION

1/2 OR 3/4 NPT

FULL TH'D.

1/2 STRAIGHT PIPE TH'D.

ASA NPSM

1/2 STRAIGHT PIPE TH'D.

15 MAX.

32 DIA.

*.262 MAX.

*.387 MAX.

T + U + 1/2 MIN.

WHICHEVER IS SHORTER

1-1/8 HEX.

*WELL I.D. TO PASS A PLUG GAGE 10 LONG OF .254 OR .379 O.D.
ALL DIMENSIONS IN INCHES

BUSHING OR WELL
FOR 1/4 & 3/8 DIAMETER TEMPERATURE SENSING ELEMENTS

FIG. 4
**WELL I.D. TO PASS A PLUG GAGE 10 LONG OF .566 O.D.**

**ALL DIMENSIONS IN INCHES**

**BUSHING OR WELL**

**FOR 9/16 DIAMETER TEMPERATURE SENSING ELEMENTS**

**FIG. 5**
DIMENSIONS NOT SHOWN ON BUSHING ARE THE SAME AS ON THE WELL TO THE LEFT

WHICHEVER IS SHORTER

U (±\frac{1}{16} FOR 12 OR LESS)

±\frac{1}{8} FOR OVER 12

*.700 MAX.

*.888 MAX.

WELL I.D. TO PASS A PLUG GAGE 10 LONG OF .691 O.D. OR .879 O.D.

ALL DIMENSIONS IN INCHES

BUSHING OR WELL

FOR 11/16 OR 7/8 DIAMETER TEMPERATURE SENSING ELEMENTS

FIG. 6
### TABLE I

**STANDARD WELL SIZES**

**ALL DIMENSIONS IN INCHES**

<table>
<thead>
<tr>
<th>INSERTION LENGTH</th>
<th>LAGGING EXTENSION LENGTH</th>
<th>FOR ALL INSERTION LENGTHS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-1/2</td>
<td>0</td>
<td>1/4</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1/2 or 3/4</td>
</tr>
<tr>
<td>4-1/2</td>
<td>0</td>
<td>3/8</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>1/2 or 3/4</td>
</tr>
<tr>
<td>7-1/2</td>
<td>0</td>
<td>9/16</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>3/4</td>
</tr>
<tr>
<td>10-1/2</td>
<td>0</td>
<td>11/16</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>16</td>
<td>0</td>
<td>7/8</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>24</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

Note: To insure interchangeability, specify Well, or Bulb to be used with Pushing or Well, by above dimensions.