

# BIMETAL THERMOMETERS



**Universal Mount**

**All Star®**

**Adjustable Union**

**All Pro**

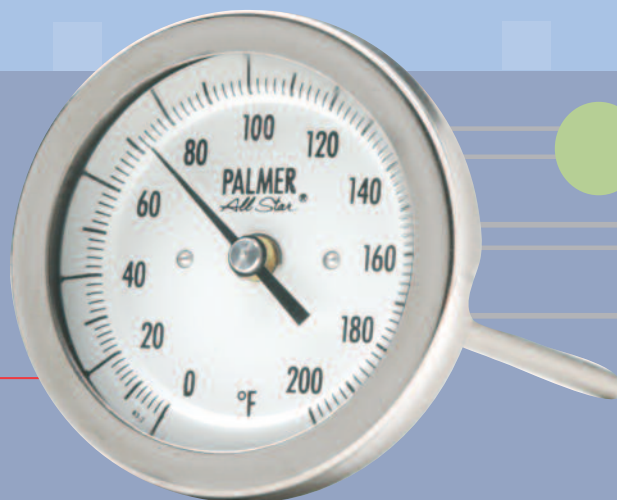
**Replaceable Element**

**Slip-Fit**

**3A Sanitary**

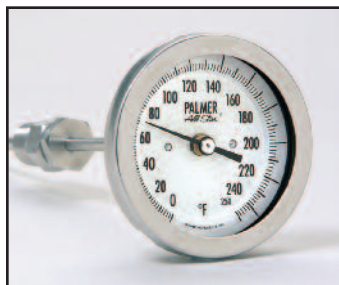
**Surface Thermometers**

**Thermowells**





*All Star Bimetal Dial Thermometer*



*New! All Star Adjustable Union*



*All Pro Bimetal Dial Thermometer*



*Bimetal Dial Surface Thermometer*

### Palmer Universal Mount Bimetal Dial Thermometer .....3

An industry innovation from Palmer, the Universal Mount Bimetal Dial Thermometer allows maximum flexibility in installing and positioning Bimetal Thermometers. Models 3AU - 3" and 5AU - 5" Dial sizes, All Angle case styles.

### Palmer All Star® Bimetal Dial Thermometers .....4,5

The industry standard for rugged accurate Bimetal Dials that perform in any application. Models 3BC, 3A - 3" and 5BC, 5A - 5" Dial sizes, All Angle and Back Connected case styles. Models 3BCJ, AJ - 3" and 5BCJ, 5AJ - 5" Dial sizes, **New! 316SS Options!**

### Palmer All Pro Bimetal Dial Thermometers .....6,7

Performance and value from Palmer's newest line of Bimetal Dial Thermometers. Models 2BCP - 2", 3AP, 3BCP, 3LCP - 3" and 5AP, 5BCP - 5" Dial sizes. All Angle, Back, and Bottom Connected case styles.

### Palmer Replaceable Element Bimetal Dial Thermometers .....8,9

A unique, time and money saving solution to Bimetal Thermometer replacement and maintenance operations. Models 3AE, 3BE - 3" and 5AE, 5BE - 5" Dial sizes in All Angle and Back Connected case styles. Also Replacement Elements only.

### Palmer "Slip Fit" Bimetal Dial Thermometers .....10,11

Another Palmer innovation, the "Slip Fit" Bimetal Thermometer allows easy replacement of a liquid or mercury filled industrial thermometer with a Bimetal Dial, with no process interruption. Models 3AI, 3BI - 3" and 5AI, 5BI - 5" Dial sizes, All Angle and Back Connected case styles.

### Palmer 3A Sanitary Bimetal Dial Thermometers .....12,13

Designed to fit directly into Sanitary Applications without use of Thermowells. Uses Tri-Clamp® fitting. Models 3AES, 3BES - 3" and 5AES, 5BES - 5" Dial sizes in All Angle and Back Connected case styles.

### Palmer Thermowells for Bimetal Dial Thermometers .....14

Regular and lagging extension wells in brass, steel, 304 stainless or 316 stainless. Specially designed to fit standard Bimetal Thermometer stem lengths. Models 1120 Series, 1121 Series, and 1126 Series.

### Wahl Bimetal Dial Surface Thermometers .....15

2" Dial Thermometers designed to deliver accurate surface temperature measurements. High visibility dial graphics, rugged design. Models with magnetic mount, maximum reading recording hand, and pipe surface attachment. Spring wound chart recorder models. Models S-700, S-701 and S-702 Series.

# Universal Mount Bimetal Thermometers

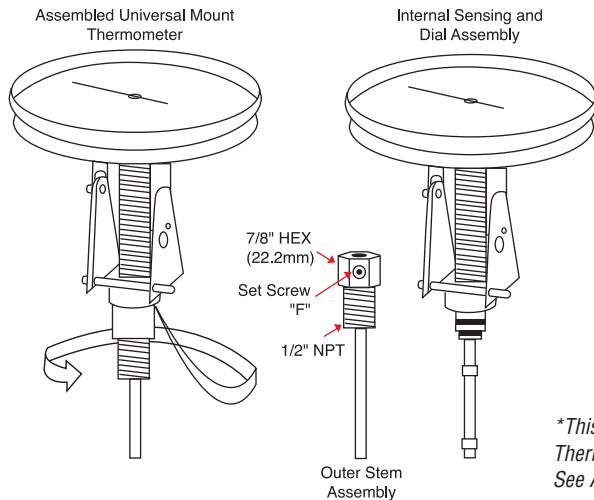
## Type 3AU • 5AU

For additional versatility in Bimetal Dial Thermometer installation, Palmer offers Universal Mount models. Universal Mount allows the internal sensing element with dial and case assembly to be disconnected from the outer stem assembly. Once disconnected, the sensing/dial/case assembly can be freely rotated 360° angular degrees without affecting the thermometer's calibration. The Universal Mount serves to:

- Maximize dial legibility by allowing the dial to be oriented independent of the threaded fitting.
- Eliminate use of thermowells in some low velocity and non-corrosive applications\*, enabling the stem assembly to stay in line while the dial sensing/dial assembly is removed.
- Allow installation in tight spaces where rotation of the entire case head would not normally be possible.
- Position the dial face and housing to facilitate access to the recalibration nut.



*Loosen set screw to allow withdrawal of assembly.*



### Installation

- 1.) Loosen set screws "F" in mounting nut.
- 2.) The working assembly can now be withdrawn from the stem, if desired.
- 3.) For installation, rotate working assembly until dial face is in desired portion for final adjustment (max rotation 360°). Tighten screws "F".



*\*This stem is rated at 3000 PSI External Pressure at 100°F. Thermowells are recommended for high velocity and corrosive applications. See All Star Bimetal Thermometers on page 5 for dimensional drawings.*

### How To Order

1. Select Case Style and Dial Size Code.

Case Style and Dial Size	
	All Angle Code
3" Dial	<b>3AU</b>
5" Dial	<b>5AU</b>

2. Select Stem Length Code from the table below.

Stem Length								
Code	2.5	4	6	9	12	15	18	24
Length (in)	2.5	4	6	9	12	15	18	24
Length (mm)	63.5	102	152	229	305	381	457	610

Stem lengths up to 60" available on special request. Lengths over 30" have a 3/8" support tubing.

3. Select Temperature Range Code from the table below.

Temperature Range Codes					
°F Range	°Div	Code	°C Range	°Div	Code
-100 to 100	2°	<b>-100/100F</b>	-50 to 50	1°	<b>-50/50C</b>
-40 to 120	1°	<b>-40/120F</b>	-50 to 100	1°	<b>-50/100C</b>
0 to 200	2°	<b>0/200F</b>	-20 to 120	1°	<b>-20/120C</b>
0 to 250	2°	<b>0/250F</b>	0 to 50 <sup>1</sup>	0.5°	<b>0/50C</b>
25 to 125 <sup>1</sup>	1°	<b>25/125F</b>	0 to 100	1°	<b>0/100C</b>
50 to 300	2°	<b>50/300F</b>	0 to 150	1°	<b>0/150C</b>
50 to 400	5°	<b>50/400F</b>	0 to 200	2°	<b>0/200C</b>
50 to 500	5°	<b>50/500F</b>	0 to 300	5°	<b>0/300C</b>
150 to 750 <sup>1</sup>	5°	<b>150/750F</b>	100 to 400 <sup>1</sup>	5°	<b>100/400C</b>
200 to 1000 <sup>1*</sup>	10°	<b>200/1000F</b>	100 to 500 <sup>1*</sup>	5°	<b>100/500C</b>

**Note:**<sup>1</sup> Minimum stem length for these ranges is 4".

<sup>\*</sup>Recommended for continuous service up to 800°F or 427°C. Can be used for intermittent service up to 1000°F or 500°C.

4. Select Option Code from the table below.

Options	
Code	Description
(PC)	Plexiglass Cover
(SPG)	Shatter Proof Safety Glass
(1/4NPT)	1/4" NPT Fixed Thread Fitting
(3/8NPT)	3/8" NPT Fixed Thread Fitting
(7/8SN)	7/8"- 22 Swivel Nut Fitting
(1/2NPS)	1/2" NPSM Union Swivel Nut
(3/8D)	3/8" Diameter Stem with Pointed Tip

**Part Number Example: 3AU40/100C(PC)(1/4NPT)**

**Calibration Services Available**

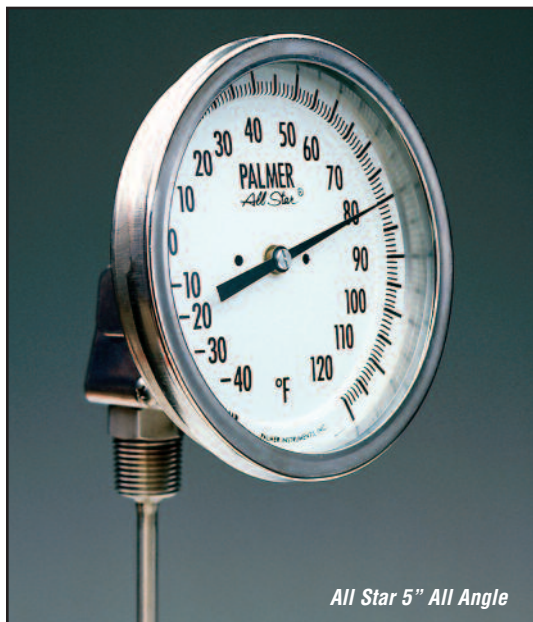
(800) 421-2853 • FAX (828) 658-0728 • [www.palmerwahl.com](http://www.palmerwahl.com)

**PALMER Wahl**  
INSTRUMENTATION GROUP

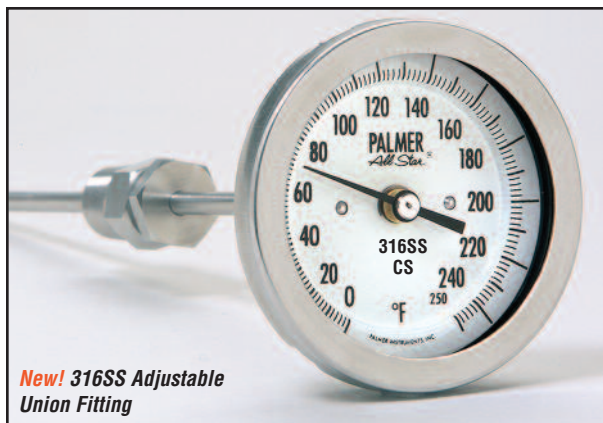
# All Star Bimetal Thermometers & 316SS Option

## Type 3BC • 5BC • 3A • 5A 3BCJ • 5BCJ • 3AJ • 5AJ

Palmer design, quality, and craftsmanship make the Palmer All Star Bimetal Thermometer an Industry standard for rugged reliability and accuracy.



All Star 5" All Angle



New! 316SS Adjustable Union Fitting

### Now available with 316SS option for resistance to harsh outdoor environments

The **NEW! 316SS Bimetal Thermometer from Palmer Instruments** is designed with deepwater drillers and offshore rigs in mind. The 316SS case resists the harsh environmental conditions, meeting the rigorous needs of outdoor use.

**Adjustable Union Fitting:** Optional Adjustable Union (shown below) easily adjusts the stem to the full depth of your thermowell for metal to metal contact, giving maximum exposure to your process. Eliminates the need to stock several different stem lengths.

**Standard Styles and Dial Sizes:** Popular Back Connected and versatile All Angle case styles in easy-reading 5" and space-saving 3" Dial sizes.

**Ranges and Stem Lengths:** Models for every application. Fahrenheit ranges from -100° up to 1000° and Celsius ranges from -50° up to 500° are available. Stem lengths up to 24" are standard with specials up to 60". Minimum stem length of 6" on Adjustable Union.

**ASME B-40.3:** Meets standards set by the American Society of Mechanical Engineers.

**Rugged Design Features:** All 304 stainless steel exterior parts with instrument glass lens (plexiglass option). Optional 316SS Case, Fitting and Stem, or Fitting and Stem only. Quick-lock, cam-action bezel ring with heavy duty, heat-resistant hermetically sealed gasket seals out moisture to prevent lens icing or fogging. Prevents bimetal coil freeze-up in extreme conditions. Built-in over-range protection and adjustable pointer are standard.

**Accuracy:** Accuracy is within 1% of full scale.

**Easy Reading:** Dials are specially fabricated of low-glare finished metal using a deep draw design for anti-parallax alignment of pointer to graduation marks. High-visibility numerals and graduations also help minimize reading errors.

**Fast Response:** Superior heat transfer characteristics, fast response, and consistent repeatability are achieved through the use of a high-torque, low mass bimetal sensing element. Materials and design combine to convert the sensor's movement quickly and accurately into a dial reading.

### Specifications

**Form:** All Angle, Fixed Back Connected, and All Angle Adjustable or Fixed Back Adjustable.

**Case:** Polished-Type 304 Stainless Steel Case and Bezel in 3" (76 mm) or 5" (127 mm) Size. Optional 316SS. Hermetically Sealed.

**Stem:** Polished-Type 304 Stainless Steel. Optional 316SS. All Welded.

**Stem Length:** See Stem Length Table, Page 5. Custom lengths up to 60" (152cm). 6" minimum on Adjustable Union.

**Fitting:** 304 Stainless Steel. 7/8" Hex with 1/2" NPT Threads. Optional 316SS.

**Dial Face:** Black Graduations and Numerals on White Background. Anti-parallax Dial Design with Linear Scale. High-Visibility Tapered-Tip Black Pointer.

**Lens:** Instrument Quality Glass Standard. Optional Plexiglass or Shatter Proof Safety Glass.

**Recalibration:** External Reset Nut. Dial Rotation Gear Positions the Dial in Relation to the Pointer.

**Accuracy:** 1% of Full Range.

**Element:** Single Helix Bimetallic Coil Sensing Element, with silicone on coil, located in bottom 2-1/2 inches of thermometer stem.

**Over-Range:** Protected Design Allows Temporary Swings of Up to 50% of Range.

**Warranty:** One Year Limited Warranty.



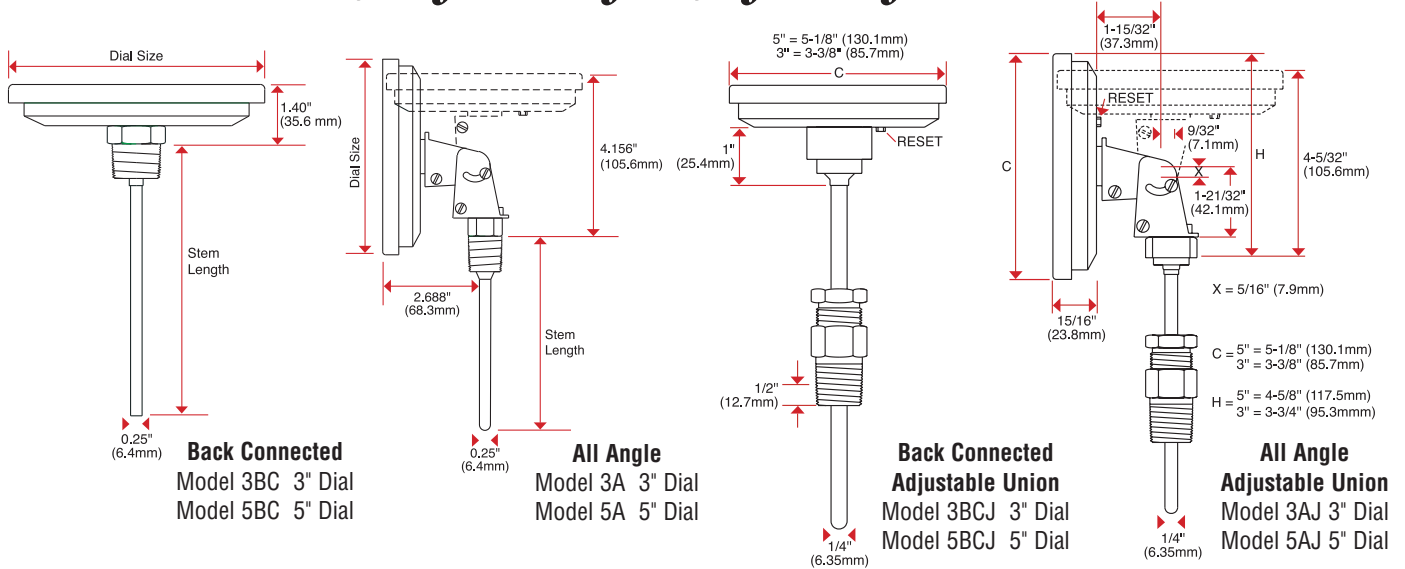
Calibration Services Available

(800) 421-2853 • FAX (828) 658-0728 • [www.palmerwahl.com](http://www.palmerwahl.com)

12/05 Rev B

# Type 3BC • 5BC • 3A • 5A 3BCJ • 5BCJ • 3AJ • 5AJ

## All Star Bimetal Thermometers & 316SS Option



### How To Order

1. Select Case Style and Dial Size Code from the table below.

Case Style and Dial Size				
Dial Size	Back Connected	All Angle Connected	Back Connected Adjustable Union	All Angle Adjustable Union
3" Dial	3BC	3A	3BCJ	3AJ
5" Dial	5BC	5A	5BCJ	5AJ

2. Select Stem Length Code from table below.

Stem Length								
Code	2.5	4	6	9	12	15	18	24
Length (in)	2.5	4	6	9	12	15	18	24
Length (mm)	63.5	102	152	229	305	381	457	610

Adjustable Union minimum Stem Length is 6". Stem Lengths up to 60" available on special request. Lengths over 30" have a 3/8" support tubing.

3. Select Temperature Range Code from the table below.

Temperature Range Codes								
3" & 5" Scales						5" Dual Range Scales		
°F Range	°Div	Code	°C Range	°Div	Code	°F/°C Range	°Div	Code
-100 to 100	2°	-100/100F	-50 to 50	1°	-50/50C	NA		
-40 to 120	1°	-40/120F	-50 to 100	1°	-50/100C	NA		
0 to 200	2°	0/200F	-20 to 120	1°	-20/120C	0 to 200/-15 to 90	2°F/1°C	0/200F&C
0 to 250	2°	0/250F	0 to 501	0.5°	0/50C	0 to 250/-20 to 120	2°F/1°C	0/250F&C
25 to 1251	1°	25/125F	0 to 100	1°	0/100C	NA		
50 to 300	2°	50/300F	0 to 150	1°	0/150C	50 to 300/10 to 150	2°F/1°C	50/300F&C
50 to 400	5°	50/400F	0 to 200	2°	0/200C	50 to 400/10 to 200	5°F/2°C	50/400F&C
50 to 500	5°	50/500F	0 to 300	5°	0/300C	50 to 500/10 to 260	5°F/2°C	50/500F&C
150 to 750 <sup>1</sup>	5°	150/750F	100 to 400 <sup>1</sup>	5°	100/400C	150 to 750/65 to 400	10°F/5°C	150/750F&C
200 to 1000 <sup>1,2</sup>	10°	200/1000F	100 to 500 <sup>1,2</sup>	5°	100/500C	200 to 1000/100 to 540	10°F/5°C	200/1000F&C

<sup>1</sup> Minimum stem length for these ranges is 4".

<sup>2</sup> Recommended for continuous service up to 800°F or 427°C. Can be used for intermittent service up to 1000°F or 500°C.

4. Select Option Code from below.

Options	
Code	Description
(GF)	Glycerine Filled
(SF)	Silicone Filled
(PC)	Plexiglass Cover
(SPG)	Shatter Proof Safety Glass
(1/4NPT)	1/4" NPT Fixed Thread Fitting*
(3/8NPT)	3/8" NPT Fixed Thread Fitting*
(7/8SN)	7/8"- 22 Swivel Nut Fitting*
(1/2NPS)	1/2" NPSM Union Swivel Nut*
(3/8D)	3/8" Diameter Stem with Pointed Tip*

\* Not available on Adjustable Union.

5. Select 316SS Option Code below.

316SS Material Options	
Code	Description
(CS)	316SS Case, Fitting and Stem
(FS)	316SS Fitting and Stem only

**Standard Part Number Example:**  
5BC1225/125F(SPG)(3/8D)

**316SS Part Number Example:**  
5BC1225/125F(SPG)(3/8D)(CS)

5" Back Connected Dial 12" Stem, 25° to 125°F Temperature Range, Shatter Proof Glass, 3/8" Diameter Stem with Pointed Tip, and 316SS Case, Fitting and Stem.

# All Pro Bimetal Thermometers

## Type 3BCP • 5BCP • 3AP • 5AP

Palmer All Pro's deliver legibility, economy, and performance to any application: HVAC, Pipe/Valve/Fitting, or Industrial Process.



All Pro 3" All Angle

### Rugged Design Features

All Pro Thermometers are an economical alternative to our All Star line. All Pro's feature All Welded 304SS construction provides the resistance needed in corrosive working environments, vibration, and other rugged conditions. The instrument has been designed to handle accurate temperature measurement for most industrial and laboratory applications, giving these thermometers a long service life.

### Easy Reading

Dials are specially fabricated of low-glare finished metal using a deep draw design for anti-parallax alignment of pointer to graduation marks. High-visibility numerals and graduations also help minimize reading errors.

### Recalibration

A hex nut located on the back of the case allows for recalibration. The low cost and high quality makes the All Pro a popular instrument for many applications.



All Pro  
3" Bottom Connected  
case style profile  
(THIS CONNECTION  
HAS BEEN DISCONTINUED)

## Specifications

**Form:** 3" and 5" Dials available in All Angle Adjustable or Back Connected. Bottom Connected has been Discontinued.

**Case:** Polished-Type 304 Stainless Steel Case and Bezel in (2" \* (50.8 mm), 3" (76 mm) or 5" (127 mm) Size. Cases are Hermetically Sealed.

**Stem:** Polished-Type 304 Stainless Steel.

**Stem Length:** Listed in Stem Length Table, Page 7.

**Fitting:** 304 Stainless Steel. 7/8" Hex with 1/2" NPT Threads, (2" Dial has 9/16" Hex and 1/4" NPT Threads).

**Lens:** Instrument Quality Glass.

**Dial Face:** Black Graduations and Numerals on White Background. Anti-parallax Dial Design with Linear Scale. High-Visibility Tapered-Tip Black Pointer.

**Temperature Ranges:** All Pros are available in °F scales, and Dual F & C Dials with exceptional legibility. Ranges cover temperatures from -40°F (-40°C) up to 500°F (260°C).

**Recalibration:** External Recalibration Mechanism for all 3" and 5" Dial Models.

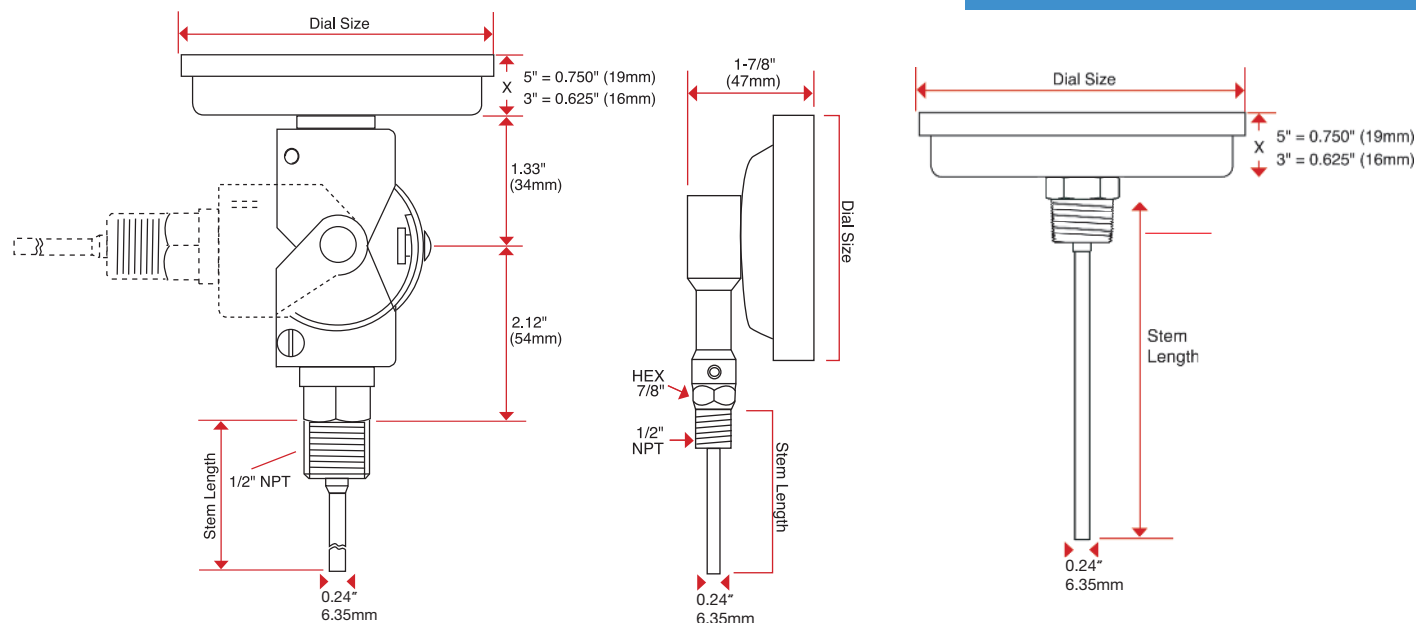
**Accuracy:** 1% of Full Range.

**Warranty:** One Year Limited Warranty.

Models 2BCP & 3LCP have been Discontinued.



## Type 3BCP • 5BCP • 3AP • 5AP



All Pro All Angle

All Pro Bottom Connected (Discontinued)

All Pro Back Connected

### How To Order

1. Select Case Style and Dial Size Code from below.

Case Style and Dial Size			
	Back Connected Code	Bottom Connected Code	All Angle Code
2" Dial	NA	NA	NA
3" Dial	<b>3BCP</b>	NA	<b>3AP</b>
5" Dial	<b>5BCP</b>	NA	<b>5AP</b>

2. Select Stem Length Code from the table below.

Stem Length								
Code	2.5	4	6	9	12	15	18	24
Length (in)	2.5	4	6	9	12	15	18	24
Length (mm)	63.5	102	152	229	305	381	457	610

3. Select Temperature Range Code from the table below.

Temperature Range Codes					
3" & 5" Scales			2", 3" & 5" Scales		
°F Range	°Div	Code	°F/°C Range	°Div	Code
-100 to 150°	2°	<b>-100/150F</b>	-100 to 150° / -70 to 70°	2°F/1°C	<b>-100/150F&amp;C</b>
-40 to 160°	2°	NA	-40 to 120° / -40 to 50°	2°F/1°C	NA
NA			-40 to 160° / -40 to 71°	2°F/1°C	<b>-40/160F&amp;C</b>
25 to 125°*	1°	<b>25/125F</b>	25 to 125° / -5 to 50°*	1°F/1/2°C	<b>25/125F&amp;C</b>
0 to 200°	2°	<b>0/200F</b>	0 to 200° / -15 to 90°	2°F/1°C	<b>0/200F&amp;C</b>
0 to 250°	2°	<b>0/250F</b>	0 to 250° / -20 to 120°	2°F/1°C	<b>0/250F&amp;C</b>
50 to 300°	2°	<b>50/300F</b>	50 to 300° / 10 to 150°	2°F/1°C	<b>50/300F&amp;C</b>
50 to 400°	5°	<b>50/400F</b>	50 to 400° / 10 to 200°	5°F/2°C	<b>50/400F&amp;C</b>
50 to 500°	5°	<b>50/500F</b>	50 to 500° / 10 to 260°	5°F/2°C	<b>50/500F&amp;C</b>
150 to 750°	10°	<b>150/750F</b>	150 to 750° / 65 to 400°	10°F/5°C	<b>150/750F&amp;C</b>
200 to 1000°	10°	<b>200/1000F</b>	200 to 1000° / 100 to 540°	10°F/5°C	<b>200/1000F&amp;C</b>

\*Minimum stem length for these ranges is 4".

4. Select Option Code from below.

Options	
Code	Description
(SPG)	Shatter Proof Safety Glass



All Pro 3"  
All Angle  
side view

Part Number Example: 2BCP2.550/300F&C

Calibration Services Available

(800) 421-2853 • FAX (828) 658-0728 • [www.palmerwahl.com](http://www.palmerwahl.com)

# Replaceable Element Bimetal Thermometers

## Type 3BE • 5BE • 3AE • 5AE

**Bimetal Thermometers offers ability to replace Element, Case and Lens separately.**



5" Dial, All Angle Model

**Easy Dial Rotation:** The replacement configuration provides for easy rotation of its dial face to a right-side up position. With the bezel and lens removed, a pointed object (such as a ballpoint pen tip) can be inserted in one of the two dial face holes. The dial can be easily rotated within the case to achieve the proper viewing angle.

**Unique Palmer Design:** Replaceable Element Bimetal Dial Thermometers make replacement operations more efficient and cost effective. Leave the case in place and remove and refit the factory-calibrated internal parts only. As easy as replacing batteries in a flashlight. No costly replacement of the case and no process shut down to remove the entire thermometer. Great for changing thermometer ranges or switching to Fahrenheit or Celsius scales with zero process down time.

**Available in Two Styles and Two Dial Sizes:** Popular Back Connected and versatile All Angle case styles in easy-reading 5" and space-saving 3" Dial sizes.

**Ranges and Stem Lengths:** Models for every application. Fahrenheit ranges from -100° up to 1000° and Celsius ranges from -50° up to 500° are available. Stem lengths up to 24" are standard with special stem lengths up to 60".

**Rugged Design Features:** All 304 stainless steel exterior parts with instrument glass lens (plexiglass option). Quick-lock, cam-action bezel ring with heavy duty, heat-resistant gasket seals out moisture to prevent lens icing or fogging and prevents bimetal coil freeze-up in extreme conditions. Built-in over range protection and adjustable pointer are standard.

**Accuracy:** Accuracy is within 1% of full scale.

**Easy Reading:** Dials are specially fabricated of low-glare finished metal using a deep drawn design for anti-parallax alignment of pointer to graduation marks. High-visibility numerals and graduations also help minimize reading errors.

**Fast Response:** Superior heat transfer characteristics, fast response, and consistent repeatability are achieved through the use of a low mass bimetal sensing element. Materials and design combine to convert the sensor's movement quickly and accurately into a dial reading.

### Specifications

**Form:** All Angle Adjustable or Fixed Back Connected.

**Case:** Polished-Type 304 Stainless Steel Case and Bezel in 3" (76 mm) or 5" (127 mm) Size. Cases are Hermetically Sealed.

**Stem:** Polished-Type 304 Stainless Steel. All Welded.

**Stem Length:** Listed in Stem Length Table, Page 9. Custom Lengths Up to 60" (152 cm).

**Fitting:** 304 Stainless Steel. 7/8" Hex with 1/2" NPT threads.

**Dial Face:** Black Graduations and Numerals on White Background. Anti-parallax Dial Design with Linear Scale. High-Visibility Tapered-Tip Black Pointer.

**Lens:** Instrument Quality Glass Standard. Optional Plexiglass.

**Recalibration:** Micro-Adjustable Pointer.

**Accuracy:** 1% of Full Range.

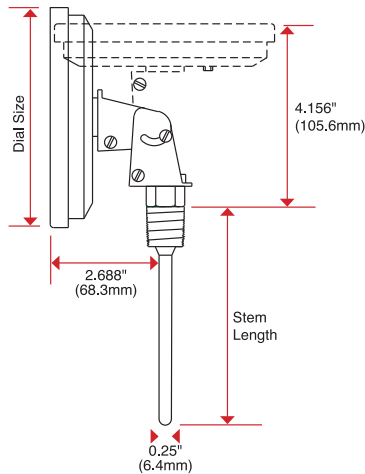
**Element:** Bimetallic Coil Sensing Element Located in Stem Tip.

**Over-Range:** Protected Design Allows Temporary Swings of Up to 50% of Range without Permanent Damage to the Thermometer.

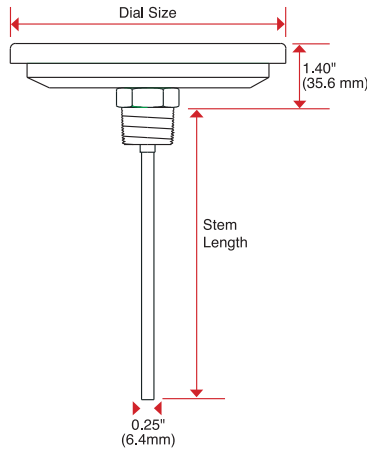
**Warranty:** One Year Limited Warranty.



## Type 3BE • 5BE • 3AE • 5AE



**All Angle Mount**  
Model 3AE: 3" Dial  
Model 5AE: 5" Dial



**Back Connected Mount**  
Model 3BE: 3" Dial  
Model 5BE: 5" Dial



*Disassembled replaceable element bimetal thermometer.*

### How To Order

1. Select Case Style and Dial Size Code from below.

Case Style and Dial Size		
	Back Connected Code	All Angle Code
3" Dial	<b>3BE</b>	<b>3AE</b>
5" Dial	<b>5BE</b>	<b>5AE</b>
3" Dial Element Only*	<b>3BEO</b>	<b>3AEO</b>
5" Dial Element Only*	<b>5BEO</b>	<b>5AEO</b>
3" Dial Case Only*	<b>3BECO</b>	<b>3AECO</b>
5" Dial Case Only*	<b>5BECO</b>	<b>5AECO</b>
*Please see "Order Notes and Information" below.		

3. Select Temperature Range Code from the table below.

Temperature Range Codes					
°F Range	°Div	Code	°C Range	°Div	Code
-100 to 100	2°	<b>-100/100F</b>	-50 to 50	1°	<b>-50/50C</b>
-40 to 120	1°	<b>-40/120F</b>	-50 to 100	1°	<b>-50/100C</b>
0 to 200	2°	<b>0/200F</b>	-20 to 120	1°	<b>-20/120C</b>
0 to 250	2°	<b>0/250F</b>	0 to 50 <sup>1</sup>	0.5°	<b>0/50C</b>
25 to 125 <sup>1</sup>	1°	<b>25/125F</b>	0 to 100	1°	<b>0/100C</b>
50 to 300	2°	<b>50/300F</b>	0 to 150	1°	<b>0/150C</b>
50 to 400	5°	<b>50/400F</b>	0 to 200	2°	<b>0/200C</b>
50 to 500	5°	<b>50/500F</b>	0 to 300	5°	<b>0/300C</b>
150 to 750 <sup>1</sup>	5°	<b>150/750F</b>	100 to 400 <sup>1</sup>	5°	<b>100/400C</b>
200 to 1000 <sup>1</sup> *	10°	<b>200/1000F</b>	100 to 500 <sup>1</sup> *	5°	<b>100/500C</b>

Note: <sup>1</sup> Minimum stem length for these ranges is 4".  
\* Recommended for continuous service up to 800°F or 427°C.  
Can be used for intermittent service up to 1000°F or 500°C.

2. Select Stem Length Code from table below.

Stem Length								
Code	2.5	4	6	9	12	15	18	24
Length (in)	2.5	4	6	9	12	15	18	24
Length (mm)	63.5	102	152	229	305	381	457	610
Stem lengths up to 60" available on special request. Lengths over 30" have a 3/8" support tubing.								

4. Select Option Code from the table below.

Options	
Code	Description
<b>(PC)</b>	Plexiglass Cover
<b>(SPG)</b>	Shatter Proof Safety Glass
<b>(1/4NPT)</b>	1/4" NPT Fixed Thread Fitting
<b>(3/8NPT)</b>	3/8" NPT Fixed Thread Fitting
<b>(7/8SN)</b>	7/8"- 22 Swivel Nut Fitting
<b>(1/2NPS)</b>	1/2" NPSM Union Swivel Nut
<b>(3/8D)</b>	3/8" Diameter Stem with Pointed Tip

#### Order Notes and Information

- On **Replaceable Element only** orders, all internal parts are included: bimetal element, shaft, and pointer/dial assembly. Assembly: The element is pre-calibrated and ready for installation.
- To order **Case only**, specify dial size, case form, and stem length. All exterior parts are included: case, stem assembly, fitting, lens, bezel ring, spacer ring, and sealing gasket.

**Part Number Example: 5AE18-20/120C(GF)(78SN)**

**Calibration Services Available**

(800) 421-2853 • FAX (828) 658-0728 • [www.palmerwahl.com](http://www.palmerwahl.com)

# Slip-Fit Bimetal Thermometers

## Type 3BIE • 5BIE • 3AIE • 5AIE 3BI • 5BI • 3AI • 5AI

Designed to “Slip” into Existing Industrial Mercury-in-Glass Type Thermowells and “Fit” with Tapered Bulbs Providing Metal-to-Metal Contact with no process interruption.



5" Dial Slip-Fit Bimetal Thermometer, All Angle Model 5AIE (Replaceable Element Model).

**Available in Two Styles and Two Dial Sizes:** BI (Back Connected) and AI (All Angle) Styles with External Reset Gear. BIE and AIE Styles with Replaceable Element option and Adjustable Pointer. 3" and 5" Dial sizes for both types.

**Rugged Design Features:** Stainless steel case, stem, and tapered bulb chamber. Glass lens with option for Plexiglass. Built-in over-range protection.

**Eliminates Conversion Kits:** Built-in tapered bulb and 1-1/4" x 18 swivel nut fitting for SLIP-FIT Bimetal Thermometer interchange with existing industrial thermometer style thermowells.

**Replaceable Element Feature: (BIE & AIE Models):** Easy to replace - just remove the element and save the case, making changing the internal elements as easy as replacing batteries in a flashlight. Range changes can be easily made. In some applications, used with a Union fitting, the case and stem will serve as a thermowell.

**Adjustable or Fixed Back Connections:** The All Angle (AI and AIE) Models offer easy adjustment to any viewing angle. Back Connected (BI and BIE) Models are fixed at the most common style connection.

**Accurate:** Consistent accuracy is achieved within 1% of full scale. Ambient temperature changes at the case will not affect accuracy.

**Simple, Convenient Recalibration:** Either reset gear or adjustable pointer feature (Replaceable Element only), permits setting for zero calibration error at any desired temperature within scale.

**Easy-To-Read 3" or 5" Dial:** Deep drawn, anti-parallax dial design. Dial can be seen from a greater distance and from more angles than mercury-in-glass thermometers. Minimized reading errors from low-glare background with graduations and pointer on the same surface level.

**Hermetically Sealed Case:** Securely sealed by quick-lock, cam-action bezel ring. Heavy, heat resistant gasket seals out moisture, prevents icing and helix freeze-up.

### Specifications

**Form:** All Angle Adjustable or Fixed Back Connected.

**Case:** Polished-Type 304 Stainless Steel Case and Bezel in 3" (76 mm) or 5" (127 mm) Size. Cases are Hermetically Sealed.

**Stem:** Polished-Type 304 Stainless Steel.

**Stem Length:** Listed in Stem Length Table, Page 11.

**Bulb:** Type 303 Stainless Steel Tapered Bulb Chamber.

**Fitting:** 1-1/4"-18 Brass Swivel Nut.

**Dial Face:** Black Graduations and Numerals on White Background. Anti-parallax Dial Design with Linear Scale. High-Visibility Tapered-Tip Black Pointer.

**Lens:** Instrument Quality Glass Standard. Optional Plexiglass.

**Recalibration:** Replaceable Element Models ("AIE" and "BIE") have an Adjustable Pointer. Other Models ("AI" and "BI") have an External Adjustment ("Reset") Gear.

**Accuracy:** 1% of Full Range.

**Element:** Bimetallic Coil Sensing Element Located in Bulb Tip.

**Over-Range:** Protected Design Allows Temporary Swings of Up to 50% of Range without Permanent Damage to the Thermometer.

**Warranty:** One Year Limited Warranty.

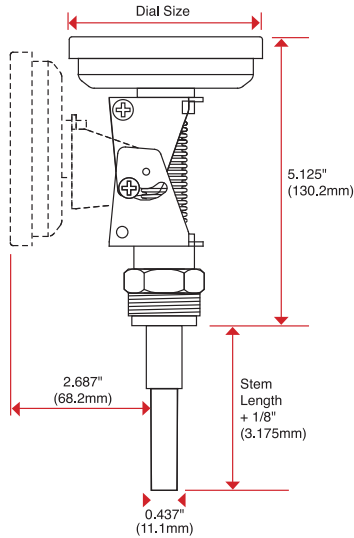


Calibration Services Available

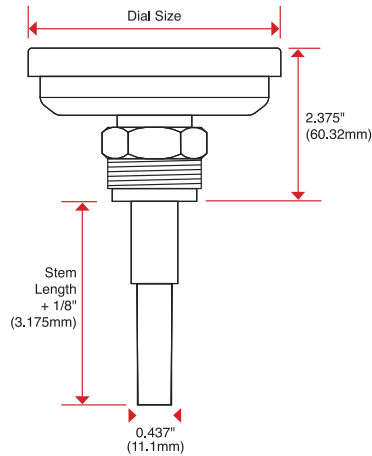
(800) 421-2853 • FAX (828) 658-0728 • [www.palmerwahl.com](http://www.palmerwahl.com)

12/05 Rev B

## Type 3BIE • 5BIE • 3AIE • 5AIE 3BI • 5BI • 3AI • 5AI



**Adjustable Angle Slip-Fit**  
Models 3A and 5A



**Back Connected Slip-Fit**  
Models 3B and 5B



*External Reset Gear (BI and AI Models) Allows Setting for Zero Error at Any Critical Temperature Point within the Thermometer's Scale Range. Replaceable Element Models AIE and BIE can be recalibrated by micro-adjustable pointer.*

### How To Order

1. Select Case Style and Dial Size Code from the table below.

Replaceable Element Slip-Fit		
	Back Connected Code	All Angle Code
3" Dial Thermometer	<b>3BIE</b>	<b>3AIE</b>
5" Dial Thermometer	<b>5BIE</b>	<b>5AIE</b>
3" Dial Element Only*	<b>3BIEO</b>	<b>3AIEO</b>
5" Dial Element Only*	<b>5BIEO</b>	<b>5AIEO</b>
External Reset Gear Slip-Fit		
	Back Connected Code	All Angle Code
3" Dial	<b>3BI</b>	<b>3AI</b>
5" Dial	<b>5BI</b>	<b>5AI</b>

\*Please see "Order Notes and Information" below.

3. Select Temperature Range Code from the table below.

Temperature Range Codes					
°F Range	°Div	Code	°C Range	°Div	Code
-100 to 100	2°	<b>-100/100F</b>	-50 to 50	1°	<b>-50/50C</b>
-40 to 120	1°	<b>-40/120F</b>	-50 to 100	1°	<b>-50/100C</b>
0 to 200	2°	<b>0/200F</b>	-20 to 120	1°	<b>-20/120C</b>
0 to 250	2°	<b>0/250F</b>	0 to 50 <sup>1</sup>	0.5°	<b>0/50C</b>
25 to 125 <sup>1</sup>	1°	<b>25/125F</b>	0 to 100	1°	<b>0/100C</b>
50 to 300	2°	<b>50/300F</b>	0 to 150	1°	<b>0/150C</b>
50 to 400	5°	<b>50/400F</b>	0 to 200	2°	<b>0/200C</b>
50 to 500	5°	<b>50/500F</b>	0 to 300	5°	<b>0/300C</b>
150 to 750 <sup>1</sup>	5°	<b>150/750F</b>	100 to 400 <sup>1</sup>	5°	<b>100/400C</b>
200 to 1000 <sup>1</sup> *	10°	<b>200/1000F</b>	100 to 500 <sup>1</sup> *	5°	<b>100/500C</b>

**Note:**<sup>1</sup> Minimum stem length for these ranges is 4". \* Recommended for continuous service up to 800°F or 427°C. Can be used for intermittent service up to 1000°F or 500°C.

2. Select Stem Length Code from table below.

Stem Length										
Code	3.5	6	8	9	12	15	18	24	30	36
Length (in)	3.5	6	8	9	12	15	18	24	30	36
Length (mm)	89	152	203	229	305	381	457	610	762	914

4. Select Option Code from the table below.

Options	
Code	Description
<b>(GF)</b>	Glycerine Filled
<b>(SF)</b>	Silicone Filled
<b>(PC)</b>	Plexiglass Cover
<b>(SPG)</b>	Shatter Proof Safety Glass

### Order Notes and Information

- On **Replaceable Element only** orders, all internal parts are included: bimetal element, shaft, and pointer/dial assembly. Assembly: The element is pre-calibrated and ready for installation.
- To order a **Case only**, specify dial size, case form, and stem length. All exterior parts are included: case, stem assembly, fitting, lens, bezel ring, spacer ring, and sealing gasket.

**Part Number Example: 5BIE6-100/100F(PC)(GF)**

# Sanitary Bimetal Thermometers

## Type 3BES • 5BES • 3AES • 5AES

### With Replaceable Bimetal Element Feature. For All Sterile Processing Environments.

**Installed Directly into Process:** No thermowell needed. Palmer Sanitary Bimetal Thermometers utilize standard Tri-Clamp® sanitary fittings for faster installation and speed of response with reduced installation costs.

**Complies with Sanitary Standard 3A 74-05:** All product contact surfaces and radiuses comply with this industry wide standard.

**Accurate:** Consistent accuracy is achieved within one scale division. High accuracy range of 120° to 200°F in 0.5°F divisions. Ambient temperature changes in the thermometer's case location will not affect accuracy.

**Replaceable Element Feature:** All the thermometer's internal elements can be removed and replaced while retaining the case in place - as easily as replacing batteries in a flashlight. Also allows changing thermometer range or scale without removing the case.

**Environmentally Conscious:** Bimetal sensor eliminates any concern over mercury or glass tubes, and the replaceable element feature reduces waste.

**Simple, Convenient Recalibration:** An adjustable pointer provides easy, precise recalibration. This feature also permits setting for zero calibration error at any desired temperature point within scale range.

**Easy-to-Read Dials in 3" or 5" Diameter:** Deep-drawn metal dial with aligned pointer provides an anti-parallax design, creating significantly improved legibility and reduced reading errors. Low glare dial background surface printed with high-contrast numerals and graduations.

**Hermetically Sealed Case and Plexiglass Lens:** Internal elements are secured in the stainless steel case by means of a quick-lock, cam-action bezel ring. A heavy-duty, heat-resistant gasket seals out moisture, preventing icing and condensation, even in wash-down areas.

**Configured for Your Application:** Choices for 1-1/2", 2" or 3" Tri-Clamp® fitting diameter, 2-1/2" or 4-1/2" stem length, and 3" or 5" dial diameter in either Back Connected or Adjustable All Angle case style. Plus choice of 12 temperature ranges in Fahrenheit or Celsius ensures just the right thermometer for your sanitary processing or storage applications.



*All Sanitary Bimetal Dial Thermometers feature a replaceable element for time and cost saving in-line replacement or repair.*

### Specifications

**Form:** All Angle Adjustable or Fixed Back Connected.

**Case:** Polished-Type 304 Stainless Steel Case and Bezel in 3" (76 mm) or 5" (127 mm) Size. Cases are Hermetically Sealed.

**Stem Material:** Type 304 Stainless Steel, 5/16" Diameter.

**Stem Length:** Same Immersion as a Sanitary Thermowell 2-1/2" or 4-1/2".

**Fitting:** One Piece Solid Barstock, 3A15 Sanitary Fitting 1-1/2", 2", or 3" Tri-Clamp®.

**Dial Face:** Black Graduations and Numerals on White Background. Anti-parallax Dial Design with Linear Scale. High-Visibility Tapered-Tip Black Pointer.

**Lens:** Shatter Proof Safety Glass.

**Calibration:** Micro Adjustable Pointer.

**Element:** Replaceable Bimetallic Sensing Element.

**Over-Range:** Protected for Temporary Swings Up to 50% Over-Range Without Affect.

**Compliance:** Sanitary Standard 3A 74-05.

**Accuracy:** 1% of Full Range.

**Warranty:** One Year Warranty.



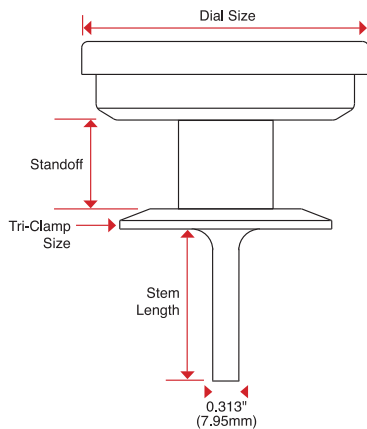
*Tri-Clamp® is a registered trademark of the Tri-Clover Company.*



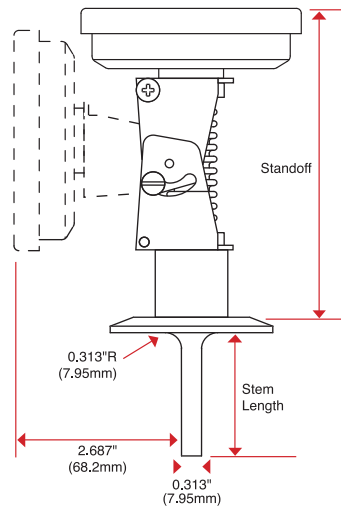
Calibration Services Available

(800) 421-2853 • FAX (828) 658-0728 • [www.palmerwahl.com](http://www.palmerwahl.com)

## Type 3BES • 5BES • 3AES • 5AES



**Back Connected  
Sanitary Bimetal Dial Thermometer**



**All Angle  
Sanitary Bimetal Dial Thermometer**

Standoff Dimensions	
Base Model No.	Standoff
3BES1.5	1.063"
3AES1.5	1.875"
5BES1.5	1.063"
5AES1.5	1.875"
3BES2.0	1.313"
3AES2.0	4.125"
5BES2.0	1.313"
5AES2.0	4.125"

### How To Order

1. Select Case Style and Dial Size Code from the table below.

3" Dial Size			
	Back Connected Code		
Tri-Clamp® Dia.	1.5"	2"	3"
Base Model No.	<b>3BES1.5</b>	<b>3BES2.0</b>	<b>3BES3.0</b>
Element Only No.	<b>3BEOS1.5</b>	<b>3BEOS2.0</b>	<b>3BEOS3.0</b>
	All Angle Code		
Tri-Clamp® Dia.	1.5"	2"	3"
Base Model No.	<b>3AES1.5</b>	<b>3AES2.0</b>	<b>3AES3.0</b>
Element Only No.	<b>3AEOS1.5</b>	<b>3AEOS2.0</b>	<b>3AEOS3.0</b>
5" Dial Size			
	Back Connected Code		
Tri-Clamp® Dia.	1.5"	2"	3"
Base Model No.	<b>5BES1.5</b>	<b>5BES2.0</b>	<b>5BES3.0</b>
Element Only No.	<b>5BEOS1.5</b>	<b>5BEOS2.0</b>	<b>5BEOS3.0</b>
	All Angle Code		
Tri-Clamp® Dia.	1.5"	2"	3"
Base Model No.	<b>5AES1.5</b>	<b>5AES2.0</b>	<b>5AES3.0</b>
Element Only No.	<b>5AEOS1.5</b>	<b>5AEOS2.0</b>	<b>5AEOS3.0</b>
<b>Note:</b> "Element Only" Models are not complete thermometers, just the internal replacement components.			

#### Order Notes and Information

- On **Replaceable Element only** orders, all internal parts are included: bimetal element, shaft, and pointer/dial assembly. Assembly: The element is pre-calibrated and ready for installation.
- To order a **Case only**, specify dial size, case form, Tri-Clamp® size, and stem length. All exterior parts are included: case, stem, Tri-Clamp® assembly, fitting, lens, bezel ring, spacer ring, and sealing gasket.

2. Select Stem Length Code from the table below.

Stem Length		
Code	2.5	4.5
Length (in)	2.5	4.5
Length (mm)	63.5	114

3. Select Temperature Range Code from the table below.

Temperature Range Codes					
°F Range	°Div	Code	°C Range	°Div	Code
-40 to 120	1°	<b>-40/120F</b>	-50 to 100	1°	<b>-50/100C</b>
0 to 200	2°	<b>0/200F</b>	-20 to 120	1°	<b>-20/120C</b>
0 to 250	2°	<b>0/250F</b>	0 to 50*	0.5°	<b>0/50C</b>
25 to 125*	1°	<b>25/125F</b>	0 to 100	1°	<b>0/100C</b>
50 to 300	2°	<b>50/300F</b>	0 to 150	1°	<b>0/150C</b>
50 to 400	5°	<b>50/400F</b>	0 to 200	2°	<b>0/200C</b>
* Available in 4.5" stem length only.					

4. Select Option Code from the table below.

Options	
Code	Description
<b>(GF)</b>	Glycerine Filled
<b>(SF)</b>	Silicone Filled
<b>(MX)</b>	316SS Stem and Tri-Clamp®

Part Number Example: **5AES4.50/100C(PC)(MX)**



Calibration Services Available

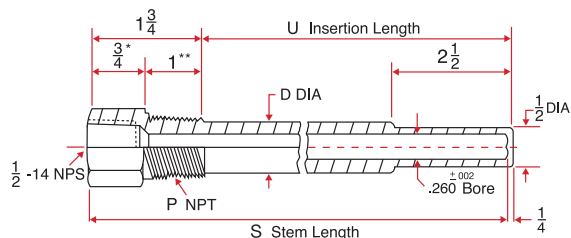
(800) 421-2853 • FAX (828) 658-0728 • [www.palmerwahl.com](http://www.palmerwahl.com)

**PALMER Wahl**  
INSTRUMENTATION GROUP

## Thermowells for use with Bimetal Thermometers

**Regular: Series 1120**

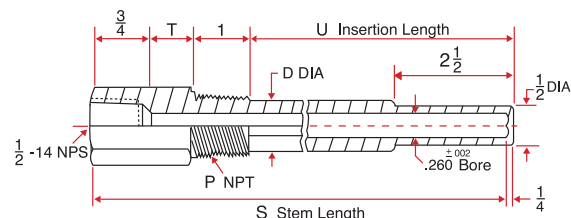
"S" Stem Length (in)	"U" Insertion Length (in)	"P" External NPT Thread Size		
		1/2" -14	3/4" -14	1" -11.5
2.5	1.625	1120-102	1120-202	1120-302
4	2.5	1120-104	1120-204	1120-304
6	4.5	1120-106	1120-206	1120-306
9	7.5	1120-109	1120-209	1120-309
12	10.5	1120-112	1120-212	1120-312
15	13.5	1120-115	1120-215	1120-315
18	16.5	1120-118	1120-218	1120-318
24	22.5	1120-124	1120-224	1120-324
"D" Diameter		5/8"	3/4"	3/4"
MATERIALS - Add suffix: BRASS -01; STEEL -02; 304 SS -03; 316 SS -05				



\* 1" on the 1/2-14 NPT External Thread  
 \*\*3/4" on the 1/2-14 NPT External Thread

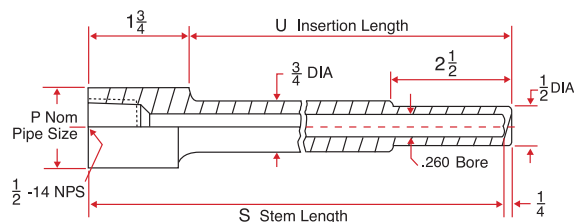
**Lagging Extension: Series 1121**

"S" Stem Length (in)	"U" Insertion Length (in)	"T" Lagging Extension (in)	"P" External NPT Thread Size		
			1/2" -14	3/4" -14	1" -11.5
6	2.5	2	1121-106	1121-206	1121-306
9	4.5	3	1121-109	1121-209	1121-309
12	7.5	3	1121-112	1121-212	1121-312
15	10.5	3	1121-115	1121-215	1121-315
18	13.5	3	1121-118	1121-218	1121-318
24	22.5	3	1121-124	1121-224	1121-324
"D" Diameter			5/8"	3/4"	3/4"
MATERIALS - Add suffix: BRASS -01; STEEL -02; 304 SS -03; 316 SS -05					



**Welding: Series 1126**

"S" Stem Length (in)	"U" Insertion Length (in)	"P" Nominal Pipe Size	
		3/4" -1.050	1" -1.315
4	2.5	1126-204	1126-304
6	4.5	1126-206	1126-306
9	7.5	1126-209	1126-309
12	10.5	1126-212	1126-312
15	13.5	1126-215	1126-315
18	16.5	1126-218	1126-318
24	22.5	1126-224	1126-324
MATERIALS - Add suffix: BRASS -01; STEEL -02; 304 SS -03; 316 SS -05			



# Type 700 • 701 • 702

## Wahl® Surface Thermometers

### Easy-To-Read, Low Cost Thermometers.

### Manual recording hand indicates minimum or maximum temperatures.

Series 700 Closed Case Surface Thermometers will help you measure surface temperatures and save energy throughout your facility. Choose among seven two-inch diameter temperature scales covering the ranges of 0 to 750°F (-20 to 400°C). Accuracy is a tight  $\pm 2\%$  full scale calibrated on NIST traceable secondary standards. Precision bimetallic thermal sensors are preconditioned for stability in accordance with ASTM standards. The receptacle is exposed for a fast response time. Select magnetic, surface or pipe mounted.

#### Applications

Measure surface temperatures of:

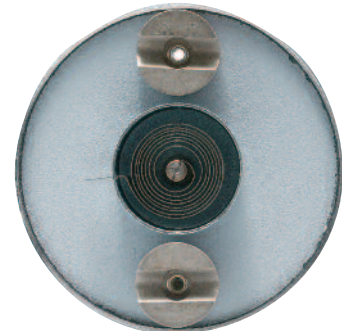
- Foundry core Boxes
- Annealing Ovens & Furnaces
- Die-Cast Dies
- Boilers
- Tanks
- Drums
- Weld Preheats
- Motors
- Generators
- Engines
- Bearings
- Plastic & Rubber Dies
- Molds
- Platens
- Hot Plates
- Griddles
- Air Ducts

Use pipe-mounted for energy conservation audits and preventive maintenance on:

- Steam Traps & Lines
- Hot & Cold Pipes
- Insulation
- Thermostats
- Hydraulic Lines



*Glass cover with magnetic clutch recording hand helps you measure temperatures from 0 to 750° (-20 to 400°C).*



*Back View of thermometer showing Bimetal Coil and Magnetic Mounting.*

Temperature Range	Standard Model With Recording Hand		Economy Model Without Recording Hand		Pipe Mounted Diameter Inches	
	Magnetic Mounted (A)	Surface Mounted (B)	Magnetic Mounted (A)	Surface Mounted (B)	1.5 to 3.5 inch Diameter	3.75 to 8 inch Diameter
0 to 150°F	S-700-1A	S-700-1B	E-700-1A	E-700-1B	S-701-1P	S-702-1P
0 to 250°F	S-700-2A	S-700-2B	E-700-2A	E-700-2B	S-701-2P	S-702-2P
0 to 500°F	S-700-3A	S-700-3B	E-700-3A	E-700-3B	S-701-3P	S-702-3P
50 to 750°F	S-700-4A	S-700-4B	E-700-4A	E-700-4B	S-701-4P	S-702-4P
-20 to 250°C	S-700-5A	S-700-5B	E-700-5A	E-700-5B	S-701-5P	S-702-5P
10 to 400°C	S-700-6A	S-700-6B	E-700-6A	E-700-6B	S-701-6P	S-702-6P
-20 to 120°C	S-700-7A	S-700-7B	E-700-7A	E-700-7B	S-701-7P	S-702-7P



*Pipe Mount Model*

Calibration Services Available

(800) 421-2853 • FAX (828) 658-0728 • [www.palmerwahl.com](http://www.palmerwahl.com)





America's First Manufacturer of Precision  
Industrial Temperature, and Pressure Instrumentation

### CALIBRATION SERVICES

Wahl designs and manufactures to the most stringent quality standards. We provide certified, traceable calibration data in support of companies whose requirements include meeting ISO 9001, FAA and FDA quality standards. Calibrations to both IPTS-68 and ITS-90 are available. Choose from two levels of calibrations services to meet your quality system requirements.

**STANDARD CERTIFICATION:** Unit is calibrated to factory specifications using NIST traceable equipment. Unit is provided with:

**Certificate of Conformance\*** - Statement that our product meets published specifications. Included when you buy a new product.

**Calibration Sticker\*** - (or tag) Advising you of the date your instrument(s) was/were calibrated, and the suggested date for its next calibration. This is provided when you buy a new product and when you return a product for calibration. (\*Most Products)

**NIST TRACEABLE TEST REPORT:** Unit is calibrated to factory specifications using NIST Traceable equipment. Unit is provided with:

**NIST Traceable Test Report** - Our quality Management system is certified to conform to ISO9001:2008. We maintain a calibration system in conformance with ANSI/NCSL Z-540 and MIL-STD-45662A.



**"As Received" and "As Left" Data** with Out of Tolerance conditions noted.

**Calibration Sticker** (see above).

### REPAIR AND OTHER SERVICES

**REGISTER YOUR PRODUCT:** Registration is fast and easy. In about a minute you can register your product for Warranty Protection and our Calibration Reminder Service to keep your QC Program in compliance. Go to [www.palmerwahl.com/register](http://www.palmerwahl.com/register).

**REPAIR SERVICES:** Palmer Wahl offers repair and calibration services on most products we sell. Contact Customer Service for pricing, and an RMA. Please see note below.

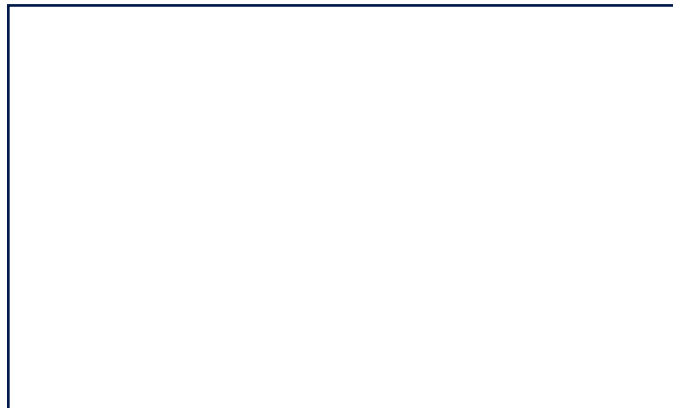
**Detailed Repair Report** - Available upon request, this report provides details of evaluation and repairs made.

**Custom Points** - Palmer Wahl will calibrate your instruments at your specified temperature or pressure.

**Special Requests** - When calibrating your instrument, our experienced personnel will help you to achieve the level of quality that you need in your facility.

**Note:** You must have a **Return Merchandise Authorization Number**, (RMA) before returning a product for repair or calibration. To obtain an RMA, please call Customer Service at 1-800-421-2853 or go to [www.palmerwahl.com](http://www.palmerwahl.com) and click on: Service > Product Return Request.

**Wahl Bimetal Thermometers are distributed by:**



### Why you need to Calibrate your Instruments

- Increase customer satisfaction with consistent products.
- Comply with quality standards.
- Improve product quality.
- Ensure traceability throughout your entire manufacturing process.
- Palmer Wahl offers a complete line of Calibrators to integrate all the necessary functions for adjustment and maintenance of your process.
- Our products are easy to use and Palmer Wahl is there to help, every step of the way.
- Go to: [www.palmerwahl.com](http://www.palmerwahl.com) > Test & Calibration.

[www.palmerwahl.com](http://www.palmerwahl.com)

### Palmer Wahl Warranty

Manufacturer warrants all products listed in this catalog to be free from defects in material or workmanship under normal use and service. The Manufacturer agrees to repair or replace any product which upon examination is revealed to have been defective due to faulty workmanship or material if returned to our factory, transportation charges prepaid, within the product specific warranty period stated in the catalog by the manufacturer. This warranty is in lieu of all other warranties, expressed or implied and of all obligations or liabilities on its part for damages including but not limited to consequential damages, following the use or misuse of instruments sold by the Manufacturer. No agent is authorized to assume for manufacturer any liability except as set forth above.

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