Thermocouple Technology, Inc.

Series E
End Cap Series - Manufacturing Standard
Valid only for Overall Length "L" maximum of 24" and/or one-piece construction barstock stems.

*NOTICE: TTEC provides a one piece construction machined barstock design for "L" lengths up to 24".

SEC. I Tolerances

DWG KEY	DESCRIPTION	STANDARD TOLERANCE
A	Bore Depth	+.030"/-.000" Depth; W-Shaped bore bottom
B	Bore Diameter	+/-.005"
C	Chamfer	Nominal
D	Diameter	+/-.015"
E	Tip Thickness	+/-.063"
F	End Cap Thickness	+/-.015"
I	Instrument Conn.	ANSI B1.20.1
J	Radius	Nominal
K	Head Length	Nominal – See "A", "E"& "U" for accumulated length tolerances
L	Overall Length	Nominal – See "A", "E" & "U" for accumulated length tolerances
P	End Cap Dimensions	Compliant to Manufacturer's mating end cap tolerances.
Q	Shank Diameter(s)	+/-.010"
T	Lag ext. Length	Nominal – See "A", "E" &"U" for accumulated length tolerances
U	Insertion Length	+/-.063"
V	Tapered Length	+/-.500" when "U" length is longer than 16"
Y	Reduced Length	Nominal

Sec. II – Manufacturer's Standard Specifications

1. Bore Concentricity: .0015" per inch / maximum T.I.R. .035".
2. Instrument connection: 1/2" NPT compliant to ANSI B1.20.1. Standard dimensions: Entrance bevel 60º +/-2º. I.D. .718" +/-.005" x 1.00" +/-.015" depth with 59º nominal drill bottom. Tap 1/2" NPT threads x .875" nominal depth. Tolerance: ANSI compliant 3 full plug gauge turns minimum x 4.5 turns maximum. *Note: Request alternate thread dimensions for any Series with a "K" length of <1.00".
3. Materials: In compliance with the applicable governing National Standard such as ASTM, ASME, AWS, etc.
4. Stamping: 3/32" minimum height characters indicating material grade & traceability code. TTEC reserves the option to relocate standard stamp locations if there are surface area constraints.
5. Surface Finish: Mechanical polish of 16-32 RMS over 85% of the external surface. Electropolish is available, upon request, with an additional charge.
6. Tapered length "V": Full length taper is provided for U16" or less. Longer lengths are tapered over the last 16" as a standard. A full length taper for all lengths is available for an additional charge.

Thermocouple Technology, Inc.

Series F
Flanged Series - Manufacturing Standard
Valid only for Overall Length "L" maximum of 42" and/or one-piece construction barstock stems.

SEC. I Tolerances

DWG KEY	DESCRIPTION	STANDARD TOLERANCE
A	Bore Depth	+.030"/-.000" Depth; W-Shaped bore bottom
B	Bore Diameter	+.007"/-.005"
C	Chamfer	Nominal
D	Diameter	Option 1) Barstock o.d.: Mill Standard tolerance/-.032" Option 2) Machined o.d.: +/-.015"
E	Tip Thickness	+/-.063"
F	Flg. Thickness	Post-fabricated ANSI B16.5 flanges: Mill Standard/-.063"
G	GTAW Weld	ASME Sec. IX, B&PVC – certified welders
I	Instrument Conn.	ANSI B1.20.1
J	Radius	Nominal
K	Head Length	Nominal – See "A", "E" & "U" for accumulated length tolerances.
L	Overall Length	Nominal – See "A", "E" & "U" for accumulated length tolerances.
P	Proc. Conn.	ANSI B16.5 Pre-fabricated flange
Q	Shank Diameter(s)	+/-.010"
T	Lag ext. Length	Nominal – See "A", "E" & "U" for accumulated length tolerances.
U	Insertion Length	+/-.063"
V	Tapered Length	+/-.500" when "U" length is longer than 16"
Y	Reduced Length	Nominal

Sec. II – Manufacturer's Standard Specifications

1. Bore Concentricity: .0015" per inch / maximum T.I.R. .035".
2. Instrument connection: 1/2" NPT compliant to ANSI B1.20.1. Standard dimensions: Entrance bevel 60º +/-2º. I.D. .718" +/-.005" x 1.00" +/-.015" depth with 59º nominal drill bottom. Tap 1/2" NPT threads x .875" nominal depth. Tolerance: ANSI compliant 3 full plug gauge turns minimum x 4.5 turns maximum. *Note: Request alternate thread dimensions for any series with a "K" length of <1.00".
3. Materials: In compliance with the applicable governing National Standard such as ASTM, ASME, AWS, etc.
4. Post-Fabricated Flange dimensions: Reference document titled Series PFD.
5. Stamping: 3/32" minimum height characters indicating material grade & traceability code. TTEC reserves the option to relocate standard stamp locations if there are surface area constraints.
6. Surface Finish: 16-32 RMS over 85% of the "U" length- the remainder of the stem area is belt-sanded. Surface finish varies for "high carbon/low alloy" materials due to inherent rusting characteristics. Gasket surface finishes for flanges/connectors are provided on document Series PFD.
7. Tapered length "V": Full length taper is provided for U16" or less. Longer lengths are tapered over the last 16" as a standard. A full length taper for all lengths is available for an additional charge.
8. Welding: Request the applicable welding specification.

Thermocouple Technology, Inc.

Series PFD
Post-Fabricated Flange Dimensions – Manufacturing Standard

SEC. I – Tolerances

1. Flange Thickness

RF, FF, RTJ	+.12"/-.063"
All Others	+/-.063"

2. Gasket Surface

Std Flanges	125-200 Microinch. Serrated-Spiral grooves (phonographic)
RTJ (Ring Type)	125-200 AARH. Smooth machined surface- no grooves.
Vanstone Series	125-200 AARH. Smooth machined surface-no grooves.
Flanged w/ Sheath	32-64 RMS (surface finish of the thermowell flange face)

3. Stamping
a) ANSI B16.5 Mill Standard stamping, and
b) Manufacturer's traceability code and/or requested stamping using 3/32" min. height characters.

4. Threaded Flanges
Reference TTEC Series information for Threaded-On & Seal Welded Series thermowells. Unless specified otherwise, flange threads are in compliance with ANSI B1.20.1 to mate with a thermowell stem. (ASME B16.5 threads will not properly mate with a thermowell stem.)

5. Drilled Diameters
a) Varies to accommodate the interdependent factors of the thermowell's specifications. Request the applicable TTEC Welding Specification.
b) +.005"/.000" drilled diameters provided for "flange only" orders.

6. Welding

Qualifications	Certified under ASME Sec. IX, B&PVC.
Documentation	WPS (Welding Procedure Qualification) & PQR (Procedural Qualification Record) are available upon request, PRIOR to fabrication.
Specifications	Request TTEC welding specifications for the applicable procedure: a) Standard welding – TTEC Series SW b) Full penetration welding – TTEC Series FPW c) Custom – request information from the Sales Department

Sec. II – Flanged Thermowell Disclosure

1. Flanged thermowells are proprietary products and are not governed by the ASME B16.5. Post-Fabricated flanges do NOT qualify as compliant with the ASME B16.5 Standard. Ref: ANSI B16.5-1988 (1992) Interpretation Section "1-1: Modification to Flanges, reply to number (1) and (2)" and Section "1-4: Proprietary Products, reply to (1) and (3)" for additional information regarding compliance rulings for flanged thermowells.
*NOTE: TTEC will be pleased to quote price & availability for post-fabricated flanges that meet the ASME B16.5 minimum flange thickness. Pricing will increase and availability may be extended.

Thermocouple Technology, Inc.

Series S
Socket-Weld Series - Manufacturing Standard
Valid only for Overall Length "L" maximum of 42" and/or one-piece construction barstock stems.

SEC. I Tolerances

DWG KEY	DESCRIPTION	STANDARD TOLERANCE
A	Bore Depth	+.030"/-.000" Depth; W-Shaped bore bottom
B	Bore Diameter	+/-.005"
C	Chamfer	Nominal
D	Diameter	Standard Machined o.d.: +/-.015". Option: Barstock o.d.: Mill Standard tolerance/-.032"
E	Tip Thickness	+/-.063"
I	Instrument Conn.	ANSI B1.20.1
J	Radius	Nominal
K	Head Length	Nominal – See "A", "E" & "U" for governing tolerances.
L	Overall Length	Nominal – See "A", "E" & "U" for governing tolerances.
Q	Shank Diameter(s)	+/-.010"
T	Lag ext. Length	Nominal – See "A", "E" & "U" for governing tolerances.
U	Insertion Length	+/-.063"
V	Tapered Length	+/-.500" when "U" length is longer than 16"
Y	Reduced Length	Nominal

Sec. II – Manufacturer's Standard Specifications

1. Bore Concentricity: .0015" per inch / maximum T.I.R. .035".
2. Instrument connection: 1/2" NPT compliant to ANSI B1.20.1. Standard dimensions: Entrance bevel 60º +/-2º. I.D. .718" +/-.005" x 1.00" +/-.015" depth with 59º nominal drill bottom. Tap 1/2" NPT threads x .875" nominal depth. Tolerance: ANSI compliant 3 full plug gauge turns minimum x 4.5 turns maximum. *Note: Request thread dimensions for series with "K" length constraints.
3. Materials: In compliance with the applicable governing National Standard such as ASTM, ASME, AWS, etc.
4. Stamping: 3/32" minimum height characters indicating material grade & traceability code. TTEC reserves the option to relocate standard stamp locations if there are surface area constraints.
5. Surface Finish: 16-32 RMS over 85% of the "U" length- the remainder of the stem area is belt-sanded. Surface finish varies for "high carbon/low alloy" materials due to inherent rusting characteristics.
6. Tapered length "V": Full length taper is provided for U16" or less. Longer lengths are tapered over the last 16" as a standard. A full length taper for all lengths is available for an additional charge.

Thermocouple Technology, Inc.

Series T
Threaded Series - Manufacturing Standard
Valid only for Overall Length "L" maximum of 42" and/or one-piece construction barstock stems.

SEC. I Tolerances

DWG KEY	DESCRIPTION	STANDARD TOLERANCE
A	Bore Depth	+.030"/-.000" Depth; W-Shaped bore bottom
B	Bore Diameter	+/-.005"
C	Chamfer	Nominal
D	Diameter	Option 1) Barstock o.d.: Mill Standard tolerance/-.032" Option 2) Machined o.d.: +/-.015"
E	Tip Thickness	+/-.063"
I	Instrument Conn.	ANSI B1.20.1
J	Radius	Nominal
K	Head Length	Nominal – See "A", "E"& "U" for governing tolerance
L	Overall Length	Nominal – See "A", "E" & "U" for governing tolerance
Q	Shank Diameter(s)	+/-.010"
R	Thread Length	Nominal – See "A", "E", "I" & "U" for governing tolerance
T	Lag ext. Length	Nominal – See "A", "E" &"U" for governing tolerance
U	Insertion Length	+/-.063"
V	Tapered Length	+/-.500" when "U" length is longer than 16"
W	Wrench Allow.	Option 1) Nominal for Hex barstock Option 2) Machined wrench flats: +/-.375"
Y	Reduced Length	Nominal

Sec. II – Manufacturer's Standard Specifications

1. Bore Concentricity: .0015" per inch / maximum T.I.R. .035".
2. Instrument connection: 1/2" NPT compliant to ANSI B1.20.1. Standard dimensions: Entrance bevel 60º +/-2º. I.D. .718" +/-.005" x 1.00" +/-.015" depth with 59º nominal drill bottom. Tap 1/2" NPT threads x .875" nominal depth. Tolerance: ANSI compliant 3 full plug gauge turns minimum x 4.5 turns maximum. *Note: Request thread dimensions for Series with "K" length constraints.
3. Materials: In compliance with the applicable governing National Standard such as ASTM, ASME, AWS, etc.
4. Stamping: 3/32" minimum height characters indicating material grade & traceability code. TTEC reserves the option to relocate standard stamp locations if there are surface area constraints.
5. Surface Finish: 16-32 RMS over 85% of the "U" length. The remainder of the stem area is belt-sanded. Surface finish varies for "high carbon/low alloy" materials due to inherent rusting characteristics.
6. Tapered length "V": Full length taper is provided for U16" or less. Longer lengths are tapered over the last 16" as a standard. A full length taper for all lengths is available for an additional charge.

Thermocouple Technology, Inc.

Series V

Vanstone Series - Manufacturing Standard

Valid only for Overall Length "L" maximum of 42" and/or one-piece construction barstock stems.

SEC. I Tolerances

DWG KEY	DESCRIPTION	STANDARD TOLERANCE
A	Bore Depth	+.030"/-.000" Depth; W-Shaped bore bottom
B	Bore Diameter	+/-.005"
C	Chamfer	Nominal
D	Diameter	Machined o.d.: +/-.015"
E	Tip Thickness	+/-.063"
F	RF Dia. Thickness	+/-.063"
I	Instrument Conn.	ANSI B1.20.1
J	Radius	Nominal
K	Head Length	Nominal – See "A", "E" and "U" for governing tolerance
L	Overall Length	Nominal – See "A", "E" and "U" for governing tolerance
P	Pipe Size Dia.	+/-.015"
Q	Shank Diameter(s)	+/-.010"
T	Lag ext. Length	Nominal – See "A", "E" and "U" for governing tolerance
U	Insertion Length	+/-.063"
V	Tapered Length	+/-.500" when "U" length is longer than 16"
Y	Reduced Length	Nominal

Sec. II – Manufacturer's Standard Specifications

1. Bore Concentricity: .0015" per inch / maximum T.I.R. .035".
2. Instrument connection: 1/2" NPT compliant to ANSI B1.20.1. Standard dimensions: Entrance bevel 60º +/-2º. I.D. .718" +/-.005" x 1.00" +/-.015" depth with 59º nominal drill bottom. Tap 1/2" NPT threads x .875" nominal depth. Tolerance: ANSI compliant 3 full plug gauge turns minimum x 4.5 turns maximum. *Note: Request thread dimensions for Series with "K" Length constraints.
3. Materials: In compliance with the applicable governing National Standard such as ASTM, ASME, AWS, etc.
4. Stamping: 3/32" minimum height characters indicating material grade & traceability code. TTEC reserves the option to relocate standard stamp locations if there are surface area constraints.
5. Surface Finish: 16-32 RMS over 85% of the "U" length – the remainder of the stem is belt-sanded. Gasket surface: 125-200 AARH. Smooth machined surface – no grooves. Surface finish varies for "high carbon/low alloy" materials due to inherent rusting characteristics.
6. Tapered length "V": Full length taper is provided for U16" or less. Longer lengths are tapered over the last 16" as a standard. A full length taper for all lengths is available for an additional charge.

Thermocouple Technology, Inc.

Series W
Weld-In Series - Manufacturing Standard
Valid only for Overall Length "L" maximum of 42" and/or one-piece construction barstock stems.

SEC. I Tolerances

DWG KEY	DESCRIPTION	STANDARD TOLERANCE
A	Bore Depth	+.030"/-.000" Depth; W-Shaped bore bottom
B	Bore Diameter	+/-.005"
C	Chamfer	Nominal
D	Diameter	Standard Machined o.d.: +/-.015" Option: Barstock o.d.: Mill Standard tolerance/-.032"
E	Tip Thickness	+/-.063"
I	Instrument Conn.	ANSI B1.20.1
J	Radius	Nominal
K	Head Length	Nominal – See "A", "E"& "U" for accumulated length tolerances
L	Overall Length	Nominal – See "A", "E" & "U" for accumulated length tolerances
P	Proc. Conn.	See "D" above
Q	Shank Diameter(s)	+/-.010"
T	Lag ext. Length	Nominal – See "A", "E" &"U" for accumulated length tolerances
U	Insertion Length	+/-.063"
V	Tapered Length	+/-.500" when "U" length is longer than 16"

Sec. II – Manufacturer's Standard Specifications

1. Bore Concentricity: .0015" per inch / maximum T.I.R. .035".
2. Instrument connection: 1/2" NPT compliant to ANSI B1.20.1. Standard dimensions: Entrance bevel 60º +/-2º. I.D. .718" +/-.005" x 1.00" +/-.015" depth with 59º nominal drill bottom. Tap 1/2" NPT threads x .875" nominal depth. Tolerance: ANSI compliant 3 full plug gauge turns minimum x 4.5 turns maximum. *Note: Request thread dimensions for Series with "K" Length constraints.
3. Materials: In compliance with the applicable governing National Standard such as ASTM, ASME, AWS, etc.
4. Stamping: 3/32" minimum height characters indicating material grade & traceability code. TTEC reserves the option to relocate standard stamp locations if there are surface area constraints.
5. Surface Finish: 16-32 RMS over 85% of the "U" length – the remainder of the stem is belt-sanded. Surface finish varies for "high carbon/low alloy" materials due to inherent rusting characteristics.
6. Tapered length "V": Full length taper is provided for U16" or less. Longer lengths are tapered over the last 16" as a standard. A full length taper for all lengths is available for an additional charge.