BURNS® ENGINEERING

Temperature Measurement Experts

Series S

Sanitary Sensors and Thermowells

Temperature Measurement Experts®

Since 1960, Burns Engineering has been an industry leader in the design and manufacture of temperature sensors. Accuracy, reliability and consistency are hallmarks of the Burns brand. At Burns, temperature is our language. We understand the subtleties of temperature measurement and how they can impact your processes and ultimately your success. We worry about the details so you don't have to. When you select Burns you're getting more than a sensor, you're getting your own team of Temperature Measurement Experts.

Series S Sanitary Sensors and Thermowells

The Series S family of sensors and thermowells are specifically designed to meet strict sanitary requirements and provide temperature measurement confidence in your processes. From 1/8 inch Mini Sensors to Non-Intrusive designs, the Series S offers SIP, CIP, HTST capable performance and material traceability to meet the stringent quality systems of the Pharmaceutical, Biotech and Food Processing industries .

Allow us to provide a quote! Call us at 800-328-3871 or configure your own quote through our Web Quote system.

Here's how: Go to www.burnsengineering.com

1. Search for the model (S01, S40, SWE, SNR), using the search box (upper right).
2. Click on configure.
3. Select the parameters for your model.
4. Add to Quote Cart.
5. Submit Cart for Quote.

It's fast, easy and we'll get back to you within a day!

BURNS® ENGINEERING
Temperature Measurement Experts

Product Index

Series S Sanitary Sensors and Thermowells

Designed For Performance and Reliability

Series S sensors are designed to meet strict sanitary requirements and provide top performance in a wide variety of applications.

The Burns design team, through their participation in the ASME-BPE Standard Committee on BioProcess Equipment (BPE) and the 3A Sanitary Standard organization, understands the important design characteristics necessary to ensure performance and cleanability for sanitary operation.

3A, #74 Conformance:

Detailed attention to the design, material, and fabrication criteria set forth in the most current revision of 3A Sanitary Standard number 74. Look for the 3A logo on approved products.

BPE Standard:

The guidelines regarding Metallic Materials (MM), Material Joining (MJ), Sanitary Design (SD), and other parts of the BPE Standard are a core consideration within the Series S product design as a Process Instrument (PI).

N.E.T Solution™:

The N.E.T Solution design provides an assembly with No Exposed Threads that eliminates the cracks and crevices where bacteria, dirt or other unwanted material can hide. Watch for the N.E.T Solution reference throughout the Series S.

Documentation & Material Traceability:

Burns Engineering offers, as standard, the most common certifications required for sanitary applications. For all Series S sensors and thermowells that contain “wetted” surfaces, the heat numbers of all “wetted” materials are marked on the extension and a material traceability certificate is included. A certificate of surface finish and electropolish are automatically provided when applicable - no need to specify these certifications.

All certificates are supplied in hard copy as standard practice. Several electronic formats are also available upon request.

Custom documentation packages and NVLAP accredited calibration can be supplied to meet all of your quality and validation requirements. Contact your local Burns representative or Burns Customer Service for more information on custom documentation packages.

For the Scope of Accreditation
Under NVLAP Lab Code 200706-0

Specifications

RTDS

Operating Temperature Range:

-50ºC to 200ºC

Element Resistance:

100 ohms at 0°C nominal

Temperature Coefficient of Resistance (alpha):

0.00385 Ω/Ω/°C nominal

Accuracy:

Standard: 0.10% of resistance at 0°C

Precision: 0.05% of resistance at 0°C

Insulation Resistance:

100 megohms minimum at 100 VDC at 25°C

(Not applicable for grounded thermocouples)

Interchangeability:

For 100 ohm elements the tolerance values at any temperature for these specifications are given by:

Tolerance °C = ±(0.13 + 0.00185 ItI) for accuracy code 05

Tolerance °C = ±(0.26 + 0.0037 ItI) for accuracy code 10

(ItI = absolute value of temperature in °C)

Leadwire:

PTFE insulated nickel-plated stranded copper, 22 and 24 AWG typical

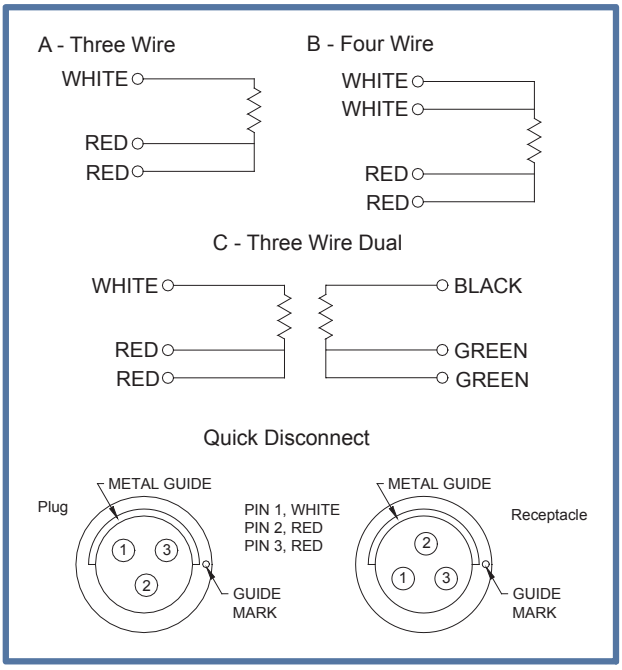
Sheath Material:

316L stainless steel typical

100% Tested:

For accuracy at 0°C and insulation resistance

Color Codes Element/Leadwire Configuration



Temperature °C	Temperature °F	Interchangeability 0.05%**		0.10%	
-50	-58	±.23°C	±.41°F	±.45°C	±.80°F
0	32	±.13°C	±.23°F	±.26°C	±.46°F
100	212	±.32°C	±.57°F	±.64°C	±1.15°F
200	392	±.50°C	±.90°F	±1.00°C	±1.80°F

** ±0.05 accuracy is not currently available with all models. See the Ordering Information Table for each model for applicability.

Thermocouples

The tables listed below are provided to the user for a ready reference of thermocouple designations as compared to the generic and trade names for the most common thermocouple materials. The letter “P” in the designation indicates the positive (+) leg of the thermocouple while the letter “N” designates the negative (-). Color coding and other means of conductor identification are also provided. Specification reference per ASTME230 / E230M.

ANSI Thermocouple Type	Temperature Range	Special Limits
E	-50°C to 125°C 125°C to 200°C	±0.5°C ±0.4%*
J	0°C to 200°C	±1.1°C
K	0°C to 200°C	±1.1°C
T	-50°C to 125°C 125°C to 200°C	±0.5°C ±0.4%*

* % applies to measurement in °C

Thermocouple Grade Wire

ANSI Type	Grade or Generic Trade Names	Single Conductors	Magnetic	Conductor Color Code	Overall Color Code
E	Chromel® Constantan	EP EN	No No	Purple Red	Brown w/ Purple Tracer
J	Iron Constantan	JP JN	Yes No	White Red	Brown w/ White Tracer
K	Chromel® Alumel®	KP KN	No Yes	Yellow Red	Brown w/ Yellow Tracer
T	Copper Constantan	TP TN	No No	Blue Red	Brown w/ Blue Tracer

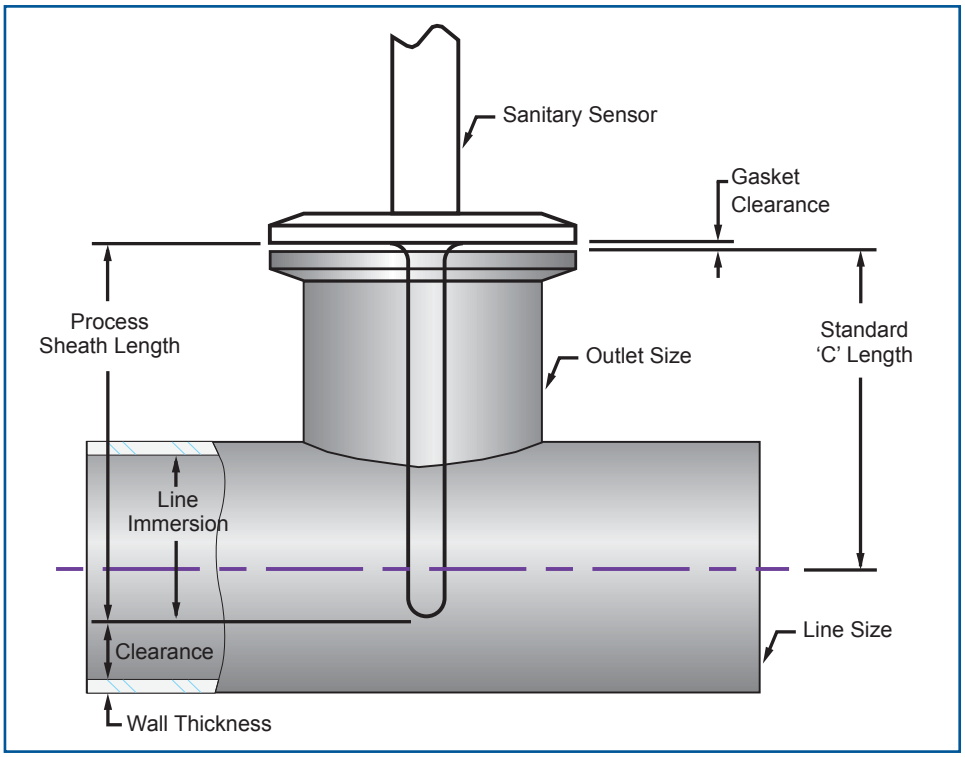
Extension Grade Wire

ANSI Type	Grade or Generic Trade Names	Single Conductors	Magnetic	Conductor Color Code	Overall Color Code
EX	Chromel® Constantan	EPX ENX	No No	Purple Red	Purple
JX	Iron Constantan	JPX JNX	Yes No	White Red	Black
KX	Chromel® Alumel®	KPX KNX	No Yes	Yellow Red	Yellow
TX	Copper Constantan	TPX TNX	No No	Blue Red	Blue

Application and Product Selection Guide

Immersion Sensors in Standard or Short Outlet Tees

When using the Series S models with a standard or short immersion tee it is important to specify the correct process sheath length for the best performance. The sheath length must be immersed in the process far enough to eliminate measurement errors due to stem conduction (minimum process sheath length). The sheath length must also maintain clearance between the sheath tip and the inside wall of the process line (maximum process sheath length). Use the tables on page 6 to determine the minimum and maximum recommended process sheath lengths for the tee used in the application. Then use the table to choose a model appropriate for the application and its corresponding standard process sheath length for that length range.



Application and Product Selection Guide

Immersion Sensors in Standard or Short Outlet Tees

Example: For a 1.5” x 1.5” short outlet tee, what Series S models can be used and what standard process sheath lengths are available?

Using the table for Short Outlet Tee the following information is determined:

Standard ‘C’ dimension = 1.38”

Minimum recommended process sheath length = 0.98”

Maximum recommended process sheath length = 2.03”

Applicable Models:

Series S01 with a standard process sheath length of 1.10”

Series S55 with a standard process sheath length of 1.25”

Series S60 with a standard process sheath length of 1.25”

Definitions:

Clearance = 0.06 Inches

Wall Thickness = 0.065 Inches

Gasket Clearance = 0.03 Inches

Minimum Line Immersion = 0.25 Inches

Minimum Process Sheath Length = Standard ‘C’ Length + Gasket Clearance - (Line Size/2) + Minimum Line Immersion + Wall Thickness

Maximum Process Sheath Length = Standard ‘C’ Length + Gasket Clearance + (Line Size/2) - Clearance - Wall Thickness

	Standard Tee									Process Sheath Length							Immersion Length	
Line Size	Outlet Size								Std. 'C'	Recommended		Standard					SWT	
	.50	.75	1.0	1.5	2.0	2.5	3.0	4.0		Min.	Max.	S01	S03	S20	S40	S55	S60*	S65*
.50	√								2.38	2.48	2.53	2.50	-	-	-	2.50	2.50	2.50
.75	√	√							2.50	2.47	2.78	2.50	-	-	-	2.50	2.50	2.50
1.0	√	√	√						2.63	2.48	3.03	3.00	-	3.00	-	2.50	2.50	2.50
1.5	√	√	√	√					2.88	2.48	3.53	3.00	3.50	3.00	-	2.50	2.50	2.50
2.0	√	√	√	√					3.13	2.48	4.03	3.00	3.50	3.00	4.00	4.00	4.00	4.00
2.0					√				3.38	2.73	4.28	3.00	3.50	3.00	4.00	4.00	4.00	4.00
2.5					√				3.38	2.48	4.53	3.00	3.50	3.00	4.00	4.00	4.00	4.00
2.5						√			3.63	2.73	4.78	3.00	3.50	3.00	4.00	4.00	4.00	4.00
3.0					√	√			3.63	2.48	5.03	3.00	3.50	3.00	4.00	4.00	4.00	4.00
3.0							√		3.88	2.73	5.28	3.00	3.50	3.00	4.00	4.00	4.00	4.00
4.0					√	√	√		4.38	2.73	6.28	3.00	3.50	3.00	4.00	4.00	4.00	4.00
4.0								√	4.75	3.10	6.65	-	3.50	-	4.00	4.00	4.00	4.00

*S60 and S65 models must be used in conjunction with a SWT thermowell. Length stated is the thermowell Immersion length and not the C Compression Length.

	Short Outlet Tee									Process Sheath Length							Immersion Length	
Line Size	Outlet Size								Std. 'C'	Recommended		Standard					SWT	
	0.50	0.75	1.00	1.50	2.00	2.50	3.00	4.00		Min.	Max.	S01	S03	S20	S40	S55	S60*	S65*
0.50	√								1.00	1.10	1.15	1.10	-	-	-	-	-	-
0.75	√								1.00	0.97	1.28	1.10	-	-	-	1.25	1.25	-
0.75		√							1.13	1.10	1.41	1.10	-	-	-	1.25	1.25	-
1.0	√	√	√						1.13	0.98	1.53	1.10	-	-	-	1.25	1.25	-
1.5	√	√	√	√					1.38	0.98	2.03	1.10	-	-	-	1.25	1.25	-
2.0	√	√	√	√	√				1.63	0.98	2.53	2.50	-	-	-	2.50	2.50	2.50
2.5					√	√			1.88	0.98	3.03	2.50	-	3.00	-	2.50	2.50	2.50
3.0					√	√	√		2.13	0.98	3.53	2.50	3.50	3.00	-	2.50	2.50	2.50
4.0				√	√	√	√		2.63	0.98	4.53	2.50	3.50	3.00	4.00	4.00	4.00	4.00
4.0								√	2.75	1.10	4.65	2.50	3.50	3.00	4.00	4.00	4.00	4.00

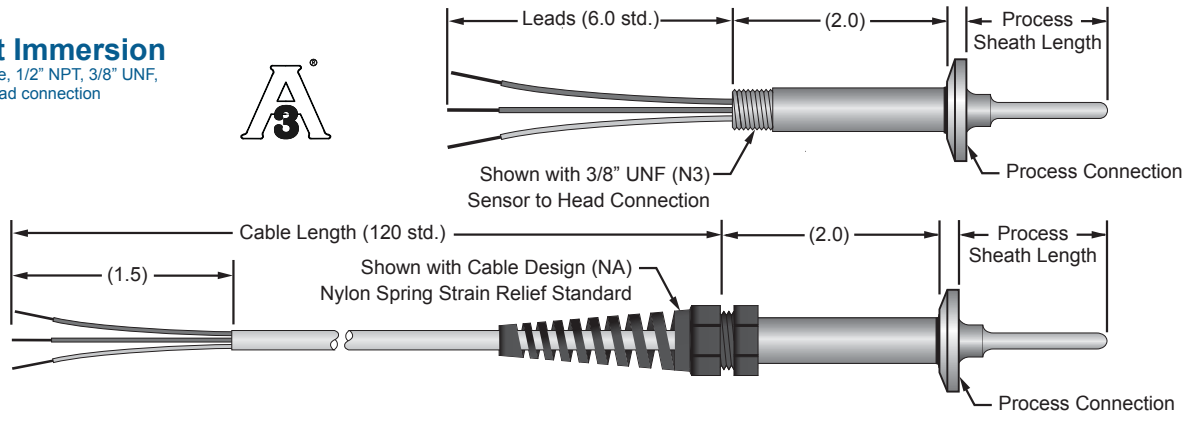
*S60 and S65 models must be used in conjunction with a SWT thermowell. Length stated is the thermowell Immersion length and not the C Compression Length.

S01 & S03 Direct Immersion Sensors

Specifications

S01-
1/8” Direct Immersion

Available with cable, 1/2” NPT, 3/8” UNF, and 1/2” NPSM head connection



All dimensions in inches.

S01 Application

The 1/8” diameter direct immersion (S01) is generally used in process lines less than 1 inch in diameter and/or when the process has physical constraints that limit the immersion to less than 3.5 inches. This sensor is available with cable or various thread sizes for connection heads.

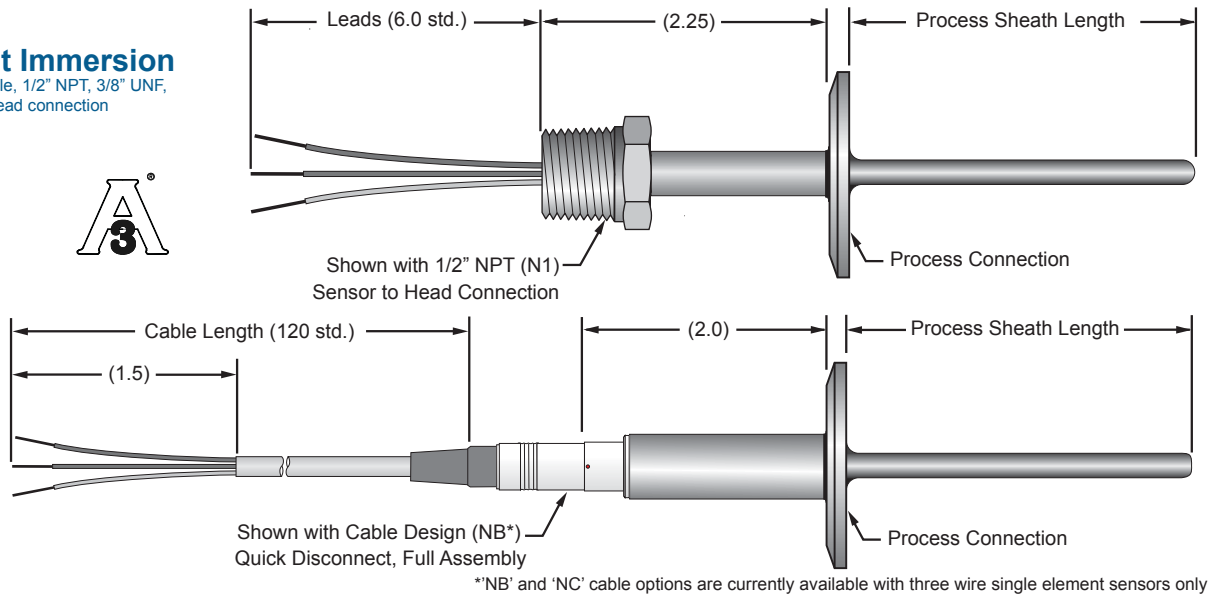
S01 Specifications

Time Constant: Maximum time to reach 63.2% of a step change in temperature in water flowing at 3 fps.	1.5 seconds
RTD Repeatability: Maximum change in resistance at 0°C after 10 cycles over the full temperature range.	0.04%
RTD Long Term Stability: Maximum change in resistance at 0°C after 1000 hours at 200°C	Precision: 0.01% Standard: 0.10%
RTD Hysteresis: Maximum % error at the mid point of the operating temperature range. (Example: 0.04% over a 250°C range = 0.10°C)	Precision: 0.04% Standard: 0.08%

See page 4 for General and Thermocouple Specifications.

S03-
1/4” Direct Immersion

Available with cable, 1/2” NPT, 3/8” UNF, and 1/2” NPSM head connection



*’NB’ and ‘NC’ cable options are currently available with three wire single element sensors only

All dimensions in inches.

S03 Application

The S03 direct immersion is generally used in process lines greater than 1 inch in diameter and for immersion lengths between 3.5 and 24.0 inches.

S03 Specifications

Time Constant: Maximum time to reach 63.2% of a step change in temperature in water flowing at 3 fps.	6.0 seconds
RTD Repeatability: Maximum change in resistance at 0°C after 10 cycles over the full temperature range.	0.04%
RTD Long Term Stability: Maximum change in resistance at 0°C after 1000 hours at 200°C	Precision: 0.01% Standard: 0.10%
RTD Hysteresis: Maximum % error at the mid point of the operating temperature range. (Example: 0.04% over a 250°C range = 0.10°C)	Precision: 0.04% Standard: 0.08%

See page 4 for General and Thermocouple Specifications.

S01 & S03 Direct Immersion Sensors

Ordering Information

Sensor Style		Min Process Sheath Length	Max Process Sheath Length	Sheath Length Tolerance
01-	1/8" Direct Immersion (NOTE 1)	1.0"	8.5"	+/- 0.05"
03-	1/4" Direct Immersion	3.5"	40.0"	+/- 0.125"

RTD (Accuracy)

10	Standard RTD +/- 0.10% of resistance at 0 degrees C
05	Precision RTD +/- 0.05% of resistance at 0 degrees C (not currently available with the S01 model)

Thermocouple (Type)

E	Chromel/Constantan (leadwire code = purple+, red-)
J	Iron/Constantan (leadwire code = white+, red-)
K	Chromel/Alumel (leadwire code = yellow+, red-)
T	Copper/Constantan (leadwire code = blue+, red-)

RTD Element Lead Configuration

A	Three Wire Single
B	Four Wire Single
C	Three Wire Dual

Thermocouple Junction Configuration

D	Single Ungrounded
E	Single Grounded
F	Dual Ungrounded
G	Dual Grounded

Process Sheath Length (Note sensor type minimum & maximum values above)

0110	1.1 inches
0250	2.5 inches
0300	3.0 inches
0350	3.5 inches
0400	4.0 inches
0500	5.0 inches
0550	5.5 inches
1200	12.0 inches
	Specify Process Sheath Length in Inches

Connection Head (NOTE 2)		Sensor/Head Connection
-1C	Cast Iron, Black Enamel	1/2" NPT
-1EN	Cast Iron, White Epoxy Coated, N.E.T. Solution	1/2" NPSM
-2A	Aluminum, Gray	1/2" NPT
-2E	Aluminum, Epoxy Coated	1/2" NPT
-2EN	Aluminum, Epoxy Coated, N.E.T. Solution	1/2" NPSM
-5A	Aluminum	1/2" NPT
-5E	Aluminum Epoxy Coated	1/2" NPT
-5EN	Aluminum, Epoxy Coated, N.E.T. Solution	1/2" NPSM
-9P	Polypropylene, White	1/2" NPT
-9PN	Polypropylene, White, N.E.T. Solution	1/2" NPSM
-14S	Stainless Steel	1/2" NPT
-14SN	Stainless Steel, N.E.T. Solution	1/2" NPSM
-16AN	Miniature Aluminum, N.E.T. Solution	3/8" UNF
-19A	Aluminum with LED Indicator	1/2" NPT
-19AN	Aluminum with LED Indicator, N.E.T. Solution	1/2" NPSM
-20P	Plastic with LED Indicator	1/2" NPT
-20PN	Plastic with LED Indicator, N.E.T. Solution	1/2" NPSM
-N1	No Connection Head, Bushing	1/2" NPT
-N2	No Connection Head, Bushing, N.E.T. Solution	1/2" NPSM
-N3	No Connection Head, No Bushing, N.E.T. Solution	3/8" UNF
-NA	No Connection Head, Cable Design, 120", Nylon Spring Standard	n/a
-NB	No Head. Sensor with Quick Disconnect and Mating 120" cable (NOTE 3)	n/a
-NC	No Head. Sensor with Quick Disconnect only, no cable (NOTE 3)	n/a

Process Type

T	Hygienic Ferrule, (Tri-clamp style)

Process Connection Size		(Used with tube sizes)
05	1/2"	1/2", 3/4"
15	1 1/2"	1", 1 1/2"
20	2"	2"
25	2 1/2"	2 1/2"
30	3"	3"
40	4"	4"

Wetted Surface Material

03	316 Stainless Steel
06	316L Stainless Steel

Wetted Surface Finish

M32	32 Ra mechanical finish, max.
M25	25 Ra mechanical finish, max.
M20	20 Ra mechanical finish, max.
M15	15 Ra mechanical finish, max.
E32	32 Ra mechanical finish, max. with electropolish
E25	25 Ra mechanical finish, max. with electropolish
E20	20 Ra mechanical finish, max. with electropolish
E15	15 Ra mechanical finish, max. with electropolish
E10	10 Ra mechanical finish, max. with electropolish

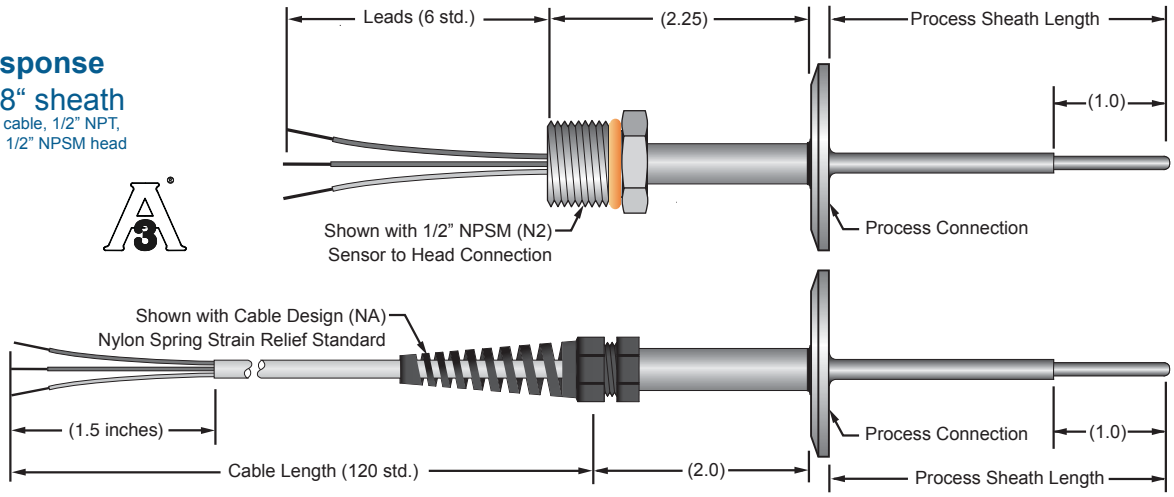
See pages 35 - 39

NOTE 1: ±0.05% accuracy is not currently available with the S01 model
NOTE 2: For full descriptions see page 40 or: www.BurnsEngineering.com/Con-Heads.pdf
NOTE 3: Currently available with three wire single only

S20 & S40 Direct Immersion Sensors

Specifications

S20-
Fast Response
1/4” x 1/8“ sheath
Available with cable, 1/2” NPT, 3/8” UNF, and 1/2” NPSM head connection



All dimensions in inches.

S20 Application

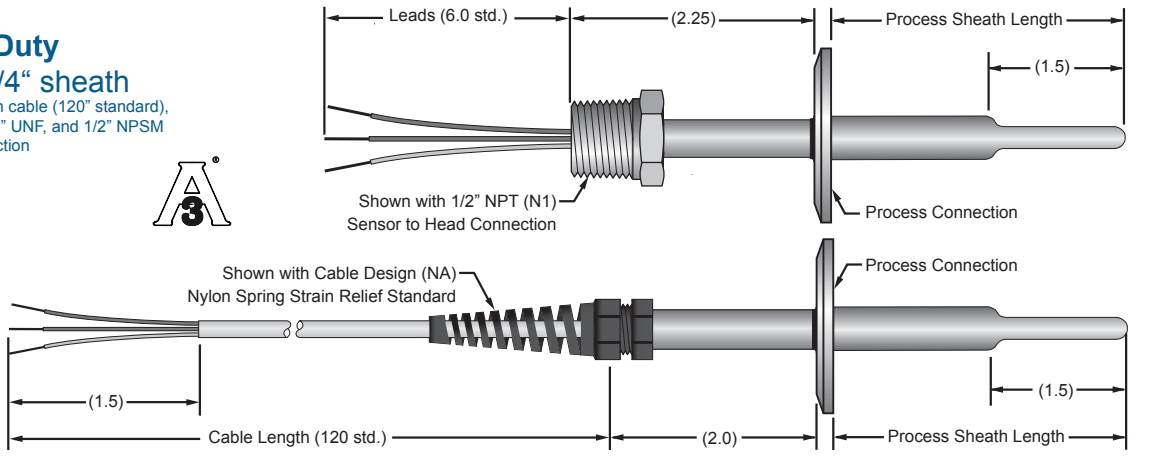
The S20 direct immersion is generally used in applications with longer immersion lengths that require the physical durability associated with a 1/4 inch sheath diameter and the time response of a 1/8 inch sheath diameter. Use S20 in applications with immersions lengths between 3.5 and 24.0 inches.

S20 Specifications

Time Constant: Maximum time to reach 63.2% of a step change in temperature in water flowing at 3 fps.	2.5 seconds
RTD Repeatability: Maximum change in resistance at 0°C after 10 cycles over the full temperature range.	0.04%
RTD Long Term Stability: Maximum change in resistance at 0°C after 1000 hours at 200°C	Precision: 0.01% Standard: 0.10%
RTD Hysteresis: Maximum % error at the mid point of the operating temperature range. (Example: 0.04% over a 250°C range = 0.10°C)	Precision: 0.04% Standard: 0.08%

See page 4 for General and Thermocouple Specifications.

S40-
Heavy Duty
1/2” x 1/4“ sheath
Available with cable (120” standard), 1/2” NPT, 3/8” UNF, and 1/2” NPSM head connection



All dimensions in inches.

S40 Application

The S40 direct immersion is generally used in applications with longer immersion lengths that require the physical durability associated with a 1/2 inch sheath diameter and the time response associated with a 1/4 inch sheath diameter. Use S40 in applications with the longest immersion lengths (greater than 12.0 inches) and in high viscosity processes.

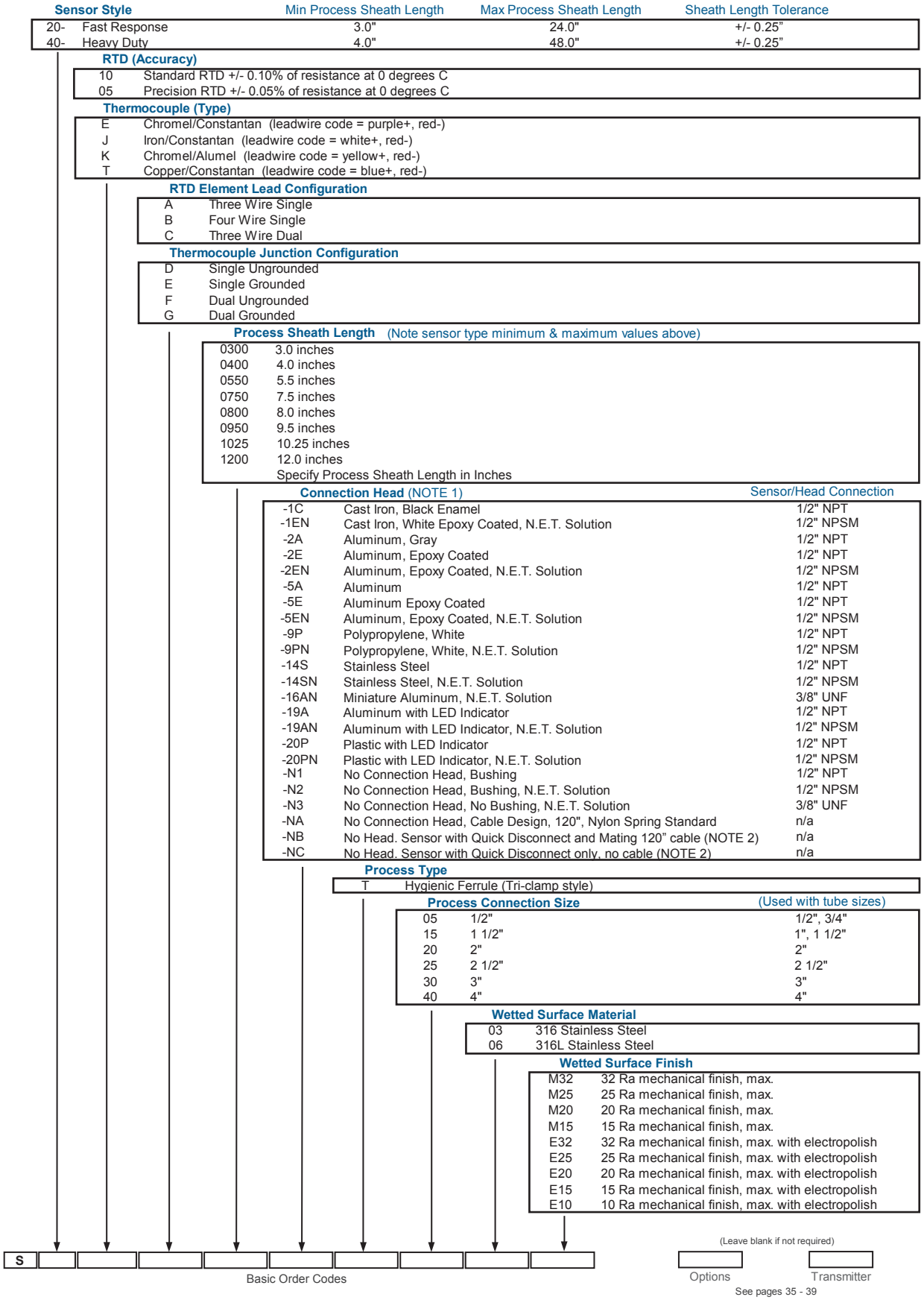
S40 Specifications

Time Constant: Maximum time to reach 63.2% of a step change in temperature in water flowing at 3 fps.	3.5 seconds
RTD Repeatability: Maximum change in resistance at 0°C after 10 cycles over the full temperature range.	0.04%
RTD Long Term Stability: Maximum change in resistance at 0°C after 1000 hours at 200°C	Precision: (0.05%) – 0.01% Standard: (0.10%) – 0.10%
RTD Hysteresis: Maximum % error at the mid point of the operating temperature range. (Example: 0.04% over a 250°C range = 0.10°C)	Precision: (0.05%) – 0.04% Standard: (0.10%) – 0.08%

See page 4 for General and Thermocouple Specifications.

S20 & S40 Direct Immersion Sensors

Ordering Information



Sensor Style

		Min Process Sheath Length	Max Process Sheath Length	Sheath Length Tolerance
20-	Fast Response	3.0"	24.0"	+/- 0.25"
40-	Heavy Duty	4.0"	48.0"	+/- 0.25"

RTD (Accuracy)

10	Standard RTD +/- 0.10% of resistance at 0 degrees C
05	Precision RTD +/- 0.05% of resistance at 0 degrees C

Thermocouple (Type)

E	Chromel/Constantan (leadwire code = purple+, red-)
J	Iron/Constantan (leadwire code = white+, red-)
K	Chromel/Alumel (leadwire code = yellow+, red-)
T	Copper/Constantan (leadwire code = blue+, red-)

RTD Element Lead Configuration

A	Three Wire Single
B	Four Wire Single
C	Three Wire Dual

Thermocouple Junction Configuration

D	Single Ungrounded
E	Single Grounded
F	Dual Ungrounded
G	Dual Grounded

Process Sheath Length (Note sensor type minimum & maximum values above)

0300	3.0 inches
0400	4.0 inches
0550	5.5 inches
0750	7.5 inches
0800	8.0 inches
0950	9.5 inches
1025	10.25 inches
1200	12.0 inches
	Specify Process Sheath Length in Inches

Connection Head (NOTE 1)

		Sensor/Head Connection
-1C	Cast Iron, Black Enamel	1/2" NPT
-1EN	Cast Iron, White Epoxy Coated, N.E.T. Solution	1/2" NPSM
-2A	Aluminum, Gray	1/2" NPT
-2E	Aluminum, Epoxy Coated	1/2" NPT
-2EN	Aluminum, Epoxy Coated, N.E.T. Solution	1/2" NPSM
-5A	Aluminum	1/2" NPT
-5E	Aluminum Epoxy Coated	1/2" NPT
-5EN	Aluminum, Epoxy Coated, N.E.T. Solution	1/2" NPSM
-9P	Polypropylene, White	1/2" NPT
-9PN	Polypropylene, White, N.E.T. Solution	1/2" NPSM
-14S	Stainless Steel	1/2" NPT
-14SN	Stainless Steel, N.E.T. Solution	1/2" NPSM
-16AN	Miniature Aluminum, N.E.T. Solution	3/8" UNF
-19A	Aluminum with LED Indicator	1/2" NPT
-19AN	Aluminum with LED Indicator, N.E.T. Solution	1/2" NPSM
-20P	Plastic with LED Indicator	1/2" NPT
-20PN	Plastic with LED Indicator, N.E.T. Solution	1/2" NPSM
-N1	No Connection Head, Bushing	1/2" NPT
-N2	No Connection Head, Bushing, N.E.T. Solution	1/2" NPSM
-N3	No Connection Head, No Bushing, N.E.T. Solution	3/8" UNF
-NA	No Connection Head, Cable Design, 120", Nylon Spring Standard	n/a
-NB	No Head. Sensor with Quick Disconnect and Mating 120" cable (NOTE 2)	n/a
-NC	No Head. Sensor with Quick Disconnect only, no cable (NOTE 2)	n/a

Process Type

T	Hygienic Ferrule (Tri-clamp style)

Process Connection Size (Used with tube sizes)

05	1/2"	1/2", 3/4"
15	1 1/2"	1", 1 1/2"
20	2"	2"
25	2 1/2"	2 1/2"
30	3"	3"
40	4"	4"

Wetted Surface Material

03	316 Stainless Steel
06	316L Stainless Steel

Wetted Surface Finish

M32	32 Ra mechanical finish, max.
M25	25 Ra mechanical finish, max.
M20	20 Ra mechanical finish, max.
M15	15 Ra mechanical finish, max.
E32	32 Ra mechanical finish, max. with electropolish
E25	25 Ra mechanical finish, max. with electropolish
E20	20 Ra mechanical finish, max. with electropolish
E15	15 Ra mechanical finish, max. with electropolish
E10	10 Ra mechanical finish, max. with electropolish

S [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]

Basic Order Codes

(Leave blank if not required)

[ ] Options [ ] Transmitter

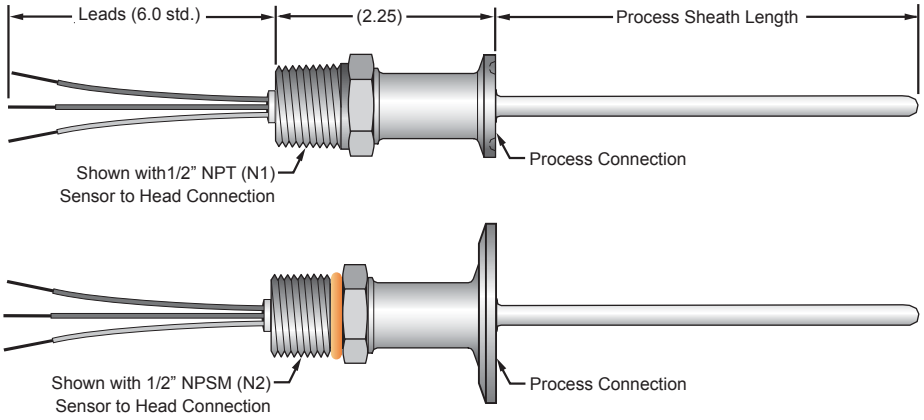
See pages 35 - 39

NOTE 1: For full descriptions see page 40 or: www.BurnsEngineering.com/Con-Heads.pdf
NOTE 2: Currently available with three wire single only

S55 Sensor with Integral Thermowell

Specifications

S55-
Integral 3/16“ Well
Available with 1/2” NPT and
1/2” NPSM head connection



All dimensions in inches.

S55 Application

The S55 is a hybrid between a direct immersion sensor and a complete spring loaded thermowell assembly. This configuration offers the convenience of a removable spring loaded sensing element and the functionality of a compact package. Use the S55 in applications that require removal of the sensing element while the process is in operation.

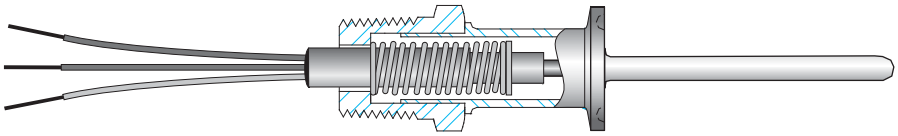
S55 Specifications

Time Constant: Maximum time to reach 63.2% of a step change in temperature in water flowing at 3 fps.	1.5 seconds-sensor only 6.0 seconds typical in thermowell
RTD Repeatability: Maximum change in resistance at 0°C after 10 cycles over the full temperature range.	0.04%
RTD Long Term Stability: Maximum change in resistance at 0°C after 1000 hours at 200°C	Standard: 0.10%
RTD Hysteresis: Maximum % error at the mid point of the operating temperature range. (Example: 0.04% over a 250°C range = 0.10°C)	Standard: 0.08%

See page 4 for General and Thermocouple Specifications.

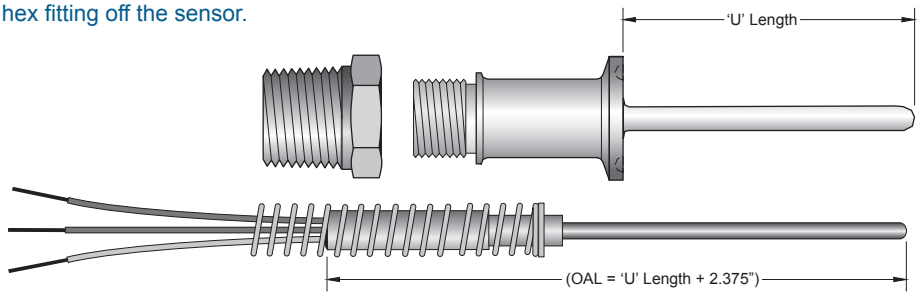
General Information

This is a spring loaded sensor with an integral thermowell.
The complete assembly and replacement sensor is ordered based on the ‘U’ length.



Assembly Information

The spring is retained by the hex fitting threaded onto the sensor extension and into the head.
When you pull slightly on the leads you will experience the spring action.
To remove the sensor, thread the hex fitting off the sensor.



S55 Sensor with Integral Thermowell

Ordering Information

Sensor Style		Min Process Sheath Length	Max Process Sheath Length	Sheath Length Tolerance
55-	3/16" Sensor with Integral Thermowell	1.25"	8.5"	+/- 0.125"

RTD (Accuracy)

10	Standard RTD +/- 0.10% of resistance at 0 degrees C

Thermocouple (Type)

E	Chromel/Constantan (leadwire code = purple+, red-)
J	Iron/Constantan (leadwire code = white+, red-)
K	Chromel/Alumel (leadwire code = yellow+, red-)
T	Copper/Constantan (leadwire code = blue+, red-)

RTD Element Lead Configuration

A	Three Wire Single
B	Four Wire Single
C	Three Wire Dual

Thermocouple Junction Configuration

D	Single Ungrounded
E	Single Grounded
F	Dual Ungrounded
G	Dual Grounded

Process Sheath Length (Note sensor type minimum & maximum values above)

0125	1.25 inches
0250	2.5 inches
0300	3.0 inches
0400	4.0 inches
0450	4.5 inches
0600	6.0 inches
0700	7.0 inches
0825	8.25 inches
	Specify Process Sheath Length in Inches

Connection Head (NOTE 1)		Sensor/Head Connection
-1C	Cast Iron, Black Enamel	1/2" NPT
-1EN	Cast Iron, White Epoxy Coated, N.E.T. Solution	1/2" NPSM
-2A	Aluminum, Gray	1/2" NPT
-2E	Aluminum, Epoxy Coated	1/2" NPT
-2EN	Aluminum, Epoxy Coated, N.E.T. Solution	1/2" NPSM
-5A	Aluminum	1/2" NPT
-5E	Aluminum Epoxy Coated	1/2" NPT
-5EN	Aluminum, Epoxy Coated, N.E.T. Solution	1/2" NPSM
-9P	Polypropylene, White	1/2" NPT
-9PN	Polypropylene, White, N.E.T. Solution	1/2" NPSM
-14S	Stainless Steel	1/2" NPT
-14SN	Stainless Steel, N.E.T. Solution	1/2" NPSM
-16AN	Miniature Aluminum, N.E.T. Solution	3/8" UNF
-19A	Aluminum with LED Indicator	1/2" NPT
-19AN	Aluminum with LED Indicator, N.E.T. Solution	1/2" NPSM
-20P	Plastic with LED Indicator	1/2" NPT
-20PN	Plastic with LED Indicator, N.E.T. Solution	1/2" NPSM
-N1	No Connection Head, Bushing	1/2" NPT
-N2	No Connection Head, Bushing, N.E.T. Solution	1/2" NPSM

Process Type

T	Hygienic Ferrule (Tri-clamp Style)

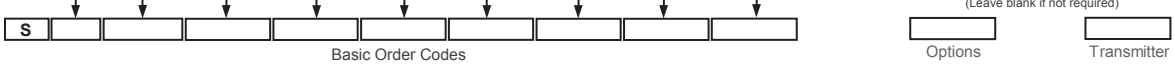
Process Connection Size		(Used with tube sizes)
05	1/2"	1/2", 3/4"
15	1 1/2"	1", 1 1/2"
20	2"	2"
25	2 1/2"	2 1/2"
30	3"	3"
40	4"	4"

Wetted Surface Material

03	316 Stainless Steel
06	316L Stainless Steel

Wetted Surface Finish

M32	32 Ra mechanical finish, max.
M25	25 Ra mechanical finish, max.
M20	20 Ra mechanical finish, max.
M15	15 Ra mechanical finish, max.
E32	32 Ra mechanical finish, max. with electropolish
E25	25 Ra mechanical finish, max. with electropolish
E20	20 Ra mechanical finish, max. with electropolish
E15	15 Ra mechanical finish, max. with electropolish
E10	10 Ra mechanical finish, max. with electropolish



Basic Order Codes

(Leave blank if not required)

Options | Transmitter

See pages 35 - 39

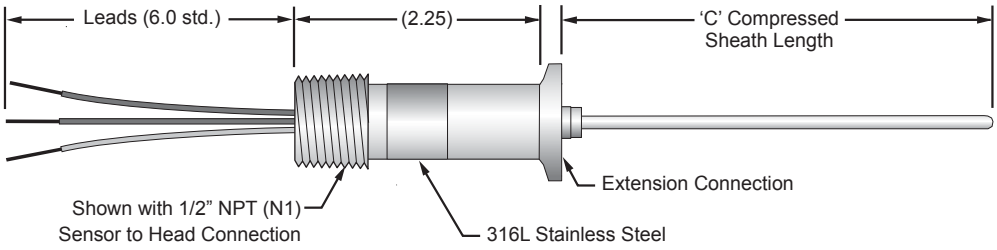
NOTE 1: For full descriptions see page 40 or: www.BurnsEngineering.com/Con-Heads.pdf

S60 & S65 Spring Loaded Sensors

Specifications

S60-
Spring Loaded 1/8”

Available with 1/2” NPT and
1/2” NPSM head connection



All dimensions in inches.

S60 Application

The S60 spring loaded sensor is designed to be used with the SWT standard sanitary thermowell. The hygienic ferrule extension connection provides a quick and easy way to remove the sensor for calibration and process verification while eliminating the NPT threads normally used with a thermowell.

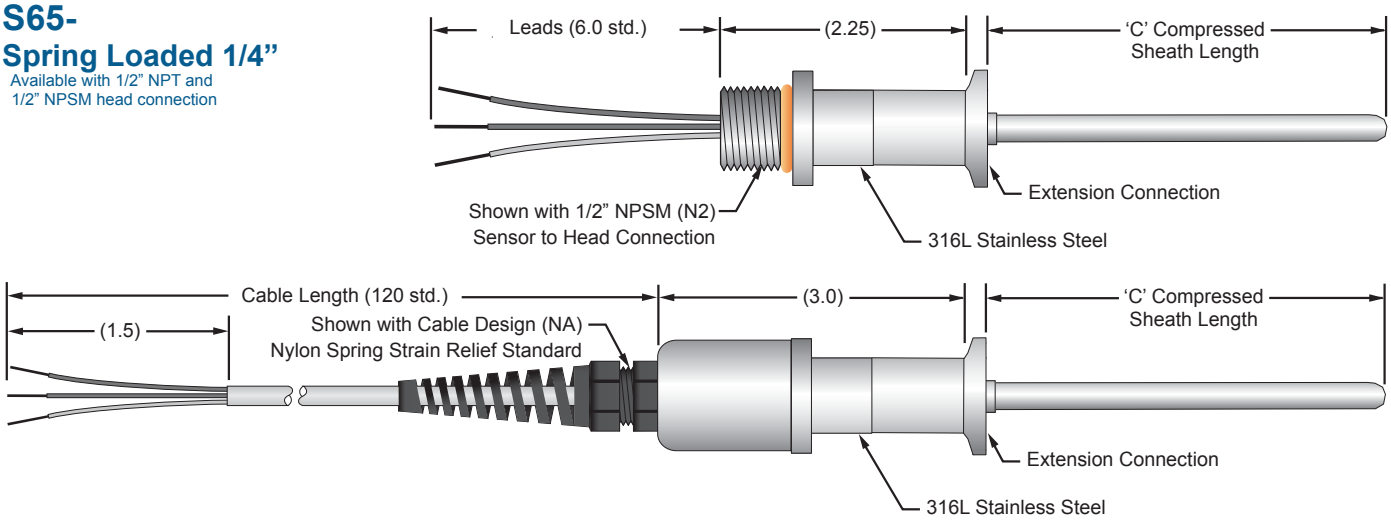
S60 Specifications

Time Constant: Maximum time to reach 63.2% of a step change in temperature in water flowing at 3 fps.	1.5 seconds-sensor only
RTD Repeatability: Maximum change in resistance at 0°C after 10 cycles over the full temperature range.	0.04%
RTD Long Term Stability: Maximum change in resistance at 0°C after 1000 hours at 200°C	Standard: 0.10%
RTD Hysteresis: Maximum % error at the mid point of the operating temperature range. (Example: 0.04% over a 250°C range = 0.10°C)	Standard: 0.08%

See page 4 for General and Thermocouple Specifications.

S65-
Spring Loaded 1/4”

Available with 1/2” NPT and
1/2” NPSM head connection



All dimensions in inches.

S65 Application

The S65 spring loaded sensor is designed to be used with the SWE sanitary elbow thermowell or the SWT standard sanitary thermowell. The hygienic ferrule extension connection provides a quick and easy way to remove the sensor for calibration and process verification while eliminating the NPT threads normally used with a thermowell.

S65 Specifications

Time Constant: Maximum time to reach 63.2% of a step change in temperature in water flowing at 3 fps.	4.0 seconds
RTD Repeatability: Maximum change in resistance at 0°C after 10 cycles over the full temperature range.	0.04%
RTD Long Term Stability: Maximum change in resistance at 0°C after 1000 hours at 200°C	Precision: 0.01% Standard: 0.10%
RTD Hysteresis: Maximum % error at the mid point of the operating temperature range. (Example: 0.04% over a 250°C range = 0.10°C)	Precision: 0.04% Standard: 0.08%

See page 4 for General and Thermocouple Specifications.

S60 & S65 Spring Loaded Sensors

Ordering Information

Sensor Style		Min 'C' Sheath Length	Max 'C' Sheath Length	'C' Sheath Length Tolerance
60-	1/8" Spring Loaded (NOTE 1)	1.25"	8.5"	+/- 0.125" (non compressed length)
65-	1/4" Spring Loaded	2.0"	60.0"	+/- 0.125" (non compressed length)

RTD (Accuracy)

10	Standard RTD +/- 0.10% of resistance at 0 degrees C
05	Precision RTD +/- 0.05% of resistance at 0 degrees C (not currently available with the S60 model)

Thermocouple (Type)

E	Chromel/Constantan (leadwire code = purple+, red-)
J	Iron/Constantan (leadwire code = white+, red-)
K	Chromel/Alumel (leadwire code = yellow+, red-)
T	Copper/Constantan (leadwire code = blue+, red-)

RTD Element Lead Configuration

A	Three Wire Single
B	Four Wire Single
C	Three Wire Dual

Thermocouple Junction Configuration

D	Single Ungrounded
E	Single Grounded
F	Dual Ungrounded
G	Dual Grounded

'C' Compressed Sheath Length (Note sensor type minimum & maximum values above)

0125	1.25 inches
0250	2.5 inches
0400	4.0 inches
0450	4.5 inches
0550	5.5 inches
0600	6.0 inches
0825	8.25 inches
	Specify Process Immersion Length in Inches

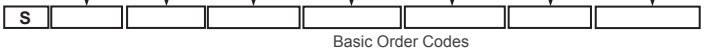
Connection head (NOTE 2)		Sensor/Head Connection
-2A	Aluminum, Gray	1/2" NPT
-2E	Aluminum, Epoxy Coated	1/2" NPT
-2EN	Aluminum, Epoxy Coated, N.E.T. Solution	1/2" NPSM
-5A	Aluminum	1/2" NPT
-5E	Aluminum Epoxy Coated	1/2" NPT
-5EN	Aluminum, Epoxy Coated, N.E.T. Solution	1/2" NPSM
-9P	Polypropylene, White	1/2" NPT
-9PN	Polypropylene, White, N.E.T. Solution	1/2" NPSM
-14S	Stainless Steel	1/2" NPT
-14SN	Stainless Steel, N.E.T. Solution	1/2" NPSM
-19A	Aluminum with LED Indicator	1/2" NPT
-19AN	Aluminum with LED Indicator, N.E.T. Solution	1/2" NPSM
-20P	Plastic with LED Indicator	1/2" NPT
-20PN	Plastic with LED Indicator, N.E.T. Solution	1/2" NPSM
-N1	No Connection Head, Bushing	1/2" NPT
-N2	No Connection Head, Bushing, N.E.T. Solution	1/2" NPSM
-N3	No Connection Head, No Bushing, N.E.T. Solution	3/8" UNF
-NA	No Connection Head, Cable Design, 120", Nylon Spring Standard	n/a

Extension ConnectionType

T	Hygienic Ferrule (Tri-clamp style)

Extension Connection Size (Used with tube sizes)

05	1/2"	1/2" 3/4"
15	1 1/2"	1", 1 1/2"
20	2"	2"
25	2 1/2"	2 1/2"
30	3"	3"
40	4"	4"



Basic Order Codes

(Leave blank if not required)

Options Transmitter

See pages 35 - 39

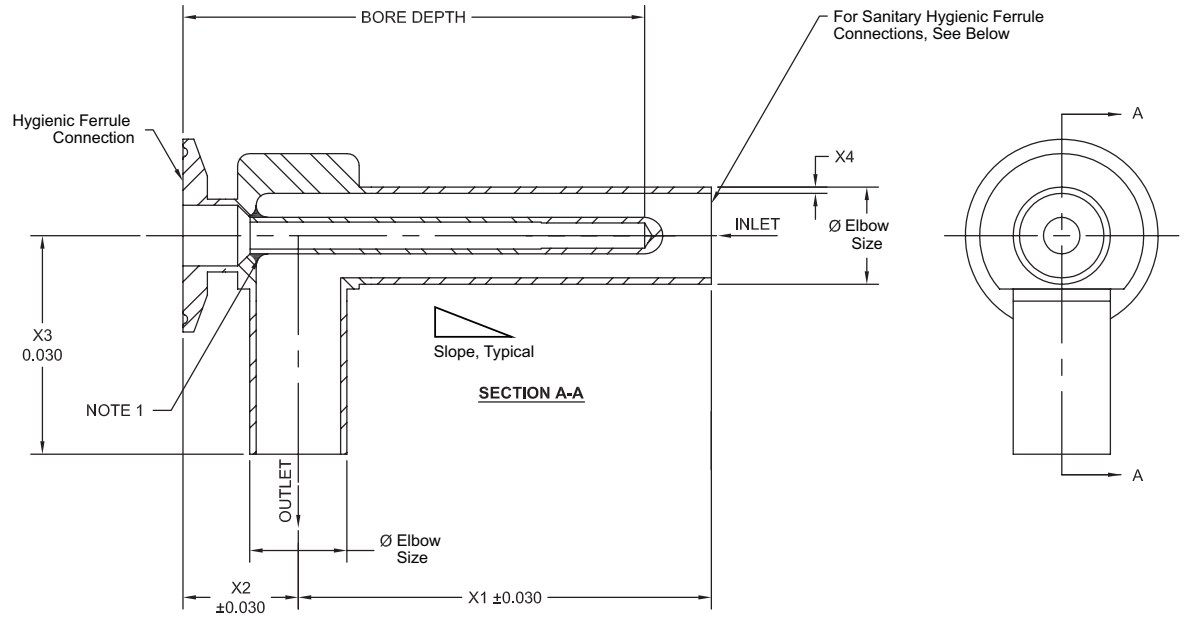
NOTE 1: ±0.05% accuracy is not currently available with the S60 model
NOTE 2: For full descriptions see page 40 or: www.BurnsEngineering.com/Con-Heads.pdf

Sanitary Well Elbow (SWE)

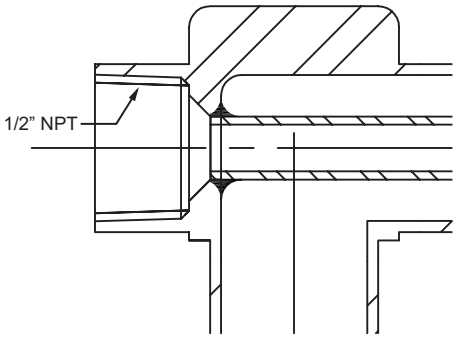
1” to 6” Line Size (Straight Body) Well Specifications

The SWE Straight Body design offers a range of sizes from 1 to 6 inches to support a wide range of processes. This design can be configured with hygienic ferrule or weld-end process connections and either a threaded or a hygienic ferrule sensor connection. The larger sizes are ideal for higher viscosity materials and ensure proper immersion for the most accurate temperature measurement. All SWE products include certification of wetted surface materials and surface finish.

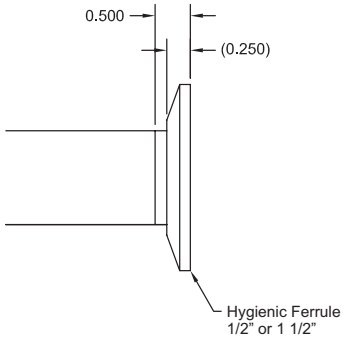
1” to 6” Style Elbow Thermowell



Optional Threaded Sensor Connection



Optional Hygienic Ferrule Process Connection



The Straight Body design SWE can be installed in any orientation providing the line slope is sufficient to ensure gravity drainability.

NOTE 1: This specific weld area will not fully comply with ASME-BPE due to accessibility limitations.

Sanitary Elbow (SWE)

1” to 6” Line Size, Ordering Information

SWE — **Sanitary Elbow Thermowells**

Elbow Size (Tube O.D.)

		‘X3’ Dimension, Nominal	Wall Thickness
-100	1" Elbow	2.25"	0.065"
-150	1 1/2" Elbow	3.0"	0.065"
-200	2" Elbow	3.375"	0.065"
-250	2 1/2" Elbow	3.5"	0.065"
-300	3" Elbow	4.0"	0.065"
-400	4" Elbow	6.0"	0.083"
-600	6" Elbow	5.625"	0.109"

Style

S	Straight, Available with -100 (1 inch) or larger Elbow Size

Process Connection

A	Hygienic Ferrule, both inlet and outlet
B	Weld ends, both inlet and outlet
C	Hygienic Ferrule inlet connection, weld ends outlet connection
D	Weld ends inlet connection, Hygienic Ferrule outlet connection

Material Type

06	316L Stainless Steel (Per ASME-BPE Chemical Composition)

Bore Depth

25	2.5 inches
45	4.5 inches
60	6.0 inches

Bore Diameter

	O.D.	I.D.	Tolerance
A	0.375"	0.260"	+0.005/-0.003

Other Bore Diameters are available. Please contact our Application Engineering group for available selections

Sensor Connection

A	1/2" NPT Threaded Connection
B	1/2" Hygienic Ferrule
C	1 1/2" Hygienic Ferrule

Wetted Surface Finish

M32	32 Ra mechanical finish, max.
M25	25 Ra mechanical finish, max.
M20	20 Ra mechanical finish, max.
M15	15 Ra mechanical finish, max.
E32	32 Ra mechanical finish, max. with electropolish
E25	25 Ra mechanical finish, max. with electropolish
E20	20 Ra mechanical finish, max. with electropolish
E15	15 Ra mechanical finish, max. with electropolish
E10	10 Ra mechanical finish, max. with electropolish

External Surface Finish

M32	32 Ra mechanical finish, max.
M20	20 Ra mechanical finish, max.
E20	20 Ra mechanical finish, max. with electropolish
E15	15 Ra mechanical finish, max. with electropolish

Basic order code (specify all)

For All Process Connections, (A, B, C, D)

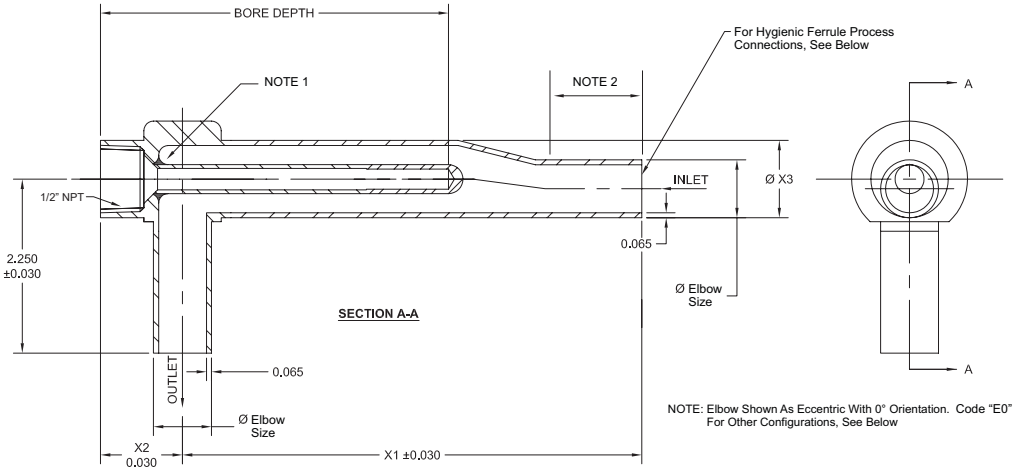
	‘X1’ Dimension, ±0.063	‘X2’ Dimension, Nominal
1" Elbow	bore depth - 0.25"	1.185"
1 1/2" Elbow	bore depth + 0.5"	1.435"
2" Elbow	bore depth + 0.875"	1.685"
2 1/2" Elbow	bore depth + 1.0"	1.935"
3" Elbow	bore depth + 1.5"	2.185"
4" Elbow	bore depth + 3.5"	2.75"
6" Elbow	5.625”	5.75"

Sanitary Well Elbow (SWE)

½” and ¾” Line Size (Reduced Body) Well Specification

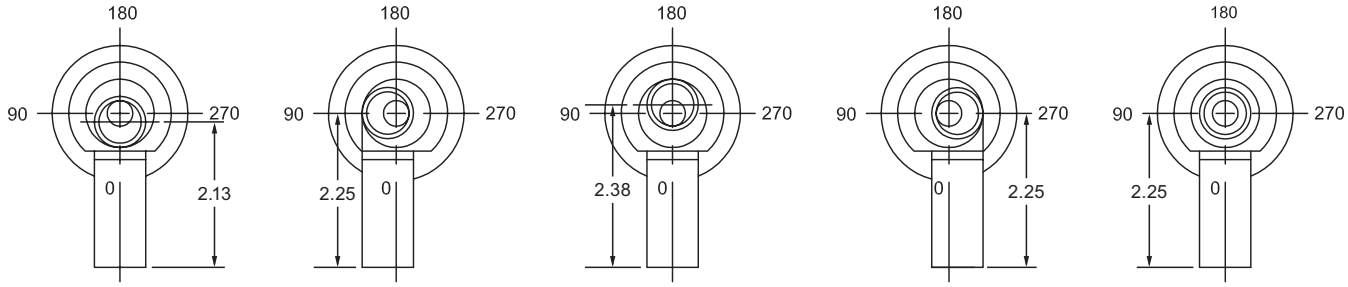
This SWE Reduced Body design offers a process tube size reduced from a larger body to support installation in ½” and ¾” line sizes. The reduced style of the body provides excellent immersion and ensures component drainability and minimal pressure drop. This design can be configured as concentric or eccentric for ease of installation. (NOTE 3)
All SWE products include certification of wetted surface materials and surface finish.

½” and ¾” Line Size Elbow Thermowell

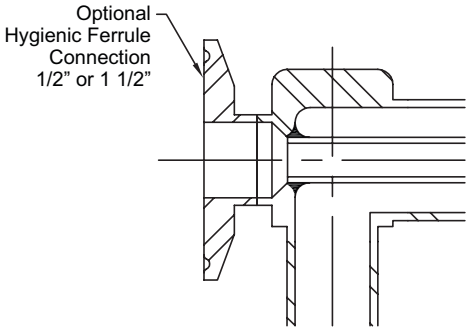


All dimensions in inches.

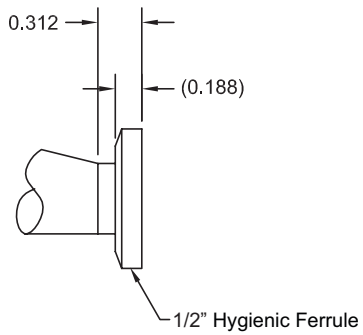
Inlet/Outlet Orientation



Optional Hygienic Ferrule Sensor Connection



Optional Hygienic Ferrule Process Connection



NOTE 1: This specific weld area will not fully comply with ASME-BPE due to accessibility limitations.
NOTE 2: This length is 1.25” minimum for all Weld End process connections and nominally 0.312” for Hygienic Ferrule process connections.
NOTE 3: For typical installation orientation for each configuration see the SWE Installation Manual at: www.BurnsEngineering.com/SWE-Installation.pdf

Sanitary Elbow (SWE)

½" and ¾" Line Size, Ordering Information

SWE — **Sanitary Elbow Thermowells**

Elbow Size (Tube O.D.)

		'X3' Dimension, Nominal
-050	1/2" Elbow	0.75"
-075	3/4" Elbow	1.0"

Inlet/Outlet Orientation (See illustrations on page 17)

C	Concentric
E0	0°, Eccentric
E90	90°, Eccentric
E180	180°, Eccentric
E270	270°, Eccentric

Process Connection

A	Hygienic Ferrule, both inlet and outlet
B	Weld Ends, both inlet and outlet
C	Hygienic Ferrule inlet connection, Weld Ends outlet connection
D	Weld Ends inlet connection, Hygienic Ferrule outlet connection

Material Type

06	316L Stainless Steel (Per ASME-BPE Chemical Composition)

Bore Depth

25	2.5 inches
45	4.5 inches
60	6.0 inches

Bore Diameter

	O.D.	I.D.	Tolerance
A	0.375"	0.260"	+0.005/-0.003

Other Bore Diameters are available. Please contact our Application Engineering group for available selections

Sensor Connection

A	1/2" NPT Threaded Connection
B	1/2" Hygienic Ferrule
C	1 1/2" Hygienic Ferrule

Wetted Surface Finish

M32	32 Ra mechanical finish, max.
M25	25 Ra mechanical finish, max.
M20	20 Ra mechanical finish, max.
M15	15 Ra mechanical finish, max.
E32	32 Ra mechanical finish, max. with electropolish
E25	25 Ra mechanical finish, max. with electropolish
E20	20 Ra mechanical finish, max. with electropolish
E15	15 Ra mechanical finish, max. with electropolish
E10	10 Ra mechanical finish, max. with electropolish

External Surface Finish

M32	32 Ra mechanical finish, max.
M20	20 Ra mechanical finish, max.
E20	20 Ra mechanical finish, max. with electropolish
E15	15 Ra mechanical finish, max. with electropolish

Basic order code (specify all)

Weld End Inlet Process Connection, (B & D)

	'X1' Dimension, ±0.063	'X2' Dimension, Nominal
1/2" Elbow	bore depth + 1.438"	0.935"
3/4"Elbow	bore depth + 1.438"	1.063"

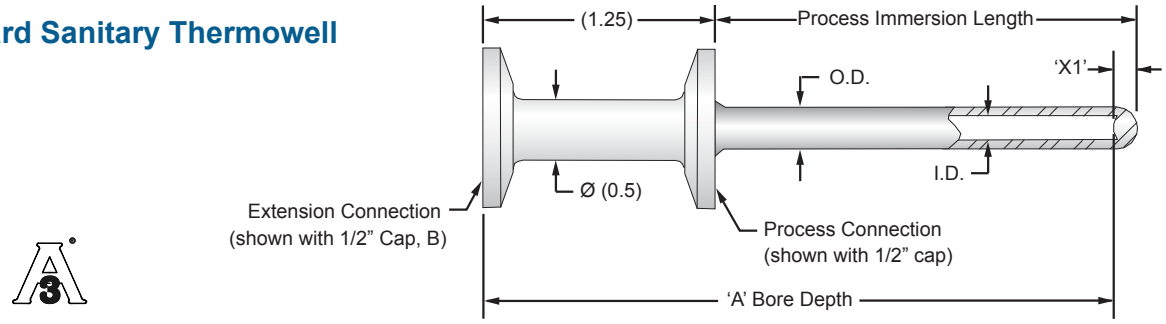
Hygienic Ferrule Inlet Process Connection, (A & C)

	'X1' Dimension, ±0.063	'X2' Dimension, Nominal
1/2" Elbow	bore depth + 0.47"	0.935"
3/4"Elbow	bore depth + 0.35"	1.063"

SWT Standard Sanitary Thermowell

Specifications

SWT-
Standard Sanitary Thermowell



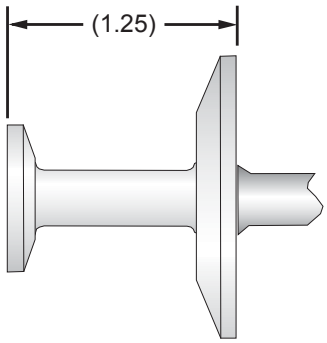
'A' Bore Depth = Extension Length + Process Immersion - X1
'A' Bore Depth = 'C' Compressed Sheath Length

SWT Drawing link: www.BurnsEngineering.com/SWT

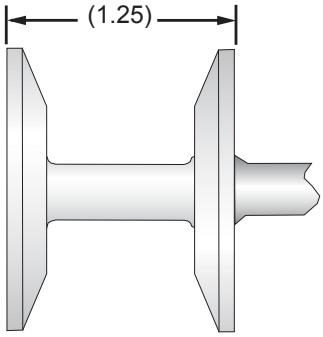
All dimensions in inches.

SWT (Standard Sanitary Thermowells) are used in applications that require sensor removal during process operation. The SWT is designed to be used with the S60 and S65 sanitary spring loaded sensors to create a complete sanitary assembly. Simply match the thermowell bore depth 'A' to the sensor compressed sheath length 'C'. The SWT can also be used with our Series 100, 200 and 300 spring loaded sensors by selecting the ½ inch NPT threaded extension connection, code 'A'.

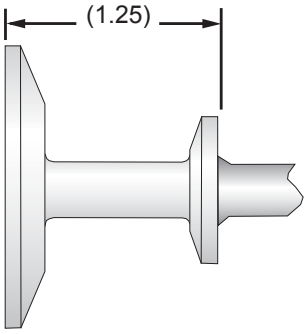
Extension and Process Connection Types



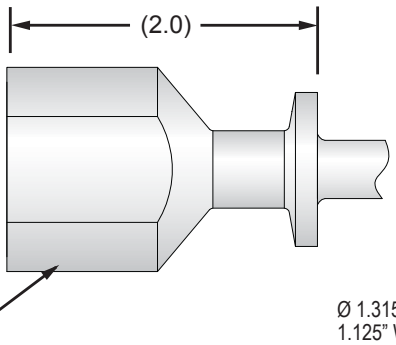
Extension Connection: 1/2", Code B
Process Connection*: 1 1/2, Code T15



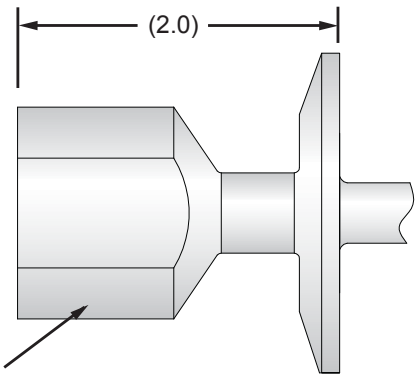
Extension Connection: 1 1/2", Code C
Process Connection*: 1 1/2, Code T15



Extension Connection: 1 1/2", Code C
Process Connection*: 1/2, Code T05



Extension Connection: 1/2", NPT, Code A
Process Connection*: 1/2, Code T05



Extension Connection: 1/2", NPT, Code A
Process Connection*: 1 1/2, Code T15

* The Process Connection is also available in 2", 2 1/2", 3" and 4" sizes

All dimensions in inches.

SWT Standard Sanitary Thermowell

Ordering Information

SWT **Sanitary Thermowell, Standard**

Process Connection

		(Used with tube sizes)
-T05	1/2" Hygienic Ferrule	1/2", 3/4"
-T15	1 1/2" Hygienic Ferrule	1", 1 1/2"
-T20	2" Hygienic Ferrule	2"
-T25	2 Hygienic Ferrule	2"
-T30	3" Hygienic Ferrule	3"
-T40	4" Hygienic Ferrule	4"

Material Type

03	316 Stainless Steel
06	316L Stainless Steel

Process Immersion Length

0250	2.5 inches
0300	3.0 inches
0400	4.0 inches
0450	4.5 inches
0600	6.0 inches
	Specify Process Immersion Length in Inches (12” = 1200)

Bore Diameter

	O.D.	I.D.	Tolerance	Dimension 'X1'
A	0.375"	0.260"	+0.005/-0.003”	0.25”
B	0.375"	0.305"	±0.010”	0.25”
C	0.250"	0.194"	+0.004/-0.000”	0.25”
D	0.188"	0.144"	±0.005”	0.12”
E	0.455"	0.385"	+0.005/-0.003”	0.25”
F	0.188"	0.135"	±0.005”	0.12”

Extension Connection / Extension Length

A	1/2" NPT Threaded Connection	2.0"
B	1/2" Hygienic Ferrule	1.25"
C	1 1/2" Hygienic Ferrule	1.25"

Wetted Surface Finish

M32	32 Ra mechanical finish, max.
M25	25 Ra mechanical finish, max.
M20	20 Ra mechanical finish, max.
M15	15 Ra mechanical finish, max.
E32	32 Ra mechanical finish, max. with electropolish
E25	25 Ra mechanical finish, max. with electropolish
E20	20 Ra mechanical finish, max. with electropolish
E15	15 Ra mechanical finish, max. with electropolish
E10	10 Ra mechanical finish, max. with electropolish

SWT						

Basic Ordering Codes

1/2" NPT Threaded Extension Connection, (A)

Process Immersion Length	‘X1’ Dimension, Nominal	Bore Depth, Nominal
1.25"	0.25”	3.00"
1.25"	0.12”	3.13"
2.50"	0.25”	4.25"
2.50"	0.12”	4.38"
3.00"	0.25”	4.75"
3.00"	0.12”	4.88"
5.00"	0.25”	6.75"
5.00"	0.12”	6.88"
Specify	0.25”	Immersion Length + 1.75
Specify	0.12”	Immersion Length + 1.88

Hygienic Ferrule Extension Connection, (B & C)

Process Immersion Length	‘X1’ Dimension, Nominal	Bore Depth, Nominal
1.25"	0.25”	2.25"
1.25"	0.12”	2.38"
2.50"	0.25”	3.50"
2.50"	0.12”	3.63"
3.00"	0.25”	4.00"
3.00"	0.12”	4.13"
5.00"	0.25”	6.00"
5.00"	0.12”	6.13"
Specify	0.25”	Immersion Length + 1.00
Specify	0.12”	Immersion Length + 1.13

Note: The SWT includes certification of wetted surface materials, finish and electropolish when applicable.

SNx Non-Intrusive Assemblies
SNI, SNS and SNR

Product Overview

Sanitary Non-intrusive Application

The Sanitary Non-Intrusive (SNx) is an in-line RTD or Thermocouple ideally suited for use in small diameter process lines where direct immersion temperature probes cannot be used, but where temperature measurement is required. The in-line design eliminates the need for direct probe insertion into the product flow where viscosity and flow rate can affect accuracy and structural integrity.

SNx family:

The SNI model is available in flow tube diameters as small as ¼" with an overall length of 8".

The SNS provides a shorter 5" installation length and flow tube diameters from ½" to 4".

The SNR incorporates a removable sensor for ease of periodic calibration and installs with a hygienic clamp union. It is available in flow tube sizes from 1/2" to 4".

If you don't see something that meets your needs, give us a call and we'll customize for your specific application.

SNx Non-Intrusive Assemblies
SNI, SNS and SNR

Selection Guide

Operating Range:

All SNx designs provide a temperature measurement range of -50ºC to 200ºC. The ambient temperature limit is dependent on external configuration choices such as connection heads, cables and use of a local transmitter. When the ambient temperature can deviate from the process temperature by more than a 70°C delta, the use of insulation over the installed sensor assembly can help maintain measurement accuracy.

Response Time:

The non-intrusive nature of the SNx design can be slower to respond to temperature variations than immersion style sensors. Insulating the measurement location will improve accuracy and responsiveness. The SNx is designed to ensure sensitivity to the process fluid providing a time response of 12 seconds to 63.2% of a step change in temperature. For more information regarding the time response measurement of non-intrusive / surface style devices, see the Burns technical paper on measuring response time of surface sensors at: http://www.burnsengineering.com/tech-papers/

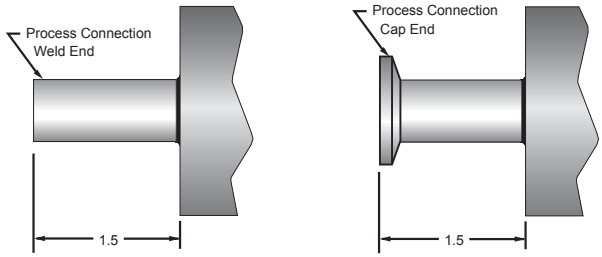
Process Considerations:

For process systems where space is a constraint, the SNS (short) model reduces the flow tube length from 8” to 5” without reducing performance.

When accuracy and repeatability are a foremost consideration, the SNR provides ultimate flexibility. The sensor is designed to be removed for calibration or replacement when necessary. Sensor design supports connection head with terminal block, local transmitter or extended cable installations.

All three SNx designs are available with hygienic connections or weld-ends for connection to the process tubing. BPE compliant and designed to meet the SSI 3-A standard, these sensors are an excellent solution for the Sanitary process industry, and an effective alternative when immersion sensors are not an option.

Process Connection Types

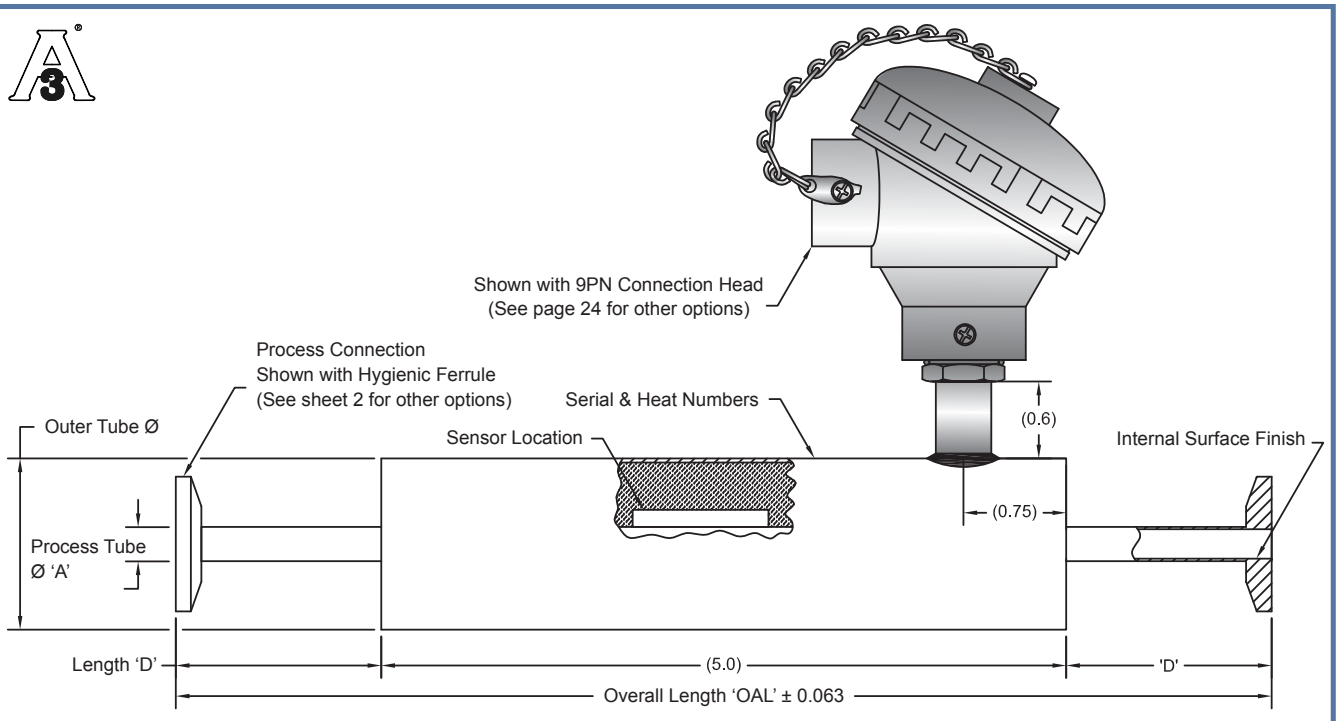


Installation Considerations:

To ensure drainability and measurement accuracy, the SNx should be mounted in a vertical section of tubing where the process fluid is flowing upward. If the process tubing is always completely full such that the fluid will be in contact with the entire inside diameter of the SNx sensor, alternate installation orientations can be effective. Note that the SNS, due to the short length of the process tubing, is marked with the required flow direction to ensure proper performance. The design of the SNI and SNR allow flow in either direction.

SNI Non-Intrusive

Specification



Link to Drawing: www.BurnsEngineering.com/SNI.pdf

All dimensions in inches.

SNI Specifications

Time Constant: Maximum time to reach 63.2% of a step change in temperature in water flowing at 3 fps.	12.0 seconds
RTD Repeatability: Maximum change in resistance at 0°C after 10 cycles over the full temperature range.	0.04%
RTD Long Term Stability: Maximum change in resistance at 0°C after 1000 hours at 200°C	Precision: 0.01% Standard: 0.10%
RTD Hysteresis: Maximum % error at the mid point of the operating temperature range. (Example: 0.04% over a 250°C range = 0.10°C)	Precision: 0.04% Standard: 0.08%

- **General Specifications:**
  - » See page 4 of this catalog
- **Process Connections:**
  - » Hygienic ferrules for hygienic clamp union connection
  - » Weld-ends squared off to support automatic weld process
- **Installation Length:**
  - » For assemblies with hygienic ferrules, the OAL is 8.0 inches.
  - » For assemblies with weld-ends, to support automatic welding, the OAL range is 8.5 to 9.25 inches based on the process tube size. See ordering information table under 'Process Tube Ø'

SNI, Non-Intrusive

Ordering Information

Sensor Style

SNI- Sanitary Non-Intrusive

RTD Accuracy

10 Standard RTD +/-0.10% of resistance at 0 degrees C
05 Precision RTD +/-0.05% of resistance at 0 degrees C

Thermocouple Type

E Chromel/Constanian (leadwire colors = +purple -red)
J Iron/Constanian (leadwire colors = +white -red)
K Chromel/Alumel (leadwire colors = +yellow -red)
T Copper/Constanian (leadwires colors = +blue -red)

RTD Lead Element Configuration

A Three Wire Single
B Four Wire Single
C Three Wire Dual

Thermocouple Junction Configuration

D Single Ungrounded
E Single Grounded
F Dual Ungrounded
G Dual Grounded

Connection Head (NOTE 1)

1EN	Cast Iron, Epoxy Coated NET Solution
2EN	Aluminum, Epoxy Coated NET Solution
5EN	Aluminum, Epoxy Coated NET Solution
9PN	Polypropylene White, NET Solution
14SN	Stainless Steel, NET Solution
16AN	Mini Aluminum, Epoxy Coated NET Solution
19AN	Aluminum, with LED indicator NET Solution
20PN	Plastic, with LED indicator NET Solution
21SN	Stainless Steel, with LED indicator NET Solution
22AN	Aluminum, with LCD indicator NET Solution
23PN	Plastic, with LCD indicator NET Solution
24SN	Stainless Steel, with LCD indicator NET Solution
N1	No Connection Head, 1/2" NPT Bushing
N2	No Connection Head, 1/2" NPSM Bushing
N3	No Connection Head with 3/8-24 UNF Threads
NA	Cable Design, 120" Length, Nylon Spring Standard
****	See page 40 for other options

Process Tube Ø 'A'		Wall Thickness	Outer Tube Ø	Process Connection Length 'D' for Weld Ends	Overall Length for Weld Ends
0250	0.250	0.032"	1.25	1.75"	6.50"
0500	0.500"	0.065"	1.25"	1.75"	6.50"
0750	0.750"	0.065	2"	1.75"	6.50"
1000	1.000	0.065"	3"	1.75"	6.50"
1250	1.250"	0.065"	3"	1.75"	6.50"
1500	1.500"	0.065"	3"	1.75"	6.50"
2000	2.000"	0.065"	4	1.75"	6.50"
2500	2.500"	0.065"	4"	1.75"	6.50"
3000	3.000"	0.065"	6"	2.00"	7.00"
4000	4.000"	0.083"	6"	2.13"	7.25"

Process Tube Material

-06 316L
-20 AL6XN

Internal Finish

A 32 Ra Mechanical Finish
B 10 Ra Electropolish
N Standard Pipe Finish, Mechanical, Not Available with 3A

External Finish

1 Sand Blasted
2 Bright Mechanical (32 Ra Surface Finish)

Process Connection Fitting

C Hygienic Ferrule
N Weld Ends No Process Connection

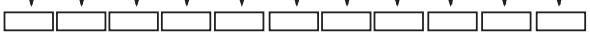
Process Connection Size 'C' Compatible with tube sizes

050	1/2"	0500, 0750
150	1 1/2"	1000, 1500
200	2"	2000
250	2 1/2"	2500
300	3"	3000
400	4"	4000

Weld Ends, No Process Connection, Leave Blank

Process Connection Material

-06 316L SS
-20 AL6XN
Weld Ends, Leave Blank

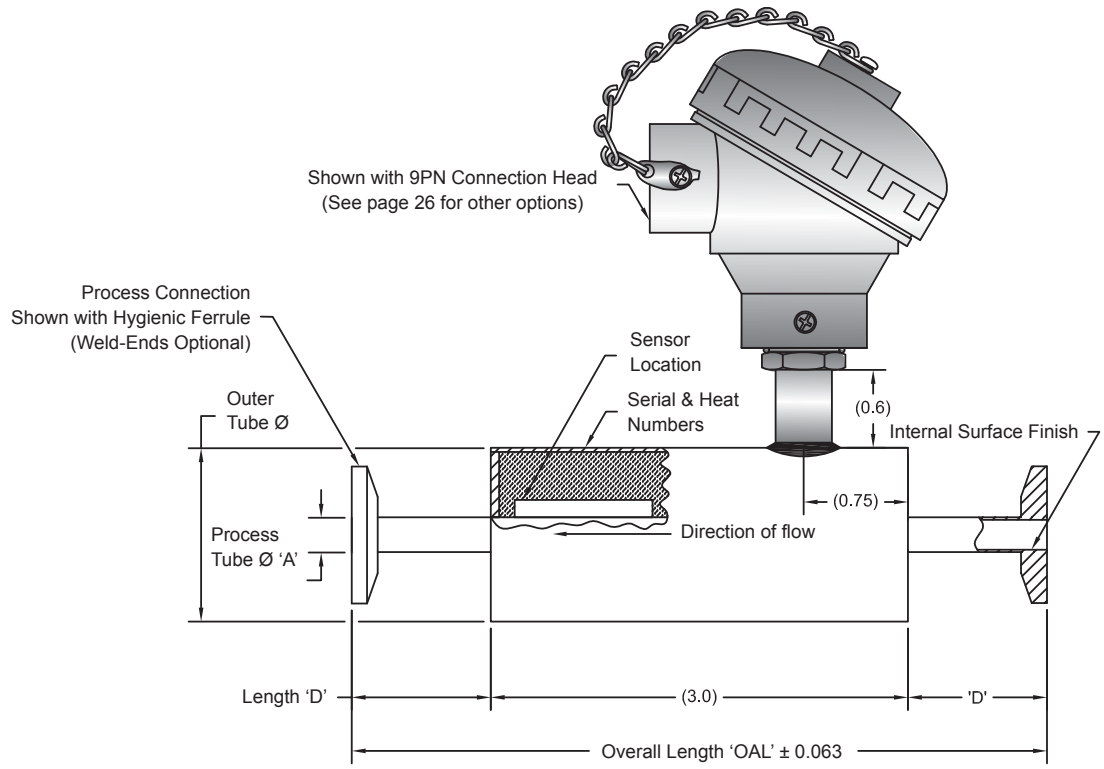


Example Part Number: SNS-10A9PN1000-06A1C150-06

NOTE 1: For full descriptions see page 40 or: www.BurnsEngineering.com/Con-Heads.pdf

SNS Non-Intrusive Short

Specification



Link to Drawing: www.BurnsEngineering.com/SNS.pdf

All dimensions in inches.

SNS Specifications

Time Constant: Maximum time to reach 63.2% of a step change in temperature in water flowing at 3 fps.	12.0 seconds
RTD Repeatability: Maximum change in resistance at 0°C after 10 cycles over the full temperature range.	0.04%
RTD Long Term Stability: Maximum change in resistance at 0°C after 1000 hours at 200°C	Precision: 0.01% Standard: 0.10%
RTD Hysteresis: Maximum % error at the mid point of the operating temperature range. (Example: 0.04% over a 250°C range = 0.10°C)	Precision: 0.04% Standard: 0.08%

- **General Specifications:**
  - » See page 4 of this catalog
- **Process Connections:**
  - » Hygienic ferrules for hygienic clamp union connection
  - » Weld-ends squared off to support automatic weld process
- **Installation Length:**
  - » For assemblies with hygienic ferrules, the OAL is 5.0 inches.
  - » For assemblies with weld-ends, to support automatic welding, the OAL range is 6.5 to 7.25 inches based on the process tube size. See ordering information table under 'Process Tube Ø'

SNS Non-Intrusive Short

Ordering Information

Sensor Style

SNS- Sanitary Non-Intrusive

RTD Accuracy

10 Standard RTD +/-0.10% of resistance at 0 degrees C
05 Precision RTD +/-0.05% of resistance at 0 degrees C

Thermocouple Type

E Chromel/Constanian (leadwire colors = +purple -red)
J Iron/Constanian (leadwire colors = +white -red)
K Chromel/Alumel (leadwire colors = +yellow -red)
T Copper/Constanian (leadwires colors = +blue -red)

RTD Lead Element Configuration

A Three Wire Single
B Four Wire Single
C Three Wire Dual

Thermocouple Junction Configuration

D Single Ungrounded
E Single Grounded
F Dual Ungrounded
G Dual Grounded

Connection Head (NOTE 1)

1EN	Cast Iron, Epoxy Coated NET Solution
2EN	Aluminum, Epoxy Coated NET Solution
5EN	Aluminum, Epoxy Coated NET Solution
9PN	Polypropylene White, NET Solution
14SN	Stainless Steel, NET Solution
16AN	Mini Aluminum, Epoxy Coated NET Solution
19AN	Aluminum, with LED indicator NET Solution
20PN	Plastic, with LED indicator NET Solution
21SN	Stainless Steel, with LED indicator NET Solution
22AN	Aluminum, with LCD indicator NET Solution
23PN	Plastic, with LCD indicator NET Solution
24SN	Stainless Steel, with LCD indicator NET Solution
N1	No Connection Head, 1/2" NPT Bushing
N2	No Connection Head, 1/2" NPSM Bushing
N3	No Connection Head with 3/8-24 UNF Threads
NA	Cable Design, 120" Length, Nylon Spring Standard
****	See page 40 for other options

Process Tube Ø 'A'		Wall Thickness	Outer Tube Ø	Process Connection Length 'D' for Weld Ends	Overall Length for Weld Ends
0250	0.250	0.032"	1.25	1.75"	6.50"
0500	0.500"	0.065"	1.25"	1.75"	6.50"
0750	0.750"	0.065	2"	1.75"	6.50"
1000	1.000	0.065"	3"	1.75"	6.50"
1250	1.250"	0.065"	3"	1.75"	6.50"
1500	1.500"	0.065"	3"	1.75"	6.50"
2000	2.000"	0.065"	4	1.75"	6.50"
2500	2.500"	0.065"	4"	1.75"	6.50"
3000	3.000"	0.065"	6"	2.00"	7.00"
4000	4.000"	0.083"	6"	2.13"	7.25"

Process Tube Material

-06 316L
-20 AL6XN

Internal Finish

A 32 Ra Mechanical Finish
B 10 Ra Electropolish
N Standard Pipe Finish, Mechanical, Not Available with 3A

External Finish

1 Sand Blasted
2 Bright Mechanical (32 Ra Surface Finish)

Process Connection Fitting

C Hygienic Ferrule
N Weld Ends No Process Connection

Process Connection Size 'C' Compatible with tube sizes

050	1/2"	0500, 0750
150	1 1/2"	1000, 1500
200	2"	2000
250	2 1/2"	2500
300	3"	3000
400	4"	4000

Weld Ends, No Process Connection, Leave Blank

Process Connection Material

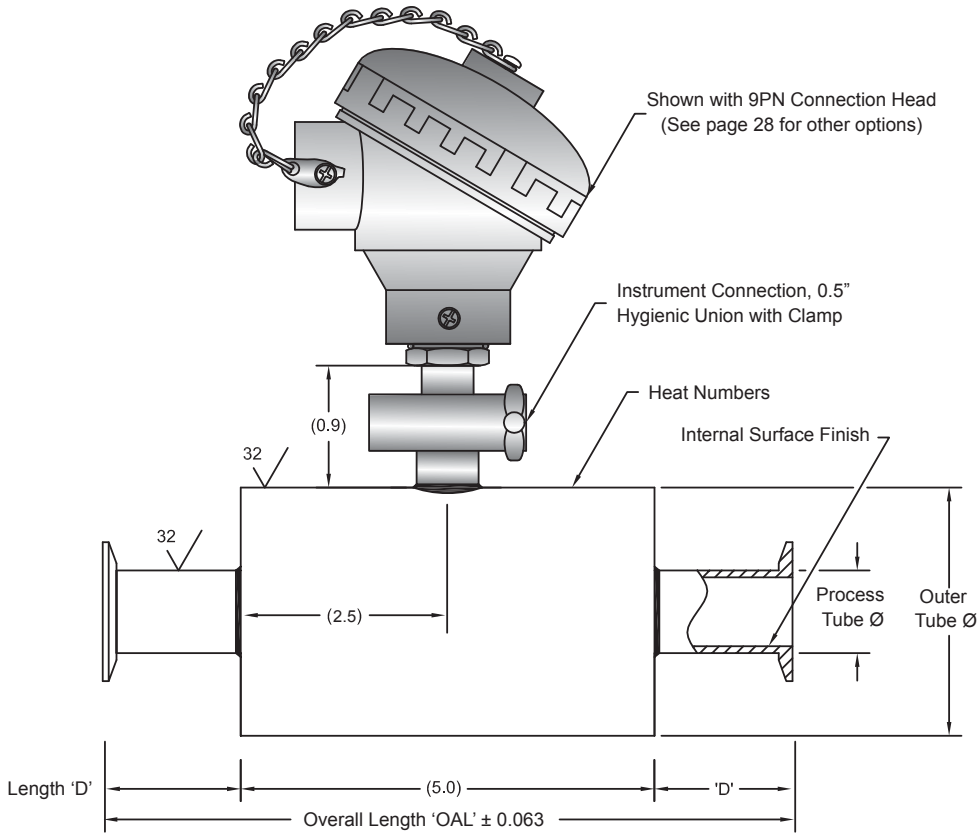
-06 316L SS
-20 AL6XN
Weld Ends, Leave Blank

Example Part Number: SNS-10A9PN1000-06A1C150-06

NOTE 1: For full descriptions see page 40 or: www.BurnsEngineering.com/Con-Heads.pdf

SNR Non-Intrusive Removable

Specification

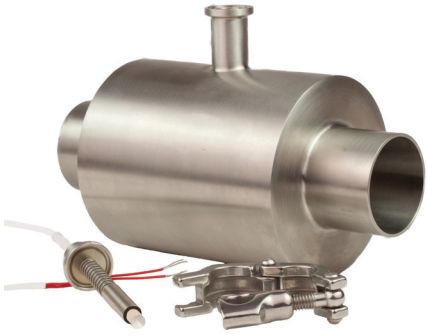


Link to Drawing: www.BurnsEngineering.com/SNR.pdf

All dimensions in inches.

SNR Specifications

Time Constant: Maximum time to reach 63.2% of a step change in temperature in water flowing at 3 fps.	12.0 seconds
RTD Repeatability: Maximum change in resistance at 0°C after 10 cycles over the full temperature range.	0.04%
RTD Long Term Stability: Maximum change in resistance at 0°C after 1000 hours at 200°C	Precision: 0.01% Standard: 0.10%
RTD Hysteresis: Maximum % error at the mid point of the operating temperature range. (Example: 0.04% over a 250°C range = 0.10°C)	Precision: 0.04% Standard: 0.08%



- **General Specifications:**
  - » See page 4 of this catalog
- **Removable Sensor:**
  - » Details see pages 29 and 30
- **Process Connections:**
  - » Hygienic ferrules for hygienic clamp union connection
  - » Weld-ends squared off to support automatic weld process
- **Installation Length:**
  - » For assemblies with hygienic ferrules, the OAL is 8.0 inches.
  - » For assemblies with weld-ends, to support automatic welding, the OAL range is 8.5 to 9.25 inches based on the process tube size. See ordering information table under 'Process Tube Ø'

SNR Non-Intrusive Removable

Ordering Information

Sensor Style

SNR-	Sanitary Non-intrusive Removable

RTD Accuracy

10	Standard RTD +/-0.10% of resistance at 0 degrees C

Thermocouple Type

E	Chromel/Constanian (leadwire colors = +purple -red)
J	Iron/Constanian (leadwire colors = +white -red)
K	Chromel/Alumel (leadwire colors = +yellow -red)
T	Copper/Constanian (leadwires colors = +blue -red)

RTD Element Lead Configuration

A	Three Wire Single
B	Four Wire Single

Thermocouple Junction Configuration

D	Single Ungrounded

Connection Head (NOTE 1)

2EN	Aluminum, Epoxy Coated NET Solution
5EN	Aluminum, Epoxy Coated NET Solution
9PN	Polypropylene White, NET Solution
14SN	Stainless Steel, NET Solution
16AN	Mini Aluminum, Epoxy Coated NET Solution
19AN	Aluminum, with LED indicator NET Solution
20PN	Plastic, with LED indicator NET Solution
21SN	Stainless Steel, with LED indicator NET Solution
22AN	Aluminum, with LCD indicator NET Solution
23PN	Plastic, with LCD indicator NET Solution
24SN	Stainless Steel, with LCD indicator NET Solution
N2	No Connection Head, 1/2" NPSM Bushing
NA	Cable design, 120" Length, Nylon Spring Standard
****	See page 40 for other options

Process Tube	Flow Tube Diameter	Wall Thickness	Outer Tube Ø	Bore Depth	RTD w/Cable	RTD w/Head	Thermocouple	Length 'D' for Weld Ends	Overall Length for Weld Ends
0500	0.500"	0.065"	1.25"	1.5"	22535-1	22536-1	22537-1	1.75"	8.50"
0750	0.750"	0.065"	2"	1.5"	22535-1	22536-1	22537-1	1.75"	8.50"
1000	1.000"	0.065"	3"	2.188"	22535-2	22536-2	22537-2	1.75"	8.50"
1500	1.500"	0.065"	3"	1.5"	22535-1	22536-1	22537-1	1.75"	8.50"
2000	2.000"	0.065"	4"	2.188"	22535-2	22536-2	22537-2	1.75"	8.50"
2500	2.500"	0.065"	4"	1.5"	22535-1	22536-1	22537-1	1.75"	8.50"
3000	3.000"	0.065"	6"	2.188"	22535-2	22536-2	22537-2	2.00"	9.00"
4000	4.000"	0.083"	6"	2.188"	22535-2	22536-2	22537-2	2.13"	9.25"

Material

-06	316L
-20	AL6XN

Internal Finish

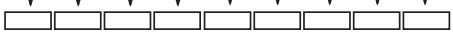
M32	32 Ra Mechanical Finish
E10	10 Ra Electropolish

Process Connection Fitting

C	Sanitary Cap (Hygienic Ferrule)
N	Weld Ends No Process Connection

Process Connection Size

	Compatible with tube sizes
050 1/2"	0500, 0750
150 1 1/2"	1000, 1500
200 2"	2000
250 2 1/2"	2500
300 3"	3000
400 4"	4000
Weld Ends, No Process Connection, Leave Blank	



Example Part Number: SNR-10A20PN2000-06E10C200

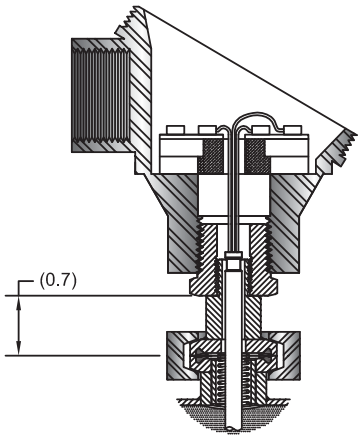
NOTE 1: For full descriptions see page 40 or: www.BurnsEngineering.com/Con-Heads.pdf

SNR Non-Intrusive Removable Replacement Sensor

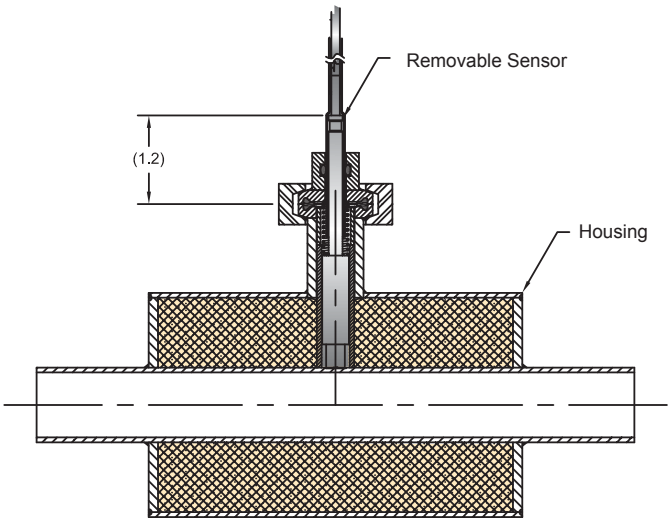
Installation

The SNR sensor is uniquely designed to reduce stem conduction and ensure maximum thermal contact with the process, and is removable for periodic calibration. Available with extended cable or wires for connection head wiring, the SNR sensor will provide confident non-intrusive temperature measurements.

SNR Non-Intrusive Removable Replacement Sensor Installation



Sensor installation with connection head

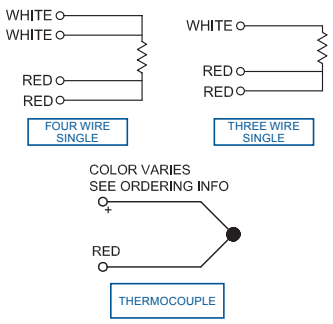


Sensor installation with cable option

Replacement Sensor Part Number

Process Tube	Flow Tube Diameter	Outer Tube Ø	Bore Depth	RTD w/Cable	RTD w/Head	Thermocouple
0500	0.500"	1.25"	1.5"	22535-1	22536-1	22537-1
0750	0.750"	2"	1.5"	22535-1	22536-1	22537-1
1000	1.000"	3"	2.188"	22535-2	22536-2	22537-2
1500	1.500"	3"	1.5"	22535-1	22536-1	22537-1
2000	2.000"	4"	2.188"	22535-2	22536-2	22537-2
2500	2.500"	4"	1.5"	22535-1	22536-1	22537-1
3000	3.000"	6"	2.188"	22535-2	22536-2	22537-2
4000	4.000"	6"	2.188"	22535-2	22536-2	22537-2

Element/Lead Wire Configuration



Wire Guage Size:

Cable Designs (RTD):

3 Conductor Cable: 22 AWG

4 Conductor Cable: 26 AWG

Wire Designs (RTD):

3 Conductor Cable: 22 AWG

4 Conductor Cable: 24 AWG

Thermocouple Designs:

2 Wire, Single Thermocouple: 20AWG

SNR Non-Intrusive Removable Replacement Sensor

Ordering Information

Replacement RTD for Assemblies with Cable

22535-

Bore Depth (NOTE 1)

1	1.5 Inches
2	2.188 Inches

Element Configuration

A	3 Wire
B	4 Wire

"LY" Cable Length in Inches (NOTE 2)

120	120 inches
240	240 inches
***	Specify Length (060 = 60 Inches)

EXAMPLE PART NUMBER
22535-1B120

Link to Drawing: www.BurnsEngineering.com/22535

Replacement RTD for Assemblies with Connection Head

22536-

Bore Depth (NOTE 1)

1	1.5 Inches
2	2.188 Inches

Element Configuration

A	3 Wire
B	4 Wire

"L" PFA Sheath Length in Inches

006	6 inches (NOTE 3)
012	12 inches
024	24 inches

EXAMPLE PART NUMBER
22536-1B012

Link to Drawing: www.BurnsEngineering.com/22536

Replacement Thermocouple for Assemblies with Connection Heads or Cable

22537-

Bore Depth (NOTE 1)

1	1.5 Inches
2	2.188 Inches

Element Configuration

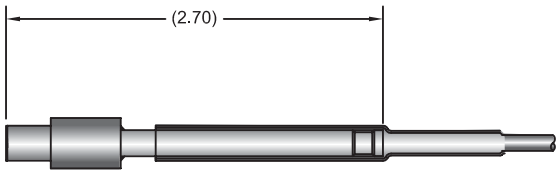
E	Type 'E'
J	Type 'J'
K	Type 'K'
T	Type 'T'

"LY" Cable Length in Inches

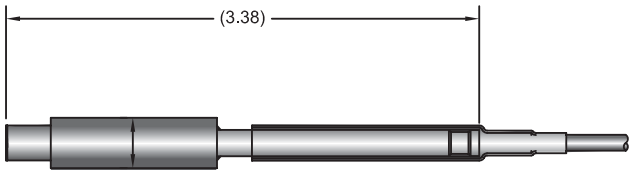
006	6 inches
120	120 inches
***	Specify Length in Inches

EXAMPLE PART NUMBER
22537-1J006

Link to Drawing: www.BurnsEngineering.com/22537



REMOVEABLE PROBE USED ON:
1.5" BORE DEPTH SNR DESIGNS



REMOVEABLE PROBE USED ON:
2.188" BORE DEPTH SNR DESIGNS

To identify the proper replacement sensor, measure the sensor length to determine bore depth code in ordering tables.

NOTE 1: To determine the correct Bore Depth code, see the sensor illustration and the table on page 29 relating process tube size, bore depth and replacement sensor part number.

NOTE 2: For 3 wire designs – Order the actual installed length. To maintain stated RTD accuracy, 3 wire Single designs with LY>324" and 3 wire dual designs with LY> 120" cannot be shortened.

NOTE 3: For replacement thermocouple sensor in an assembly with a connection head, choose 6" leads – code '006'

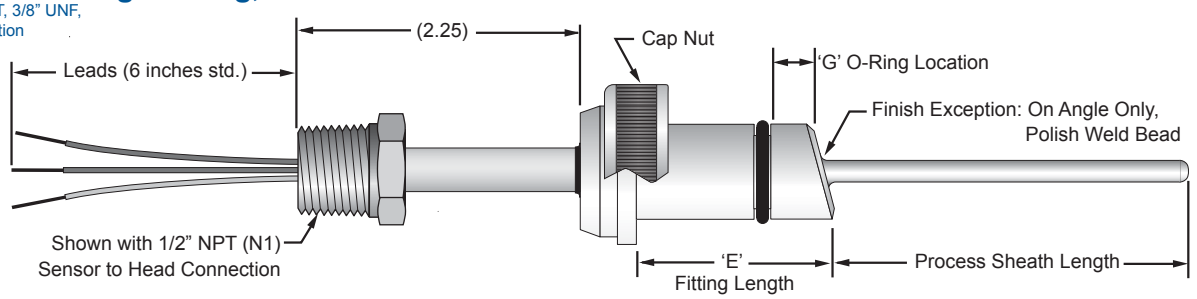
SPA & SPS Direct Immersion Ingold® Port Sensor

Specifications

SPA-

Ingold® Port with 15° angle fitting, 1/4”

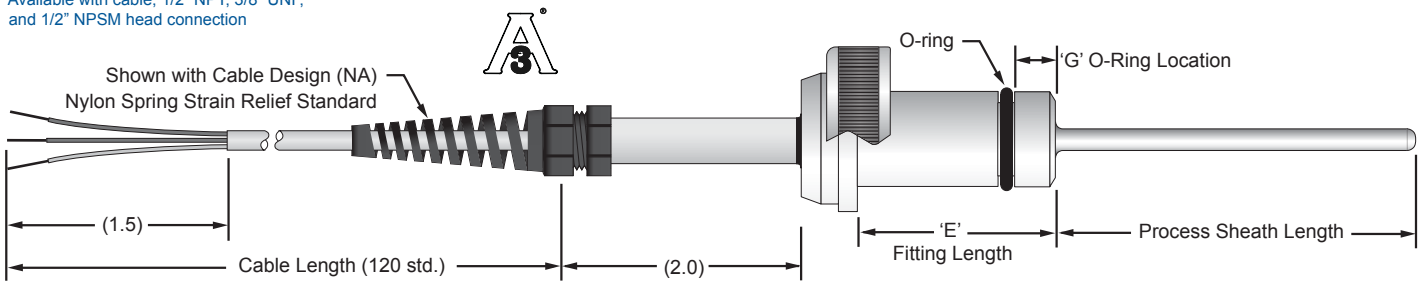
Available with cable, 1/2” NPT, 3/8” UNF, and 1/2” NPSM head connection



SPS-

Ingold® Port with straight fitting, 1/4”

Available with cable, 1/2” NPT, 3/8” UNF, and 1/2” NPSM head connection



All dimensions in inches.

SPA & SPS Application

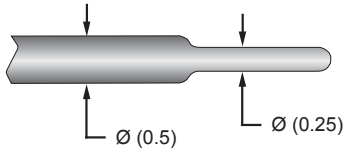
The Ingold® port fitting offers a clean and safe instrumentation mounting configuration while maintaining the ease-of-use of a removable sensor. The Burns design has the flexibility for specifying the O-ring location to minimize the “dead” space, allowing for the cleanest possible installation. The Ingold® solution is ideal for sanitary vessels and fermentation applications.

SPA & SPS Specifications

Time Constant: Maximum time to reach 63.2% of a step change in temperature in water flowing at 3 fps.	3.5 seconds
RTD Repeatability: Maximum change in resistance at 0°C after 10 cycles over the full temperature range.	0.04%
RTD Long Term Stability: Maximum change in resistance at 0°C after 1000 hours at 200°C	Precision: 0.01% Standard: 0.10%
RTD Hysteresis: Maximum % error at the mid point of the operating temperature range. (Example: 0.04% over a 250°C range = 0.10°C)	Precision: 0.04% Standard: 0.08%

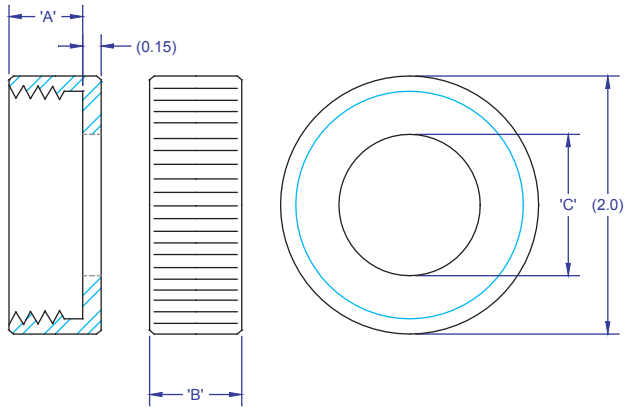
See page 4 for General and Thermocouple Specifications.

Optional /SD40 Heavy Duty Sheath



All dimensions in inches.

Cap Nut Dimensions



All dimensions in inches.

Note: The SPA & SPS include certification of wetted surface materials, finish and electropolish when applicable.

SPA & SPS Direct Immersion Ingold® Port Sensor

Ordering Information

Sensor Style

		Min Process Sheath Length	Max Process Sheath Length	Sheath Length Tolerance
PA-	Ingold® Port with 15° Angle Fitting, 1/4" Sheath	1.5"	36.0"	+/- 0.125"
PS-	Ingold® Port with Straight Fitting, 1/4" Sheath	1.5"	36.0"	+/- 0.125"

RTD (Accuracy)

10	Standard RTD +/- 0.10% of resistance at 0 degrees C
05	Precision RTD +/- 0.05% of resistance at 0 degrees C

Thermocouple (Type)

E	Chromel/Constantan (leadwire code = purple+, red-)
J	Iron/Constantan (leadwire code = white+, red-)
K	Chromel/Alumel (leadwire code = yellow+, red-)
T	Copper/Constantan (leadwire code = blue+, red-)

RTD Element Lead Configuration

A	Three Wire Single
B	Four Wire Single
C	Three Wire Dual

Thermocouple Junction Configuration

D	Single Ungrounded
E	Single Grounded
F	Dual Ungrounded
G	Dual Grounded

Process Sheath Length (Note sensor type minimum & maximum values above)

0250	2.50 inches
0400	4.00 inches
0825	8.25 inches
1200	12.00 inches
	Specify Process Sheath Length in Inches

Connection Head

		Sensor/Head Connection
-1C	Cast Iron, Black Element	1/2" NPT
-1EN	Cast Iron, White Epoxy Coated N.E.T. Solution	1/2" NPSM
-2A	Aluminum, Gray	1/2" NPT
-2E	Aluminum, Epoxy Coated	1/2" NPT
-2EN	Aluminum, Epoxy Coated, N.E.T. Solution	1/2" NPSM
-5A	Aluminum	1/2" NPT
-5E	Aluminum, Epoxy Coated	1/2" NPT
-5EN	Aluminum, Epoxy Coated, N.E.T. Solution	1/2" NPSM
-9P	Polypropylene, White	1/2" NPT
-9PN	Polypropylene, White, N.E.T. Solution	1/2" NPSM
-14S	Stainless Steel	1/2" NPT
-14SN	Stainless Steel, N.E.T. Solution	1/2" NPSM
-16AN	Miniature Aluminum, N.E.T. Solution	3/8" UNF
-19A	Aluminum with LED Indicator	1/2" NPT
-19AN	Aluminum with LED Indicator, N.E.T. Solution	1/2" NPSM
-20P	Plastic with LED Indicator	1/2" NPT
-20PN	Plastic with LED Indicator, N.E.T. Solution	1/2" NPSM
-N1	No Connection, Bushing	1/2" NPT
-N2	No Connection, Bushing, N.E.T. Solution	1/2" NPSM
-N3	No Connection, No Bushing, N.E.T. Solution	3/8" UNF
-NA	No Connection, Cable Design, 120", Nylon Spring Standard	n/a
-NB	No Connection, Cable Design, 120", Quick Disconnect, Full Assembly (NOTE 1)	n/a
-NC	No Connection, Cable Design, Quick Disconnect, Replacement Sensor (NOTE 1)	n/a

'E' Fitting Length

30	30mm (1.18")
40	40mm (1.57")
48	48mm (1.89")
50	50mm (1.97")
52	52mm (2.047")
55	55mm (2.17")
60	60mm (2.36")
	Specify 'E' in millimeters

'G' O-Ring Location

079	0.079 inches
188	0.188 inches
	Specify in decimal inches (250 = 0.25". 375 = 0.375")

O-Ring (NOTE 1)

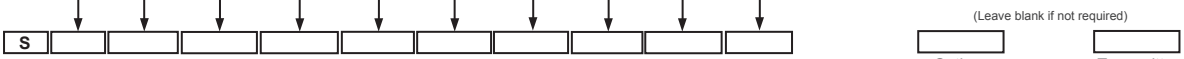
		Maximum Temperature Limit
1	EPDM O-Ring, FDA Compliant	250°F
2	Viton® O-Ring, FDA Compliant	400°F
3	Silicone Rubber O-Ring, FDA Compliant	400°F
4	Buna N O-Ring, FDA Compliant	275°F
N	None, No O-Ring required	n/a

Cap Nut

		'A'	'B'	'C'
3	Burns Standard	0.55	0.70	1.358
N	None	n/a	n/a	n/a

Wetted Surface Finish

M32	32 Ra mechanical finish, max.
M25	25 Ra mechanical finish, max.
M20	20 Ra mechanical finish, max.
M15	15 Ra mechanical finish, max.
E32	32 Ra mechanical finish, max. with electropolish
E25	25 Ra mechanical finish, max. with electropolish
E20	20 Ra mechanical finish, max. with electropolish
E15	15 Ra mechanical finish, max. with electropolish
E10	10 Ra mechanical finish, max. with electropolish



See pages 35 - 39

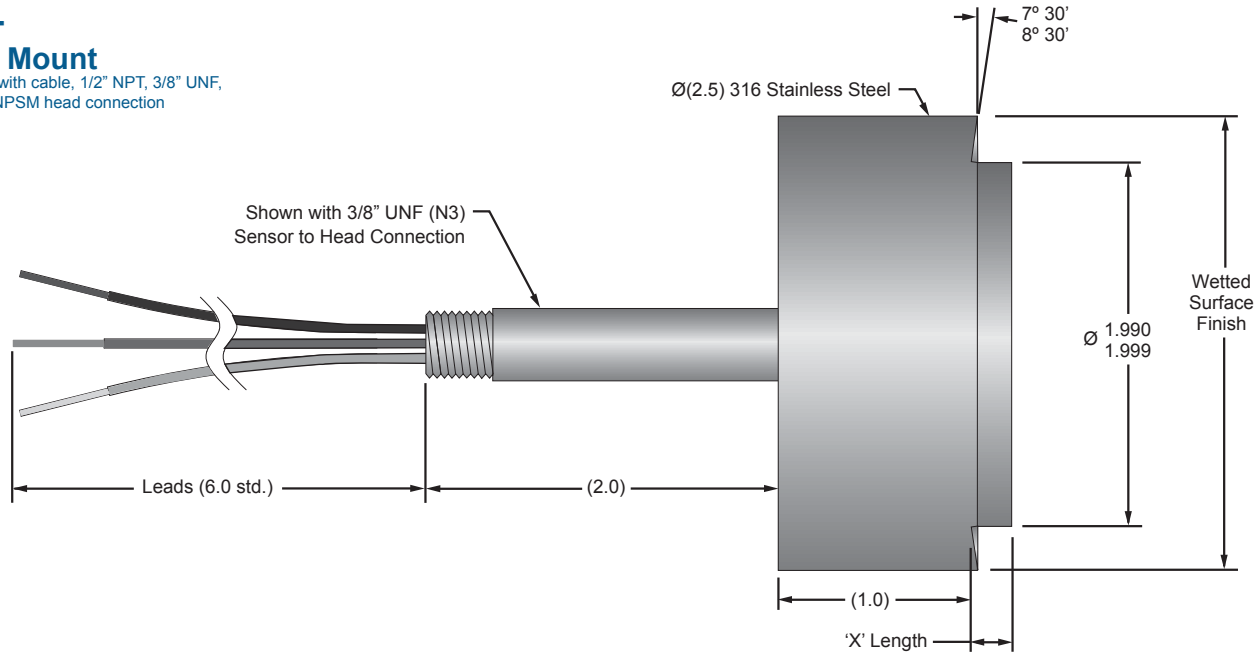
NOTE 1: All O-Rings are FDA Compliant per 21 CFR 177.2600

SFM Sanitary Flush Mount

Specifications

SFM-
Flush Mount

Available with cable, 1/2" NPT, 3/8" UNF, and 1/2" NPSM head connection



All dimensions in inches.

SFM Application

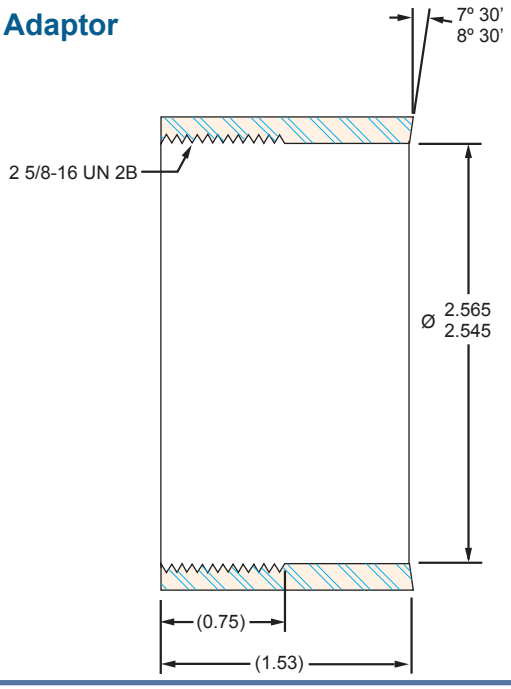
The SFM is designed for tanks that have a mixer blade or other obstruction that prevents the use of a standard immersion sensor. A backing nut and adaptor allow easy installation and removal.

SFM Specifications

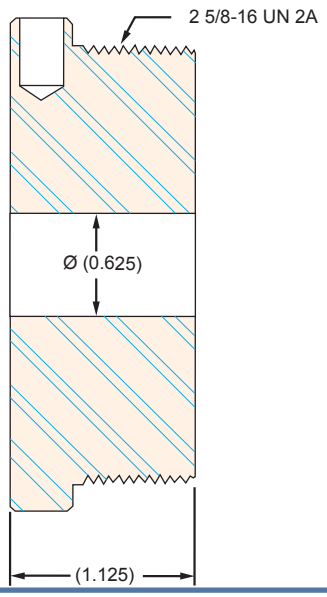
Time Constant: Maximum time to reach 63.2% of a step change in temperature in water flowing at 3 fps.	15.0 seconds
RTD Repeatability: Maximum change in resistance at 0°C after 10 cycles over the full temperature range.	0.04%
RTD Long Term Stability: Maximum change in resistance at 0°C after 1000 hours at 200°C	Precision: 0.01% Standard: 0.10%
RTD Hysteresis: Maximum % error at the mid point of the operating temperature range. (Example: 0.04% over a 250°C range = 0.10°C)	Precision: 0.04% Standard: 0.08%

See page 4 for General and Thermocouple Specifications.

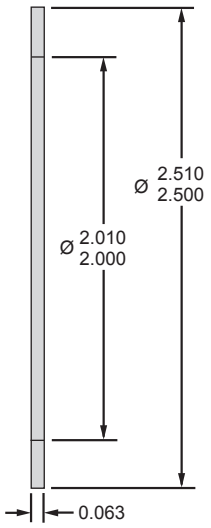
Adaptor



Backing Nut



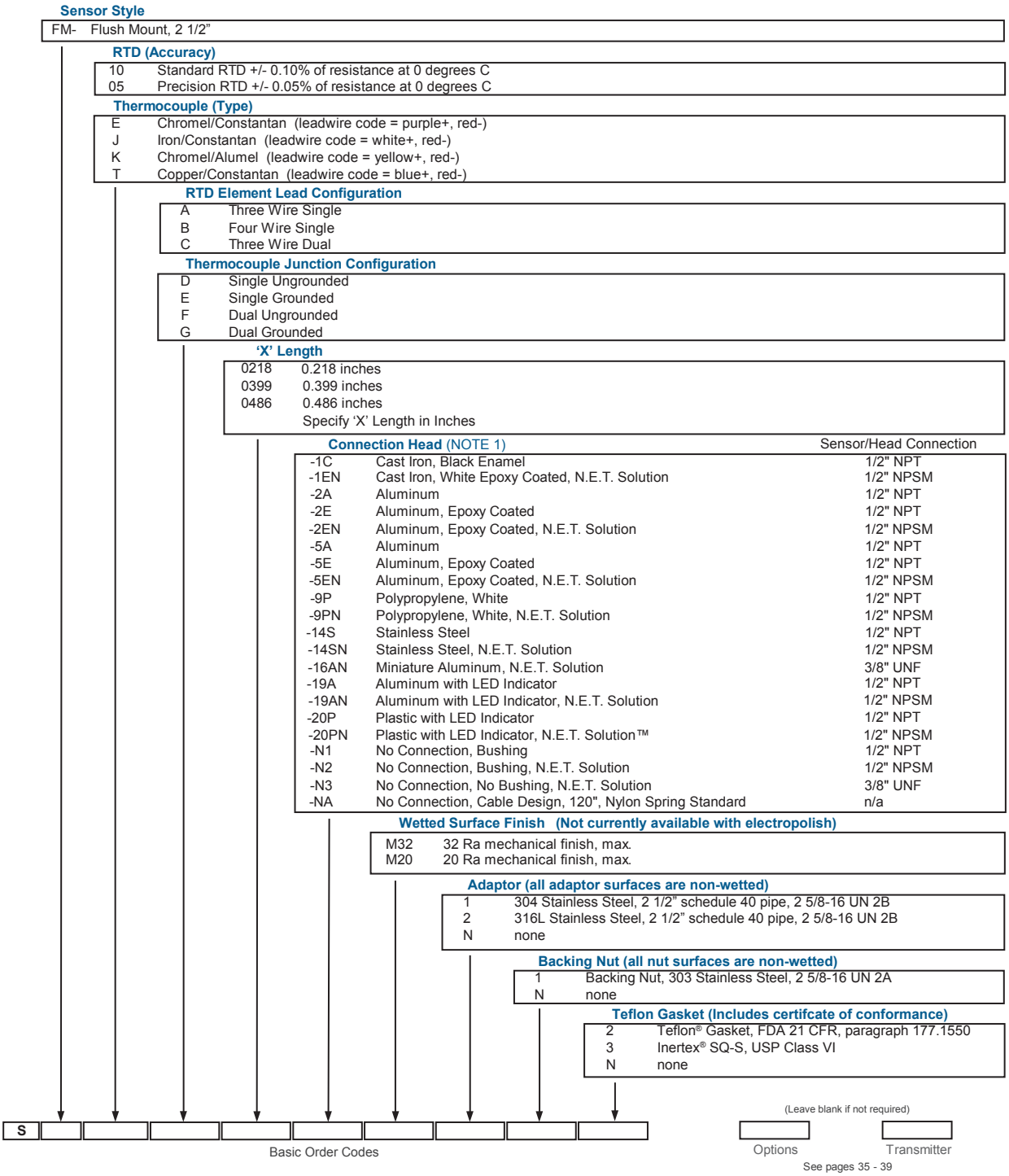
Gasket



All dimensions in inches.

SFM Sanitary Flush Mount

Ordering Information

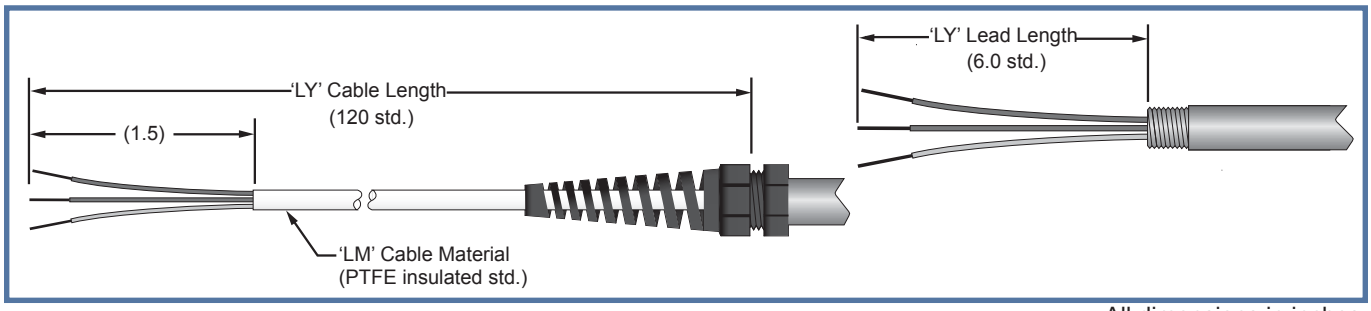


See pages 35 - 39

NOTE 1: For full descriptions see page 40 or: www.BurnsEngineering.com/Con-Heads.pdf

Accessories and Option Codes

Leadwire Options



All dimensions in inches.

L Lead Wire Options

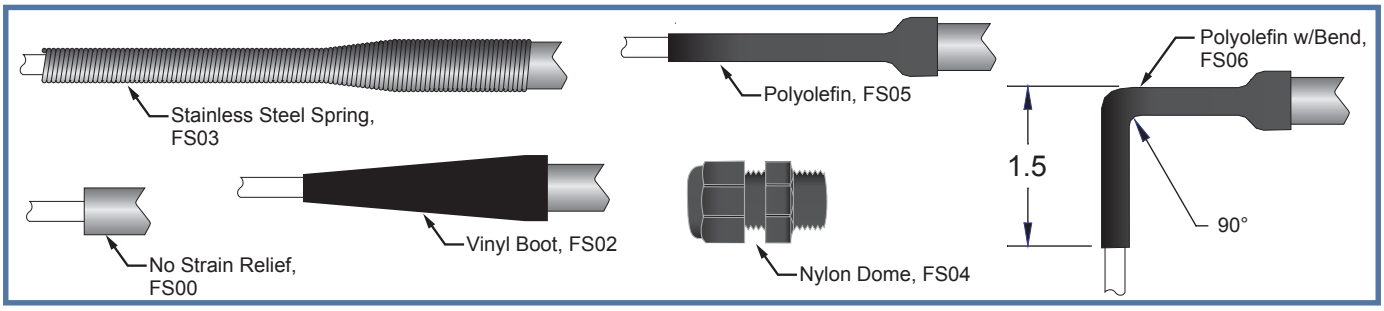
Lead Wire Length ('Y' option)

Y____	Specify lead wire length in one inch increments Example: For a 12 inch 'Y' length specify 012, For a 15 foot 'Y' length specify Y180 Cable designs: Minimum 12.0 inches (Y012) Maximum 300.0 inches (Y300) Lead wire designs: Minimum 3.0 inches (Y003) Maximum 36.0 inches (Y036)

Lead Wire Configuration ('C' option) Available only when -NA cable design is specified

C20	Shielded Cable (Stainless Steel braided shield)
C23	Shielded Cable (Kapton® polyimide film foil shield with drain wire)
C30	Cable with Stainless Steel Overbraid

Strain Relief Options



F Fitting Options

Strain Relief Options ('S' option) available only when -NA cable design is specified

S00	No Strain Relief Required
S02	Vinyl Boot
S03	Stainless Steel Spring
S04	Nylon Dome
S05	Polyolefin, Adhesive Lined
S06	Polyolefin, Adhesive Lined with 90° Bend

Cable Gland Options

H Head Options

Cable Gland Options ('C' option)

C01	Nylon Cable Gland, 1/4" NPT, 0.080 - 0.200
C02	Nylon Cable Gland, 1/2" NPT, 0.236 - 0.473
C03	Nylon Cable Gland, 3/4" NPT, 0.472 - 0.708
C04	Nylon Hubbell, 1/2" NPT, 0.250 - 0.375
C05	Nylon Hubbell, 1/2" NPT, 0.187 - 0.250

Accessories and Option Codes

Cable for Remote Mount Options

H Head Options

Leadwire/Cable Length ('L' option)

L012	12 inches (1 foot)
L060	60 inches (5 feet)
L120	120 inches (10 feet)
	Specify in one-inch increments

Material

01	PTFE
02	Fiberglass
03	Polyimide Film

Configuration

01	Individual Insulated Lead Wires
10	Cable
20	Shielded Cable - Stainless Steel Braided Shield
21	Shielded Cable - Copper Braided Shield
23	Shielded Cable – Polyester/Aluminum Foil Shield with Drain Wire
30	Cable with Stainless Steel Overbraid

Tagging Options

M Miscellaneous Options

Sensor Tagging Options

T01	Paper Tag with Tag Number (sensor assembly)
T02	Stainless Steel Tag with Tag Number (sensor assembly)
T24	Paper Tag with Time Constant (used with S40 HTST sensors only)

Calibration Options

Burns Engineering is a NVLAP accredited (Lab code 200706-0) temperature calibration facility,

C Calibration Options with Calilbration Report and R vs T Table

Units, Report and Table

I	Degrees C
F	Degrees F

Range of Calibration

25	4 Points, ºC: -38, 0, 50, 100 or ºF: -36, 32, 122, 212F
26	4 Points, ºC: -38, 0, 100, 200 or ºF: -36, 32, 212, 392
35	3 Points, ºC: 0, 50, 100 or ºF: 32, 122, 212
36	3 Points, ºC: 0, 100, 200 or ºF: 32, 212, 392

Reports Options

R10	Certificate of Calibration for RTD at 0°C
R11	Certificate of Conformance with Certified Drawing
R12	Certificate of Calibration for Thermocouple at 100ºC

Documentation

For all Series S sensors and thermowells with a wetted surface the heat numbers of all wetted materials will be electro-etch marked on the sensor and/or thermowell extension. A Material Certification of wetted surfaces (SR01) (WE04) and a certificate of surface finish (SR03 or SR05) (WE06 or WE14) will be included automatically. A Certificate of Conformance will also be included for O-rings used in the SPS and SPA designs (SR12). No option codes are required for the above. The options below are available only if requested at time of order.

S Sheath Options

Certifications ('R' option)

R10	Certification that no polishing compound was used on the sensor assembly

W Thermowell Options

Testing and Documentation ('E' option)

E10	Certification that no polishing compound was used on the Thermowell
E16	Positive Material Identification (PMI)

Transmitter Options

T51 and T55 Transmitters with TP05 Programmer

Description:

Loop powered DIN B Form RTD and thermocouple temperature transmitters for head mounting. Model T51 and T55 transmitters carry FM, CE, and CSA approvals allowing installation and use in a variety of applications.

Features and Benefits:

- Vibration and shock resistance
- Configurable to fit your application
- Provides RTD “matching” capability for improved system accuracy (T55)
- HART programmable (T55)
- 0.05% accuracy
- PC programmable with TP05 interface and communication software
- Full input-output isolation
- Configurable via a PC or HART Communicator
- RTD or Thermocouple Inputs
- Outputs: 2-wire, 4-20mA

T51	RTD Transmitter
T55	RTD Transmitter, Matching Capabilities, HART Communication

Calibration Type

M	Transmitter and Sensor matched for improved performance (Only available with T55 Transmitter)
(blank)	Not matched

Temperature Range

{Tmin to Tmax}	Tmin = Temperature for 4mA output Tmax = Temperature for 20mA output

Temperature Units

C	Degrees Celsius
F	Degrees Fahrenheit

TP05 Programming Module:

Communication via USB Port

Using TP05, the communication between the programming unit and the PC is now carried out by way of a USB port. TP05 is fully compatible with PCs running Windows 2000, XP, 7, and Vista operating systems.

Quick Set-Up

The programming module is simple and quick to use. Once the driver has been installed, the user only needs to connect the module to the PC and programming can start. Power is supplied from the USB port.

Online Programming

Either transmitter model can be configured independent of the process or, alternatively, directly in the process while connected to your control system.

TP05 Package Includes

Interface Device, Software with drivers, and Communication cable

For T51 and T55 full specifications and features see the Temperature Transmitter Catalog

http://www.burnsengineering.com/document/catalogs/TemperatureTransmitters.pdf

Transmitter Options

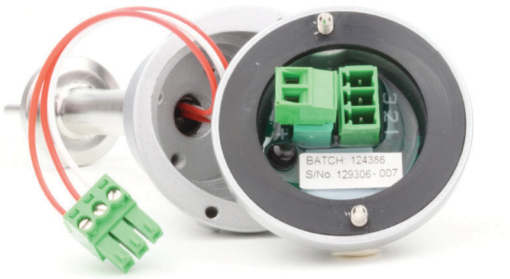
T16 Miniature Transmitter with TP16 Programmer

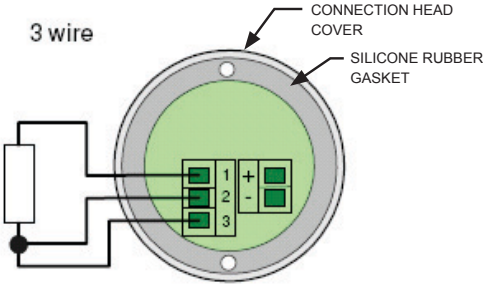
Description:

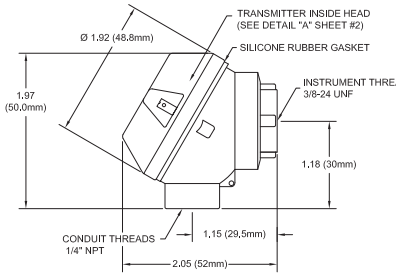
The T16 is a miniature loop-powered RTD temperature transmitter integrated into a compact aluminum connection head. The T16 is ideal for applications where additional signal enhancement is required and space is limited, such as process skids and small reactor vessels.

Features and Benefits:

- Input: 2 or 3 wire PT100 RTD
- Temperature Range: -200°C to 500°C
- Minimum Span: 25°C
- Output: 2 wire current loop 4-20mA
- Supply Voltage: 8 – 30 Vdc
- Operating Range: -40°C to 85°C
- Size: 2.05” x 1.97” Conduit Port: ¼ NPT
- Sensor Port: 3/8-24 UNF







TP16 Programming Module:

Description:

The T16 is easily programmed with a PC using the Burns TP16 Programming Module and communication software.

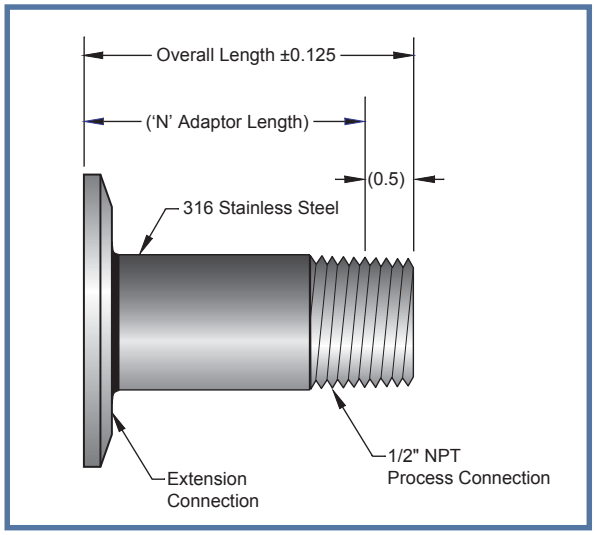
For T16 full specifications and features see the T16 Specification page or the Burns Website.

http://www.burnsengineering.com/document/catalogs/t16.pdf

Sanitary Accessories

Adaptors

Burns Sanitary Adaptors allow you to modify any existing NPT connection to a hygienic connection, giving you the capability to select and use the Series S standard and N.E.T. Solution™ sensors with existing systems. The Sanitary Adaptor is available in several different connection sizes and lengths ranging from 1.5 to 6.0 inches.



*1/2 inch is nominal thread engagement for the 1/2" NPT thread size

All dimentions in inches

SAA Sanitary Adaptor

Extension Connection Size (Used with tube sizes)

-05	1/2"	1/2" 3/4"
-15	1 1/2"	1", 1 1/2"
-20	2"	2"
-25	2 1/2"	2 1/2"
-30	3"	3"
-40	4"	4"

Extension Connection Material

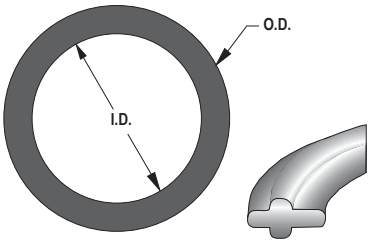
03	316 Stainless Steel
06	316L Stainless Steel

'N' Adaptor Length*

-0150	1.50 inch 'N' Length (OAL = 2.00 inches)
-0175	1.75 inch 'N' Length (OAL = 2.25 inches)
-0300	3.00 inch 'N' Length (OAL = 3.50 inches)
	Specify 'N' Length in Inches

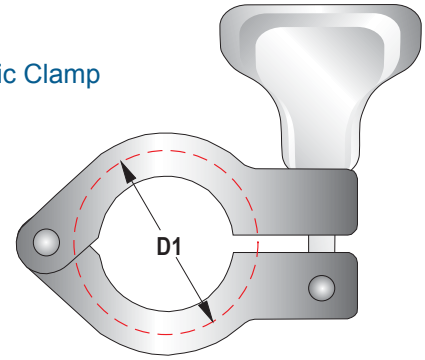
*Minumum length 1.0 inches, -100 / maximum length 6.0 inches -600

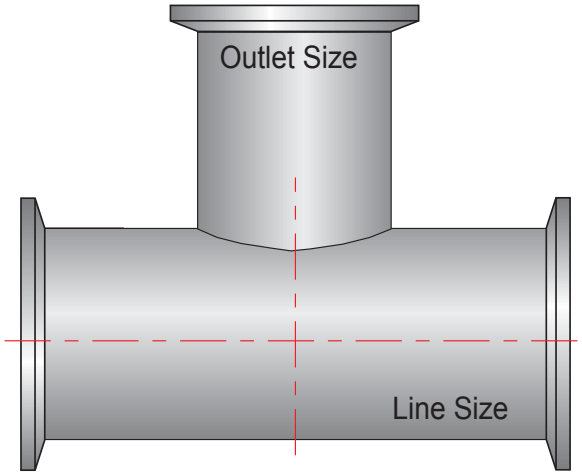
Consult the factory.



Hygienic Gasket

Hygienic Clamp





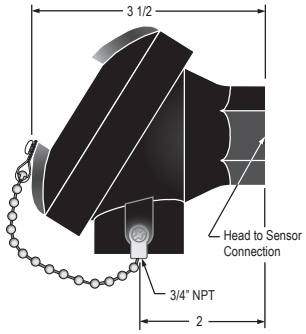
Hygienic Clamp Joint Tees

Connection Head Descriptions

Standard Enclosures

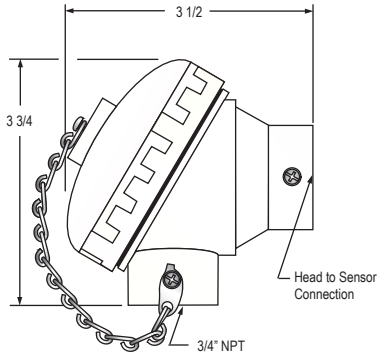
Burns Engineering offers an extensive array of connection heads to complement the sensor and its operational environment. Each connection head can be specified with traditional NPT threads or N.E.T. Solution™ NPSM threads. For full descriptions of all Burns Connection Heads see: www.BurnsEngineering.com/Con-Heads.pdf

Cast iron weather proof, connection head NEMA type 4 enclosure. For use with single element, three wire dual element RTDs and DIN B sized transmitters.



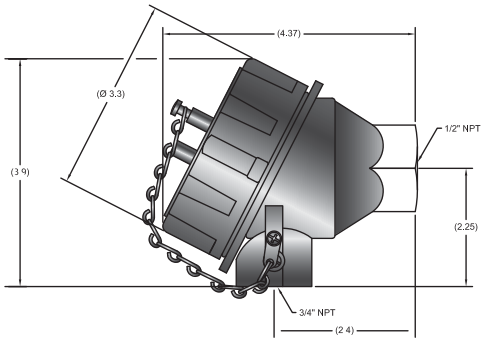
Burns 1C (1/2" NPT head to sensor connection)
Burns 1EN (1/2" NPSM head to sensor connection)

Polypropylene weather proof NEMA type 4X connection head. For use with single element, three wire dual element RTDs and DIN B sized transmitters.



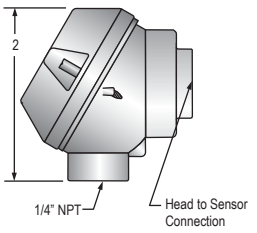
Burns 9P (1/2" NPT head to sensor connection)
Burns 9PN (1/2" NPSM head to sensor connection)

316 stainless steel connection head CSA and FM rated as explosion proof Class I, Div 1, Group B,C,D: dust ignition proof for Div II, Group E,F,G: NEMA 4X. For use with single and dual sensing element and DIN B sized transmitters.



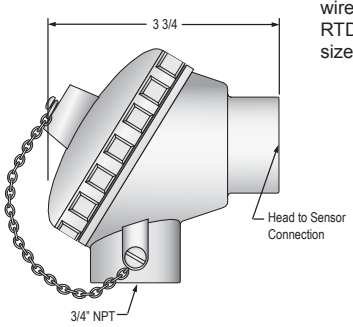
Burns 14S (1/2" NPT head to sensor connection)
Burns14SN (1/2" NPSM head to sensor connection)

Miniature aluminum connection head. For use with single element RTDs.



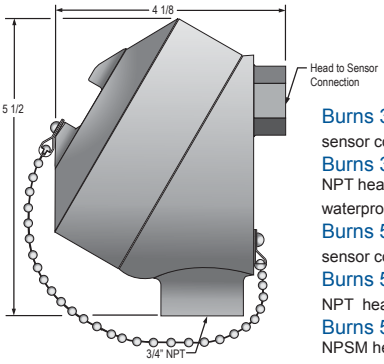
Burns 16AN
(3/8"-24 UNF head to sensor connection)

Cast aluminum weather proof connection head NEMA type 4X enclosure. For use with single element, three wire dual element RTDs and DIN B sized transmitters.



Burns 2A (1/2" NPT head to sensor connection)
Burns 2E (epoxy coated, 1/2" NPT head to sensor connection)
Burns 2EN (epoxy coated, 1/2" NPSM head to sensor connection)

Cast aluminum connection head FM rated as explosion proof Class I, Div 1, Group A,B,C,D: Class II, Div 1, Group E,F,G: Class III, Div 1, NEMA 4X. For use with single and dual sensing element, DIN B sized and model TL transmitters.

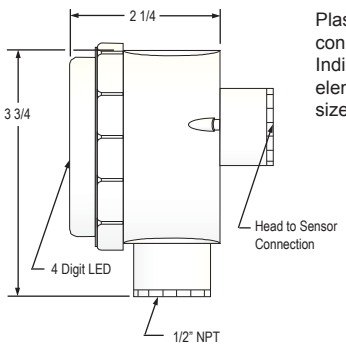


Burns 3A (1/2" NPT head to sensor connection w/waterproof kit)
Burns 3E (epoxy coated, 1/2" NPT head to sensor connection w/ waterproof kit)
Burns 5A (1/2" NPT head to sensor connection)
Burns 5E (epoxy coated, 1/2" NPT head to sensor connection)
Burns 5EN (epoxy coated, 1/2" NPSM head to sensor connection)

Enclosures with LED Indicator

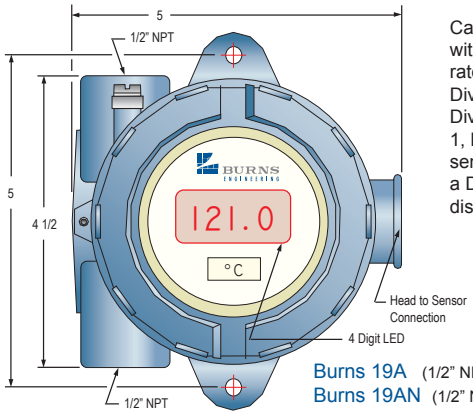
Burns Engineering offers loop powered and battery powered Indicators which incorporate a high efficiency display in an enclosure. The unit is microprocessor based and set-up is achieved by means of three push buttons located on the underside of the module following a simple menu structure. It can be driven by the Burns Model T51 or T55 transmitters which sit in the same head underneath the indicator making a compact efficient package. Or it can be configured to run from any 4 to 20 mA source and display the desired process variable. Contact the factory for details on the battery powered option.

Plastic NEMA type 4X weather proof connection head with 4 digit LED Indicator. For use with single sensing elements only. Requires a DIN B sized transmitter for display.



Burns 20P (1/2" NPT head to sensor connection)
Burns 20PN (1/2" NPSM head to sensor connection)

Cast aluminum connection head with 4 digit LED Indicator FM rated as explosion proof Class I, Div 1, Group A,B,C,D: Class II, Div 1, Group E,F,G: Class III, Div 1, NEMA 4X. For use with single sensing elements only. Requires a DIN B sized transmitter for display.



Burns 19A (1/2" NPT head to sensor connection)
Burns 19AN (1/2" NPSM head to sensor connection)

Resistance vs Temperature

RTD Reference Table

R vs T °C

Resistance of 100 ohm RTD Degrees C

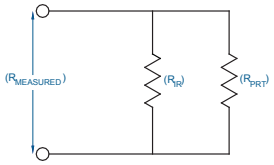
	0	1	2	3	4	5	6	7	8	9
200	175.86	176.22	176.59	176.96	177.33	177.69	178.06	178.43	178.79	179.16
190	172.17	172.54	172.91	173.28	173.65	174.02	174.38	174.75	175.12	175.49
180	168.48	168.85	169.22	169.59	169.96	170.33	170.70	171.07	171.42	171.80
170	164.77	165.14	165.51	165.89	166.26	166.63	167.00	167.37	167.74	168.11
160	161.05	161.43	161.80	162.17	162.54	162.91	163.29	163.66	164.03	164.40
150	157.33	157.70	158.07	158.45	158.82	159.19	159.56	159.94	160.31	160.68
140	153.58	153.96	154.33	154.71	155.08	155.46	155.83	156.20	156.58	156.95
130	149.83	150.21	150.58	150.96	151.33	151.71	152.08	152.46	152.82	153.21
120	146.07	146.44	146.82	147.20	147.57	147.95	148.33	148.70	149.08	149.46
110	14.29	142.67	143.05	143.43	143.80	144.18	144.56	144.94	145.31	145.69
100	138.51	138.88	139.26	139.64	140.02	140.40	140.78	141.16	141.54	141.91
90	134.71	135.09	135.47	135.85	136.23	136.61	136.99	137.37	137.75	138.13
80	130.90	131.28	131.66	132.04	132.42	132.80	133.18	133.57	133.95	134.33
70	127.08	127.46	127.84	128.22	128.61	128.99	129.37	129.75	130.13	130.52
60	123.24	123.63	124.01	124.39	124.78	125.16	125.54	125.93	126.31	126.69
50	119.40	119.78	120.17	120.55	120.94	121.32	121.71	122.09	122.47	122.86
40	115.54	115.93	116.31	116.70	117.08	117.47	117.86	118.24	118.63	119.01
30	111.67	112.06	112.45	112.83	113.22	113.61	114.00	114.38	114.77	115.15
20	107.79	108.18	108.57	108.96	109.35	109.73	110.12	110.51	110.90	111.29
10	103.90	104.29	104.68	105.07	105.46	105.85	106.24	106.63	107.02	107.40
0	100.00	100.39	100.78	101.17	101.56	101.95	102.34	102.73	103.12	103.51

	0	-1	-2	-3	-4	-5	-6	-7	-8	-9
0	100.00	99.61	99.22	98.83	98.44	98.04	97.65	97.26	96.87	96.48
-10	96.09	95.69	95.30	94.91	94.52	94.12	93.73	93.34	92.95	92.55
-20	92.16	91.77	91.37	90.98	90.59	90.91	89.80	89.40	89.01	88.62
-30	88.22	87.83	87.43	87.04	86.64	86.25	85.85	85.46	85.06	84.67
-40	84.27	83.87	83.48	83.08	82.69	82.29	81.89	81.50	81.10	80.70
-50	80.31	79.91	79.51	79.11	78.72	78.32	77.92	77.52	77.12	76.73

Insulation Resistance (IR) ~ Influence on the Resistance Measurement:

IR refers to the electrical resistance between the sensing circuit and the metallic sheath of a RTD. It is important for the sensing element circuit to be insulated from the sheath because electrical leakage can cause an error when measuring the resistance of the sensing element. Any error in measured resistance will translate to an error in the indicated temperature.

$$R_{Measured} = \frac{[R_{PRT} x R_{IR}]}{[R_{PRT} + R_{IR}]}$$



For more information on Insulation Resistance please refer to The Burns Engineering Document “Error Sources That Effect Platinum Resistance Thermometer Accuracy Part 2 – Insulation Resistance”.
(Available online at http://www.burnsengineering.com/document/pdf/a080211.pdf)

Resistance vs Temperature

RTD Reference Table

R vs T °F

Resistance of 100 ohm RTD Degrees F

	0	1	2	3	4	5	6	7	8	9
400	177.49	177.69	177.90	178.10	178.30	178.51	178.71	178.92	179.12	179.32
390	175.45	175.65	175.86	176.06	176.26	176.47	176.67	176.88	177.08	177.29
380	173.40	173.61	173.81	174.02	174.22	174.43	174.63	174.83	175.04	175.24
370	171.35	171.56	171.76	171.97	172.17	172.38	172.58	172.79	172.99	173.20
360	169.30	169.51	169.71	169.92	170.12	170.33	170.53	170.74	170.94	171.15
350	167.24	167.45	167.66	167.86	168.07	168.27	168.48	168.68	168.89	169.09
340	165.18	165.39	165.60	165.80	166.01	166.21	166.42	166.63	166.83	167.04
330	163.12	163.33	163.53	163.74	163.95	164.15	164.36	164.57	164.77	164.98
320	161.05	161.26	161.47	161.67	161.88	162.09	162.29	162.50	162.71	162.91
310	158.98	159.19	159.40	159.61	159.81	160.02	160.23	160.43	160.64	160.85
300	156.91	157.12	157.33	157.53	157.74	157.95	158.15	158.36	158.57	158.78
290	154.83	155.04	155.25	155.46	155.66	155.87	156.08	156.29	156.49	156.70
280	152.75	152.96	153.17	153.38	153.58	153.79	154.00	154.21	154.42	154.62
270	150.67	150.88	151.08	151.29	151.50	151.71	151.92	152.13	152.33	152.54
260	148.58	148.79	149.00	149.21	149.41	149.62	149.83	150.04	150.25	150.46
250	146.49	146.70	146.91	147.11	147.32	147.53	147.74	147.95	148.16	148.37
240	144.39	144.60	144.81	145.02	145.23	145.44	145.65	145.86	146.07	146.28
230	142.29	142.50	142.71	142.92	143.13	143.34	143.55	143.76	143.97	144.18
220	140.19	140.40	140.61	140.82	141.03	141.24	141.45	141.66	141.87	142.08
210	138.08	138.29	138.51	138.72	138.93	139.14	139.35	139.56	139.77	139.98
200	135.97	136.19	136.40	136.61	136.82	137.03	137.24	137.45	137.66	137.87
190	133.86	134.07	134.28	134.50	134.71	134.92	135.13	135.34	135.55	135.76
180	131.74	131.96	132.17	132.38	132.59	132.80	133.01	133.23	133.44	133.65
170	129.62	129.84	130.05	130.26	130.47	130.68	130.90	131.11	131.32	131.53
160	127.50	127.71	127.93	128.14	128.35	128.56	128.78	128.99	129.20	129.41
150	125.37	125.59	125.80	126.01	126.22	126.44	126.65	126.86	127.08	127.29
140	123.24	123.46	123.67	123.88	124.09	124.31	124.52	124.73	124.95	125.16
130	121.11	121.32	121.53	121.75	121.96	122.18	122.39	122.60	122.82	123.03
120	118.97	119.18	119.40	119.61	119.82	120.04	120.25	120.47	120.68	120.89
110	116.83	117.04	117.26	117.47	117.68	117.90	118.11	118.33	118.54	118.76
100	114.68	114.90	115.11	115.33	115.54	115.76	115.97	116.18	116.40	116.61
90	112.53	112.75	112.96	113.18	113.39	113.61	113.82	114.04	114.25	114.47
80	110.38	110.60	110.81	111.03	111.24	111.46	111.67	111.89	112.10	112.32
70	108.23	108.44	108.66	108.87	109.09	109.30	109.52	109.73	109.95	110.17
60	106.07	106.28	106.50	106.71	106.93	107.15	107.36	107.58	107.79	108.01
50	103.90	104.12	104.34	104.55	104.77	104.98	105.20	105.42	105.63	105.85
40	101.74	101.95	102.17	102.39	102.60	102.82	103.04	103.25	103.47	103.69
30	99.57	99.78	100.00	100.22	100.43	100.65	100.87	101.09	101.30	101.52
20	97.39	97.61	97.83	98.04	98.26	98.48	98.70	98.91	99.13	99.35
10	95.21	95.43	95.65	95.87	96.09	96.30	96.52	96.74	96.96	97.17
0	93.03	93.25	93.47	93.69	93.91	94.12	94.34	94.56	94.78	95.00

	0	-1	-2	-3	-4	-5	-6	-7	-8	-9
0	93.03	92.82	92.60	92.80	82.16	91.94	91.72	91.50	91.29	91.07
-10	90.85	90.63	90.41	90.19	89.97	89.75	89.54	89.32	89.10	88.88
-20	88.66	88.44	88.22	88.00	87.78	87.56	87.34	87.13	86.91	86.69
-30	86.47	86.25	96.03	85.61	85.59	85.37	85.15	84.93	84.71	84.49
-40	84.27	84.05	93.83	83.61	83.39	83.17	82.95	82.73	82.51	82.29
-50	82.07	81.85	81.63	81.41	81.19	80.97	80.75	80.53	80.31	80.09
-60	79.86	76.64	79.42	79.20	78.98	78.76	78.54	78.32	78.10	77.88

Millivolts vs Temperature

Thermocouple Reference Table

mV vs T °C

mV in degrees C

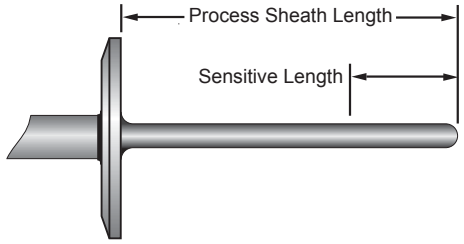
Temp C	T	J	E	K
-50	-1.819	-2.663	-2.787	-1.889
-45	-1.648	-2.431	-2.523	-1.709
-40	-1.475	-2.197	-2.255	-1.527
-35	-1.299	-1.961	-1.984	-1.343
-30	-1.121	-1.722	-1.709	-1.156
-25	-0.940	-1.482	-1.432	-0.968
-20	-0.757	-1.239	-1.152	-0.778
-15	-0.571	-0.995	-0.868	-0.586
-10	-0.383	-0.749	-0.582	-0.392
-5	-0.193	-0.501	-0.292	-0.197
0	0.000	-0.251	0.000	0.000
5	0.195	0.000	0.294	0.198
10	0.391	0.253	0.591	0.397
15	0.589	0.507	0.890	0.597
20	0.790	0.762	1.192	0.798
25	0.992	1.019	1.495	1.000
30	1.196	1.277	1.801	1.203
35	1.403	1.537	2.109	1.407
40	1.612	1.797	2.420	1.612
45	1.823	2.059	2.733	1.817
50	2.036	2.322	3.048	2.023
55	2.251	2.585	3.365	2.230
60	2.468	2.850	3.685	2.436
65	2.687	3.116	4.006	2.644
70	2.909	3.382	4.330	2.851
75	3.132	3.650	4.656	3.059
80	3.358	3.918	4.985	3.267
85	3.585	4.187	5.315	3.474
90	3.814	4.456	5.648	3.682
95	4.046	4.726	5.982	3.889
100	4.279	4.997	6.319	4.096
105	4.513	5.269	6.658	4.303
110	4.750	5.541	6.998	4.509
115	4.988	5.814	7.341	4.715
120	5.228	6.087	7.685	4.920
125	5.470	6.360	8.031	5.124
130	5.714	6.634	8.379	5.328
135	5.959	6.909	8.729	5.532
140	6.206	7.184	9.081	5.735
145	6.454	7.459	9.434	5.937
150	6.704	7.734	9.789	6.138
155	6.956	8.010	10.145	6.339
160	7.209	8.286	10.503	6.540
165	7.463	8.562	10.863	6.741
170	7.720	8.839	11.224	6.941
175	7.977	9.115	11.587	7.140
180	8.237	9.392	11.951	7.340
185	8.497	9.669	12.317	7.540
190	8.759	9.947	12.684	7.739
195	9.023	10.224	13.052	7.939
200	9.288	10.501	13.421	8.138

The unique advantage of Thermocouples:

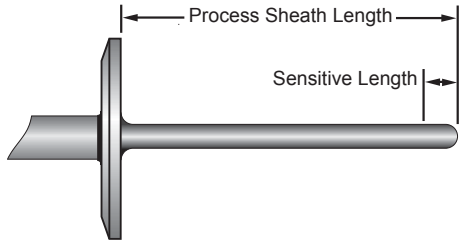
Measuring the temperature of small objects or small amounts of fluid can be a big challenge. While the RTD has the advantage over the thermocouple for sensor accuracy, there are cases where the measurement accuracy may be better with the less accurate thermocouple. For example, measuring temperature of a fluid inside a 5/8” diameter vial that has 1/16” of fluid depth presents such a challenge. It is very important to note the distinction between sensor accuracy and measurement accuracy for applications such as this because the two can be very different. Details of the installation and ambient conditions are very important when selecting a temperature sensor for maximum accuracy.

For more information on this topic please refer to the Burns Engineering Application Note “A090826, RTD or Thermocouple?”.

RTD: Element Sensitive Length



Thermocouple: Junction Sensitive Length



Millivolts vs Temperature

Thermocouple Reference Table

mV vs T °F

mV in degrees F

Temp F	T	J	E	K
-60	-1.857	-2.483	-2.846	-1.929
-55	-1.762	-2.353	-2.699	-1.830
-50	-1.667	-2.223	-2.552	-1.729
-45	-1.572	-2.092	-2.404	-1.628
-40	-1.475	-1.961	-2.255	-1.527
-35	-1.378	-1.828	-2.105	-1.425
-30	-1.279	-1.695	-1.953	-1.322
-25	-1.181	-1.562	-1.801	-1.218
-20	-1.081	-1.428	-1.648	-1.114
-15	-0.980	-1.293	-1.494	-1.010
-10	-0.879	-1.158	-1.339	-0.905
-5	-0.777	-1.022	-1.183	-0.799
0	-0.675	-0.886	-0.868	-0.586
5	-0.571	-0.749	-1.026	-0.692
10	-0.467	-0.611	-0.550	-0.370
15	-0.362	-0.473	-0.709	-0.478
20	-0.256	-0.334	-0.227	-0.153
25	-0.150	-0.195	-0.389	-0.262
30	-0.043	-0.056	0.098	0.066
35	0.065	0.084	-0.065	-0.044
40	0.173	0.225	0.426	0.286
45	0.282	0.365	0.262	0.176
50	0.391	0.507	0.591	0.397
55	0.501	0.649	0.757	0.508
60	0.611	0.791	0.924	0.619
65	0.723	0.933	1.091	0.731
70	0.834	1.076	1.259	0.843
75	0.947	1.220	1.427	0.955
80	1.060	1.364	1.597	1.068
85	1.174	1.508	1.767	1.181
90	1.288	1.652	1.938	1.294
95	1.403	1.797	2.109	1.407
100	1.519	1.942	2.281	1.521
105	1.635	2.088	2.454	1.635
110	1.752	2.234	2.628	1.749
115	1.870	2.380	2.802	1.863
120	1.988	2.527	2.977	1.977
125	2.107	2.673	3.153	2.092
130	2.227	2.821	3.330	2.207
135	2.347	2.968	3.507	2.321
140	2.468	3.116	3.685	2.436
145	2.590	3.264	3.863	2.552
150	2.712	3.412	4.042	2.667
155	2.835	3.560	4.222	2.782
160	2.958	3.709	4.403	2.897
165	3.082	3.858	4.584	3.013
170	3.207	4.007	4.766	3.128
175	3.333	4.157	4.948	3.244
180	3.459	4.306	5.131	3.359
185	3.585	4.456	5.315	3.474
190	3.712	4.606	5.500	3.590
195	3.840	4.757	5.685	3.705
200	3.968	4.907	5.871	3.820

Temp F	T	J	E	K
205	4.097	5.058	6.057	3.935
210	4.227	5.209	6.244	4.050
215	4.357	5.360	6.432	4.165
220	4.487	5.511	6.620	4.280
225	4.618	5.662	6.809	4.395
230	4.750	5.814	6.998	4.509
235	4.882	5.965	7.188	4.623
240	5.015	6.117	7.379	4.738
245	5.148	6.269	7.570	4.852
250	5.282	6.421	7.762	4.965
255	5.416	6.573	7.954	5.079
260	5.551	6.726	8.147	5.192
265	5.687	6.878	8.340	5.306
270	5.823	7.031	8.535	5.419
275	5.959	7.184	8.729	5.532
280	6.096	7.336	8.924	5.644
285	6.233	7.489	9.120	5.757
290	6.371	7.642	9.316	5.869
295	6.510	7.795	9.513	5.982
300	6.648	7.949	9.710	6.094
305	6.788	8.102	9.907	6.205
310	6.928	8.255	10.106	6.317
315	7.068	8.409	10.304	6.429
320	7.209	8.562	10.503	6.540
325	7.350	8.716	10.703	6.652
330	7.492	8.869	10.903	6.763
335	7.634	9.023	11.104	6.874
340	7.777	9.177	11.305	6.985
345	7.920	9.331	11.506	7.096
350	8.064	9.485	11.708	7.207
355	8.208	9.639	11.911	7.318
360	8.352	9.793	12.113	7.429
365	8.497	9.947	12.317	7.540
370	8.643	10.101	12.520	7.650
375	8.789	10.255	12.724	7.761
380	8.935	10.409	12.929	7.872
385	9.082	10.563	13.134	7.983
390	9.229	10.717	13.339	8.094
395	9.377	10.871	13.545	8.205
400	9.525	11.025	13.751	8.316

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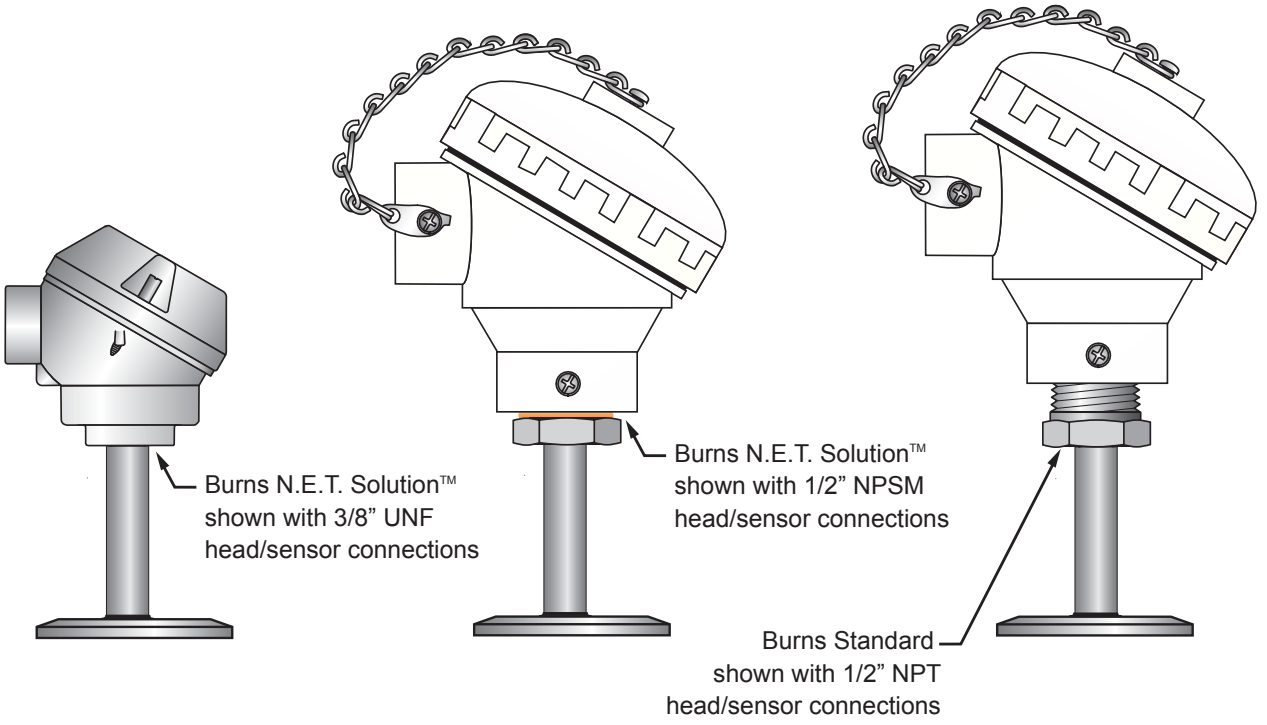
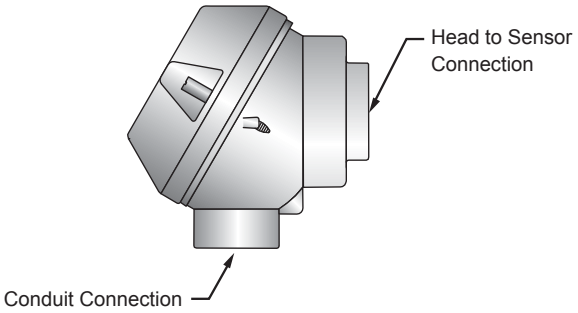
Head & Sensor Connection Options

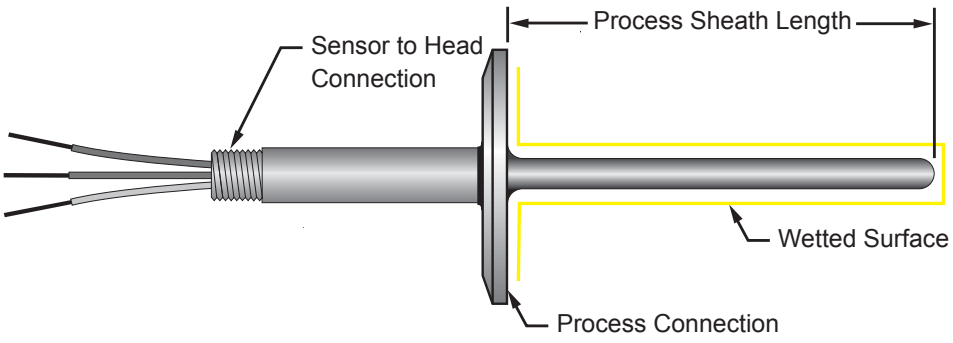
Burns Connection Heads are available with NPT, NPSM and UNF threads. See page 40 for more information.





Direct Immersion Sensors

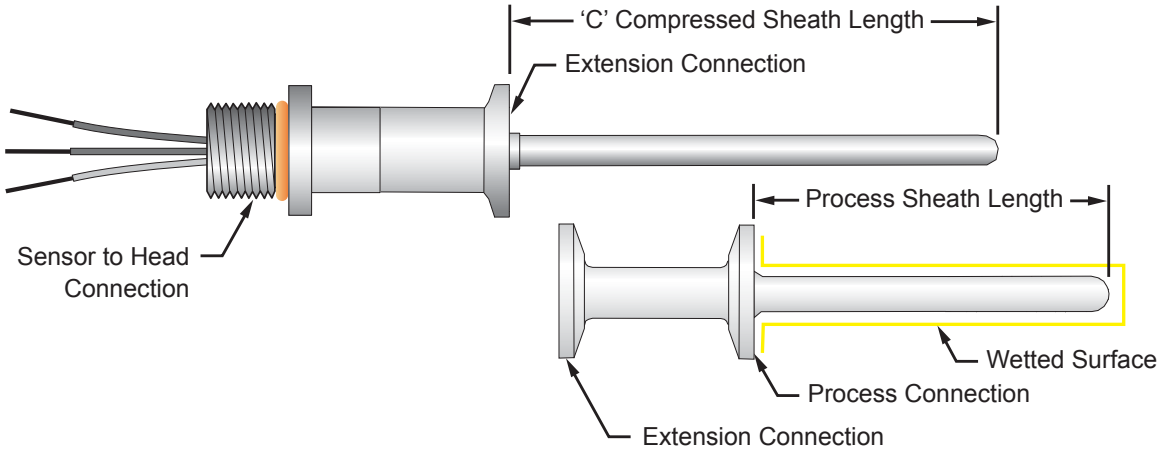
Direct Immersion sensors are available in several different diameters. See pages 7 - 10 for more information.



Terminology and Options Guide

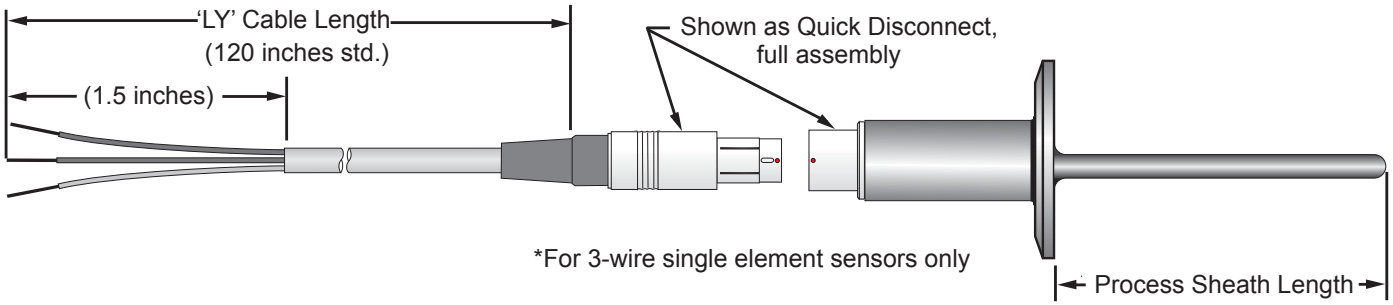
Spring Loaded Style Sensors & Thermowells

A material and surface finish certification is supplied on all wetted surfaces. See page 36 for other documentation available.



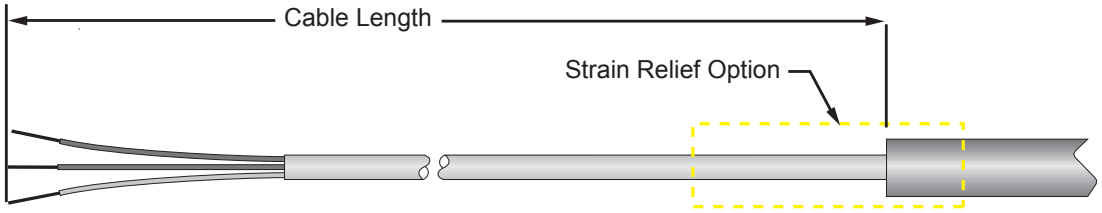
Interconnect Style Sensors and Cable*

The Quick Disconnect is available with the S01, S03, S20, S40, SPA and SPS style sensors. See the connection head ordering information for more details.



Cable & Strain Relief Options

Several different cable types, strain relief and remote mounting options are available. See pages 35 and 36.



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