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/

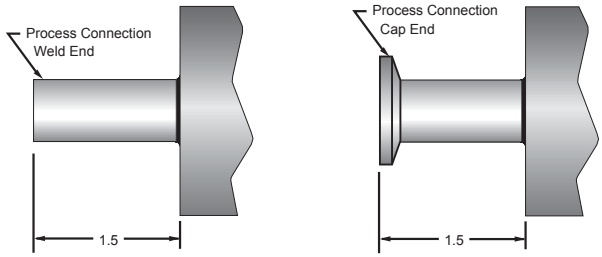
Process Considerations:

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

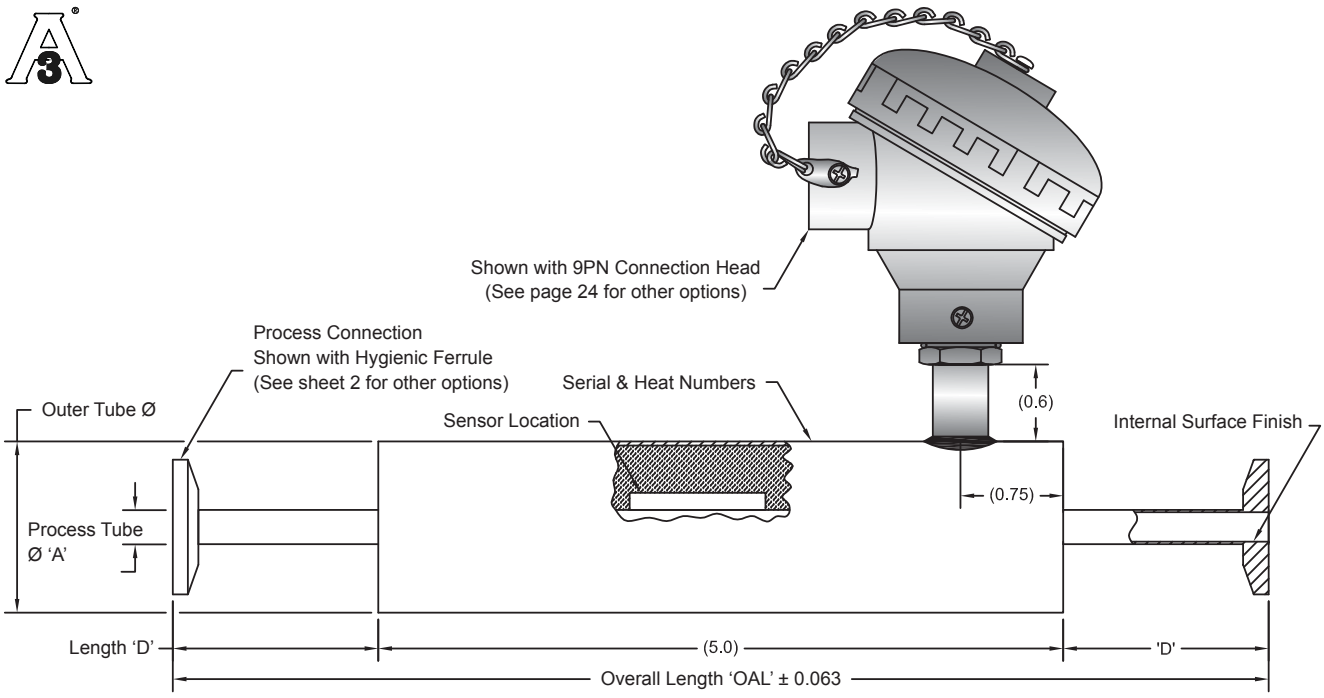


Installation Considerations:

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

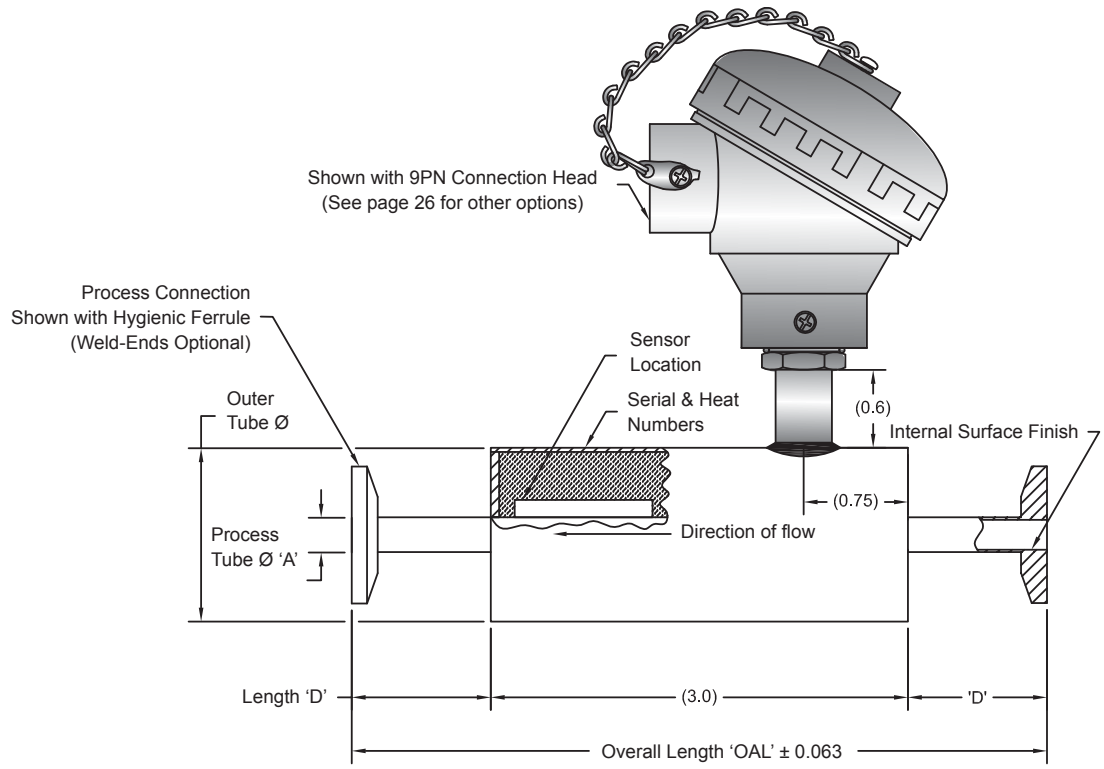
-06 316L SS
-20 AL6XN
Weld Ends, Leave Blank

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

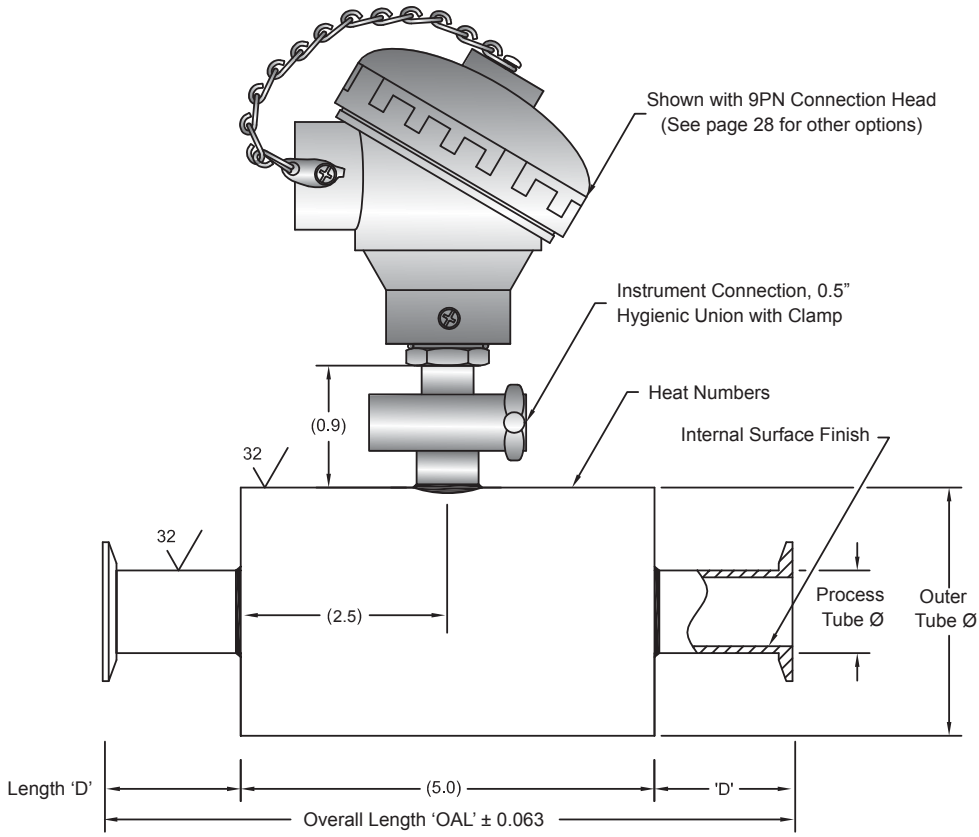
-06 316L SS
-20 AL6XN
Weld Ends, Leave Blank

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

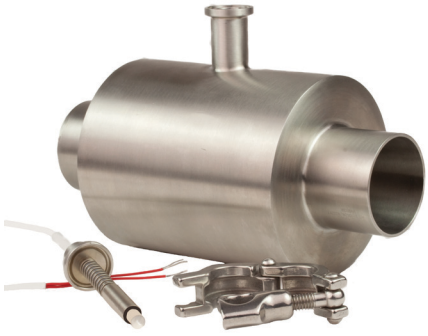


Link to Drawing: www.BurnsEngineering.com/SNR.pdf

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

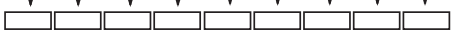
M32	32 Ra Mechanical Finish
E10	10 Ra Electropolish

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

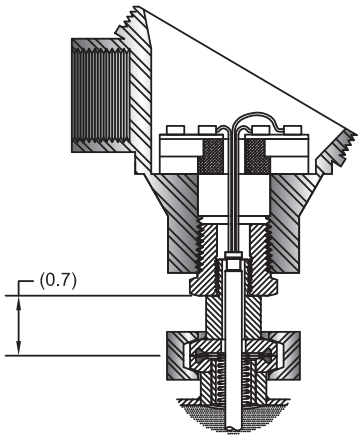
NOTE 1: For full descriptions see page 40 or: www.BurnsEngineering.com/Con-Heads.pdf

SNR Non-Intrusive Removable Replacement Sensor

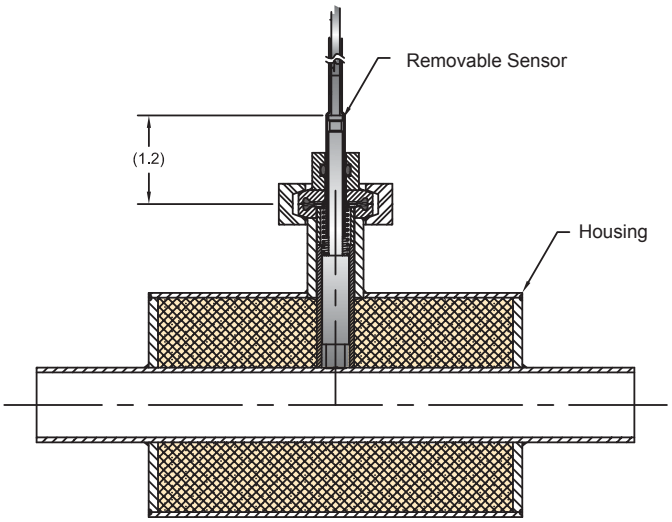
Installation

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

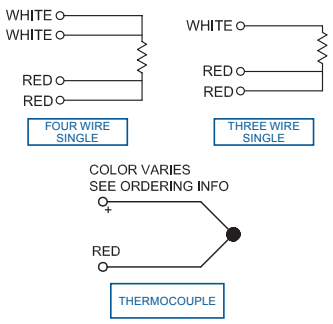


Sensor installation with cable option

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

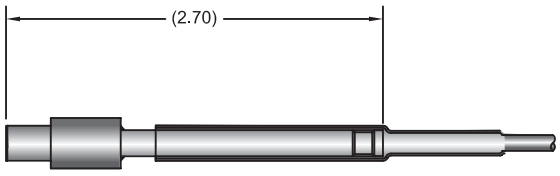
E	Type 'E'
J	Type 'J'
K	Type 'K'
T	Type 'T'

"LY" Cable Length in Inches

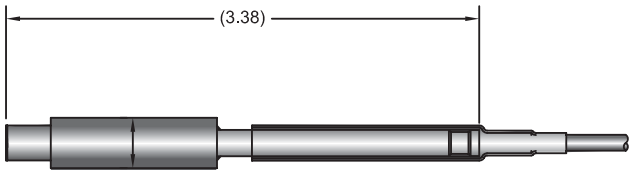
006	6 inches
120	120 inches
***	Specify Length in Inches

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'

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

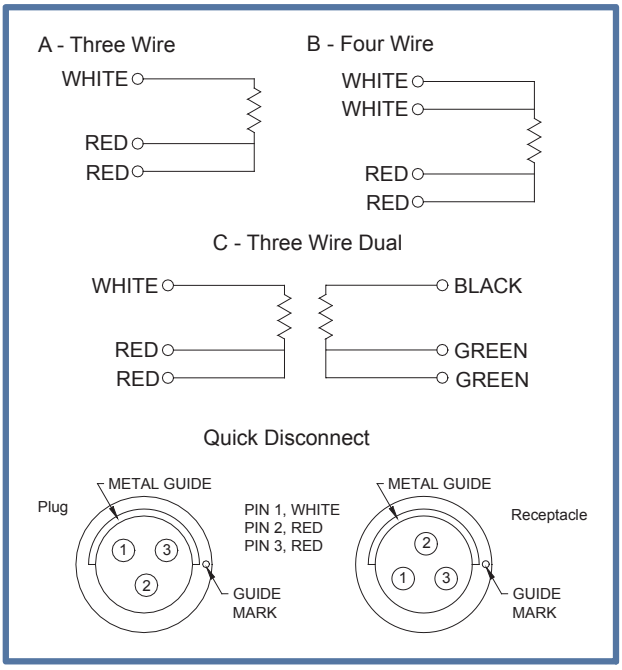
Sheath Material:

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%**		Interchangeability 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