




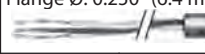


## ▶ SECTION 5: MINIATURE SENSORS

- Embedment sensors install in bearings for over-temperature protection
- Small, rugged RTDs and thermocouples withstand rough handling and harsh environments
- Agency approved embedment sensors for hazardous areas
- Bolt-on designs for easy installation

### Section 5: Miniature Sensors

Embedment RTDs .....	5-2
Embedment thermocouples.....	5-3
Hazardous area embedment sensors .....	5-4 to 5-6
Installation and accessories .....	5-7
Bolt-on sensors .....	5-8
Economy sensors .....	5-9
Non-metallic case sensors .....	5-10

# Embedment RTDs

Element	TCR $\Omega/\Omega/^{\circ}\text{C}$	Case style A		Case style B		Case style C		Case style D	
		Case L: 0.250" (6.4 mm) Case $\varnothing$ : 0.275" (7.0 mm)		Case L: 0.250" (6.4 mm) Case $\varnothing$ : 0.188" (4.8 mm) Flange $\varnothing$ : 0.250" (6.4 mm)		Case L: 0.300" (7.6 mm) Case $\varnothing$ : 0.125" (3.2 mm)		Case L: 0.300" (7.6 mm) Case $\varnothing$ : 0.080" (2.0 mm)	
		Single	Dual	Single	Dual	Single	Dual	Single	Dual
Platinum, 100 $\Omega$ $\pm 0.36\%$ at 0°C	.00392	S325PA, S11636PA*	S4026PA	S331PA	S7792PA	S341PA	S14320PA	S12414PA	
Platinum, 100 $\Omega$ $\pm 0.12\%$ at 0°C (Meets EN60751, Class B)	.00385	S304PD	S309PD	S306PD	S14405PD	S308PD	S14455PD	▼ S13282PD	
Platinum, 100 $\Omega$ $\pm 0.36\%$ at 0°C	.00385	S7304PE	S305PE	S7746PE	S307PE	S7908PE	S14456PE	S13282PE	
Platinum, 1000 $\Omega$ $\pm 0.12\%$ at 0°C	.00385	S101907PF	S101911PF	S101908PF	S101912PF	S101909PF	S101913PF	S101910PF	
Copper, 10 $\Omega$ $\pm 0.2\%$ at 25°C	.00427	S324CA	S4026CA	S332CA		S342CA			
Nickel, 120 $\Omega$ $\pm 0.5\%$ at 0°C	.00672	S326NA, S11636NA*	S4026NA	S330NA	S7792NA	S340NA			

\*MIL-T-24388C qualified models

## Overview

Install miniature sensors in or beneath the babbitt layer of bearing shoes. They monitor metal temperature — the most reliable indicator of bearing condition — to give early warning of oil film breakdown. Machines can then be shut down and the problem corrected before catastrophic failure occurs.

While no larger than many bare ceramic elements, these RTDs have metal cases and insulated leads to withstand rough handling and harsh environments. They are easy to install in drilled holes for general purpose sensing.

## Specifications

**Temperature range:** -50 to 260°C (-58 to 500°F).

**Case:** Tin plated copper alloy. Models S12414, S13282 and S101910: Stainless steel.

**Babbitt tip:** Factory applied babbitt tip, available on case style A or B, reduces the danger of overheating the sensor when installed in babbitt layer.

**Leads:** Stranded copper with PTFE insulation; stainless steel overbraid optional (one sleeve covers all leads). Polyimide insulation available on selected models (See specification and order options).

**Time constant:** 3.0 seconds (case style A) to 1.5 seconds (case style D), typical value in moving water.

**Insulation resistance:** 10 megohms min. at 100 VDC, leads to case.

\*MIL-T-24388C qualified models:  
PRT-EM-E2: Order S11636PA3K36B1.  
NRT-EM-E1: Order S11636NA3K36B1.

▼ = **STANDARD OPTIONS**

Specifications subject to change

### Leadwire size (AWG):

Case style	Number of leads			
	2	3	4	6
A	24	24	24	24
B	24	24	28	28
C	24	26	30	30
D	30	30	34	



**STOP OIL SEEPAGE!**



**STOCKED PARTS AVAILABLE**

## Specification and order options

S331PA	Model number from table
3	Number of leads per sensing element (2, ▼3, or 4): ▼:3 CA or PD elements not available with 2 leads. 4 leads available on single elements and S14405 only.
S	<b>Covering over leadwires:</b> ▼ T = PTFE insulated leads only ▼ S = Stainless steel overbraid with PTFE insulated leads F = FEP over PTFE insulated leads R = FEP over stainless steel braid and PTFE insulated leads. E = FEP over stainless steel braid, with elastomer fill and PTFE insulated leads. (max fill length 144") <b>S11636 Covering options only:</b> K = Polyimide insulated leads. S = Stainless steel overbraid with polyimide insulated leads.
120	Lead length in inches: ▼120
(Stop here for case style C or D; no installation variable)	
AC1	<b>Optional Installation/Accessory option:</b> B0 = No babbitt metal or accessories B1 = Babbitt metal applied AC1 = Supplied with AC171 spring and AC172 series ring (case style B only) AC2 = Supplied with AC171 spring and AC1038 ring (case style B only) AC3 = Supplied with AC171 spring and AC915-1 ring (case style B only)
S331PA3S120AC1 = Sample part number	

# Embedment Thermocouples

Leadwire	Case style A Case L: 0.250" (6.4 mm) Case Ø: 0.275" (7.0 mm)		Case style B Case L: 0.250" (6.4 mm) Case Ø: 0.188" (4.8 mm) Flange Ø: 0.250" (6.4 mm)		Case style C Case L: 0.300" (7.6 mm) Case Ø: 0.125" (3.2 mm)		Case style D Case L: 0.300" (7.6 mm) Case Ø: 0.080" (2.0 mm)	
	Single	Dual	Single	Dual	Single	Dual	Single	Dual
AWG 20 stranded	TC311	TC312	TC333					
AWG 24 stranded	TC2162	TC2303	TC2084	TC2096	TC344	TC2623		
AWG 24 stranded with single SS braid over both wire pairs		TC2698		TC2520		TC2837		
AWG 30 solid							▼TC2741	

## Overview

These thermocouples are mechanically interchangeable with the RTDs on pages 6-2 and 6-3.

## Specifications

**Temperature range:** -184 to 260°C (-300 to 500°F).

Copper-Constantan (Type T):

AWG 24: 200°C (392°F) maximum,

AWG 30: 150°C (302°F) maximum.

**Time constant:** Typical value in moving water:

Grounded junction: 0.3 seconds.

Ungrounded junction: 6 seconds (case style A) to 1 second (case style C).

**Insulation resistance:** 10 megohms min. at 100 VDC, leads to case, ungrounded junctions only.

**Case:** Tin plated copper alloy.

**Babbitt tip:** Factory applied babbitt tip, available on case styles A and B, reduces the danger of overheating the sensor when installed in babbitt layer.

**Leads:** See table for sizes and options. Dual element models with AWG 24 stranded leadwires are available with a single stainless steel braid over all four wires. This option is recommended for use with integral feedthroughs. See below for more information.

## Specification and order options

TC311	Model number from table
E	Junction type: ▼E = Chromel-Constantan      ▼K = Chromel-Alumel ▼J = Iron-Constantan          ▼T = Copper-Constantan
U	Junction grounding: ▼G = Grounded                  ▼U = Ungrounded
36	Lead length in inches ▼: 48, 144
S	Covering over leadwires: T = PTFE insulated leads only ▼S = Stainless steel overbraid with PTFE insulated leads F = FEP over PTFE insulated leads R = FEP over stainless steel braid and PTFE insulated leads E = FEP over stainless steel braid, with elastomer fill and PTFE insulated leads (max fill length 144")
(Stop here for case style C or D; no installation variable)	
B0	Optional Installation/Accessory option: B0 = No babbitt metal or accessories B1 = Babbitt metal applied AC1 = Supplied with AC171 spring and AC172 series ring (case style B only) AC2 = Supplied with AC171 spring and AC1038 ring (case style B only) AC3 = Supplied with AC171 spring and AC915-1 ring (case style B only)
TC311EU36SB0 = Sample part number	

## STOP OIL SEEPAGE!

**Feedthroughs** provide an oil tight seal where a cable exits a machine housing. The stainless steel tube is epoxy filled and each wire is sealed to the individual conductor. This prevents wicking of oil inside the wires as well as leakage around the wire insulation. Pressure rating to 25 psi (1.7 bar.) See page 3-11 for details.

**Leadwire and cable seal** models FG1015, FG3015 and FG4015 seal RTD or thermocouple leadwires where they exit oil-filled bearing housings of rotating equipment. Both versions include a grommet that provides the seal and allows adjustment of the wire or cable position. See page 3-12 for details.

**Elastomer rubber-filled cable** has elastomer fill between the wires, stainless steel braid, and outer jacket. This fill can extend along the entire length of the cable, or a specified portion. The outside of the cable can be sealed with an FG1015, FG3015 and FG4015 fitting. See Leadwire Covering Options on Miniature Sensors on pages 6-2 to 6-10.

For more information on the problems of oil seepage and various solutions, visit [www.minco.com](http://www.minco.com)



▼ = STANDARD OPTIONS  
Specifications subject to change

# Hazardous Area Embedment Sensors

## Overview

Install miniature sensors in or beneath the babbitt layer of bearing shoes. They monitor metal temperature—the most reliable indicator of bearing condition—to give early warning of oil film breakdown. With predictive maintenance, machines can be shut down and the problem corrected before catastrophic failure occurs.

While no larger than many bare ceramic elements, these RTDs have metal cases and insulated leads to withstand rough handling and harsh environments. They are easy to install in drilled holes for general purpose sensing.

## Agency Certifications

Certified for use in hazardous areas to IECEx, ATEX, North America (CSAc-us), KCs (Korea), PESO (India), and CCC (China) requirements. These wide-ranging certifications allow users to cover many potential certification requirements with one sensor product, thus increasing flexibility and reducing inventory. For more information see the Certification box to the right.

## Specifications

**Temperature range:** -60°C to 200°C (-76°F to 392°F),

- Reducing to 180°C (356°F) for FEP jacket on cable options;
- Reducing to 125°C (257°F) for elastomer filled cable options;
- Reducing to -20°C to 149°C (-4°F to 300°F) for feedthrough options.

**Babbitt tip:** Factory applied babbitt tip, available on case style A, reduces the danger of overheating the sensor when installed in babbitt layer.

**Time constant:** 3.0 seconds (case style A) to 1.5 seconds (case style D), typical value in moving water.

**Insulation resistance:** 10 megohms min. at 100 VDC, leads to case and to stainless steel braid and feedthrough cases when specified.

**Dielectric strength:** 600 Volts RMS at 60 Hz for 2 seconds with a maximum leakage of 5mA, leads to case and to stainless steel braid and feedthrough cases when specified.

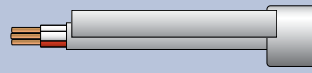
**Lead wire colors** can be specified in part number make up per IEC 60751 or Minco standard lead wire conventions.

**Special options:** Calibration data and tagging options are also available; contact Minco for details.

## Case Styles

### Case

### Specifications



**Case Style A**  
Case L: 0.250" (6.4 mm)  
Case Ø: 0.275" (7.0 mm)



**Case Style B**  
Case L: 0.250" (6.4 mm)  
Case Ø: 0.188" (4.8 mm)  
Flange Ø: 0.250" (6.4 mm)



**Case Style B Short**  
Case L: 0.188" (4.8 mm)  
Case Ø: 0.188" (4.8 mm)  
Flange Ø: 0.250" (6.4 mm)



**Case Style C**  
Case L: 0.300" (7.6 mm)  
Case Ø: 0.125" (3.2 mm)



**Case Style D**  
Case L: 0.300" (7.6 mm)  
Case Ø: 0.080" (2.0 mm)

## Certifications



**IECEx (IEC 60079):**  
Ex ia IIC Ga  
Ex eb IIC Gb  
Ex ic ec IIC Gc



**Korea (KOSHA Art. 84/Art. 110):**  
Ex ia IIC Ga  
Ex eb IIC Gb  
Ex IC ec IIC Gc

## SIL2 IEC 61508-2:2010



**ATEX (EN 60079):**  
Ex II 1 G Ex ia IIC Ga  
Ex II 2 G Ex eb IIC Gb  
Ex II 3 G Ex ic ec IIC Gc



**China (GB/T 3836):**  
Ex ia IIC Ga  
Ex eb IIC Gb  
Ex ic ec IIC Gc



**CSA Canada (CSA C22.2):** Ex ia IIC T6...T2 Ga  
Ex eb IIC T6...T2 Gb  
Ex ic ec IIC T6...T2 Gc  
IS Cl I, Div 1, Grp ABCD T6... T2  
Cl I, Div 2, Grp ABCD T6... T2



**India (Petroleum Rules 2002):**  
Ex ia IIC Ga  
Ex eb IIC Gb  
Ex ic ec IIC Gc



**CSA US (NFPA 70 Art 500 & 505):**  
Cl I, Zone 0 AEx ia IIC T6... T2 Ga  
Cl I, Zone 1, AEx eb IIC T6...T2 Gb  
Cl I, Zone 2, AEx ic ec IIC T6...T2 Gc  
IS Cl 1, Div 1, Grp ABCD T6...T2  
Cl 1, Div 2, Grp ABCD T6...T2

# Hazardous Area Embedment Sensors

## RTD Sensing Element

Code	Element	TCR Ω/Ω/°C
CA	Copper, 10 Ω ±0.2% (10.02/9.98) at 25°C	0.00427
NA	Nickel, 120 Ω ±0.5% (120.60/119.40) at 0°C	0.00672
NB	Nickel, 100 Ω ±0.22% (100.22/99.78) at 0°C (Meets Din 43760)	0.00618
PA	Platinum, 100 Ω ±0.36% (100.36/99.64) at 0°C	0.00392
PD	Platinum, 100 Ω ±0.12% (100.12/99.98) at 0°C (Meets EN60751, Class B)	0.00385
PE	Platinum, 100 Ω ±0.36% (100.36/99.64) at 0°C	0.00385
PF	Platinum, 1000 Ω ±0.12% (1001.2/998.8) at 0°C (Meets EN60751, Class B)	0.00385
PM	Platinum, 100 Ω ±0.06% (100.06/99.94) at 0°C (Meets EN60751, Class A)	0.00385

Feedthrough Options	
C	Feedthrough designator
36	Feedthrough distance from sensor case in inches
J	Feedthrough diameter code: H = .188" DIA (same as AC958) J = .215" DIA (same as AC717) M = .250" DIA (same as AC718) N = .375" DIA (same as AC961)
40	Feedthrough length in .1" increments (40 = 4.0") (Standard lengths: 20, 25, 30, 35, 40, 45)
Sample part number: S711PDZS72A1C36J40	

## Specifications and Options — RTD

S7	Model number
1	Number of RTD sensing elements: 1 = 1 sensing element (single) 2 = 2 sensing elements (dual) – no duals available in Case Style D, NA and NB duals also not available in Case Style C, CA dual only available in Case Style A
1	Case: 0 = Case Style A, copper alloy, tin plated 1 = Case Style B, copper alloy, tin plated 2 = Case Style C, copper alloy, nickel plated 3 = Case Style Short B, copper alloy, tin plated 4 = Case Style D, type 303 stainless steel
PD	RTD sensing element: CA, NA, NB, PA, PD, PE, PM or PF (from table on this page)
Z	Number of leads and lead color*: <u>Single Element</u> Y = 2 leads, RW Z = 3 leads, RWW (Minco U.S. lead colors) W = 3 leads, WRR (IEC 60751 lead colors) X = 4 leads, RRWW <u>Dual Element</u> Y = 2 leads per element, RW/BIY (Minco U.S. lead colors) V = 2 leads per element, WR/YBK (IEC 60751 lead colors) Z = 3 leads per element, RWW/BIYY (Minco U.S. lead colors) W = 3 leads per element, WRR/YBkKk (IEC 60751 lead colors) X = 4 leads per element, RRWW/BIYY (Minco U.S. lead colors) -only Case Style B U = 4 leads per element, WWRR/YBkKk (IEC 60751 lead colors) -only Case Style B
S	Leadwire configuration/covering: T = PTFE insulated leads only (no covering) F = FEP jacket over PTFE insulated leads S = Stainless steel braid over PTFE insulated leads R = FEP jacket over stainless steel braid and PTFE insulated leads E = FEP jacket over stainless steel braid and PTFE insulated leads, with elastomer fill (max fill length 144")
72	Lead length in inches
A1	Optional Installation/Accessories - skip for Case Styles C and D A1 = AC171 spring/AC172 series ring -Case Style B only A2 = AC171 spring/AC1038 rings (Qty of 2) -Case Style B only A3 = AC171 spring/AC915-1 ring -Case Style B only A4 = AC672 spring/AC172 series ring -Case style Short B only A5 = AC672 spring/AC1038 ring (Qty of 2) -Case style Short B only A6 = AC672 spring/AC915-1 ring -Case Style Short B only B0 = No babbitt or no accessory -Case Style A B0 = No accessory or feedthrough -Case Styles B and Short B B1 = Babbitt layer applied to case tip, .100" MIN -Case Style A only
<b>TO ORDER WITHOUT FEEDTHROUGH STOP HERE TO ORDER WITH FEEDTHROUGH CONTINUE IN NEXT COLUMN</b>	

\*Lead wire color code: R = red, W - white, Bl = blue, Y = yellow, Bk = black



# Hazardous Area Embedment Sensors

## Specifications and Options – Thermocouple

Feedthrough Options	
C	Feedthrough designator
36	Feedthrough distance from sensor case in inches
H	Feedthrough diameter code: H = .188" DIA (same as AC958) J = .215" DIA (same as AC717) M = .250" DIA (same as AC718) N = .375" DIA (same as AC961)
40	Feedthrough length in .1" increments (40 = 4.0") (Standard lengths: 20, 25, 30, 35, 40, 45)
Sample part number: TC711KUS120A1C36H40	

### Leadwire size (AWG)

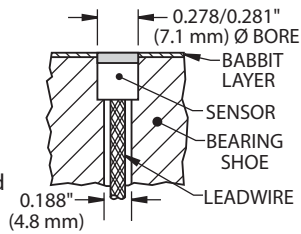
Case style	Number of leadwires				
	2	3	4	6	8
<b>RTD</b>					
A	24	24	24	24	x
B	24	24	28	28	28
Short B	24	26	28	30	x
C	24	26	30	30	x
D	30	30	34	x	x
<b>Thermocouple</b>					
A, B, C	24	x	24	x	x
Short B	24	x	24	x	x
D	30	x	x	x	x

TC7	Specification
1	<b>Number of sensing elements:</b> 1 = 1 sensing element (single) 2 = 2 sensing elements (dual) in one cable 3 = 2 sensing elements (dual) in two cables
1	<b>Case:</b> 0 = Case Style A, copper alloy, tin plated 1 = Case Style B, copper alloy, tin plated 2 = Case Style C, copper alloy, nickel plated 3 = Case Style Short B, copper alloy, tin plated 4 = Case Style D, copper alloy, tin plated
K	<b>Junction type:</b> E = Chromel-Constantan J = Iron-Constantan  K = Chromel-Alumel T = Copper-Constantan
U	<b>Thermocouple junctions:</b> U = Ungrounded (insulated from case) G = Grounded (fused internally to case)
S	<b>Leadwire covering:</b> T = TFE insulated leads (wrapped and fused) F = FEP jacket over TFE insulated leads S = Stainless steel braid over TFE insulated leads R = FEP jacket over stainless steel braid and TFE insulated leads E = FEP jacket over stainless steel braid and TFE insulated leads, with elastomer fill (max fill length 144")
120	<b>Leadwire length</b>
A1	<b>Optional Installation/Accessories – leave blank for Case Styles C and D:</b> A1 = AC171 spring/AC172 series ring - Case Style B only A2 = AC171 spring/AC1038 rings (Qty of 2) - Case Style B only A3 = AC171 spring/AC915-1 ring - Case Style B only A4 = AC672 spring/AC172 series ring - Case Style Short B only A5 = AC672 spring/AC1038 ring (Qty of 2) - Case Style Short B only A6 = AC672 spring/AC915-1 ring - Case Style Short B only B0 = No babbitt, no accessory - Case Style A only B0 = No accessory or feedthrough - Case Styles B or Short B only B1 = Babbitt layer applied to case tip, .100" MIN - Case Style A only
<b>TO ORDER WITHOUT FEEDTHROUGH STROP HERE TO ORDER WITH FEEDTHROUGH CONTINUE IN NEXT COLUMN</b>	

# Installation and Accessories

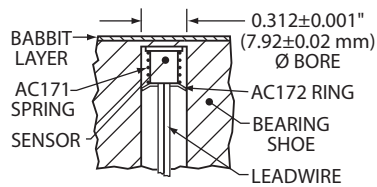
## Case style A

Install case style A sensor just below the babbitt layer, then puddle the babbitt metal over the sensor tip and smooth. Read [Engineering Instruction #164](#) and [Engineering Instruction #167](#) for complete details.



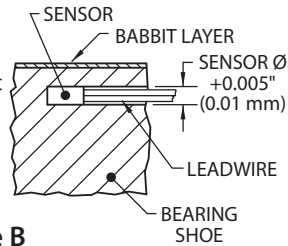
## Case style B

The “top hat” flange shape allows spring loading with the AC171 spring and AC172 or AC915 retaining ring (order separately). Choose the economical AC172 style for lowest cost. The AC915 style allows removal and reinstallation. Slide the spring and ring over the leads, insert the sensor tip into a milled hole, and push down on the retaining ring to compress the spring and secure the sensor. Read [Engineering Instruction #180](#) and [Engineering Instruction #181](#).



## Case styles C and D

Pot with epoxy inside small bearing shoes. Locate near the babbitt face for best readings. Read [Engineering Instruction #184](#).



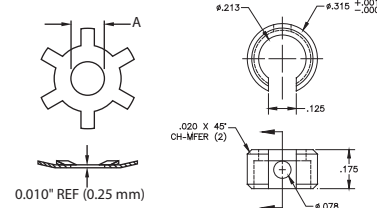
## AC171 spring for case style B

Stainless steel. Outside diameter 0.240" (6.1 mm). Compressed length 0.22" (5.6 mm). To be used in conjunction with AC172 or AC915 for spring loading case style B

## Feedthroughs

Feedthroughs provide an oil tight seal where a cable exits a machine housing. The stainless steel tube is epoxy filled and each wire is sealed to the individual conductor. This prevents wicking of oil inside the wires as well as leakage around the wire insulation. Pressure rating to 25 psi (1.7 bar). See page 3-12 for more information.

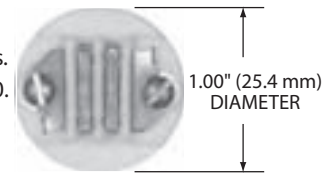
## AC172 and AC915 retaining ring for case style B



Model	"A" diameter	Hole I.D.
AC172	sized to fit leadwires	0.312" (7.92 mm)
AC172-3	0.175" (4.45 mm)	0.375" (9.53 mm)
AC915-1	0.213" (5.4 mm)	0.312" (7.92 mm)

## AC190 terminal block

Two tin-plated brass terminals. PTFE body. Meets MIL-T-17600. For instructions, read [Installation Instruction #107](#).



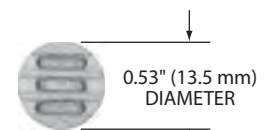
## AC191 terminal block

Two tin-plated brass terminals. PTFE body. Meets MIL-T-17600. Read [Installation Instruction #121](#) for instructions.



## AC192 terminal block

Three tin-plated brass terminals. Glass-filled PTFE body.



## AC195 terminal block

Same as AC192 except polyamide-imide body for radiation resistance to 10<sup>9</sup> rads.

## AC197 terminal block

Three tin-plated brass terminals. Glass-filled PTFE body.








## AC196 terminal block

Same as AC197 except polyamide-imide body for radiation resistance to 10<sup>9</sup> rads.

▼ = **STANDARD OPTIONS**  
Specifications subject to change

# Bolt on RTDs

	Dimensions W x L x T (max.)	Temp. range	Element options	Case material	Leadwire	Model
	0.50 x 1.00 x 0.188" (12.7 x 25.4 x 4.8 mm) w/ 0.161" (4.1 mm) diameter hole	-70 to 500°C (-94 to 932°F)	PD, PF	Stainless steel	AWG 22, Mica-glass insulated	▼ S101730
	0.29 x 1.25 x 0.188" (7.4 x 31.8 x 4.8 mm) with 0.161" (4.1 mm) hole	-70 to 500°C (-94 to 932°F)	PD, PF	Stainless steel	AWG 22, Mica-glass insulated	▼ S101731
	0.265" (6.7 mm) ID ring lug	-50 to 260°C (-58 to 500°F)	PD, PF	Nickel plated copper	2 lead: AWG 24, 3 lead: AWG 26, PTFE insulated	▼ S101732
	0.50 x 0.375 x 0.188" (12.7 x 9.5 x 4.8 mm) with 0.166" (4.2 mm) hole	-50 to 260°C (-58 to 500°F)	PD, PF	Stainless steel	2 lead: AWG 24,	▼ S101733
	1/4" - 20 x 3/8" long thread with 7/16" hex head	-50 to 260°C (-58 to 500°F)	PD, PF	Stainless steel	3 lead: AWG 26, PTFE insulated with SS braid cover	▼ S101734
	M6 x 1 thread, 10 mm long, with 10 mm hex				▼ S101797	

## Overview

Bolt-on temperature sensors are designed for easy installation in industrial and commercial environments. The sensors can be mounted on machines, against process pipes, or embedded directly into a machined part. Threaded fasteners install in seconds and can be easily removed for installation at another location.

These sensors are ideal for process control measurements, test and verification of existing systems, and retrofitting existing machines. Standard designs allow prototyping without high setup costs, while significant discounts are available for large quantities.

Standard platinum and nickel RTD elements provide stable and reliable output compatible with most control and monitoring systems. Physically interchangeable designs allow you to easily customize your installation to different instrumentation. Minco can also provide custom RTD, thermistor or thermocouple elements in these packages, or specialized case designs to meet your application needs.

- Removable and reusable
- Wide temperature range
- Configurations to fit most applications
- Standard 100 Ω platinum, 1000 Ω platinum and 100 Ω nickel elements

## Specifications

**Time constant:** Less than 10 seconds in moving water.

**Insulation resistance:** 10 megohms minimum at 100 VDC, leads to case.

**Vibration:** Withstands 10 to 2000 Hz at 20 G's minimum per MIL-STD-202. Method 204, test condition D.

Element specifications*		Code
Platinum (0.00385 TCR) (EN60751, Class B)	100 Ω ±0.12% at 0°C	▼ PD
Platinum (0.00385 TCR)	1000 Ω ±0.12% at 0°C	▼ PF
Nickel 0.00618 TCR)	100 Ω ±0.22% at 0°C	NB

## Specification and order options:









S101732	Model number from table
PD	Element code from table
3	Number of leads: ▼: 2 or 3 2 leads not recommended for PD models
S	Leadwire covering: ▼ G = Mica-glass (S101730 and S101731) ▼ T = PTFE (S100722, S101732, S101733, S101734, and S101797) ▼ S = Stainless steel braid over PTFE insulated leads (S100722, S101732, S101733, S101734, and S101797)
40	Leadwire length (inches): 40" (1000 mm) standard ▼: 40, 120
S101732PD3S40 = Sample part number	



**STOCKED PARTS AVAILABLE**

▼ = **STANDARD OPTIONS**  
Specifications subject to change

# Economy RTDs

	Dimensions	Temperature range	Element options	Case material	Leadwire	Model
	2 leads: .050" x .065" x .035" thick (1.3 x 1.7 x .9 mm) Thin-Film with insulated leads 3 leads: .063" x .098" x .035" thick (1.6 x 2.5 x .9 mm) Thin-Film with insulated leads	-50 to 150°C (-58 to 302°F)	PD, PF	Ceramic	AWG 32 solid enamel insulated	▼ S102404
	Ø .125" x .90" (Ø 3.2 x 22.9 mm)	-50 to 260°C (-58 to 500°F)	PD, PF	Stainless steel	AWG 26, PTFE insulated	▼ S102409
	Ø .125" x .90" (Ø 3.2 x 22.9 mm)	-50 to 155°C (-58 to 311°F)	PD, PF	Stainless steel	AWG 30, PTFE insulated	▼ S102737
	Ø .140" x .40" (Ø 3.6 x 10.2 mm)	-70 to 500°C (-94 to 932°F)	PD, PF	Ceramic	AWG 27, solid glass insulated nickel	▼ S102410
	Ø .188" x .90" (Ø 4.8 x 22.9 mm)	-50 to 150°C (-58 to 302°F)	PD, PF	Silicone rubber	AWG 24, silicone rubber insulated	▼ S102406
	Ø .188" x 1.25" (Ø 4.8 x 31.8 mm)	-50 to 230°C (-58 to 446°F)	PD, PF	PTFE	AWG 24, PTFE with PTFE jacket	▼ S102405
	Ø .188" x 1.25" (Ø 4.8 x 31.8 mm)	-50 to 260°C (-58 to 500°F)	PD, PF	Aluminum	AWG 22, PTFE insulated	▼ S102407
	Ø .188" x 2.38" (Ø 4.8 x 60.5 mm)	-70 to 550°C (-94 to 1022°F)	PD, PF	Stainless steel	AWG 22, glass braid insulated	▼ S102408

## Overview

Economy sensors are designed to be a component of your final assembly. With insulated leads preattached and strain relieved, final construction is easy and reliable.

- Insulated leads of variable length, installed and strain relieved
- Wide temperature range
- Configurations to fit most applications
- Standard 100 Ω platinum, 1000 Ω platinum and 120 Ω nickel elements

## Specifications

**Insulation resistance:** 10 megohms minimum at 100 VDC, leads to case.

**Vibration:** Withstands 10 to 2000 Hz at 20 G's minimum per MIL-STD-202. Method 204, test condition D.

Element specifications*	Code
Platinum (0.00385 TCR) 100 Ω ±0.12% at 0°C (EN60751, Class B)	▼ PD
Platinum (0.00385 TCR) 1000 Ω ±0.12% at 0°C	▼ PF

\* See descriptions for element options on each model.

## Specification and order options

S102408	Model number from table
PD	Element code from table
3	<b>Number of leads:</b> ▼ 2 leads (not recommended for PD models) or ▼ 3 leads (only option for S102410PD)
G	<b>Leadwire covering:</b> ▼ E = Enamel (S102404) ▼ G = Glass (S102408 and S102410) ▼ R = Silicone rubber (S102406) ▼ T = PTFE (S102405, S102407, S102409, S102737)
40	<b>Leadwire length in inches:</b> 40" (1000 mm) standard ▼ : 40, 120
S102408PD3G40 = Sample part number	



**STOCKED PARTS AVAILABLE**

▼ = STANDARD OPTIONS  
Specifications subject to change

# Non-Metallic Case Miniature Sensors

## Overview

Non-metallic case miniature sensors are designed for easy installation for industrial and commercial applications. These sensors can be installed directly into drilled holes in components such as bearings or machined parts, as well as onto surfaces of existing equipment. Non-metallic sensors can also be installed into end turn windings of motors and in other equipment. Standard cases are manufactured from DAP (Diallyl Phthalate) and elements are fully encapsulated with high temperature, thermally conductive epoxy.

Due to the electrical insulation properties of the case material, these sensors are ideal for high voltage applications. Standard designs provide low cost options in a variety of sizes and configurations.

Platinum RTD elements provide stable and reliable output compatible with most control and monitoring systems. Alternatively, interchangeable thermocouple designs allow you to easily customize your installation to different instrumentation.

- Wide temperature ranges
- Configurations to fit most applications
- Standard 100 ohms platinum and 1,000 ohm platinum RTD elements, as well as nickel element options.
- Type E, J, K, or T thermocouple options

## Case Styles

The illustrations to the right show Minco's standard case styles. Sensors are available in a variety of cylindrical cases for inserting directly into drilled holes, or rectangular cases for mounting on surfaces or embedding into a process. In addition, Minco offers several configuration options, including choices for leadwire lengths and leadwire coverings.

We can also provide custom solutions for your sensor needs, including non-standard elements (such as thermistors) and custom sensor dimensions and materials.

## Specifications

Time Constant: Less than 10 seconds in moving water.

Insulation Resistance: 10 megohms minimum at 100 VDC, leads to outer surface of the case.

Dielectric Strength: 1500 Volts RMS at 60 Hz, leads to outer surface of the case.






Vibration: Withstands 10 to 2000 Hz at 20 G's minimum per MIL-STD-202, Method 204, test condition D.

## Case Styles



# Non-Metallic Case Miniature Sensors

## RTD Specification and Options




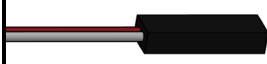

	Model number	Case dimensions	RTD Element options	Leadwire options	AWG Single 2 lead	AWG Single 3 lead	AWG Single 4 lead	AWG Dual element	Temp range	Lead Covering options
	S239391	.125" diameter, .250" length	PA, PD, PE, PF, PM, NA	V,W,X,Y,Z	24	26	30	30	-50 to 200°C (-58 to 392°F)	T, S, F, R, E
	S239392	.125" diameter, .375" length								
	S239393	.125" diameter, .500" length								
	S239394	.188" diameter, .500" length	PA, PD, PE, PF, PM, NA	U,V,W,X,Y,Z	24	24	28	28	-50 to 200°C (-58 to 392°F)	T, S, F, R, E
	S239395	.188" diameter, .500" length								
	S239396	.188" diameter, .500" length								
	S239397	.250" diameter, .500" length	PA, PD, PE, PF, PM, NA	U,V,W,X,Y,Z	24	24	24	28	-50 to 200°C (-58 to 392°F)	T, S, F, R, E
	S239398	.250" diameter, .500" length								
	S239399	.250" diameter, .500" length								
	S239447	.177" wide X .110" thick X .500 Long	PA, PD, PE, PF, PM, NA	U,V,W,X,Y,Z	24	26	26	NA	-50 to 200°C (-58 to 392°F)	T, S, F, R, E
	S239448	.155" wide X .155" thick X .495 Long	PA, PD, PE, PF, PM, NA	U,V,W,X,Y,Z	24	26	30	30	-50 to 200°C (-58 to 392°F)	T, S, F, R, E

### S239394 Model number from table

PD	<p>RTD sensing element</p> <p>PD: Platinum (0.00385 TCR), 100Ω ± .12% at 0°C (Meets EN60751, Class B)</p> <p>PF: Platinum (.00385 TCR), 1000 Ω ± .12% at 0°C (Meets EN60751, Class B)</p> <p>PE: Platinum (.00385 TCR) 100 Ω ± .36% at 0°C</p> <p>PM: Platinum (.00385 TCR) 100 Ω ± .06% at 0°C (Meets EN60751, Class A)</p> <p>PA: Platinum (.00392 TCR) 100 Ω ± .36% at 0°C</p> <p>NA: Nickel (.00672 TCR) 120 Ω ± .50% at 0°C</p> <p>*Repeated Element Code (i.e.. PDPD) Indicates Dual Sensing Elements</p>
Z	<p>Number of leads, 2, 3 or 4 (4 leads not available on all models). 2 leads not available on PD or PM elements</p> <p>Single element:</p> <p>Y: 2 leads, RW</p> <p>Z: 3 leads, RWW (Minco US lead colors)</p> <p>W: 3 leads, WRR (IEC 60751 lead colors)</p> <p>X: 4 leads, RRWW</p> <p>Dual element:</p> <p>Y: 2 leads/element, RW/BIY</p> <p>V: 2 leads per element, WR/YBk (IEC 60751 lead colors)</p> <p>Z: 3 leads per element, RWW/BIYY (Minco U.S. lead colors)</p> <p>W: 3 leads per element, WRR/YBkBk (IEC 60751 lead colors)</p> <p>X: 4 leads per element, RRWW/BIBIYY (Minco U.S. lead colors)</p> <p>U: 4 leads per element, WWRR/YYBkBk (IEC 60751 lead colors)</p>
S	<p>Leadwire Covering:</p> <p>F: FEP Jacket over PTFE Insulated Leads</p> <p>T: PTFE Insulated Leads Only (No Covering)</p> <p>S: Stainless Steel Braid over PTFE Insulated Leads</p> <p>R: FEP Jacket over Stainless Steel Braid and PTFE Insulated Leads</p> <p>E: FEP Jacket over Stainless Steel Braid and PTFE Insulated Leads with Elastomer Fill (max fill length 144")</p>
36	Length in inches
S239394PDZS36 = Sample Part Number	

# Non-Metallic Case Miniature Sensors

## Thermocouple Specification and Options

	Model number	Case dimensions	Junction type	Leadwire covering	AWG	Temp range
	TC239391	.125" diameter, .250" length	E,J,K,T (available in single element configurations)	T,S,F,R,E	24	-184 to 200°C (-299 to 392°F)
	TC239392	.125" diameter, .375" length				
	TC239393	.125" diameter, .500" length				
	TC239394	.188" diameter, .250" length	E,J,K,T (available in single element configurations)	T,S,F,R,E	24	-184 to 200°C (-299 to 392°F)
	TC239395	.188" diameter, .375" length				
	TC239396	.188" diameter, .500" length				
	TC239397	.250" diameter, .250" length	E,J,K,T (available in single element configurations)	T,S,F,R,E	24	-184 to 200°C (-299 to 392°F)
	TC239398	.250" diameter, .375" length				
	TC239399	.250" diameter, .500" length				
	TC239447	.177" wide X .110" thick X .500 Long	E,J,K,T (available in single element configurations)	T,S,F,R,E	24	-184 to 200°C (-299 to 392°F)
	TC239448	.155" wide X .155" thick X .495 Long	E,J,K,T (available in single element configurations)	T,S,F,R,E	24	-184 to 200°C (-299 to 392°F)

### TC239394 Model number from table

K	Thermocouple Type: E, J, K or T
U	Ungrounded thermocouple junction
S	Leadwire Covering: F: FEP Jacket over PTFE Insulated Leads T: PTFE Insulated Leads Only (No Covering) S: Stainless Steel Braid over PTFE Insulated Leads R: FEP Jacket over Stainless Steel Braid and PTFE Insulated Leads E: FEP Jacket over Stainless Steel Braid and PTFE Insulated Leads with Elastomer Fill (max fill length 144")
36	Length in inches
<b>TC239394KUS36</b> = Sample Part Number	