





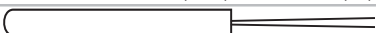






Section 11: Ceramic Elements

- Low cost thin-film elements
 - Wire wound elements
 - Accurate sensing from -200 to 850°C (-328 to 1582°F)
 - Wide choice of sizes and styles for application versatility
 - Available from stock
- | | |
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Wire-Wound and Thin-Film Elements

Dimensions in inches (mm)	R (0°C)	Temperature range	Leads	Model
550°C wire-wound elements				
0.040 \emptyset (1.020) 	0.45 (11.4) 0.75 (19)	100 Ω -20 to 550°C (-4 to 1022°F) -100 to 550°C (-148 to 1022°F)	0.006" (0.15 mm) \emptyset Platinum	S200PD
0.058 \emptyset (1.47) 	0.40 (10.2) 0.75 (19)		0.010" (0.25 mm) \emptyset Platinum alloy	S201PD
0.077 \emptyset (1.96) 	0.30 (7.6) 0.75 (19)			S202PD
0.100 \emptyset (2.54) 	0.40 (10.2) 0.75 (19)		0.014" (0.35 mm) \emptyset Platinum alloy	S203PD
0.135 \emptyset (3.43) 	0.40 (10.2) 0.75 (19)		0.014" (0.35 mm) \emptyset Platinum	S204PD
0.077 \emptyset (1.96) 	1.00 (25.4) 0.75 (19)		0.010" (0.25 mm) \emptyset Platinum alloy	S212PG
0.135 \emptyset (3.43) 	1.20 (30.5) 0.75 (19)	0.014" (0.35 mm) \emptyset Platinum	S214PG	
400°C and 600°C thin-film elements				
0.05 (1.3)  0.07 (1.7)	0.025 (0.7) THICK Lead length: 0.4 (10)	100 Ω 1,000 Ω	-50 to 400°C (-58 to 752°F) 0.010" (0.25 mm) \emptyset Ag .0004 Ω /mm/lead	S100144PD12 S101503PF12
0.08 (2.0)  0.09 (2.3)	0.055 (1.4) THICK Lead length S245: 0.6 (15) S249: 0.4 (10)	100 Ω	-70 to 400°C (-94 to 752°F) 0.010" (0.25 mm) \emptyset Ag .0004 Ω /mm/lead -70 to 600°C (-94 to 1112°F) 0.008" (0.20 mm) \emptyset Pt/Ni 0.003 Ω /mm/lead	S245PD12 S249PD12
0.08 (2.0)  0.20 (5.0)	0.055 (1.4) THICK Lead length S247: 0.6 (15) S251: 0.4 (10)	1,000 Ω	-70 to 400°C (-94 to 752°F) 0.010" (0.25 mm) \emptyset Ag .0004 Ω /mm/lead -70 to 600°C (-94 to 1112°F) 0.008" (0.20 mm) \emptyset Pt/Ni 0.003 Ω /mm/lead	S247PF12 S251PF12
0.10 (2.5)  0.20 (5.0)	0.050 (1.3) THICK Lead length: 0.6 (15)	10,000 Ω	-50 to 400°C (-58 to 752°F) 0.010" (0.25 mm) \emptyset Ag .0004 Ω /mm/lead	S19827PS12
Other standard models:		Custom models:		
<ul style="list-style-type: none"> • Class A tolerance = $\pm 0.15^\circ\text{C}$ at 0°C • $R(0^\circ\text{C}) = 500 \Omega$ • Dimensions: $1.6 \times 5 \text{ mm}$, $2 \times 10 \text{ mm}$ • Nickel, TCR = $0.00618 \Omega/\Omega/^\circ\text{C}$, -50 to 150°C 		<ul style="list-style-type: none"> • Special dimensions or shapes • Longer leadwires (to 100 mm) • Insulated extension leads (see page 11-4) • Special $R(0^\circ\text{C})$, TCR, or tolerance 		

550°C wire-wound elements

Use these elements for general purpose sensing in probes or equipment. PD models meet EN60751, Class B.

Order by model number.

Temperature range: See table above. Some elements may be used down to -269°C in certain applications. Contact factory for advice on cryogenic use.

Material: Glass-coated ceramic.

Tolerance: $\pm 0.1\%$ at 0°C .

TCR: $0.00385 \Omega/\Omega/^\circ\text{C}$. Models with 0.00391 TCR , the U.S. industrial standard, are: S201PB, S202PB, S203PB, S204PB, S212PP, S214PP. All 0.00391 TCR models use $0.010"$ (0.25 mm) diameter $0.5"$ (13mm) long platinum leads.

Diameter tolerance: $\pm 0.005"$ (0.13 mm).

Length tolerance: $\pm 0.06"$ (1.5 mm).

Repeatability: $\pm 0.1^\circ\text{C}$ or better.

Stability: Drift less than $0.1^\circ\text{C}/\text{year}$ in normal use.

Vibration: Withstands 20 G's minimum at 10 to 2,000 Hz.

Shock: Withstands 100 G's minimum sine wave shock of 8 milliseconds duration.

IN STOCK

All 0.00385 TCR models

Thin-film elements

Thin film elements offer low cost and resistances to $10\text{k} \Omega$. See page 10-2 for the S17624 thin-film Thermal-Ribbon™.

Order by model number.

Optional Class A tolerance: Change 12 to 06 for $\pm 0.06\%$ (EN60751 Class A). Not available with S19827PS.

Material: Aluminum oxide substrate with fused glass cover.

Dimensional tolerance: $\pm 0.02"$ (0.5 mm).

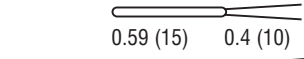
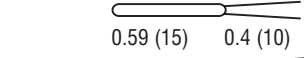
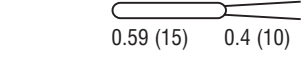
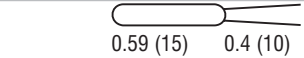
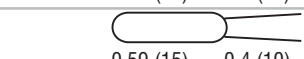
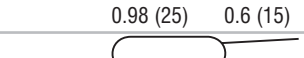
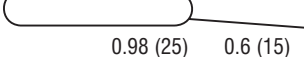
Repeatability: $\pm 0.1^\circ\text{C}$ or better.

Stability: Drift less than $0.1^\circ\text{C}/\text{year}$ in normal use.

Vibration: Withstands 20 G's minimum at 10 to 2,000 Hz.

Shock: Withstands 100 G's minimum sine wave shock of 8 milliseconds duration.

850°C Precision Elements

Dimensions in inches (mm)	Leads	Response time in seconds				Self-Heating Water, 1 m/s °C/mW	Model
		Water, 0.4 m/s		Air, 1.5 m/s			
		50%	90%	50%	90%		
0.047 ø (1.2) 	0.006" (0.15 mm) ø Platinum Resistance: 0.0055 Ω/mm/lead	0.06	0.15	3.5	12.5	0.100	S270*
		0.07	0.20	6.0	20.0	0.040	S271*
0.062 ø (1.6) 	0.010" (0.25 mm) ø Platinum Resistance: 0.002 Ω/mm/lead	0.07	0.30	6.6	25.4	0.029	S272
		0.08	0.35	7.0	25.0	0.020	S273
0.079 ø (2.0) 	0.010" (0.25 mm) ø Platinum Resistance: 0.002 Ω/mm/lead	0.08	0.35	7.0	24.0	0.012	S274
		0.09	0.45	7.5	25.3	0.008	S275
0.110 ø (2.8) 	0.010" (0.25 mm) ø Platinum Resistance: 0.002 Ω/mm/lead	0.13	0.55	9.3	30.0	0.014	S276
		0.16	0.70	10.5	34.1	0.011	S277
0.155 ø (3.9) 	0.014" (0.36 mm) ø Platinum Resistance: 0.001 Ω/mm/lead	0.29	1.24	14.3	43.3	0.011	S278
		0.35	1.55	16.0	48.0	0.010	S279
0.177 ø (4.5) 	0.014" (0.36 mm) ø Platinum Resistance: 0.001 Ω/mm/lead	0.31	1.50	17.0	51.0	0.012	S280
		0.41	1.60	18.0	54.0	0.008	S281
0.188 ø (4.8) 	0.014" (0.36 mm) ø Platinum Resistance: 0.001 Ω/mm/lead	0.32	1.58	17.3	52.1	0.012	S282
		0.43	1.65	18.4	54.8	0.008	S283

*Not available with factory installed extension leads AC887/AC888/AC889/AC101828

Obtain accurate measurements over a wide temperature range. A proprietary fill material supports the element wire without straining it, giving exceptional resistance to shock, vibration, and temperature-induced hysteresis.

IN STOCK

All models

Specifications

Element: Platinum, 100 Ω at 0°C, TCR = 0.00385 Ω/Ω/°C.
Tolerance: EN60751 Class A (± 0.06%) or Class B (± 0.12%). Calibrated 1 mm from ends of leads.
Temperature range: -200 to 850°C (-328 to 1562°F).
Diameter tolerance: ±0.005" (0.13 mm).
Length tolerance: ±0.06" (1.5 mm).
Repeatability: Meet IEC requirements. Typical shift less than 0.05°C (0.02 Ω) at 0°C after ten cycles from -200 to 850°C.
Stability: Meet IEC stability specifications after 250 hours exposure to extremes of temperature range. Typical drift is less than 0.05°C (0.02 Ω) at 0°C.
Vibration: Will withstand 10 to 5000 Hz at 2 G's minimum.
Shock: Will withstand 250 mm drop onto 8 mm thick steel plate (approximately 1400 G's for 0.08 ms).
Immersion: Elements are not hermetically sealed.

How to Order 850°C Elements

S276	Model number from table
PD	100 Ω Platinum, 0.00385 TCR
12	Tolerance at 0°C: 06 = ±0.06%, EN60751 Class A 12 = ±0.12%, EN60751 Class B Other tolerances are available
S276PD12 ← Sample P/N	

Installation and Accessories

Ceramic elements can be assembled into probes or potted inside holes in heat sinks and platens. Ceramic cement is recommended for high temperature potting. Epoxy is recommended for intermediate temperatures.

Round elements will provide the best time response in round sheaths and holes. Flat thin film elements can be bonded to surfaces.

Elements are calibrated at the end of their leads. The leads have resistances ranging from 0.6 to 2.4 Ω per foot, so you

should connect extension leads as close as possible to the end of the element leads to maintain tolerance.

Minco can supply elements with extension leadwires welded onto the sensor leads. Use the standard models below or contact us for a quote on your custom design.

One final note: Ceramic elements are fragile and can suffer damage or loss of accuracy from improper installations. In many cases, the best alternative is to buy a complete encased probe assembly

from Minco. Take advantage of our expertise and equipment for best overall performance and value.

#8 high temperature cement

#8 comes as a powder in 1 oz. packages. Just add water to form a potting compound rated to 850°C (1562°F).



Extension leads

All elements are available with factory-welded extension leads insulated with PTFE, polyimide, or mica/glass.

Insulation	Max. temp.	Lead AWG	Max. diameter over lead bundle in inches (mm)			Model
			2 leads	3 leads	4 leads	
PTFE, PTFE tubing over connections	200°C (392°F)	22	0.136 (3.45)	0.143 (3.63)	0.157 (3.99)	AC887
		24	0.122 (3.10)	0.124 (3.15)	0.147 (3.73)	
		26	0.113 (2.87)	0.119 (3.02)	0.123 (3.12)	
		28	0.110 (2.79)	0.116 (2.95)	0.118 (3.00)	
		30	0.100 (2.54)	0.101 (2.57)	0.103 (2.62)	
Mica/glass, glass braid over connections	550°C (1022°F)	22	0.157 (3.99)	0.192 (4.88)	0.195 (4.95)	AC888
Polyimide, PTFE tubing over connections	200°C (392°F)	22	0.123 (3.12)	0.141 (3.58)	0.148 (3.76)	AC889
		26	0.116 (2.95)	0.131 (3.33)	0.132 (3.35)	
		30	0.095 (2.41)	0.102 (2.59)	0.107 (2.72)	
Glass braid, glass braid over connections	550°C (1022°F)	27 solid leads	0.100 (2.54)	0.117 (2.97)	0.130 (3.30)	AC101828

How to order extension leads

AC887	Model Number
Z	Number of leads: Y = 2 leads Z = 3 leads X = 4 leads
26	Lead gauge (AWG)
L	
48	Lead length in inches
AC887Z26L48 ← Sample P/N	

Custom elements

Shown below are examples of custom design:

- A dual ceramic sensor used for air flow sensing
- Two resistor-style RTDs



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