

# OMEGAFILM®

# Platinum Thin Film RTD Elements for OEM Applications

If you've been paying too much for RTD elements...

**Look at this!  
New Lowest  
Prices!**

F2020-100, \$0.75  
each, shown larger  
than actual size.

**High Quality at an  
OEM Price!**

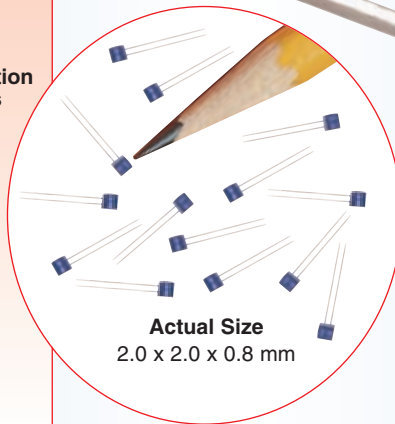
Glass coating  
over wire bonds

Connection  
wires

Connection pad

Ceramic base

Platinum thin film layer  
with glass coating



**\$0.75 ea**  
Sold in  
Packages of  
100 Elements

## The Most Popular Platinum Thin Film Elements **Off the Shelf!**

- ✓ Available in Class-A, Class-B and 1/3 DIN Accuracies
- ✓ Temperature Range: -70 to 500°C (-94 to 932°F)
- ✓ Available in 100, 500 and 1000 Ω Configurations
- ✓ Resistance per IEC/DIN 60751
- ✓ Faster Response than Most Wire Wound Elements
- ✓ Small Size is Perfect for Use in Tight Places
- ✓ Flat Package Allows for Easy Surface Mounting



*Omega's Award-Winning  
Class 10 Clean Room*

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information

# Popular Thin-Film Elements

Now Available!

**F4050**  
Starts at \$1.50

F4050-100, starts at \$1.50, shown larger than actual size.

Actual Size  
4.0 x 5.0 x 0.8 mm

**F2020**  
Starts at \$0.75

**MOST POPULAR!**

F2020-100, starts at \$0.75, shown larger than actual size.

Actual Size  
2.0 x 2.0 x 0.8 mm

**F1540**  
Starts at \$1.50

F1540-100, starts at \$1.50, shown larger than actual size.

Actual Size  
1.5 x 4.0 x 0.8 mm

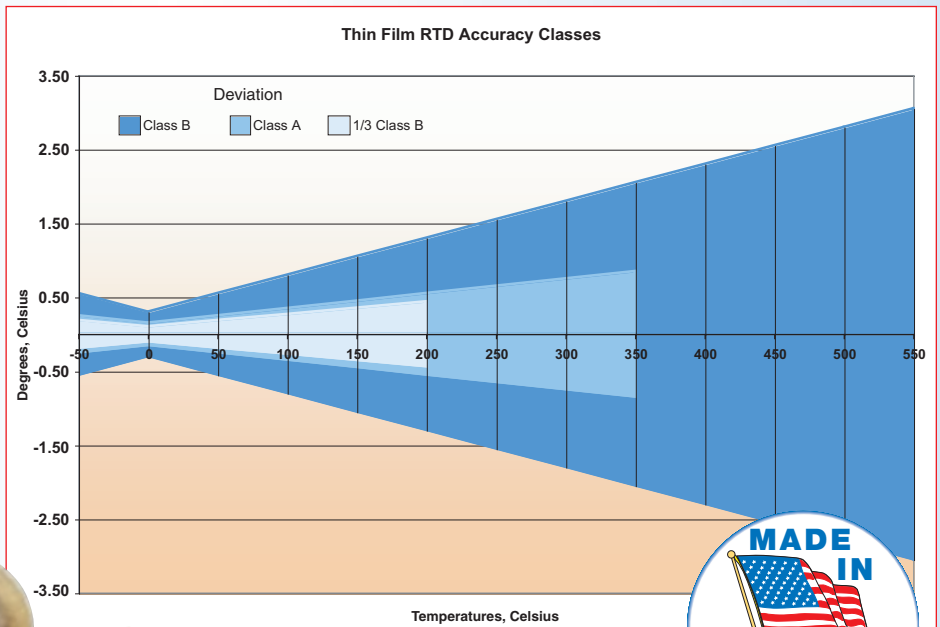
**F2010**  
Starts at \$1.50

F2010-100, starts at \$1.50, shown larger than actual size.

Actual Size  
2.0 x 9.5 x 0.8 mm

## Highest Quality...OEM Prices, You Can't Buy Them For Less!

- ✓ Available in Class-A, Class-B and 1/3 DIN Accuracies
- ✓ Element Design Has Been Extensively Tested to Ensure Performance
- ✓ Other Sizes Available, Call for Details
- ✓ Lead Wires and Accessories Also Available
- ✓ OEM Pricing When Purchased in Packages of 100 or more (Packaged in Multiples of 100)



Visit [omega.com](http://omega.com) for Complete Ordering Information on All RTD Accessories

EXTT-3CUI-24S-SB, RTD extension 3-wire stainless steel overbraided, starts at \$54 for a 7.5 M (25') spool.

OTP-U-M, 3-pin standard RTD connectors, \$3.50 each

HPC-AU-P, uncompensated RTD contact pins, \$15 per pkg of 20.

MTP-U-M, 3-pin miniature RTD connectors, \$2.50 each

EXGG-4CUI-24S, RTD extension 4-wire, starts at \$26 for a 7.5 M (25') spool.



IN STOCK!

### RTD Accessories: Wire and Connectors (2 or 3-Pin and Multi-Pin)

- ✓ 2, 3 or 4 #24 or #26 AWG
- ✓ Stranded (7 x 32) Nickel Plated Copper Conductors
- ✓ Fiberglass, PFA or PVC Insulated and Jacketed, Twisted or Parallel, Stainless Steel Overbraided
- ✓ 2 Color Codes Available, Black/Red or Red/White

# Flat Profile Thin Film Platinum for OEM Applications

- Very Low Cost
- Flat, Small Profile
- Resistance Meets Requirements of IEC60751
- Temperature Range -70 to 500°C (-94 to 932°F)
- Temperature Coefficient  $\alpha = 0.00385 \Omega/\Omega/^\circ\text{C}$
- 100, 500, and 1000  $\Omega$  Configurations
- Class A, B, and 1/3 B DIN Tolerances
- Long-Term Stability—Max R0 Drift 0.4% after 1000 Hours at 500°C (932°F)
- Vibration Resistance at Least 40 g Acceleration at 10 to 2000 Hz
- Shock Resistance at 100 g Acceleration with 8 ms Half Sine Wave
- Insulation Resistance >10 M $\Omega$  at 20°C, >1 M $\Omega$  at 500°C
- Self Heating 0.4 K/mW at 0°C
- Response Time Water Current ( $v = 0.4 \text{ m/s}$ )  $t_{0.5} = 0.2 \text{ s}$ ,  $t_{0.9} = 0.4 \text{ s}$ ; Air Stream ( $v = 1 \text{ m/s}$ )  $t_{0.5} = 3.0 \text{ s}$ ,  $t_{0.9} = 9.0 \text{ s}$
- Platinum Clad Nickel Wire Leads 10 L x 0.2 mm D (0.39 x 0.008")

**MOST ECONOMICAL!**

**"F" Series, Sold in Packages of 100 Elements**

Starts at **\$0.75** per element

Labels in diagram: Glass coating over wire bonds pattern, Connection wires, Connection pad, Platinum thin film layer, Ceramic base.

### Tolerance

Class	Tolerance ( $^\circ\text{C}$ )	Tolerance of resistance at 0 $^\circ\text{C}$ ( $\Omega$ )	Temperature Range
1/3B	$\pm\frac{1}{2} (0.30 + 0.005t)$	$\pm 0.04$	0 to 200 $^\circ\text{C}$
A	$\pm(0.15 + 0.002t)$	$\pm 0.06$	-70 to 500 $^\circ\text{C}$
B	$\pm(0.3 + 0.005t)$	$\pm 0.12$	-70 to 500 $^\circ\text{C}$

**MOST POPULAR MODELS HIGHLIGHTED!**

To Order (Specify Model Number)				
Model Number	Dimensions mm (in)	Size mm (in) W x L x H	Nominal Resistance ( $\Omega$ )	Price Per Pack (100/pk)
F2020-100-B		2.0 x 2.0 x 0.8 (0.078 x 0.078 x 0.031)	100	\$75 (0.75 each)
F2020-100-A			100	90 (0.90 each)
F2020-100-1/3B			100	225 (2.25 each)
F2020-1000-B			1000	100 (1.00 each)
F2020-1000-A			1000	175 (1.75 each)
F2020-1000-1/3B			1000	225 (2.25 each)
F2010-100-B		2.0 x 9.0 x 0.8 (0.078 x 0.354 x 0.031)	100	\$150 (1.50 each)
F2010-100-A			100	220 (2.20 each)
F2010-100-1/3B			100	335 (3.35 each)
F2010-1000-B			1000	150 (1.50 each)
F2010-1000-A			1000	260 (2.60 each)
F2010-1000-1/3B			1000	335 (3.35 each)
F4050-100-B		4.0 x 5.0 x 0.8 (0.157 x 0.196 x 0.031)	100	\$150 (1.50 each)
F4050-100-A			100	260 (2.60 each)
F4050-100-1/3B			100	335 (3.35 each)
F4050-1000-B			1000	150 (1.50 each)
F4050-1000-A			1000	260 (2.60 each)
F4050-1000-1/3B			100	335 (3.35 each)
F1540-100-B		1.5 x 4.0 x 0.8 (0.059 x 0.157 x 0.031)	100	\$150 (1.50 each)
F1540-100-A			100	260 (2.60 each)
F1540-100-1/3B			100	335 (3.35 each)

Sold in packages of 100 elements. Due to the self heating error by the measuring conditions, the measuring current should be limited to a maximum value. We recommend 100  $\Omega$  max 1 mA; 500  $\Omega$  0.7 mA; 1000  $\Omega$  max 0.3 mA.

Ordering Example: F2020-100-B-100, 100 elements of 2 x 2 x 0.8 mm 100  $\Omega$  Class B tolerance thin film RTD element, 100 x \$0.75 = \$75.

Note: OEM, original equipment manufacturer.

OMEGAFILM® elements are manufactured to meet the requirements of IEC Standard 60751. This standard uses “Classes” to define the accuracy and interchangeability for the elements, the basic resistance vs. temperature characteristics, temperature ranges and other technical information relating to the OmegaFilm RTD elements. Key portions of these requirements are summarized below.

Interchangeability in °C			
Temp °C	Class B	Class A	1/3 DIN
-200	1.30	—	—
-100	0.80	—	—
-50	0.55	0.25	0.18
0	0.30	0.15	0.10
100	0.80	0.35	0.27
200	1.30	0.55	0.43
250	1.55	0.65	—
300	1.80	0.75	—
350	2.05	0.85	—
400	2.30	0.95	—
450	2.55	1.05	—
500	2.80	—	—
600	3.30	—	—

### Accuracy Classes

There are two accuracy “Classes” defined in IEC60751, they are: “Class A” and “Class B”, there are other “Classes” not specified in IEC60751 that are used in industry, they include 1/3DIN and 1/10DIN. These “Classes” are defined as follows:

Tolerance (°C)

Class A =  $\pm(0.15 + 0.002t)$

Class B =  $\pm(0.30 + 0.005t)$

Class 1/3DIN =  $\pm\frac{1}{3}(0.30 + 0.005t)$

t = Temperature °C

Temperature Range

(-200 to 650°C)

(-200 to 850°C)

(0 to 200°C)\*



\* Note: Since there are no temperature ranges for 1/3DIN and 1/10DIN, typical industry standards have been assigned.

### Equations

Platinum RTD resistance can be calculated using the Callendar-Van Dusen Equation as follows:

For temperatures below 0°C:

$$R_t = R_0 [1 + At + Bt^2 + C(t-100)t^3]$$

where: A =  $3.90833 \times 10^{-3}$  (C<sup>-1</sup>)

B =  $-5.7753 \times 10^{-7}$  (C<sup>-2</sup>)

C =  $-4.1833 \times 10^{-12}$  (C<sup>-4</sup>)

R<sub>0</sub> = Resistance at 0°C

t = Temperature 0°C

For temperatures above 0°C, this simplifies to:

$$R_t = R_0 (1 + At + Bt^2)$$

### Maximum Operating Current

The maximum operating current is determined by the amount of electrical current that can be passed through the element without significant self heating occurring. Omega® recommends a maximum operating current of 1 milliamp for all of the 100 ohm elements and sensors we supply. Higher or lower currents may be suitable for other resistances or sensor products, **Omega® recommends testing, for self heating effects before use.**

### Resistance vs. Temperature Values per IEC60751

Temp °C (°F)	Resistance (Ω)	Temp °C (°F)	Resistance (Ω)	Temp °C (°F)	Resistance (Ω)
-200 (-328)	18.52	150 (302)	157.33	450 (842)	264.18
-150 (-238)	39.72	200 (392)	175.86	500 (392)	280.98
-50 (-58)	80.31	250 (482)	194.10	550 (1022)	297.49
0 (32)	100.00	300 (572)	212.05	600 (1112)	313.71
50 (122)	119.40	350 (662)	229.72	650 (1202)	329.64
100 (212)	138.50	400 (752)	247.09	700 (1292)	345.28

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