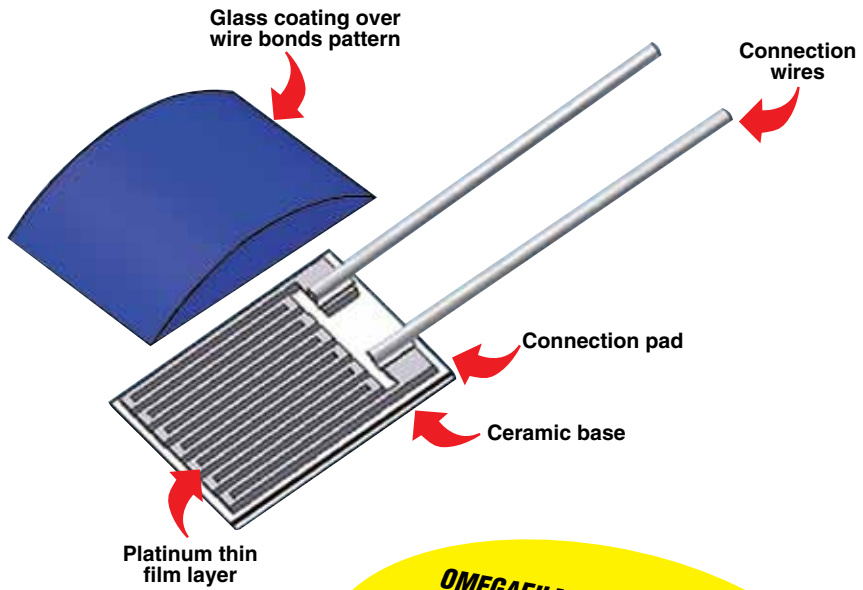
OMEGAFILM® Platinum RTD Sensors

"F" SERIES
In Multiples of 100 Pieces

MADE IN USA

- **Available in Various Sizes, Resistances, and Accuracies**
- **Single and Dual Element Configurations**
- **Flat or Cylindrical Shapes**
- **Response Times Equivalent or Better Than Wire Wound Elements**



OMEGAFILM® Sensing Elements Can Be Used As-Is, or Packaged in a Wide Variety of Sensor Styles. Custom Packaging Options Are Also Available, Contact Omega's Applications Engineering Department to Discuss Your Specific Needs.

OMEGAFILM® platinum RTD elements are manufactured using materials and processes similar to those employed in the manufacture of integrated circuits. This results in a rugged, reliable sensing element that can be produced in a wide range of sizes, resistances, and accuracies to meet even the most demanding of applications.

The resistance vs. temperature relationship of OMEGAFILM RTDs conform to the internationally accepted IEC60751 standard. RTDs conforming to this standard have a temperature coefficient of resistance (also known as Alpha) of 0.00385Ω/Ω/°C between 0 and 100°C.

As a result OMEGAFILM RTD elements can be used worldwide with a multitude of controllers and instruments designed to function within these requirements.

OMEGAFILM RTDs are available in flat, round, and specialty shapes for maximum flexibility. They are also available in resistances at 0°C that include 100, 500, and 1000 Ω depending on the element style (the resistances available for each style will be shown on their individual pages).

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 characterisitcs, temperature ranges and other technical information relating to the OMEGAFILM RTD elements. Key portions of these requirements are summarized below.

Thin Film Interchangeability in °C			
Temp °C	Class B	Class A	⅓ DIN (AA)
-50	0.55	—	—
-30	0.45	0.21	—
0	0.30	0.15	0.10
100	0.80	0.35	0.27
150	1.05	0.45	0.36
200	1.30	0.55	—
300	1.80	0.75	—
400	2.30	—	—
500	2.80	—	—

Accuracy Classes

There are three accuracy “Classes” defined in IEC60751 for film type RTDs, they are: “Class A”, “Class B”, and ⅓ DIN (also known as AA).
These “Classes” are defined as follows:

Tolerance (°C)	Temperature Range*
Class A = ±(0.15 + 0.002t)	(-30 to 300°C)
Class B = ±(0.30 + 0.005t)	(-50 to 500°C)
Class AA (was ⅓ DIN) = ±(0.1 + 0.0017t)	(0 to 150°C)
t = Temperature °C	

Note: *There is also an industry standard 1/10 DIN accuracy not available in film style RTDs.*
**** Note:*** *The temperature ranges shown are not the temperature ratings for the sensors. Temperature ranges for each product have been provided, please see the applicable page.*

Equations

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

For temperatures below 0°C:
$Rt = R0 [1 + At + Bt^2 + C(t-100)t^3]$

For temperatures above 0°C, this simplifies to:
$Rt = R0 (1 + At + Bt^2)$

where: $A = 3.9083 \times 10^{-3}$ (C^{-1})
$B = -5.775 \times 10^{-7}$ (C^{-2})
$C = -4.183 \times 10^{-12}$ (C^{-4})
R0 = Resistance at 0°C
t = Temperature in degrees celsius

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 occuring. 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)	Resistance (Ω)	Temp (°C)	Resistance (Ω)	Temp (°C)	Resistance (Ω)
-200	18.52	150	157.33	450	264.18
-150	39.72	200	175.86	500	280.98
-50	80.31	250	194.10	550	297.49
0	100.00	300	212.05	600	313.71
50	119.40	350	229.72	650	329.64
100	138.50	400	247.09	700	345.28

OMEGAFILM® RTD Elements

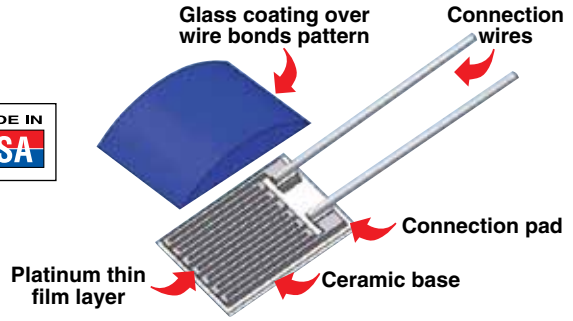
Flat Profile Thin Film Platinum for OEM Applications

Most Economical!

"F" Series, Sold in Multiples of 100 Pieces

- Very Low Cost
- Flat, Small Profile
- Resistance Meets Requirements of IEC60751
- Temperature Range (See Tolerance Table)
- Temperature Coefficient α = 0.00385 Ω/Ω/°C
- 100, 500, and 1000 Ω Configurations
- Class A, B, and AA (⅓ 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 MΩ at 20°C, >1 MΩ at 500°C
- Self Heating 0.4 K/mW at 0°C
- Response Time Water Current (v = 0.4 m/s) t0.5 = 0.2 s, t0.9 = 0.4 s; Air Stream (v = 1 m/s) t0.5 = 3.0 s, t0.9 = 9.0 s
- Platinum Clad Nickel Wire Leads 10 L x 0.2 mm D (0.39 x 0.008")

MADE IN USA

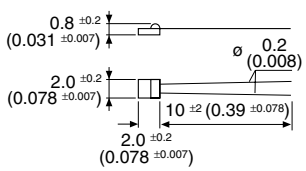
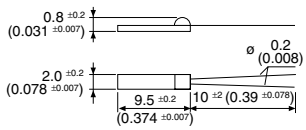
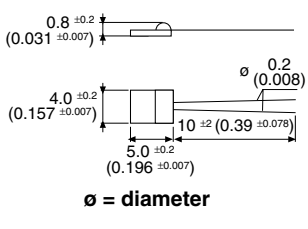
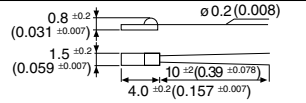


Discount Schedule			
1-4 packs	Net	10-24 packs	10%
5-9 packs	5%	25 or more packs	15%

Tolerance

Class	Tolerance (°C)	Tolerance of resistance at 0°C (Ω)	Temperature Range
AA (⅓ DIN)	±(0.1 + 0.0017t)	±0.04	0 to 150°C
A	±(0.15 + 0.002t)	±0.06	-50 to 300°C
B	±(0.3 + 0.005t)	±0.12	-70 to 500°C

To Order *visit omega.com/f1500_f2000_f4000 for Pricing and Details*

Model Number	Dimensions in mm (1 mm = 0.03937")	Size (mm) W x L x H	Nominal Resitance (Ω)
F2020-100-B		2.0 x 2.0 x 0.8	100
F2020-100-A		2.0 x 2.0 x 0.8	100
F2020-100-1/3B		2.0 x 2.0 x 0.8	100
F2020-1000-B		2.0 x 2.0 x 0.8	1000
F2020-1000-A		2.0 x 2.0 x 0.8	1000
F2020-1000-1/3B		2.0 x 2.0 x 0.8	1000
F2010-100-B		2.0 x 9.0 x 0.8	100
F2010-100-A		2.0 x 9.0 x 0.8	100
F2010-100-1/3B		2.0 x 9.0 x 0.8	100
F2010-500-B		2.0 x 9.0 x 0.8	500
F2010-1000-B		2.0 x 9.0 x 0.8	1000
F2010-1000-A		2.0 x 9.0 x 0.8	1000
F2010-1000-1/3B		1.9 x 9.5 x 0.9	1000
F4050-100-B		4.0 x 5.0 x 0.8	100
F4050-100-A		4.0 x 5.0 x 0.8	100
F4050-100-1/3B		4.0 x 5.0 x 0.8	100
F4050-500-B		4.0 x 5.0 x 0.8	500
F4050-500-A		4.0 x 5.0 x 0.8	500
F4050-1000-B		4.0 x 5.0 x 0.8	1000
F4050-1000-A		4.0 x 5.0 x 0.8	1000
F4050-1000-1/3B		4.0 x 5.0 x 0.8	100
F1540-100-B		1.5 x 4.0 x 0.8	100
F1540-100-A		1.5 x 4.0 x 0.8	100
F1540-100-1/3B		1.5 x 4.0 x 0.8	100

ø = diameter

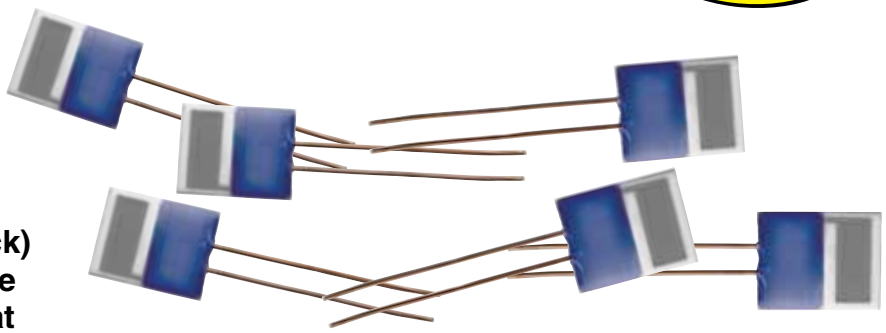
Sold in multiples of 100 pieces.
Due to the self heating error by the measuring conditions, the measuring current should be limited to a maximum value. We recommend 100 Ω max 1 mA; 500 Ω 0.7 mA; 1000 Ω max 0.3 mA.
***Ordering Example: F2020-100-B-100,** 100 pieces of 2 x 2 mm 100 Ω Class B tolerance thin film RTD element*

Thin Film RTD Elements
"F" Series for OEM Applications

Sold in Convenient Packs of 100 Elements

MADE IN USA

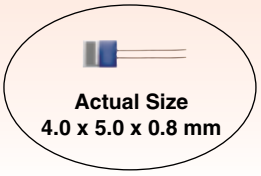
- Some as Small as Thermistors
- Flat Packages (0.8 mm Thick)
- α = 0.00385, IEC60751 Curve
- Accuracy Equivalent to That of Wire-Wound Units
- Better Response Than Wire-Wound Units of Equivalent Size
- 100, 500, and 1000 Ω (See Table Below)



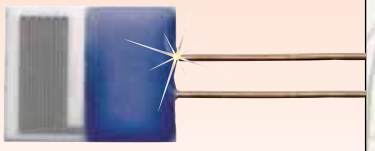
F4050-100-B, shown larger than actual size.

Actual size.

F4050

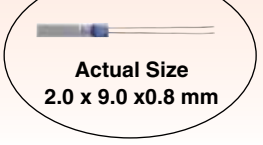


Actual Size
4.0 x 5.0 x 0.8 mm



F4050-100-B, shown larger than actual size.

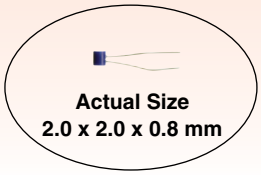
F2010



Actual Size
2.0 x 9.0 x0.8 mm

F2010-100-A, shown larger than actual size.

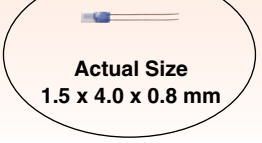
F2020



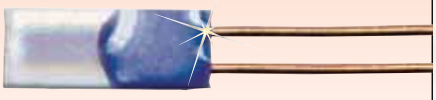
Actual Size
2.0 x 2.0 x 0.8 mm

F2020-100-B, shown larger than actual size.

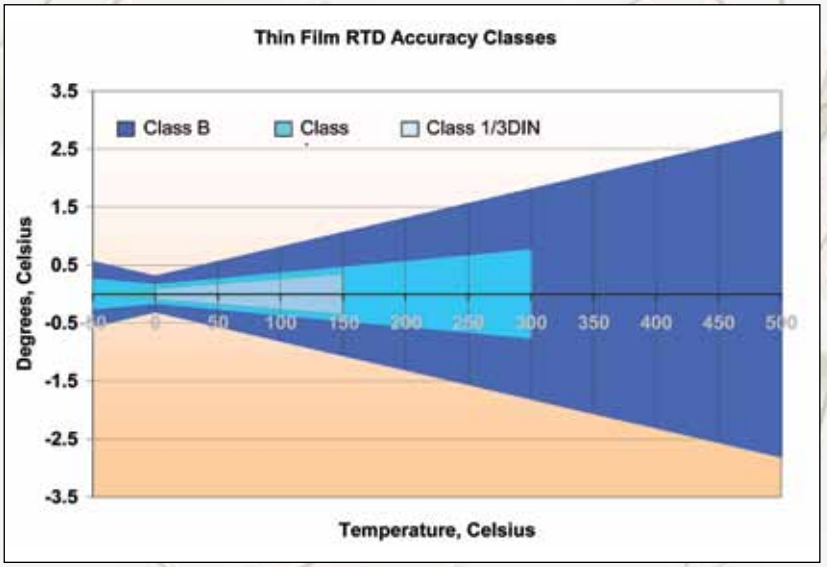
F1540



Actual Size
1.5 x 4.0 x 0.8 mm



F1540-100-1/3B, shown larger than actual size.



Interchangeability in °C			
Temp °C	Class B	Class A	⅓ DIN (AA)
-50	0.55	—	—
-30	0.45	0.21	—
0	0.30	0.15	0.10
100	0.80	0.35	0.27
150	1.05	0.45	0.36
200	1.30	0.55	—
300	1.80	0.75	—
400	2.30	—	—
500	2.80	—	—