Handy Resistor Simulates RTD Temperature Outputs, Such as PT-100 and PT-1000

FEATURES AND BENEFITS

- **Temperature coefficient of resistance (TCR): −55°C to +125°C, 25°C ref.**
  - RTD simulator (C): ±2 ppm/°C typical (see Table 1)
  - RTD simulator (K): ±1 ppm/°C typical (see Table 1)
- Resistance tolerance: to ±0.005% (50 ppm)
- Available temperature range (<–200°C to >+800°C), order your RTD Simulator by desired simulated temperature or resistance value.
- Load life stability: ±0.005% after 2,000 hrs at rated power at 70°C
- Power rating: to 0.6 W at +70°C
- Resistance range: 10 Ω to 5 kΩ (for higher or lower values, please contact us)
- VFR resistors are not restricted to standard values; specific “as required” values can be supplied at no extra cost or delivery (e.g., 1K01234 vs. 1k)
- **Electrostatic discharge (ESD): at least to 25 kV**
- Non-inductive, non-capacitive design
- Rise time: 1 ns effectively no ringing
- Current noise: 0.010 μV_{RMS}/V of applied voltage (<–40 dB)
- Thermal EMF: 0.05 µV/°C
- Voltage coefficient: <0.1 ppm/V
- **Each RTD Simulator based on the Bulk Metal® Foil technology comes with a built-in climate control (CC) feature.**

The only resistor with internal climate isolation.

R = f(T)
Any value can be provided.

Pb-free Available

RoHS* COMPLIANT

Available from our Express Hub
www.resistors4u.com

INTRODUCTION

Calibrate all your RTD inputs

The new foil RTD Simulators can simulate RTDs in all types of instruments, such as transmitters, controllers, and data acquisition, process control, and lab equipment, etc. Each resistance unit comes with certification and printed temperature on the resistor itself. Connect an RTD and instantly read the temperature indicated on the resistor.

Better than a decade box—faster, easier, and much less expensive

This new RTD Simulator is a complete compact simulator for checkout and calibration of all RTD instruments in the field, shop, or control room.

The long-term stability conditions of the RTD Simulator are regulated with respect to temperature and humidity.

CLIMATE CONTROL (CC)

Two predictable and opposing physical phenomena within the composite structure of the resistive alloy and its substrate are keys to the low absolute TCR capability of a Bulk Metal Foil resistor:

- Resistivity of the resistive alloy changes directly with temperature in free air (resistance of the foil increases when temperature increases.)
- The Coefficient of Thermal Expansion (CTE) of the alloy and the substrate to which the foil alloy is cemented are different, resulting in a compressive stress on the resistive alloy when temperature increases (resistance of the foil decreases due to compression caused by the temperature increases).

The TCR of the foil resistor is achieved by matching two opposing effects—the inherent increase in resistance due to temperature increase vs. the compression—related decrease in resistance due to that same temperature increase. The two effects occur simultaneously, resulting in an unusually low, predictable, repeatable, and controllable TCR.

Due to VPG’s Bulk Metal Foil resistor design, this TCR characteristic is accomplished automatically, without selection, and regardless of the resistance value or the date of manufacture—even if years apart!

Note

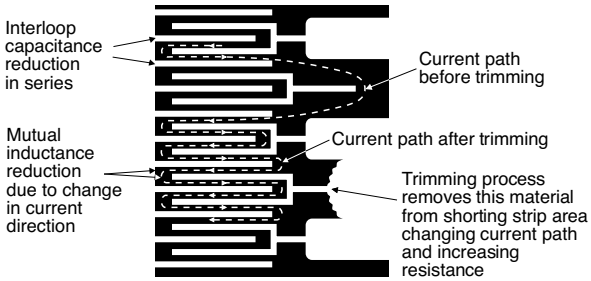
* This datasheet provides information about parts that are RoHS-compliant and/or parts that are non-RoHS-compliant. For example, parts with lead (Pb) alloy-plated terminations are not RoHS compliant. Please see the information/tables in this datasheet for details.

Table 1—Resistance vs. TCR
(–55°C to +125°C, +25°C Ref.)

RTD SIMULATOR	RESISTANCE VALUE (Ω)	NOMINAL TCR AND MAX. SPREAD (ppm/°C)
RTD-K	80 to <5k	±1 ±2.5
RTD-C	80 to <5k	±2 ±2.5
RTD-K	50 to <80	±1 ±3.5
RTD-C		±2 ±3.5
RTD-K	10 to <50	±1 ±4.5
RTD-C		±2 ±4.5

(1) C refers to C Foil Alloy; K refers to the K Foil Alloy.

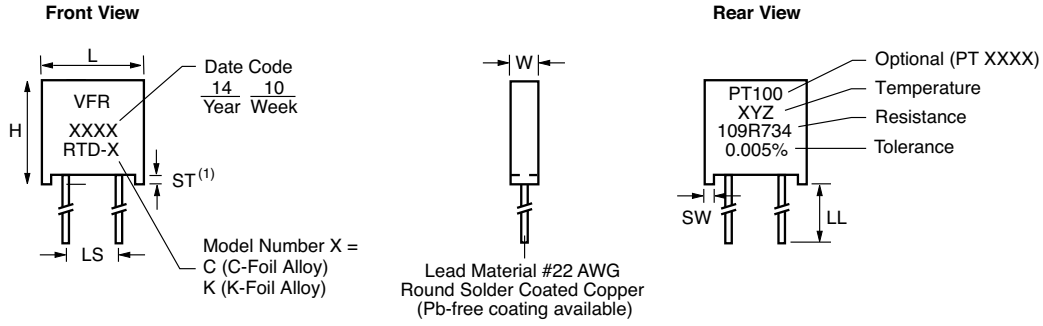
Figure 1—Trimming to Values
(conceptual illustration)



Foil shown in black, etched spaces in white

Note
To acquire a precision resistance value, the Bulk Metal Foil chip is trimmed by selectively removing built-in "shorting bars." To increase the resistance in known increments, marked areas are cut, producing progressively smaller increases in resistance. This method reduces the effect of "hot spots" and improves the long-term stability of VFR resistors.

Figure 2—Standard Imprinting and Dimensions



Notes
(1) Standoffs provided to allow proper flushing of flux, debris, and contaminants from under resistor after all solder operations.
(2) The standoffs shall be so located as to give a lead clearance of 0.010" minimum between the resistor body and the printed circuit board when the standoffs are seated on the printed circuit board.

Table 2—Model Selection

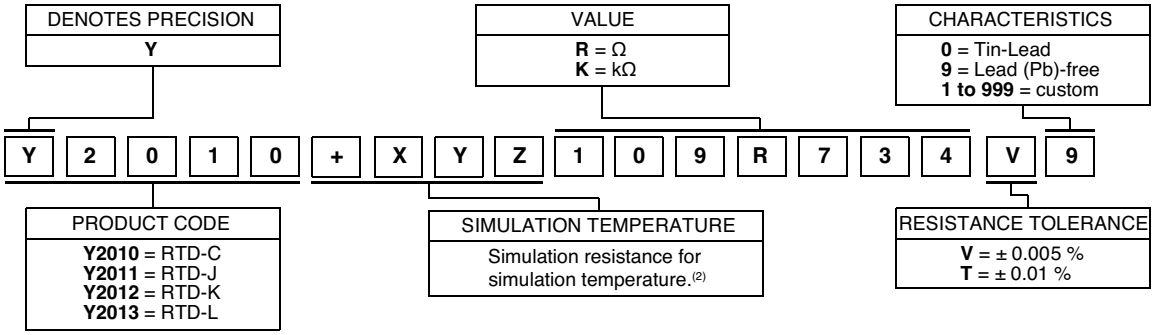
MODEL NUMBER	MAXIMUM WORKING VOLTAGE	AVERAGE WEIGHT IN GRAMS	DIMENSIONS		TIGHTEST TOLERANCE VS. LOWEST RESISTANCE VALUE
			INCHES	mm	
RTD-C (RTD-J) (1)	300	0.6	W: 0.105 ±0.010 L: 0.300 ±0.010 H: 0.326 ±0.010 ST: 0.010 min. SW: 0.040 ±0.005 LL: 1.000 ±0.125 LS: 0.150 ±0.005	2.67 ±0.25 7.62 ±0.25 8.28 ±0.25 0.254 min. 1.02 ±0.13 25.4 ±3.18 3.81 ±0.13	0.005% / 50 Ω 0.01% / 25 Ω 0.02% / 12 Ω 0.05% / 10 Ω
RTD-K (RTD-L) (1)					

(1) 0.200" (5.08 mm) lead spacing available—specify RTD-J for RTD-C and RTD-L for RTD-K.

Table 3—Environmental Performance Comparison				
GROUP/PARAMETER		MIL-PRF-55182 CHAR J	RTD SIMULATOR	
			MAXIMUM ΔR	TYPICAL ΔR
Test Group I				
Thermal shock, 5 x (–65°C to +150°C)		±0.2%	±0.01% (100 ppm)	± 0.002 % (20 ppm)
Short time overload, 6.25 x rated power, 5 seconds		±0.2%	±0.01% (100 ppm)	± 0.003 % (30 ppm)
Test Group II				
Low temperature storage (24 h at –65°C)		±0.15%	±0.01% (100 ppm)	±0.002% (20 ppm)
Low temperature operation (45 min, rated power at –65°C)		±0.15%	±0.01% (100 ppm)	±0.002% (20 ppm)
Terminal strength		±0.2%	±0.01% (100 ppm)	±0.002% (20 ppm)
Test Group III				
Dielectric Withstanding Voltage (DWV)		±0.15%	±0.01% (100 ppm)	±0.002% (20 ppm)
Resistance to solder heat		±0.1%	±0.01% (100 ppm)	±0.005% (50 ppm)
Moisture resistance		±0.4%	±0.05% (500 ppm)	±0.01% (100 ppm)
Test Group IV				
Shock		±0.2%	±0.01% (100 ppm)	±0.002% (20 ppm)
Vibration		±0.2%	±0.01% (100 ppm)	±0.002% (20 ppm)
Test Group V				
Life test at 0.3 W/+125°C	2000 h	±0.5%	±0.015% (150 ppm)	±0.01% (100 ppm)
	10 000 h	±2.0%	±0.05% (500 ppm)	±0.03% (300 ppm)
Test Group Va				
Life test at 0.6 W (2 x rated power)/+70°C, 2000 h		±0.5%	±0.015% (150 ppm)	±0.01% (100 ppm)
Test Group VI				
High temperature exposure (2000 h at +175°C)		±2.0%	±0.1% (1000 ppm)	±0.05% (500 ppm)
Test Group VII				
Voltage coefficient		5 ppm/V	<0.1 ppm/V	<0.1 ppm/V

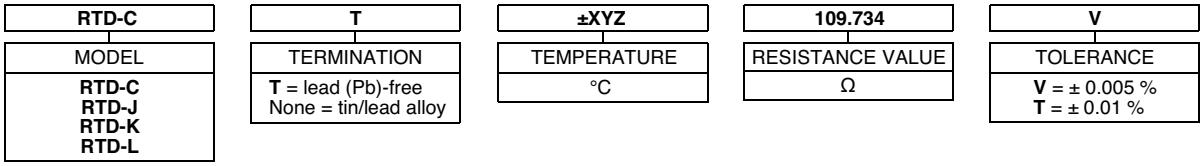
Figure 3—Part Number Information [1]

GLOBAL PART NUMBER:



TYPE: RTD-C
TEMPERATURE: ±XYZºC
VALUE: 109.734 Ω
ABSOLUTE TOLERANCE: ± 0.005 %
TERMINATION: lead (Pb)-free
PACKAGING: bulk pack (standard)

PART NUMBER: RTD-C T +XYZºC 109.734 V



Note

(1) Resistors will be supplied per value specified on the order. Temperature listed is for reference only; customer's Resistance vs Temperature correlation not verified by VFR.

(2) Please specify type of RTD and simulation temperature.

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Тел: +7 (812) 336 43 04 (многоканальный)
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