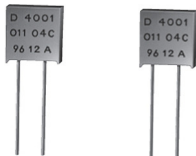


High Precision Flexible Construction Bulk Metal[®] Foil with Tolerance of $\pm 0.01\%$, TCR of 0 ± 2 ppm/ $^{\circ}\text{C}$ and Qualified to ESA Specification 4001/011 Based on RS92N (RNC90Y)



INTRODUCTION

Vishay Foil resistors are designed and manufactured to eliminate the inter-parameter compromise inherent in all other types of precision resistors. All important characteristics - tolerance, long term and load stability, temperature coefficient, noise, capacitance and inductance - are optimum, approaching in total performance the theoretical ideal, a straight wire.

Vishay has developed a new resistor concept, through the use of a proprietary Bulk Metal[®] and new, ultrafine photoetching techniques created by the company, so that the conductor can be considered a flat wire. Because the metals used are not drawn, wound or mistreated in any way during the manufacturing process, Vishay resistors maintain all of their design, physical and electrical characteristics. These factors are both measurable and predictable before, during and after manufacture.

Through the entire process, every step is carefully controlled not only to keep the metal in its virgin state, but also to eliminate the effects of any stresses that might be imposed either during manufacture or use. The sub-assembled is guarded from external stresses by a flexible shock-absorbing insulation. In addition, the temperature coefficient of the resistor is carefully controlled through compensating techniques to eliminate the effect of different coefficients of expansion for all materials used in the resistor.

Vishay resistors thus achieve maximum stability and near zero temperature coefficient. This superior performance is built-in for every unit, and does not rely on culling or other artificial means for uniform excellence. As expected, this unique process delivers a new state-of-the-art resistor with unmatched stability and total performance.

All Vishay resistors are produced from Bulk Metal film elements of known and controllable characteristics. These elements are photoetched into a variety of resistive patterns in such a way the resistance is adjustable to a tolerance as low as 0.01 %.

Permanent contact is provided through flexible ribbon leads welded to the resistive element, and then by wire leads welded to these ribbons. Routine assembly of the component to its circuit is assured while maintaining a flexible, non-stressing connection to the element.

All Vishay resistors exhibit identical temperature coefficients because all are made of the same alloy and are of identical thickness. Thus, accurate "tracking" of one Vishay resistor to another is assured. Because of this excellent tracking ability, Vishay resistors are ideal for use in resistor networks where accurate ratios must be maintained.

The entire assembly is built to eliminate or minimize the effects of thermal and mechanical stresses.

Due to the unique performance of the Bulk Metal[®] foil resistive elements, these resistors are very well adapted to high reliability applications.

Our application engineering department is available to advise and to make recommendations. For non-standard technical requirements and special applications, please contact us.

FEATURES

- Temperature coefficient of resistance (TCR): ± 2 ppm/ $^{\circ}\text{C}$ typical ($- 55$ $^{\circ}\text{C}$ to $+ 125$ $^{\circ}\text{C}$, $+ 25$ $^{\circ}\text{C}$ ref.)
- Rated power: to 0.5 W at $+ 70$ $^{\circ}\text{C}$
- Tolerance: $\pm 0.01\%$ (100 ppm)⁽¹⁾
- Load life stability: to $\pm 0.005\%$ at 70 $^{\circ}\text{C}$, 2000 h at rated power
- Resistance range: 33 Ω to 100 k Ω ⁽²⁾
- Vishay Foil Resistors are not restricted to standard values, specific "as required" values can be supplied at no extra cost or delivery (e.g. 1K1234 vs. 1K)
- Non-inductive, non-capacitive design
- Rise time: 1 ns effectively no ringing
- Thermal stabilization time < 1 s (nominal value achieved within 10 ppm of steady state value)
- Current noise: 0.010 $\mu\text{V}_{\text{RMS}}/\text{V}$ of applied voltage ($< - 40$ dB)
- Thermal EMF: 0.05 $\mu\text{V}/^{\circ}\text{C}$ typical
- Voltage coefficient: < 0.1 ppm/V
- Low inductance: < 0.08 μH typical
- Pattern design minimizing hot spots
- Terminal finish: tin/lead alloy
- For better TCR and PCR performances please review the **RNC90Z** and **Z555** datasheets (Z-Foil technology)
- ESA/SCC 4001

Four variants are available, two reliability levels are proposed:

- Level B: part serialization and test measurements provided
- Level C: part serialization and test measurements not provided

LAT:

- Lot acceptance test level 3 (LAT3): 10 additional parts needed
- Lot acceptance test level 2 (LAT2): 25 additional parts needed
- Lot acceptance test level 1 (LAT1): 31 additional parts needed

Note

⁽¹⁾ $\pm 0.01\%$ (100 ppm) is available
 $\pm 0.02\%$ (200 ppm) - ESA qualified

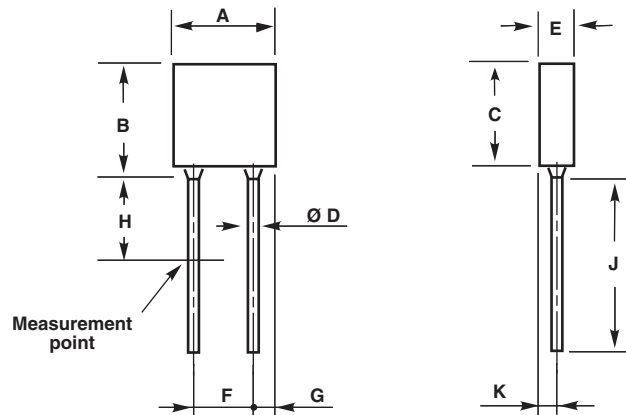
⁽²⁾ 33 Ω to 100 k Ω - available range
50 Ω to 100 k Ω - ESA qualified

RCK HR 02, RCK HR 02A (ESA Qualified)

Vishay Foil Resistors



DIMENSIONS in millimeters

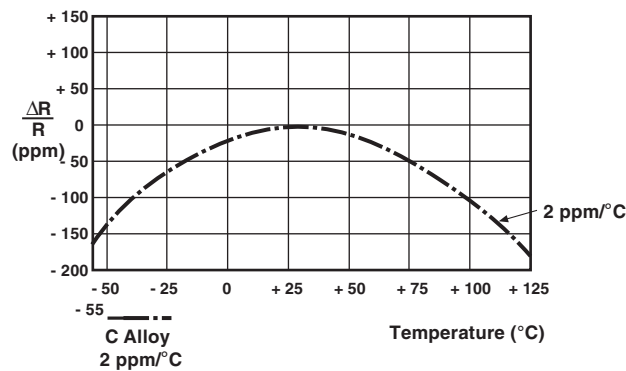


SERIES	RCK HR 02, RCK HR 02A			
	DIM.	VARIANTS ⁽¹⁾	DIM. IN mm	
			MIN.	MAX.
A	-	-	7.5	
B	-	-	8	
C	-	-	7.5	
Ø D	03 - 04 - 07 - 08	0.55	0.65	
E	-	-	2.5	
F	03 - 07	4.8	5.35	
	04 - 08	3.55	4.1	
G	03 - 07	1	1.5	
	04 - 08	1.6	2.1	
H	-	4	6	
J	03 - 04	6	-	
	07 - 08	20	-	
K	-	-	1.5	

Note

(1) The variant version determines if it is RCK HR 02 or RCK HR 02A

FIGURE 1 - FOIL RESISTOR TCR COMPARISON OF FOIL ALLOYS IN MILITARY RANGE

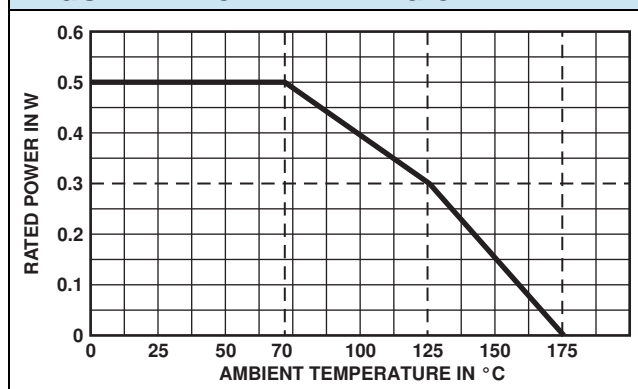


ELECTRICAL SPECIFICATIONS

VISHAY SFERNICE DESIGNATION	RCK HR
Qualified Designation	RNC 90
ESA Specification	4001/011
Power Rating at + 70 °C	0.5 W
Limiting Element Voltage	300 V
Temperature Coefficient	± 5 ppm/°C (- 55 °C + 125 °C, + 25 °C ref.) ± 10 ppm/°C (+ 125 °C to + 175 °C)
Ohmic Value Range	33 Ω to 100 kΩ available range 50 Ω to 100 kΩ qualified range
Tolerance	± 0.01 % to ± 1 % available range ± 0.02 % to ± 1 % qualified range
Temperature Limits	- 55 °C to + 175 °C
Dielectric Voltage	425 V _{RMS}
Soldering Temperature	260 °C, immersion 10 s at a distance of no less than 1.6 mm from the device body

TYPICAL PERFORMANCE SPECIFICATIONS			
TESTS	CONDITIONS	REQUIREMENTS ESA/SCC 4001/11	TYPICAL VALUES AND DRIFTS
Short Time Overload	$U = \sqrt{2 \cdot R_n} / 5 \text{ s}$ $U \text{ max.} < 450 \text{ V}$	$\pm (0.05 + (0.01 \Omega \times 100)) \% R_n$	$\pm 0.002 \%$
Rapid Temperature Change	- 55 °C/+ 175 °C 5 cycles IEC 60068-2-14 test Na	$\pm (0.05 + (0.01 \Omega \times 100)) \% R_n$	$\pm 0.002 \%$
Terminal Strength	IEC 60068-2-21 test Ua, test U21 (tensile)	$\pm (0.02 + (0.01 \Omega \times 100)) \% R_n$	$\pm 0.001 \%$
Soldering (Thermal Shock)	260 °C/10 s IEC 60068-2-20 A test Tb (met. 1A)	$\pm (0.02 + (0.01 \Omega \times 100)) \% R_n$	$\pm 0.002 \%$
Vibration	10 Hz to 2000 Hz 1.5 mm or 20 g 6 h (met. B4) IEC 60068-2-6 test Fc	$\pm (0.02 + (0.01 \Omega \times 100)) \% R_n$	$\pm 0.002 \%$
Humidity (Steady State)	56 days 95 % H.R. 40 °C IEC 60068-2-3	N/a	$\pm 0.003 \%$ Insulation resistance $> 10^4 \text{ M}\Omega$
Climatic Sequence	IEC 60068-2-2/IEC 60068-2-30 IEC 60068-2-1/IEC 60068-2-13	$\pm (0.05 + (0.01 \Omega \times 100)) \% R_n$	$\pm 0.003 \%$ Insulation resistance $> 10^4 \text{ M}\Omega$
Load Life	1000 h P_n at + 70 °C 90'/30' cycle	$\pm (0.05 + (0.01 \Omega \times 100)) \% R_n$	$\pm 0.005 \%$
High Temperature Exposure	1000 h at + 175 °C IEC 60068-2-20A Test B	$\pm (0.05 + (0.01 \Omega \times 100)) \% R_n$	$\pm 0.01 \%$

FIGURE 2 - POWER RATING CHART



TOLERANCE CODE

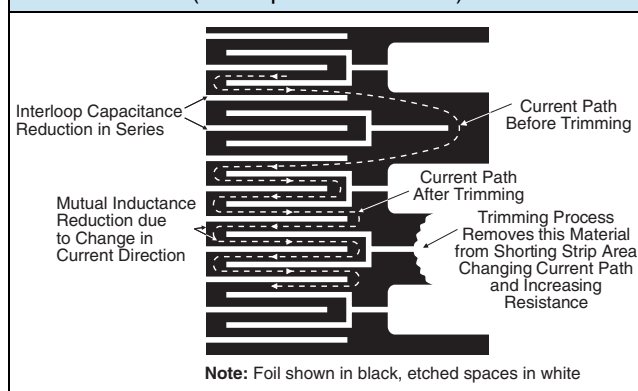
Tolerance ± %	0.01	0.02	0.05	0.1	0.2	0.5	1
Code SCC	L	P	W	B	C	D	F

PACKAGING

Resistors are packed in sealed blisters, up to 10 resistors per blister pack.
The following information is printed on the blister pack:

- order reference
- date code
- ESA specification reference
- quality level
- review number

FIGURE 3 - TRIMMING TO VALUES
(conceptual illustration)



MARKING

Ohmic value is printed on the top side, 3 to 6 digits are used, R stands for Ω and K for k Ω .
The front side is printed as follows:

- tolerance (letter code)
- ESA specification reference
- quality level
- variant
- manufacturing date (2 digits for the year, 2 digits for the week)
- a letter to differentiate manufacturing sequence.

ESA logo and serialization number are printed on the back side.

RCK HR 02, RCK HR 02A (ESA Qualified)

Vishay Foil Resistors



ORDERING INFORMATION (1)				
RCK HR	02 - 03	10 kΩ	± 1 %	B1
MODEL	VERSION - VARIANT	OHMIC VALUE	TOLERANCE	QUALITY LEVEL
	02 - 03 02 - 07 02A - 04 02A - 08		± 0.01 % ± 0.02 % ± 0.05 % ± 0.1 % ± 0.2 % ± 0.5 % ± 1 %	B1 C1 B2 C2 B3 C3 LAT on request (see page 1 LAT description)

Note

(1) For non-standard request, please contact FAE

ESA ORDERING INFORMATION (1)					
4001/011	03	B	1002	F	LAT1
ESA PART DESCRIPTION	VARIANT	LEVEL	VALUE	TOLERANCE	LAT ON REQUEST
	3 7 4 8	B C	The first three digits are significant figures and the last digit specifies the number of zero to follow. "R" designates decimal point. Example: 40R0 = 40 Ω 3901 = 3900 Ω 1002 = 10 kΩ	L = ± 0.01 % P = ± 0.02 % W = ± 0.05 % B = ± 0.1 % C = ± 0.2 % D = ± 0.5 % F = ± 1 %	LAT on request (see page 1 LAT description)

Note

(1) For non-standard request, please contact FAE

GLOBAL PART NUMBER INFORMATION (1)

NEW GLOBAL PART NUMBER: Y705680K5000T0L (preferred part number format)

DENOTES PRECISION

Y

VALUE

R = Ω
K = kΩ
M = MΩ

CHARACTERISTICS

0 = standard
1 to 999 = custom

Y **7** **0** **5** **6**

PRODUCT CODE

7056 = RCK HR 02
7057 = RCK HR 02A

8 **0** **K** **5** **0** **0** **0**

RESISTANCE TOLERANCE

T = ± 0.01 %
Q = ± 0.02 %
A = ± 0.05 %
B = ± 0.1 %
C = ± 0.25 %
D = ± 0.5 %
F = ± 1.0 %

T **0** **L**

PACKAGING

L = bulk pack

FOR EXAMPLE: ABOVE GLOBAL ORDER Y7056 80K5000 T 0 L:

TYPE: RCK HR 02
VALUE: 80.5 kΩ
ABSOLUTE TOLERANCE: ± 0.01 %
TERMINATION: standard
PACKAGING: bulk pack

HISTORICAL PART NUMBER: RCKHR10KB1W04 - Material Description: RCKHR 02A_04 B1 10K 0.05 % (will continue to be used)

RCKHR

PRODUCT CODE

10K

RESISTANCE VALUE

3/7 digits

B

NIVEAU

B
C

1

LAT

1
2
3

W

RESISTANCE TOLERANCE

L = ± 0.01 %
P = ± 0.02 %
W = ± 0.05 %
B = ± 0.1 %
C = ± 0.2 %
D = ± 0.5 %
F = ± 1.0 %

04

VARIANT

-03
-04
-07
-08

Note

(1) For non-standard requests, please contact application engineering.



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