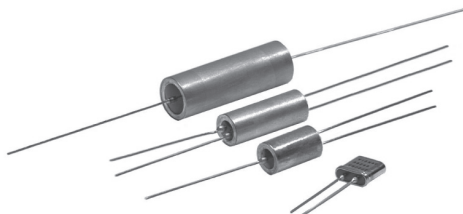


New Generation of Secondary Standards Hermetically Sealed Construction Ultra High Precision Z-Foil Technology Resistors
with TCR of ± 0.2 ppm/°C, Tolerance of $\pm 0.001\%$ and Load Life Stability of $\pm 0.002\%$ (Metrology, Laboratory, Instrumentation, Industrial)

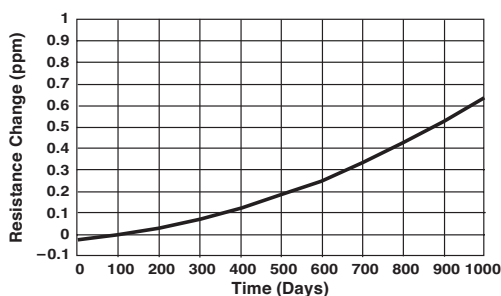
FEATURES

- Temperature coefficient of resistance (TCR): ± 0.2 ppm/°C typical (-55°C to $+125^{\circ}\text{C}$, $+25^{\circ}\text{C}$ ref.).
- Resistance range: $5\ \Omega$ to $1.1\ \text{M}\Omega$
- Power coefficient " ΔR due to self heating": 5 ppm at rated power with the Z-Foil technology
- Tolerance: to $\pm 0.001\%$ (10 ppm)
- Load life stability to $\pm 0.002\%$ (20 ppm) at 25°C , 2000 h at rated power
- Load life stability, can be considerably improved through in-house stabilization
- Shelf life stability: 2 ppm for at least 6 years (unaffected by humidity)



Available

Shelf life – VHA518-11 12K9 vs. QHE



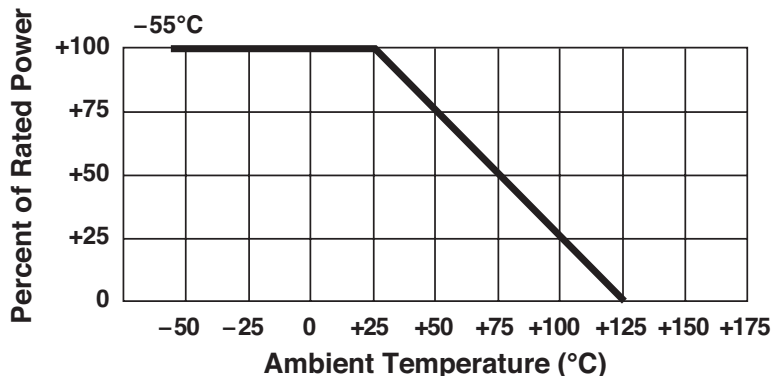
TCR Vs. Resistance Value

RESISTANCE VALUE (Ω)	TYPICAL TCR AND MAX. SPREAD (-55°C to $+125^{\circ}\text{C}$, $+25^{\circ}\text{C}$ ref.) (ppm/°C)
100 to $<1\text{M}$	$\pm 0.2 \pm 2$
50 to <100	$\pm 0.2 \pm 3$
5 to <50	$\pm 0.2 \pm 4$

Note

For maximum TCR < 1 ppm/°C, see VHP100 and contact application engineering

Power Derating Curve



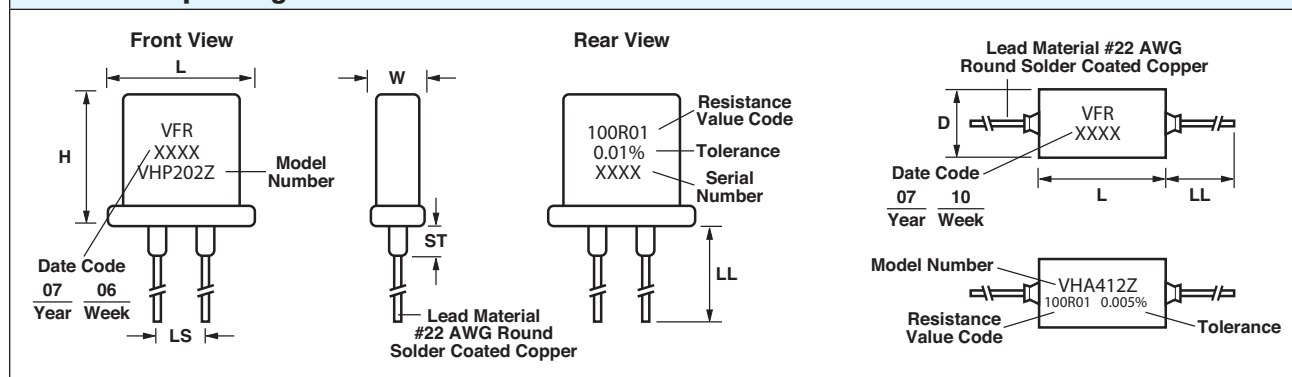
Model Selection									
MODEL NUMBER	RESISTANCE RANGE (Ω)	STANDARD RESISTANCE TOLERANCE PER RANGE		MAXIMUM WORKING VOLTAGE ⁽²⁾	POWER RATING at +25°C	AVERAGE WEIGHT (g)	CONSTRUCTION BRIEF	DIMENSIONS ⁽³⁾	
		RANGE (Ω)	TIGHTEST (%)					INCHES	mm
VHP202Z	10 to 66K 66K to 100K	1K to □ ⁽¹⁾ 500 to <1K 50 to <500 30 to <50 20 to <30 10 to <20 5 to <10	±0.001 ±0.0025 ±0.005 ±0.01 ±0.02 ±0.05 ±0.1	300	0.3 W 0.2 W	1.4	Oil-filled, tinned copper leads, nickel shell, kovar and glass header	W: 0.162±0.020 L: 0.415±0.020 H: 0.430±0.020** LL: 1.000±0.125 LS: 0.150±0.010 ⁽⁴⁾ ST: 0.095 max.	4.11±0.51 10.54±0.51 10.92±0.51 25.4±3.18 3.81±0.25 2.41 max.
VHA412Z	10 to 66K 66K to 100K			250	0.3 W 0.2 W	4.6	Oil-filled, tinned copper leads, tinned brass shell, kovar and glass end bells	L: 0.625±0.031 D: 0.375±0.031 LL: 1.000 min.	15.88±0.79 9.53±0.79 25.4 min.
VHA414Z	5 to 120K >120K to 200K			350	0.5 W 0.3 W	7.3		L: 1.000±0.031 D: 0.375±0.031 LL: 1.000 min.	25.4±0.79 9.53±0.79 25.4 min.
VHA512Z*	5 to 180K 180K to 300K			350	0.75 W 0.4 W	6.3		L: 0.625±0.031 D: 0.500±0.031 LL: 1.000 min.	15.88±0.79 12.7±0.79 25.4 min.
VHA516-4Z* VHA516-5Z* VHA516-6Z*	5 to 240K >240K to 400K 5 to 300K >300K to 500K 5 to 360K >360K to 600K			500	1.0 W 0.5 W 1.25 W 0.6 W 1.5 W 0.7 W	9.2		L: 1.000±0.031 D: 0.500±0.031 LL: 1.000 min.	25.4±0.79 12.7±0.79 25.4 min.
VHA518-7Z* VHA518-8Z* VHA518-9Z* VHA518-10Z* VHA518-11Z*	5 to 420K >420K to 700K 5 to 480K >480K to 800K 5 to 540K >540K to 900K 5 to 600K >600K to 1.0M 5 to 660K >660K to 1.1M			600	1.75 W 0.8 W 2.0 W 0.9 W 2.25 W 1.0 W 2.5 W 1.1 W 2.5 W 1.2 W	13.5		L: 1.500±0.031 D: 0.500±0.031 LL: 1.000 min.	38.1±0.79 12.7±0.79 25.4 min.

Notes

* Available in a 4-lead terminal

** 0.375 H available – See next page for numbered footnotes

Standard Imprinting and Dimensions



"H" Series Specifications

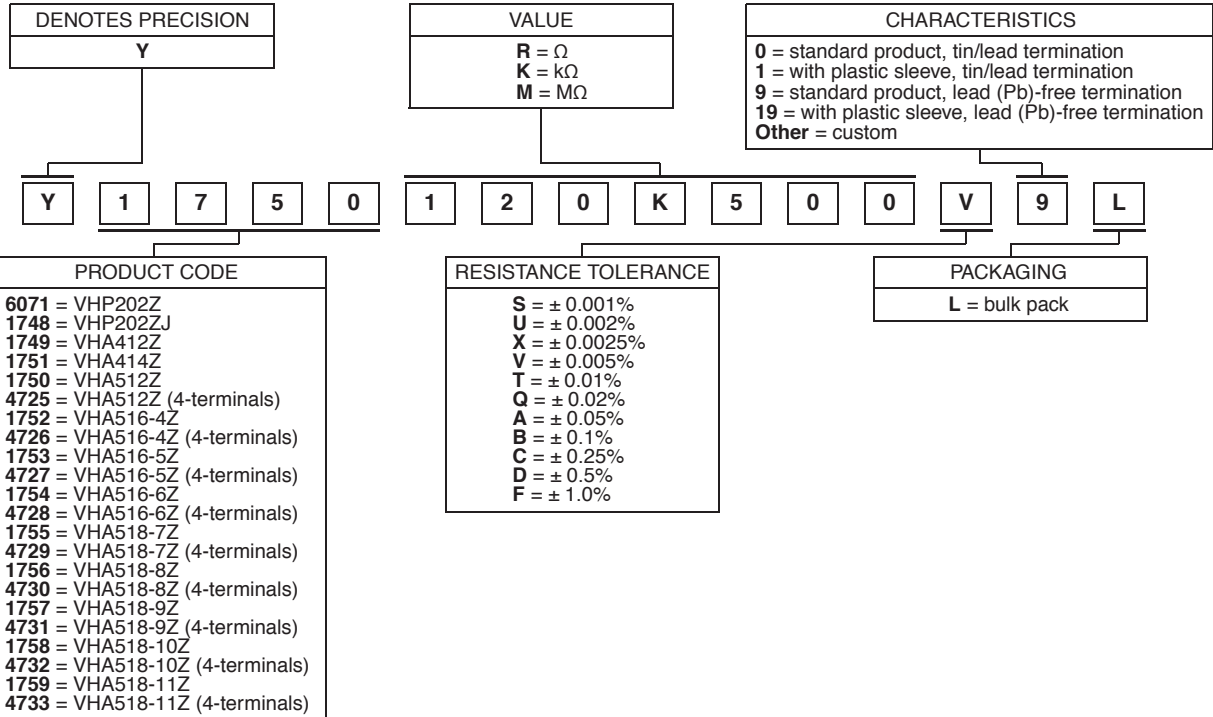
Stability Load life at 2000 h Shelf life	$\pm 0.002\%$ (20 ppm) at 25°C at rated power ± 2 ppm (0.0002%) after at least 6 years
Current Noise	$< 0.010 \mu V_{RMS}/V$ of applied voltage (-40 dB)
High Frequency Operation Rise time Inductance (L) ⁽⁵⁾ Capacitance (C)	1.0 ns without ringing 0.1 μH maximum; 0.08 μH typical 1.0 pF maximum; 0.5 pF typical
Voltage Coefficient	< 0.1 ppm/V ⁽⁶⁾
Thermal EMF⁽⁷⁾	0.1 $\mu V/^{\circ}C$ maximum; 0.05 $\mu V/^{\circ}C$ typical; 1 $\mu V/W$ maximum
Hermeticity	10^{-7} atmospheric cc/s maximum

Notes

- (1) Upper end of resistance range varies with model selected (i.e. VHP202Z; the range is to 100 k Ω ; VHA518-10Z, the range is to 1.0 M Ω)
- (2) Not to exceed power rating of resistor
- (3) Insulating sleeve – a special case insulating plastic sleeve is available on VHAZ models – specify letter "P" as a suffix to model number (i.e. VHA412ZP)
- (4) 0.200 in (5.08 mm) lead spacing available – specify VHP202ZJ
- (5) Inductance (L) due mainly to the leads
- (6) The resolution limit of existing test equipment (within measurement capability of the equipment, or "essentially zero")
- (7) $\mu V/^{\circ}C$ relates to EMF due to lead temperature difference and $\mu V/W$ due to power applied to the resistor

Global Part Number Information⁽¹⁾

NEW GLOBAL PART NUMBER: Y1750120K500V9L (preferred part number format)



FOR EXAMPLE: ABOVE GLOBAL ORDER Y1750 120K500 V 9 L:

TYPE: VHA512Z

VALUE: 120.5 k Ω

ABSOLUTE TOLERANCE: $\pm 0.005\%$

TERMINATION: lead (Pb)-free

PACKAGING: bulk pack

HISTORICAL PART NUMBER: VHA512ZT 120K50 V B (will continue to be used)

VHA512Z	T		120K50	V	B
MODEL	TERMINATION	PLASTIC SLEEVE	OHMIC VALUE	TOLERANCE	PACKAGING
VHP202Z VHP202ZJ VHA412Z VHA414Z VHA512Z ⁽²⁾ VHA516-4Z ⁽²⁾ VHA516-5Z ⁽²⁾ VHA516-6Z ⁽²⁾ VHA518-7Z ⁽²⁾ VHA518-8Z ⁽²⁾ VHA518-9Z ⁽²⁾ VHA518-10Z ⁽²⁾ VHA518-11Z ⁽²⁾	T = lead (Pb)-free None = tin/lead	P = plastic sleeve None = standard	120K50 = 120.5 k Ω	S = $\pm 0.001\%$ U = $\pm 0.002\%$ X = $\pm 0.0025\%$ V = $\pm 0.005\%$ T = $\pm 0.01\%$ Q = $\pm 0.02\%$ A = $\pm 0.05\%$ B = $\pm 0.1\%$ C = $\pm 0.25\%$ D = $\pm 0.5\%$ F = $\pm 1.0\%$	B = bulk pack

Note

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

⁽²⁾ 4-terminal construction of these types are available, please quote:

2-Terminal	VHA512Z	VHA516-4Z	VHA516-5Z	VHA516-6Z	VHA518-7Z	VHA518-8Z	VHA518-9Z	VHA518-10Z	VHA518-11Z
4-Terminal	302073Z	302074-4Z	302074-5Z	302074-6Z	302075-7Z	302075-8Z	302075-9Z	302075-10Z	302075-11Z