

## Vishay Angstrom Hermetically-Sealed Metal Film Resistors

### PRODUCT TECHNOLOGY

#### Hermeticity is the solution

- Moisture is one of the main factors in resistor failure and can cause open circuits and out of tolerance conditions. Vishay Angstrom hermetically sealed resistors are moisture proof.
- Obtain the excellent electrical specification of Nichrome without concern for performance degradation. No need to degrade to Tantalum Nitride (replaces RNC and commercial molded or conformal metal film product where moisture issues are a concern).
- Use in hostile environments. Corrosive environments and atmospheres have no effect on the resistor. Each resistor is tested with an external force of 3000 PSI. Excellent for chemical and other process environments as well as saltwater, high temperatures and space.
- The resistor element is totally protected, but can be viewed at any time.

#### Other considerations

- “S” Level reliability demonstrated - better than 0.001 %/ 1000 hours failure rate, capable of passing T (Space) failure level. Absolutely no out gassing.
- The resistor minimizes any thermal EMF as it is spiralled across its entire body length. Resistance, and therefore self heating, is uniformly distributed over the length. No thinning of the film is done as all adjustments are made by laser spiral trimming.

### PRODUCT CONSTRUCTION

#### Homogeneous metal film

Sputtered deposition produces a uniform homogeneous metal film on the substrate. This provides a core blank which has a specific resistivity and a temperature coefficient of resistance, which is virtually free of localized hot spots, assuring unsurpassed long term stability characteristics.

#### Metal end caps and leads

Gold-plated nickel leads welded to the end caps, which are precision fitted over the core ends, provide the most reliable method of interconnects available. Hot solder-dipped nickel leads are available.

#### Adjusting to value

The metal film of the basic resistor is now helixed to the required value by a laser beam.

#### Hermetic enclosure

Following helixing, the hermetic seal is established by fusing the clear glass sleeve to kovar bellows-type discs in a dry helium atmosphere, which are in turn simultaneously brazed to the resistor leads. The helium serves as an inert atmosphere for the resistor element and as a means for determining the seal effectiveness (which has been consistently demonstrated to have a leak rate of less than  $1 \times 10^{-8}$  cc/s) After marking for identification, a clear varnish is applied to the enclosure.

#### Tight tolerance calibration

Because of the clear glass enclosure, tight tolerance resistors can be calibrated using laser technology, after the resistor is completely sealed in its own inert environment. This calibration technique provides added assurance of long term stability.

#### Pre-conditioning and testing

As a high reliability part, the RNR/RNN resistor is subjected to pre-conditioning and acceptance testing in accordance with MIL-PRF-55182. “Improved Performance Testing” is available to meet customer specifications or application requirements.

#### Quality control

All manufacturing, inspections and testing are closely monitored by exacting in-process controls audited by Quality Control and Reliability personnel.

