

# Type MG Precision High Voltage Resistors

Part Performance and Size Options provide the Designer with High Voltage Module Optimization

Tolerance of  $\pm 1\%$  to  $\pm 0.1\%$ , Temperature Coefficient as tight as 80 ppm/ $^{\circ}\text{C}$ , combined with Excellent Long-Term Stability.

Caddock's Micronox<sup>®</sup> complex metal oxide resistance films are the source of the Type MG Precision High Voltage Resistors' outstanding combination of performance features:

- Resistance Tolerances from  $\pm 1\%$  to  $\pm 0.1\%$ .
- Temperature Coefficient, for standard resistance range, of 80 ppm/ $^{\circ}\text{C}$ , with resistance tolerances as tight as  $\pm 0.1\%$ .
- Type MG resistors have demonstrated stability of 0.01% per 1,000 hours in extended load life testing of standard resistance range values.
- Overvoltage capabilities of 150% of standard working voltages for all models and values (except "-15" ratings).
- Extended higher maximum operating voltage, "-15 ratings"
- Outstanding short term high voltage transient stability.
- Single resistor values as high as 10,000 Megohms.

This exceptional performance has been proven through many years of use in equipment that demands the highest reliability and stability, including TWT HV power supplies, electron microscopes, e-beam equipment, electrical distribution HV monitor dividers, X-ray systems, geophysical instruments, medical electronics, as well as HV probes and compact instrument probes.

## Preconditioning for Power and Voltage Ratings

All power ratings and maximum operating voltage ratings are for continuous duty. These ratings are based on pre-stress voltage levels applied during the manufacturing process to provide for stable resistor performance even under momentary overload conditions.

For certain models, the maximum operating voltage may be extended 60% higher than the operating voltage listed in the table by adding "-15" to the model number (Example: MG750-15-200M-1%; 16,000 Volts). Note: The resistance range is from "-15 Min." to "Std Max". The overload and overvoltage ratings do not apply to resistors with the "-15 rating".

## Non-Inductive Performance

All models are manufactured with Caddock's Non-Inductive Designs, which includes the serpentine resistive pattern that provides for neighboring lines to carry current in opposite directions, thereby achieving maximum cancellation of flux fields over the entire length of the resistor. This efficient non-inductive construction is accomplished without derating of any performance advantages.

| Model No. | Wattage | Std. Max. Continuous Oper. Volt. (DC or ACrms) | Overload Rating | Coating Dielectric Strength (ACrms) | Resistance   |         |           |              | Dimensions in inches and (millimeters)  |                                      |                                     |
|-----------|---------|--|-----------------|-------------------------------------|--------------|---------|-----------|--------------|---|--------------------------------------|-------------------------------------|
|           |         |  |                 |                                     | Std Min      | -15 Min | Std Max   | Extended Max | A                                       | B                                    | C                                   |
| MG650     | 0.5     | 600  | Type 1          | 750                                 | 200 $\Omega$ | N/A     | 5 Meg     | N/A          | .313 $\pm$ .020<br>(7.95 $\pm$ .51)     | .094 $\pm$ .015<br>(2.39 $\pm$ .38)  | .025 $\pm$ .002<br>(.64 $\pm$ .05)  |
| MG655     | 0.5     | 600  | Type 1          | 750                                 | 200 $\Omega$ | N/A     | 8 Meg     | N/A          | .313 $\pm$ .030<br>(7.95 $\pm$ .76)     | .109 $\pm$ .025<br>(2.77 $\pm$ .64)  | .025 $\pm$ .002<br>(.64 $\pm$ .05)  |
| MG660     | 0.6     | 1,000  | Type 1          | 750                                 | 400 $\Omega$ | N/A     | 10 Meg    | N/A          | .500 $\pm$ .030<br>(12.70 $\pm$ .76)    | .094 $\pm$ .015<br>(2.39 $\pm$ .38)  | .025 $\pm$ .002<br>(.64 $\pm$ .05)  |
| MG680     | 0.8     | 2,000  | Type 1          | 750                                 | 600 $\Omega$ | N/A     | 20 Meg    | N/A          | .750 $\pm$ .030<br>(19.05 $\pm$ .76)    | .094 $\pm$ .015<br>(2.39 $\pm$ .38)  | .025 $\pm$ .002<br>(.64 $\pm$ .05)  |
| MG710     | 1.0     | 4,000  | Type 1          | 750                                 | 800 $\Omega$ | N/A     | 50 Meg    | N/A          | 1.000 $\pm$ .040<br>(25.40 $\pm$ 1.02)  | .094 $\pm$ .015<br>(2.39 $\pm$ .38)  | .025 $\pm$ .002<br>(.64 $\pm$ .05)  |
| MG712     | 0.6     | 1,000  | Type 2          | 750                                 | 800 $\Omega$ | N/A     | 20 Meg    | N/A          | .400 $\pm$ .060<br>(10.16 $\pm$ 1.52)   | .140 $\pm$ .030<br>(3.56 $\pm$ .76)  | .025 $\pm$ .002<br>(.64 $\pm$ .05)  |
| MG714     | 1.0     | 1,000  | Type 2          | 750                                 | 200 $\Omega$ | 6.5 Meg | 20 Meg    | N/A          | .562 $\pm$ .060<br>(14.27 $\pm$ 1.52)   | .150 $\pm$ .030<br>(3.81 $\pm$ .76)  | .032 $\pm$ .002<br>(.81 $\pm$ .05)  |
| MG715     | 1.0     | 2,000  | Type 2          | 750                                 | 400 $\Omega$ | 26 Meg  | 50 Meg    | N/A          | .750 $\pm$ .060<br>(19.05 $\pm$ 1.52)   | .140 $\pm$ .030<br>(3.56 $\pm$ .76)  | .025 $\pm$ .002<br>(.64 $\pm$ .05)  |
| MG716     | 1.5     | 4,000  | Type 2          | 750                                 | 600 $\Omega$ | 70 Meg  | 75 Meg    | N/A          | 1.000 $\pm$ .060<br>(25.40 $\pm$ 1.52)  | .140 $\pm$ .030<br>(3.56 $\pm$ .76)  | .025 $\pm$ .002<br>(.64 $\pm$ .05)  |
| MG717     | 1.5     | 2,000  | Type 2          | 750                                 | 600 $\Omega$ | 17 Meg  | 75 Meg    | 225 M        | .710 $\pm$ .050<br>(18.03 $\pm$ 1.27)   | .240 $\pm$ .030<br>(6.10 $\pm$ .76)  | .040 $\pm$ .002<br>(1.02 $\pm$ .05) |
| MG720     | 2.0     | 6,000  | Type 2          | 750                                 | 1 K          | N/A     | 150 Meg   | N/A          | 1.500 $\pm$ .080<br>(38.10 $\pm$ 2.03)  | .140 $\pm$ .030<br>(3.56 $\pm$ .76)  | .025 $\pm$ .002<br>(.64 $\pm$ .05)  |
| MG721     | 2.0     | 4,000  | Type 2          | 750                                 | 200 $\Omega$ | 51 Meg  | 100 Meg   | 300 M        | 1.000 $\pm$ .050<br>(25.40 $\pm$ 1.27)  | .240 $\pm$ .030<br>(6.10 $\pm$ .76)  | .040 $\pm$ .002<br>(1.02 $\pm$ .05) |
| MG725     | 2.5     | 10,000   | Type 2          | 750                                 | 1.5 K        | N/A     | 200 Meg   | N/A          | 2.000 $\pm$ .080<br>(50.80 $\pm$ 2.03)  | .140 $\pm$ .030<br>(3.56 $\pm$ .76)  | .025 $\pm$ .002<br>(.64 $\pm$ .05)  |
| MG730     | 3.0     | 6,000  | Type 2          | 1,000                               | 500 $\Omega$ | 77 Meg  | 250 Meg   | 750 M        | 1.500 $\pm$ .080<br>(38.10 $\pm$ 2.03)  | .240 $\pm$ .030<br>(6.10 $\pm$ .76)  | .040 $\pm$ .002<br>(1.02 $\pm$ .05) |
| MG731     | 2.6     | 4,000  | Type 2          | 1,000                               | 200 $\Omega$ | 40 Meg  | 150 Meg   | 750 M        | 1.000 $\pm$ .060<br>(25.40 $\pm$ 1.52)  | .315 $\pm$ .030<br>(8.00 $\pm$ .76)  | .040 $\pm$ .002<br>(1.02 $\pm$ .05) |
| MG735     | 3.6     | 10,000   | Type 2          | 1,000                               | 750 $\Omega$ | 178 Meg | 300 Meg   | 1,000 M      | 2.000 $\pm$ .080<br>(50.80 $\pm$ 2.03)  | .240 $\pm$ .030<br>(6.10 $\pm$ .76)  | .040 $\pm$ .002<br>(1.02 $\pm$ .05) |
| MG740     | 3.6     | 6,000  | Type 2          | 1,000                               | 300 $\Omega$ | 64 Meg  | 300 Meg   | 1,500 M      | 1.500 $\pm$ .060<br>(38.10 $\pm$ 1.52)  | .315 $\pm$ .030<br>(8.00 $\pm$ .76)  | .040 $\pm$ .002<br>(1.02 $\pm$ .05) |
| MG745     | 5.0     | 15,000   | Type 2          | 1,000                               | 1 K          | 288 Meg | 500 Meg   | 1,500 M      | 3.000 $\pm$ .100<br>(76.20 $\pm$ 2.54)  | .240 $\pm$ .030<br>(6.10 $\pm$ .76)  | .040 $\pm$ .002<br>(1.02 $\pm$ .05) |
| MG750     | 5.0     | 10,000   | Type 2          | 1,000                               | 400 $\Omega$ | 128 Meg | 500 Meg   | 2,500 M      | 2.125 $\pm$ .060<br>(53.98 $\pm$ 1.52)  | .315 $\pm$ .030<br>(8.00 $\pm$ .76)  | .040 $\pm$ .002<br>(1.02 $\pm$ .05) |
| MG780     | 7.5     | 15,000   | Type 2          | 1,000                               | 600 $\Omega$ | 192 Meg | 750 Meg   | 3,750 M      | 3.125 $\pm$ .060<br>(79.38 $\pm$ 1.52)  | .315 $\pm$ .030<br>(8.00 $\pm$ .76)  | .040 $\pm$ .002<br>(1.02 $\pm$ .05) |
| MG785     | 8.0     | 20,000   | Type 2          | 1,000                               | 800 $\Omega$ | 320 Meg | 1,000 Meg | 5,000 M      | 4.000 $\pm$ .120<br>(101.60 $\pm$ 3.05) | .315 $\pm$ .030<br>(8.00 $\pm$ .76)  | .040 $\pm$ .002<br>(1.02 $\pm$ .05) |
| MG810     | 10.0    | 25,000   | Type 2          | 1,000                               | 1 K          | 400 Meg | 1,250 Meg | 6,250 M      | 5.000 $\pm$ .120<br>(127.00 $\pm$ 3.05) | .315 $\pm$ .030<br>(8.00 $\pm$ .76)  | .040 $\pm$ .002<br>(1.02 $\pm$ .05) |
| MG815     | 15.0    | 30,000   | Type 2          | 1,000                               | 1 K          | 384 Meg | 2,000 Meg | 10,000 M     | 6.000 $\pm$ .120<br>(152.40 $\pm$ 3.05) | .350 $\pm$ .040<br>(8.89 $\pm$ 1.02) | .040 $\pm$ .002<br>(1.02 $\pm$ .05) |

**Lead Finish:** Solderable. Thin gold plate over thick nickel layer on copper core.

**Encapsulation:** High Temperature Silicone Conformal.

**Operating Temperature Range:** -55 $^{\circ}\text{C}$  to +225 $^{\circ}\text{C}$ , see Derating Curve.

## Specifications:

### Resistance Tolerance:

| Resistance Range        | Tolerance   |
|-------------------------|---|
| Standard                | $\pm 1\%$ ; also $\pm 0.1\%$ , $\pm 0.25\%$ , $\pm 0.5\%$ |
| Std'd with "-15" rating | $\pm 1\%$ ; also $\pm 5\%$                                |
| Extended Range          | $\pm 1\%$ ; also $\pm 5\%$                                |

### Temperature Coefficient:

| Resistance Range                     | TC Specifications   |
|--------------------------------------|---|
| Standard and Std'd with "-15" rating | $\pm 80$ ppm/ $^{\circ}\text{C}$ from -15 $^{\circ}\text{C}$ to +105 $^{\circ}\text{C}$ , referenced to +25 $^{\circ}\text{C}$ .  |
| Extended Range                       | $\pm 80$ ppm/ $^{\circ}\text{C}$ from +25 $^{\circ}\text{C}$ to +105 $^{\circ}\text{C}$ , -200 ppm/ $^{\circ}\text{C}$ to +50 ppm/ $^{\circ}\text{C}$ from -15 $^{\circ}\text{C}$ to +25 $^{\circ}\text{C}$ . |

**Voltage Coefficient:** Contact Caddock Applications Engineering

**Overload/Overvoltage:** 5 times rated power with applied voltage not to exceed 1.5 times maximum continuous operating voltage for 5 seconds.

Type 1: DC Voltage

Type 2: DC Voltage or VAC<sub>rms</sub>

| Resistance Range        | Overload/Overvoltage, $\Delta R$ |
|-------------------------|----------------------------------|
| Standard                | 0.5% max.                        |
| Std'd with "-15" rating | N/A                              |
| Extended Range          | 0.8% max.                        |

**Load Life:** 1,000 hours at +125 $^{\circ}\text{C}$  at rated voltage, not to exceed rated power.

| Resistance Range        | Load Life, $\Delta R$                |
|-------------------------|--------------------------------------|
| Standard                | 0.5% max. at +125 $^{\circ}\text{C}$ |
| Std'd with "-15" rating | 0.8% max. at +85 $^{\circ}\text{C}$  |
| Extended Range          | 0.8% max. at +125 $^{\circ}\text{C}$ |

**Thermal Shock:** Mil-Std-202, Method 107, Cond. C,  $\Delta R$  0.25% max.

**Moisture Resistance:** Mil-Std-202, Method 106,  $\Delta R$  0.4% max.

**Insulation Resistance:** 10,000 Megohms, min.

**CADDOCK ELECTRONICS, INC.**

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For Caddock Distributors listed by country see [caddock.com/contact/dist.html](http://caddock.com/contact/dist.html)

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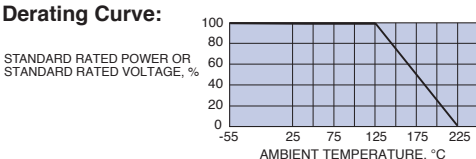
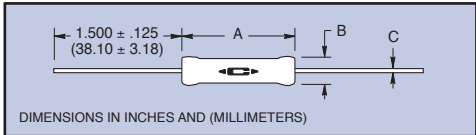
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# Type MG Precision High Voltage Resistors

**N** Non-inductive performance with Caddock's exclusive design

All Type MG Models are available with Caddock's Non-inductive Serpentine Pattern

Certain products shown in this catalog are covered by one or more patents, there are also patents pending.



**Design Assistance in Developing High Voltage Resistor Sets with Low TC Tracking.**

For immediate engineering assistance in developing Low Ratio TC matched high voltage resistor sets, contact our Applications Engineering and we will be pleased to offer the best solution from our high voltage resistor product capabilities.

**Ordering Information:**

**MG750 -100M - 1%**

Model Number: \_\_\_\_\_ Tolerance: \_\_\_\_\_

Resistor Value: \_\_\_\_\_

**CADDOCK ELECTRONICS, INC.**  
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