Series 70 Custom Potentiometer Designer Guide
Now almost any special combination potentiometer you specify can be manufactured and shipped soon after your order is received.

Since Clarosystem and Mod Pot potentiometers are modular in construction, we can produce prototype quantities of 1/2 or 5/8 inch square, conductive plastic, cermet, or hot molded carbon pots for you in just a few hours . . . . and even production quantities in a matter of days with our VIP (Very Important Potentiometer) service!

Over one billion combinations of single, dual, triple, quad arrangements, push-pull or rotary switches and hundreds of shaft terminal variations can be produced.

If you need a potentiometer and you need it fast, call our product manager or fax us your requirements using the Custom Potentiometer Order Forms included in this catalog.

WHY WAIT?
Series 70, 72
Hot-Molded Carbon*, Conductive Plastic (CP), and Cermet Panel Potentiometers

Unmatched Flexibility

The MOD POT® Family includes:

Series 70 – Metal or Plastic Shaft – Metal Bushing.
Series 72 – Metal or Plastic Shaft – Plastic Bushing.

Features
- Modular Construction
- 50 Ohms to 10 Megohms
- Linear and Non-Linear Tapers
- Multiple Sections/Concentric Shafts
- Rotary and Push-Pull Switch Options
- Multi-Turn (Vernier) Option
- Attenuators
- 0.625 Inch (15.87 mm) Square
- 1/4” or 1/8” Shaft Diameter
- Metal or Plastic Shaft
- RoHS Compliant

Benefits
- Versatility
- Wide Resistance Range
- Versatility
- Versatility
- Versatility
- Versatility
- Versatility
- Moderate Size
- Versatility
- Non-Magnetic
- International Acceptance

Disclaimer
Due to the unlimited design combinations, certain designs may not perform in accordance with all of the specifications

* Hot Molded Carbon is no longer available
**SPECIFICATIONS**

**General**

**Versatile Panel Potentiometer**

The MOD POT® concept consists of standardized potentiometer modules that can be mixed and matched in over a billion combinations. Now, you can be far more imaginative with potentiometers because you can get special combinations with the ease of standards.

Allen-Bradley originated the modular potentiometer concept in response to requests from design engineers who wanted virtually unlimited variety in variable resistors for greatly increased design freedom.

MOD POT® modules are 5/8 inch square by about 1/2 inch deep. This provides minimum center-to-center distance for compact panel mounting. You can gang resistance and switch modules in combinations of up to four modules. Select from a whole family of resistive elements, resistive values and tolerances, tapers, shafts, bushings, lug options and more. You get a virtually unlimited number of design options.

### TEMPERATURE RANGE

<table>
<thead>
<tr>
<th>Series</th>
<th>Module Type</th>
<th>Maximum Temp °C</th>
<th>Minimum Temp °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>Hot-Molded* or Conductive Plastic</td>
<td>+120°</td>
<td>–55°</td>
</tr>
<tr>
<td></td>
<td>Cermet</td>
<td>+150°</td>
<td>–55°</td>
</tr>
<tr>
<td>72</td>
<td>Hot-Molded*, Conductive Plastic or Cermet</td>
<td>+100°</td>
<td>–55°</td>
</tr>
<tr>
<td>70, 72</td>
<td>Multi-Turn Vernier</td>
<td>+100°</td>
<td>–55°</td>
</tr>
<tr>
<td>70, 72</td>
<td>Switches</td>
<td>+100°</td>
<td>–55°</td>
</tr>
</tbody>
</table>

**Hardware** – Hardware is: .250 inch (6.35 mm) diameter bushing: (1) M-4748; (1) M-4721; (1) M-4761 (M-4761 is supplied only with locking bushings)

4.375 inch (9.52 mm) diameter bushing: (1) M-2898; (1) M-2786; (1) M-3638 (M-3638 is supplied only with locking bushings)

All hardware shipped in bulk — not assembled unless otherwise specified.

**Mounting Torque**

**Series 70** - Torque applied to the mounting nuts should not exceed 15 to 18 inch-pounds (1.7 to 2.0 N-m) for the .375 inch (9.52 mm) diameter bushing.

**Series 72** - Torque applied to the mounting nuts should not exceed 7 inch-pounds (790 mN-m) for the .250 inch (6.35 mm) diameter bushing or 14 inch-pounds (1580 mN-m) for the .375 inch (9.52 mm) diameter bushing.

**Turning Torque** – Initially, at 25°C, the potentiometer torque will be 0.5 inch-ounce (3.5 mN-m) minimum while the maximum is:

<table>
<thead>
<tr>
<th>Style</th>
<th>Torque Inch-Ounces (mN-m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cermet and Hot-Molded Elements</td>
<td>CP Elements</td>
</tr>
<tr>
<td>Single</td>
<td>3 (21)</td>
</tr>
<tr>
<td>Dual</td>
<td>6 (42)</td>
</tr>
<tr>
<td>Triple</td>
<td>8 (56)</td>
</tr>
<tr>
<td>Quad</td>
<td>10 (71)</td>
</tr>
</tbody>
</table>

Variation within a control is 1 oz. in. maximum.

The maximum additional torque required for the multi-turn vernier drive is 10 inch-ounces (71mN-m) on inner, coarse adjustment shaft.

**Stop Torque** – Minimum of 4 inch-pounds (451 mN-m) except for the Series 72 with a .125 inch (3.18 mm) diameter shaft which is 2 inch-pounds (225 mN-m) minimum. Multi-turn vernier drives have slip clutches.

**Rotation**

<table>
<thead>
<tr>
<th>Rotation in Degrees</th>
<th>Rotation in Degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Mechanical (±5°)</td>
<td>Electrical (Nominal)</td>
</tr>
<tr>
<td>Potentiometers</td>
<td>300</td>
</tr>
<tr>
<td>Potentiometers and Rotary Switch</td>
<td>300</td>
</tr>
<tr>
<td>Potentiometers and Push-Pull Switches</td>
<td>305</td>
</tr>
<tr>
<td>Rotary Switches</td>
<td>25</td>
</tr>
<tr>
<td>Rotary Switches and Push-Pull Switches</td>
<td>30</td>
</tr>
</tbody>
</table>

**Multi-Turn Vernier drive** – Two multi-turn vernier drive modules are available with hot-molded*, cermet, and conductive plastic modules. Through a gearing arrangement, the total rotation will be changed to 16 turns or 4 turns. A ratchet clutch is provided in place of fixed stops for the fine adjustment shaft. Series 70 variable resistors may have concentric shafts. The inner concentric shaft (.078 inch (1.98 mm) diameter) may be used as a coarse adjustment shaft.

**Enclosure** – Dust and splash resistant. They are not immersion sealed.

**Materials** – Corrosion-resistant and essentially nonmagnetic. The shafts and bushings of the Series 72 are plastic.

**Standard Marking** – State Electronics part number and nominal total resistance are marked in two lines. Other markings are possible.

* Hot Molded Carbon is no longer available
**Electrical**

**Total resistance tolerances** – Hot-Molded*, CP: ±10% or ±20%; Cermet: ±5% or ±10%.

### POWER

<table>
<thead>
<tr>
<th>Series</th>
<th>Hot-Molded* at 70°C</th>
<th>Cermet at 70°C</th>
<th>CP at 70°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>70 (single)</td>
<td>1.0</td>
<td>2.0</td>
<td>.5</td>
</tr>
<tr>
<td>70 (multi-section)</td>
<td>.5</td>
<td>1.0</td>
<td>.25</td>
</tr>
<tr>
<td>72 (single)</td>
<td>.5</td>
<td>1.0</td>
<td>.25</td>
</tr>
<tr>
<td>72 (dual)</td>
<td>.5</td>
<td>.5</td>
<td>.25</td>
</tr>
</tbody>
</table>

**Power derating** – Derate power linearly from rated temperature to zero at maximum temperature. Derate 50 percent for non-metallic mounting. Derate 60 percent for CP elements with “A” and “B” tapers.

Derate 50 percent for hot-molded elements with “A”, “B”, “S”, and “DB” tapers. For rheostat applications, derate power directly with shaft or actuator position.

**Voltage** – 350 volts maximum working voltage (RMS or DC), or as determined by $E_{max} = \sqrt{PR}$, whichever is less (at sea level).

### ATTENUATORS – HOT MOLDED*<sup>*</sup>

<table>
<thead>
<tr>
<th>Series</th>
<th>Bridged-T</th>
<th>L</th>
<th>Bridged-H</th>
<th>Straight-T</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>72</td>
<td>A</td>
<td>A</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

Consult factory for further details
A=Available
NA=Not Available

**Linearity** – ±5 percent independent for linear tapers with a total resistance up to 1.0 megohm.

**Dielectric withstand voltage** – Maximum continuous voltage, 350 Volts (RMS) at sea level. One second test of 1000 Volts (RMS) at sea level. 500 VAC (RMS) at 3.4 Inches (86.36mm) mercury, equivalent to 50,000 feet. (Glossary Definition Link)

**Insulation resistance** – 1000 megohms minimum for clean and dry conditions at +25 °C.

**Operational**

**Contact resistance variation – linear taper** – Maximum value is: Hot-Molded* & Cermet: 1.5 percent of nominal resistance value or 1.5 ohms, whichever is greater. CP: 1.0 percent of nominal resistance value.

**Load Life** – Maximum change in total resistance as a result of a 1000 hour test at rated power across entire element at +70° C (1.5 hours "ON", 0.5 hour "OFF") 5 percent for cermet element, 10 percent for hot-molded* and CP elements

**Rotational life** – 10 percent maximum change in total resistance as a result of a 100,000 mechanical cycle life test without load.

**Environmental**

**Vibration** – 2 percent maximum change in total resistance, 5 percent maximum change in resistance setting. (Tested per method 204, condition “C” of MIL-STD-202.) Applicable to single shaft potentiometers only.

**Shock** – 2 percent maximum change in total resistance, 5 percent maximum change in resistance setting. (Tested per method 213, condition “I” of MIL-STD-202.) Applicable to single shaft potentiometers only.

**Humidity** – Maximum change in total resistance as a result of 95 percent humidity at 40°C for 100 hours: 5 percent for cermet element, 10 percent for hot-molded and CP elements.

**Temperature cycling** – 3 percent maximum change in total resistance as a result of the temperature cycling test. (Five cycles at –55° C to the maximum temperature.)

**Effect of soldering** – Maximum change in total resistance as a result of immersing the terminals in 350° C solder to within 0.125 inch (3.18mm) of the resistor body for 5 seconds: 1 percent for cermet element, 2 percent for hot-molded and CP elements.

**Low temperature operation** – Maximum change in total resistance as a result of the low temperature operation test (–55°C for two hours without load and 45 minutes with rated load): 2 percent for cermet element; 3 percent for hot-molded and CP elements.

**High temperature exposure** – Maximum change in total resistance as a result of the high temperature exposure test (maximum rated temperature for 1000 hours without load): 4 percent for cermet element; 10 percent for hot-molded and CP elements.

**Washability** – MOD POT® performance may be adversely affected if subjected to conventional after-solder boardwash processes.

* Hot Molded Carbon is no longer available
Environmental (continued)

Temperature characteristics – Maximum percent temporary total resistance change from the +25° C value. See chart below.

<table>
<thead>
<tr>
<th>Nominal Resistance in Ohms</th>
<th>CP — “U” Linear Taper °C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-55°</td>
</tr>
<tr>
<td>100</td>
<td>-9.0</td>
</tr>
<tr>
<td>1K</td>
<td>±5.5</td>
</tr>
<tr>
<td>10K</td>
<td>±5.0</td>
</tr>
<tr>
<td>100K</td>
<td>±5.0</td>
</tr>
<tr>
<td>1.0 Meg</td>
<td>±6.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nominal Resistance in Ohms</th>
<th>HOT MOLDED® — “U” Linear Taper °C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-55°</td>
</tr>
<tr>
<td>100</td>
<td>+4.5</td>
</tr>
<tr>
<td>1K</td>
<td>+5.5</td>
</tr>
<tr>
<td>10K</td>
<td>+7.0</td>
</tr>
<tr>
<td>100K</td>
<td>+8.0</td>
</tr>
<tr>
<td>1.0 Meg</td>
<td>+10.0</td>
</tr>
</tbody>
</table>

For “S”, “A” and “DB” tapers multiply percentage figures shown above by 1.25

* HOT MOLDED option is discontinued - for reference only

Temperature coefficient – For cermet linear taper elements, temperature coefficient less than ±100 ppm/°C.

Tapers – Available in the following resistance ranges:

<table>
<thead>
<tr>
<th>UNIT</th>
<th>TAPER</th>
<th>TOTAL RESISTANCE RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot-Molded*</td>
<td>U</td>
<td>50 Ohms to 10.0 Megohms</td>
</tr>
<tr>
<td></td>
<td>A, B, S, DB</td>
<td>250 Ohms to 10.0 Megohms</td>
</tr>
<tr>
<td>Cermet</td>
<td>U, W (X=5%)</td>
<td>100 Ohms to 5.0 Megohms</td>
</tr>
<tr>
<td>CP</td>
<td>U</td>
<td>100 Ohms to 1.0 Megohm</td>
</tr>
<tr>
<td></td>
<td>A, B</td>
<td>250 Ohms to 1.0 Megohm</td>
</tr>
</tbody>
</table>

* Hot Molded Carbon is no longer available

Schematic

Potentiometer Terminals

End Resistance

Minimum Resistance Between Terminals:

<table>
<thead>
<tr>
<th>TAPER</th>
<th>Hot-Molded*</th>
<th>CP</th>
<th>Cermet</th>
</tr>
</thead>
<tbody>
<tr>
<td>U</td>
<td>1 &amp; 2</td>
<td>1</td>
<td>4 &amp; 4</td>
</tr>
<tr>
<td>S</td>
<td>1 &amp; 2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>A</td>
<td>1 &amp; 2</td>
<td>4</td>
<td>4 &amp; 4</td>
</tr>
<tr>
<td>B</td>
<td>2 &amp; 3</td>
<td>1</td>
<td>4 &amp; 4</td>
</tr>
<tr>
<td>DB</td>
<td>3 &amp; 4</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

1. Less than 0.004 percent of total resistance or less than 4 ohms, whichever is greater.
2. Less than 1 percent of total resistance or less than 4 ohms, whichever is greater.
3. Less than 4 ohms
4. Less than 2 ohms
Switches

Rotary Switch – The rotary switch consists of two sets of contacts. See Part Number Explanation for available options. When supplied on the Series 72, the rotary switch must be used with a .250 inch (6.35 mm) diameter shaft.

Push-pull Switch – A four pole switch that is operated by a .125 inch (3.18mm) diameter solid shaft. An inner concentric shaft that operated the push-pull switch only may have a diameter of .125 inch (3.18mm) or .078 inch (1.98mm). Shaft lengths are measured from the bushing mounting surface to the free end of the shaft with the shaft in the extended position. Available only on Series 70.

Ambient Temperature – –55ºC to +100ºC

Momentary Push Switch – A push-pull switch equipped with a return spring such that the switch will return to the extended position when the actuating force is removed. Available only on Series 70.

Life – The switches will be electrically and mechanically operative after operational life test at rated current and voltage with a resistive load, per switch characteristics below.

Terminals – Switches are available with lug terminals only. They are not available with square terminals. On request, switches will be rotated 90º such that the switch terminals come out the sides of the control instead of the top and bottom.

### PUSH-PULL AND MOMENTARY SWITCHES

<table>
<thead>
<tr>
<th>Switch Number</th>
<th>Type</th>
<th>Voltage in Volts at 60 Hz RMS</th>
<th>Current in Amps</th>
<th>Actuating Force</th>
<th>Shaft Travel</th>
<th>Operational Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>3001</td>
<td>Push-Pull</td>
<td>125</td>
<td>2</td>
<td>7 ounces (1.9N) Min. 19 ounces (5.3N) Max.</td>
<td>.125 Inch (3.18mm)</td>
<td>25,000</td>
</tr>
<tr>
<td>3002</td>
<td>Momentary Push</td>
<td>125</td>
<td>2</td>
<td>20 ounces (5.6N) Min. 30 ounces (8.3N) Max.</td>
<td>.125 Inch (3.18mm)</td>
<td>25,000</td>
</tr>
</tbody>
</table>

### ROTARY SWITCHES

<table>
<thead>
<tr>
<th>Switch Number</th>
<th>Detent at</th>
<th>In Detent Terminals 1 and 2 are:</th>
<th>Term 3 and 4 are:</th>
<th>Voltage in Volts at 60 Hz RMS</th>
<th>Current in Amps</th>
<th>Actuating Torque</th>
<th>Length of Throw</th>
<th>Operational Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>1001</td>
<td>CCW end</td>
<td>Open</td>
<td>Closed</td>
<td>125</td>
<td>2</td>
<td>Med</td>
<td>15°</td>
<td>25°</td>
</tr>
<tr>
<td>1003</td>
<td>CCW end</td>
<td>Open</td>
<td>Open</td>
<td>125</td>
<td>2</td>
<td>Med</td>
<td>15°</td>
<td>25°</td>
</tr>
<tr>
<td>2001</td>
<td>CW end</td>
<td>Open</td>
<td>Closed</td>
<td>125</td>
<td>2</td>
<td>Med</td>
<td>15°</td>
<td>25°</td>
</tr>
<tr>
<td>2003</td>
<td>CW end</td>
<td>Open</td>
<td>Open</td>
<td>125</td>
<td>2</td>
<td>Med</td>
<td>15°</td>
<td>25°</td>
</tr>
<tr>
<td>1BT1</td>
<td>CW end</td>
<td>Open</td>
<td>Closed</td>
<td>125</td>
<td>.1</td>
<td>Med</td>
<td>15°</td>
<td>25°</td>
</tr>
<tr>
<td>1BT3</td>
<td>CCW end</td>
<td>Open</td>
<td>Open</td>
<td>125</td>
<td>.1</td>
<td>Low</td>
<td>15°</td>
<td>25°</td>
</tr>
<tr>
<td>2BT1</td>
<td>CCW end</td>
<td>Open</td>
<td>Open</td>
<td>125</td>
<td>.1</td>
<td>Low</td>
<td>15°</td>
<td>25°</td>
</tr>
<tr>
<td>2BT3</td>
<td>CC end</td>
<td>Open</td>
<td>Open</td>
<td>125</td>
<td>.1</td>
<td>Low</td>
<td>15°</td>
<td>25°</td>
</tr>
</tbody>
</table>

Maximum of 2 rotary switches per shaft.

Med Actuating Torque = Maximum of 20 inch-ounces (5.6 N)
Low Actuation Torque = Maximum of 7.5 inch-ounces (53 mN-m). Minimum of 3.5 inch-ounces (24.7 mN-m)
■ For use with conductive plastic element modules only. (Discontinued- For Reference Only)
Explanation of Part Numbers

**Shaft Type and Bushing Diameter**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>S</td>
<td>.250 (6.35)</td>
<td>Standard Slot</td>
<td>.375 (9.52)</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>.250 (6.35)</td>
<td>Plain Round</td>
<td>.375 (9.52)</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>.250 (6.35)</td>
<td>Standard Flat</td>
<td>.375 (9.52)</td>
</tr>
<tr>
<td></td>
<td>L</td>
<td>.125 (3.18)</td>
<td>Standard Slot</td>
<td>.250 (6.35)</td>
</tr>
<tr>
<td></td>
<td>R</td>
<td>.125 (3.18)</td>
<td>Plain Round</td>
<td>.250 (6.35)</td>
</tr>
<tr>
<td></td>
<td>K</td>
<td>.125 (3.18)</td>
<td>Standard Flat</td>
<td>.250 (6.35)</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>.250 (6.35)</td>
<td>Cross Slot</td>
<td>–</td>
</tr>
</tbody>
</table>

*These codes used with Series 70 only.

**Total Resistance Value**

First two digits are significant figures and the third indicates the number of zeros following the first two digits —

Examples:

- 500 = 50 Ohms
- 501 = 500 Ohms
- 255 = 2.5 Megohms

**Locating Lug Options**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
</tbody>
</table>

**Configuration**

**Lug Terminals**

- A = Single (Hot Molded)
- B = Single (Cermet)
- J = Single (Conductive Plastic)
- C = Dual (Hot Molded)
- D = Dual (Cermet)
- T = Dual (Conductive Plastic)
- E = Triple (Hot Molded)
- F = Triple (Cermet)
- K = Quad (Hot Molded)
- H = Quad (Cermet)
- N = Quad (Conductive Plastic)
- L = Single (Cermet) with Switch 1001

**Square Terminals**

- M = Single (Hot Molded)
- N = Single (Cermet)
- U = Single (Conductive Plastic)
- P = Dual (Hot Molded)
- R = Dual (Cermet)
- W = Dual (Conductive Plastic)

**70A1G056L501U**

- **Bushing Type and Length**
  - F — Face Plate
  - G — Plain .250 inch (6.35 mm) long
  - H — Plain .500 inch (12.70 mm) long
  - N — Plain .375 inch (9.52 mm) long
  - L — Locking .500 inch (12.70 mm) long

**Shaft Length**

Measured from mounting surface of the potentiometer in inches and sixty-fourths one inch.

Examples:

- 7/8” shaft length
- 1-1/4” shaft length

**Some Common Shaft Lengths**

<table>
<thead>
<tr>
<th>Fraction</th>
<th>Three Digit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4</td>
<td>250</td>
</tr>
<tr>
<td>3/8</td>
<td>375</td>
</tr>
<tr>
<td>7/16</td>
<td>437</td>
</tr>
<tr>
<td>1/2</td>
<td>500</td>
</tr>
<tr>
<td>5/8</td>
<td>625</td>
</tr>
<tr>
<td>3/4</td>
<td>750</td>
</tr>
<tr>
<td>7/8</td>
<td>875</td>
</tr>
<tr>
<td>1</td>
<td>1,000</td>
</tr>
<tr>
<td>1-1/8</td>
<td>1,125</td>
</tr>
<tr>
<td>1-1/4</td>
<td>1,250</td>
</tr>
<tr>
<td>1-3/8</td>
<td>1,500</td>
</tr>
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**Attenuator Type and Characteristic Impedance Tolerance**

- E = Attenuator L-Pad ±15%
- L = Attenuator L-Pad ±20%
- N = Attenuator Bridge T-Pad ±15%
- L = Attenuator Bridge T-Pad ±20%

**Disclaimer:** Due to the unlimited design combinations, certain designs may not perform in accordance with all of the specifications.

**CAUTION:** Not all part number combinations are valid. Check parameter limits in text.

EXAMPLE: 70A1N024P501U

Invalid Bushing/Shaft Combination

Plain .375 inch (9.52 mm) long bushing with plain .375 inch (9.52 mm) long shaft.

* Hot Molded Carbon is no longer available
**Common Combinations**

The MOD POT® Potentiometer is available in single, dual, triple, and quadruple construction. This includes potentiometer, switch and multi-turn vernier drive modules. The table below lists some of the options available for single and multi-section controls. Because of the versatility of the MOD POT® Potentiometer, many other options are available. Momentary push switches may be used in place of push-pull switches in the listed combinations.

![Single Unit](image1)

![Dual Unit](image2)

![Triple Unit](image3)

![Quad Unit](image4)

<table>
<thead>
<tr>
<th>Section #1</th>
<th>Section #2</th>
<th>Section #3</th>
<th>Section #4</th>
<th>Potentiometer / Solder Lugs</th>
<th>Potentiometer / PC Pins</th>
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**NOTES:**
1. The outer shaft operates Sections #1 and #2.
2. The outer shaft operates Sections #1, #2, and #3.
3. The inner shaft (.078 [1.98 mm] diameter) is for the coarse adjustment, the outer shaft for the fine adjustment.
4. Series 72 must have .250 inch (6.35 mm) diameter shaft.
5. Available in 70 Series only.
6. Hot Molded Carbon is no longer available.
## RESISTANCE MODULES – LINEAR TAPER

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A = Available from Distributor Stock.
– = Special order only. Contact factory for information.
* = Not Available.

## RESISTANCE MODULES – NON-LINEAR TAPER

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A = Available from Distributor Stock.
– = Special order only. Contact State Electronics for information.
* = Not Available.

* Hot Molded Carbon is no longer available
### Standard Components

#### Standard Shaft Types

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<td>.250 (6.35 mm) Dia. Bushing Series 70</td>
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#### Standard Shaft / Bushing Combinations

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<td>Inner Concentric</td>
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#### Popular Shaft Lengths

- .250" (6.35mm)
- .375" (9.52mm)
- .4375" (11.11mm)
- .500" (12.70mm)
- .625" (15.88mm)
- .750" (19.05mm)
- 1.00" (25.40mm)
- 1.125" (28.58mm)
- 1.25" (31.75mm)
- 1.50" (38.11mm)
- 2.00" (50.80mm)
- 2.50" (63.50mm)

#### Standard Bushings

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<tr>
<td></td>
<td></td>
<td>.500</td>
<td>12.70 A</td>
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</table>

Shaft is cross slotted for screwdriver actuation. Flush with faceplate.
Mounting bushings are supplied with 32-NEF-2A thread. All bushing lengths measured from the mounting face to the end of the bushing.
A = Available. NA = Not Available.

70 = Available on Series 70. Note that Series 72 is only available as Plastic Single Shaft.
70, 72 = Available on Series 70 and 72
* = Available as a Special Order only. Contact State Electronics for information.

Bushing, Shaft and Hardware Dimensions are shown on Page 69-70
## Ordering Information

1. Basic type (Series 70, Series 72)
2. Type of element (cermet or conductive plastic (CP)).
3. Type of terminals (resistor element only).
4. Number of sections.
5. Taper (each element on multi-section controls).
6. Total resistance value in ohms (each element on multi-section controls).
7. Tolerance percent (each element on multi-section controls).
8. Bushing type (plain or locking).
9. Bushing length in inches or millimeters.
10. Bushing diameter .375" (9.52mm) or .250" (6.35mm)
11. Shaft ending (plain, slotted or flatted).
12. Shaft length FMS in inches or millimeters.
13. Shaft material: plastic or metal.
14. Switch type. (maximum 2 rotary switches per shaft)
15. Multi-Turn Vernier drive.
16. Locating lug option.
17. Mounting hardware.
18. Your part number, if any.
19. Marking requirement on the part.
20. Special features. (Forward complete detailed specs)

## DIMENSIONS

### Mounting Holes

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<td>.096 (2,44)</td>
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<td>.261 (6.63)</td>
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<td>.375 (9.52)</td>
<td>.261 (6.63)</td>
<td>.406 (10,31)</td>
<td>.096 (2,44)</td>
<td>*</td>
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<td>.406 (10,31)</td>
<td>.128 (3,24)</td>
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<td>7</td>
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<td>.531 (13,49)</td>
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<td>.406 (10,31)</td>
<td>.128 (3,24)</td>
<td>*</td>
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<tr>
<td>8</td>
<td>.531 (13,49)</td>
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<td>.261 (6.63)</td>
<td>.406 (10,31)</td>
<td>.128 (3,24)</td>
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<td>9</td>
<td>.531 (13,49)</td>
<td>*</td>
<td>.261 (6.63)</td>
<td>.406 (10,31)</td>
<td>.128 (3,24)</td>
<td>*</td>
</tr>
</tbody>
</table>

Dimension C Note:
Solid line is .261 inch diameter
Dashed line is .406 inch diameter

Dimension tolerance ± .016 (0.40) except as specified

* = Not Required

---

**Disclaimer:** Due to the unlimited design combinations, certain designs may not perform in accordance with all of the specifications

* Hot Molded Carbon is no longer available
Section 1: Single Module, Single Shaft

1A Single Potentiometer, Single Shaft, Solder Lugs

1A-PC Single Potentiometer, Single Shaft, Solder Pins

Notes:
   CP Plating - Terminals 1 & 3: .015” ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS).
2. All drawings are shown with 3/8” dia. bushing with 1/4” dia. shaft. 1/4” dia. bushing with 1/8” dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (0.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 1: Single module, Single Shaft (continued)

2A Single Rotary Switch, Single Shaft, Solder Lugs

Switch Option specifications

3A Single Push-Pull/Momentary Switch, Single Shaft, Solder Lugs

Dimension Notes:
- Terminal hole size: .047±.005 x .078±.005 (1.19±0.13 x 1.98±0.13)
- Note: Shaft length is measured in outer position

Notes:
1. Cermet Plating - Terminals 1 & 3: .025“ ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015“ ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminal 2: .015“ ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8” dia. bushing with 1/4” dia. shaft. 1/4” dia. bushing with 1/8” dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (0.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 2: Dual module, Single Shaft

4A Dual Potentiometer, Single Shaft, Solder Lugs

4A-PC Dual Potentiometer, Single Shaft, Solder Pins

Notes:
1. Cermet Plating - Terminals 1 & 3: .025” ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015” ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
2. All drawings are shown with 3/8” dia. bushing with 1/4” dia. shaft. 1/4” dia. bushing with 1/8” dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (0.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Notes:
1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 Micronches Gold.
   CP Plating - Terminal 2: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Micronches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Micronches Gold.
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Refer to Page 70 for Locating Lug options.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
5A-PC Single Potentiometer, Single DPST Rotary Switch, PC Pins

**Switch Option specifications**

**5A-PC-90° Single Potentiometer, Single DPST Rotary Switch, PC Pins (Rotated Switch Module)**

**Dimension Notes:**
- **T1** = 200 ± 0.10 (5.08 ± 0.25)
- **T2** = 0.085 ± 0.005 (2.16 ± 0.13)
- **T3** = 0.15 ± 0.005 (3.81 ± 0.13)
- **T4** = 0.25 ± 0.005 (6.35 ± 0.05)

Terminal hole size: 0.047 ± 0.005 × 0.078 ± 0.005 (1.19 ± 0.25 × 1.98 ± 0.25)

**Notes:**
1. Cermet Plating - Terminals 1 & 3: 0.025 ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   - CP Plating - Terminals 1 & 3: 0.015 ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±0.016 (0.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 2: Dual module, Single Shaft (continued)

5B Single Potentiometer, Single Push-Pull Switch, Solder Lugs

Dimension Notes:
- T1 = .175 ± .010 (4.45 ± .25)
- T2 = .085 ± .005 (2.16 ± .13)
- T3 = .015 ± .002 (0.38 ± .05)
- T4 = .100 ± .010 (2.54 ± .25)
- T5 = CP Element .085 ± .005 (2.16 ± .13); Cermet .125 Max
- T6 = CP Element .015 ± .002 (0.38 ± .05); Cermet .025 ± .002 (0.64 ± .05)
- Terminal hole size: .047 ± .005 x .078 ± .005 (1.19 ± .13 x 1.98 ± .13)
- Note: Shaft length is measured in outer position

Switch Option Specifications

5B-90° Single Potentiometer, Single Push-Pull Switch, Solder Lugs (Rotated Switch Module)

Dimension Notes:
- T1 = .175 ± .010 (4.45 ± .25)
- T2 = .085 ± .005 (2.16 ± .13)
- T3 = .015 ± .002 (0.38 ± .05)
- T4 = .100 ± .010 (2.54 ± .25)
- T5 = CP Element .085 ± .005 (2.16 ± .13); Cermet .125 Max
- T6 = CP Element .015 ± .002 (0.38 ± .05); Cermet .025 ± .002 (0.64 ± .05)
- Terminal hole size: .047 ± .005 x .078 ± .005 (1.19 ± .13 x 1.98 ± .13)
- Note: Shaft length is measured in outer position

Notes:
1. Cermet Plating - Terminals 1 & 3: .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   - CP Plating - Terminals 1 & 3: .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   - Cermet Plating - Terminal 2: .025 ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   - CP Plating - Terminal 2: .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   - Cermet Plating - Terminal 2: .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   - CP Plating - Terminal 2: .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware Dimensions.
4. Dimensional Tolerance ±.016 (0.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 2: Dual module, Single Shaft (continued)

5B-PC Single Potentiometer, Single Push-Pull Switch, PC Pins

Dimension Notes:
- T1 = .200 ± .015 (5.08 ± 0.38)
- T2 = .015 ± .003 (3.81 ± 0.076)
- T3 = .085 ± .005 (2.16 ± 0.13)
- T4 = .025 ± .002 (0.64 ± 0.05)
- Terminal hole size: .047 ± .005 x .078 ± .005 (1.19 ± 0.13 x 1.98 ± 0.13)

Note: Shaft length is measured in outer position.

Switch Option specifications

5B-PC-90° Single Potentiometer, Single Push-Pull Switch, PC Pins (Rotated Switch Module)

Dimension Notes:
- T1 = .200 ± .015 (5.08 ± 0.38)
- T2 = .015 ± .003 (3.81 ± 0.076)
- T3 = .085 ± .005 (2.16 ± 0.13)
- T4 = .025 ± .002 (0.64 ± 0.05)

Note: Shaft length is measured in outer position.

Notes:
1. Cermet Plating - Terminals 1 & 3: .025 ± .001 Soft Copper CDA Alloy 110, Plate 10 - 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015 ± .001 Soft Copper CDA Alloy 110, Plate 10 - 200 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025 ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 2: .015 ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.

2. All drawings are shown with 3/8” dia. bushing with 1/4” dia. shaft. 1/4” dia. bushing with 1/8” dia. shaft is available. Locking bushing is also available.

3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.

4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (.40), except as specified.

5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.

6. Drawings are not to scale.
Section 2: Dual module, Single Shaft (continued)

6A Potentiometer with Multi-Turn Vernier Drive, Single Shaft, Solder Lugs

6A-PC Potentiometer with Multi-Turn Vernier Drive, Single Shaft, Solder Pins

Notes:
1. Cermet Plating - Terminals 1 & 3: .025” ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015” ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025” ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 2: .015” ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8” dia. bushing with 1/4” dia. shaft. 1/4” dia. bushing with 1/8” dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
   Refer to Page 70 for Locating Lug options.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (0.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 3: Dual module, Concentric Shaft

7A Dual Potentiometer, Concentric Shaft, Solder Lugs

7A-PC Dual Potentiometer, Concentric Shaft, Solder Pins

Dimension Notes:
T1 = .175±.010 (4.45±0.25)
T2 = .275±.010 (6.98±0.25)
T3 = CP Element .085±.005 (2.16±0.13); Cermet .125Max
T4 = CP Element .015±.002 (0.38±0.05); Cermet .025±.002 (0.64±0.05)
T5 = CP Element .345 (8.76); Cermet .362 (9.19)
Terminal hole size: .047±.005 x .078±.005 (1.19 ±0.13 x 1.98±0.13)

Dimension Notes:
T1 = .200±.010 (5.08±0.25)
T2 = .300±.010 (7.62±0.25)
T3 = .025±.002 (0.64±0.05)

Notes:
1. Cermet Plating - Terminals 1 & 3: .025” ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015” ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025” ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 2: .015” ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8” dia. bushing with 1/4” dia. shaft.  1/4” dia. bushing with 1/8” dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
   Refer to Page 70 for Locating Lug options.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (0.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
### Section 3: Dual module, Concentric Shaft (continued)

#### 8A Single Potentiometer, Push-Pull Switch, Concentric Shaft, Solder Lugs

![Diagram of 8A Single Potentiometer, Push-Pull Switch, Concentric Shaft, Solder Lugs](image)

**Dimension Notes:**
- T1 = 175 ± .010 (4.45 ± 0.25)
- T2 = 085 ± .005 (2.16 ± 0.13)
- T3 = 015 ± .002 (0.38 ± 0.05)
- T4 = 100 ± 0.010 (2.54 ± 0.25)
- T5 = CP Element .085 ± .005 (2.16 ± 0.13), Cermet .125Max
- T6 = CP Element .015 ± .002 (0.38 ± 0.05), Cermet .025 ± .002 (0.64 ± 0.05)

**Notes:**
- Shaft length is measured in outer position

---

#### 8A-90° Single Potentiometer, Push-Pull Switch, Concentric Shaft, Solder Lugs (Rotated Switch Module)

![Diagram of 8A-90° Single Potentiometer, Push-Pull Switch, Concentric Shaft, Solder Lugs (Rotated Switch Module)](image)

**Dimension Notes:**
- T1 = 175 ± .010 (4.45 ± 0.25)
- T2 = 085 ± .005 (2.16 ± 0.13)
- T3 = 015 ± .002 (0.38 ± 0.05)
- T4 = 100 ± .010 (2.54 ± 0.25)
- T5 = CP Element .085 ± .005 (2.16 ± 0.13), Cermet .125Max
- T6 = CP Element .150 ± .005 (3.81 ± 0.13), Cermet .150 ± .002 (0.64 ± 0.05)

**Notes:**
- Shaft length is measured in outer position

---

### Notes:

1. Cermet Plating - Terminals 1 & 3: .025” ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   - CP Plating - Terminals 1 & 3: .015” ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   - Cermet Plating - Terminal 2: .025” ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   - CP Plating - Terminal 2: .015” ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   - Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.

2. All drawings are shown with 3/8” dia. bushing with 5/16” dia. shaft. 1/4” dia. bushing with 1/8” dia. shaft is available. Locking bushing is also available.

3. Refer to Page 69 for Bushing, Shaft and Hardware dimension.
   - Refer to Page 70 for Locating Lug options.

4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (0.40), except as specified.

5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.

6. Drawings are not to scale.

---

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Updated Jun.17.2019

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Cage Code: 7A378         http://www.potentiometers.com
Section 3: Dual module, Concentric Shaft (continued)

8A-PC Single Potentiometer, Push-Pull Switch, Concentric Shaft, PC Pins

Switch Option specifications

8A-PC-90° Single Potentiometer, Push-Pull Switch, Concentric Shaft, PC Pins (Rotated Switch Module)

Notes:
1. Cermet Plating - Terminals 1 & 3: .025” ± 0.001 Soft Copper CDA Alloy 110, Plate 20 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015” ± 0.001 Soft Copper CDA Alloy 110, Plate 20 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025” ± 0.001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 2: .015” ± 0.001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8” dia. bushing with 1/4” dia. shaft. 1/4” dia. bushing with 1/8” dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±0.016 (0,40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 3: Dual module, Concentric Shaft (continued)

9A Single Potentiometer, Rotary Switch, Concentric Shaft, Solder Lugs

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Dimension</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>0.175 ± 0.010 (4.45 ± 0.25)</td>
<td></td>
</tr>
<tr>
<td>T2</td>
<td>0.061 ± 0.005 (2.46 ± 0.13)</td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td>0.011 ± 0.002 (0.38 ± 0.005)</td>
<td></td>
</tr>
<tr>
<td>T4</td>
<td>CP Element 0.085 ± 0.005 (2.16 ± 0.13), Cermet 0.125 Max</td>
<td></td>
</tr>
<tr>
<td>T5</td>
<td>CP Element 0.015 ± 0.002 (0.38 ± 0.005), Cermet 0.025 ± 0.002 (0.64 ± 0.05)</td>
<td></td>
</tr>
</tbody>
</table>

Terminal hole size: 0.047 ± 0.005 x 0.078 ± 0.005 (1.19 ± 0.13 x 1.98 ± 0.13)

Note: Shaft length is measured in outer position.

Dimension Notes:

- T1 = 1.02 ± 0.02 (4.02 ± 0.005)
- T2 = 0.175 ± 0.010 (4.45 ± 0.25)
- T3 = 0.011 ± 0.002 (0.38 ± 0.005)
- T4 = CP Element 0.085 ± 0.005 (2.16 ± 0.13), Cermet 0.125 Max
- T5 = CP Element 0.015 ± 0.002 (0.38 ± 0.005), Cermet 0.025 ± 0.002 (0.64 ± 0.05)

Note: Shaft length is measured in outer position.

9A-90° Single Potentiometer, Rotary Switch, Concentric Shaft, Solder Lugs (Rotated Switch Module)

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Dimension</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>0.175 ± 0.010 (4.45 ± 0.25)</td>
<td></td>
</tr>
<tr>
<td>T2</td>
<td>0.061 ± 0.005 (2.46 ± 0.13)</td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td>0.011 ± 0.002 (0.38 ± 0.005)</td>
<td></td>
</tr>
<tr>
<td>T4</td>
<td>CP Element 0.085 ± 0.005 (2.16 ± 0.13), Cermet 0.125 Max</td>
<td></td>
</tr>
<tr>
<td>T5</td>
<td>CP Element 0.015 ± 0.002 (0.38 ± 0.005), Cermet 0.025 ± 0.002 (0.64 ± 0.05)</td>
<td></td>
</tr>
</tbody>
</table>

Terminal hole size: 0.047 ± 0.005 x 0.078 ± 0.005 (1.19 ± 0.13 x 1.98 ± 0.13)

Note: Shaft length is measured in outer position.

Dimension Notes:

- T1 = 1.02 ± 0.02 (4.02 ± 0.005)
- T2 = 0.175 ± 0.010 (4.45 ± 0.25)
- T3 = 0.011 ± 0.002 (0.38 ± 0.005)
- T4 = CP Element 0.085 ± 0.005 (2.16 ± 0.13), Cermet 0.125 Max
- T5 = CP Element 0.015 ± 0.002 (0.38 ± 0.005), Cermet 0.025 ± 0.002 (0.64 ± 0.05)

Note: Shaft length is measured in outer position.

Notes:
1. Cermet Plating - Terminals 1 & 3: 0.025 ± 0.001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microniches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: 0.015 ± 0.001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microniches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: 0.025 ± 0.001 Soft Copper CDA Alloy 110, Plate 20 Microniches Gold.
   CP Plating - Terminal 2: 0.015 ± 0.001 Soft Copper CDA Alloy 110, Plate 20 Microniches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microniches Gold.
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
   Refer to Page 70 for Locating Lug options.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ± 0.016 (0.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 3: Dual module, Concentric Shaft (continued)

9A-PC Single Potentiometer, Rotary Switch, Concentric Shaft, Solder Lugs

Switch Option specifications

9A-PC-90° Single Potentiometer, Rotary Switch, Concentric Shaft, Solder Lugs (Rotated Switch Module)

Notes:
1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 2: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Refer to Page 70 for Locating Lug options.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 3: Dual module, Concentric Shaft (continued)

10A Potentiometer with Multi-Turn Vernier Drive, Concentric Shaft, Solder Lugs

The inner shaft (.078 [1.98 mm] diameter) is for the coarse adjustment, the outer shaft for the fine adjustment.

10A-PC Potentiometer with Multi-Turn Vernier Drive, Concentric Shaft, Solder Pins

The inner shaft (.078 [1.98 mm] diameter) is for the coarse adjustment, the outer shaft for the fine adjustment.

11A Rotary Switch, Push-Pull/Momentary Switch, Concentric Shaft, Solder Lugs

Switch Option specifications

Notes:
1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 2: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
   Refer to Page 70 for Locating Lug options.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
## Section 4: Triple module, Single Shaft

### 12A Triple Potentiometer, Single Shaft, Solder Lugs

![Diagram of 12A Triple Potentiometer](image1)

**Dimension Notes:**
- **T1** = .175±.010 (4.45±.25)
- **T2** = .200±.010 (5.08±.25)
- **T3** = CP Element .085±.005 (2.16±.13); Cermet .125Max
- **T4** = CP Element .015±.002 (0.38±.05); Cermet .025±.002 (0.64±.05)
- **T5** = CP Element .345 (8.76); Cermet .362 (9.19)

**Terminal hole size:** .047±.005 x .078±.005 (1.19±.013 x 1.98±.013)

### 12A-PC Triple Potentiometer, Single Shaft, Solder Pins

![Diagram of 12A-PC Triple Potentiometer](image2)

**Dimension Notes:**
- **T1** = .200±.010 (5.08±.25)
- **T2** = .025±.002 (0.64±.05)

**Notes:**
1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 100, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 100, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 2: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (0.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 4: Triple module, Single Shaft (continued)

12B - Dual Potentiometer, Push-Pull Switch, Solder Lugs

Switch Option specifications

12B-90° Dual Potentiometer, Push-Pull Switch, Solder Lugs (Rotated Switch Module)

Notes:
1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
Cermet Plating - Terminal 2: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
CP Plating - Terminal 2: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
Refer to Page 70 for Locating Lug options.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
**Section 4: Triple module, Single Shaft (continued)**

### 12B-PC Dual Potentiometer, DPST Push-Pull Switch, PC Pins

![Bottom View](image1)

**Dimension Notes:**

- \( T_1 = 200.0 \pm 0.1 \) (5.88 ± 0.025)
- \( T_2 = 0.150 \) (3.81)
- \( T_3 = 0.150 \) (3.81)
- \( T_4 = 0.150 \) (3.81)

Terminal hole size: \( 0.047 \) ± 0.005 x \( 0.078 \) ± 0.005 (1.19 ± 0.13 x 1.98 ± 0.13)

**Note:** Shaft length is measured in outer position

---

### 12B-PC-90° Single Potentiometer, DPST Push-Pull Switch, PC Pins (Rotated Switch Module)

![Bottom View](image2)

**Dimension Notes:**

- \( T_1 = 200.0 \pm 0.1 \) (5.88 ± 0.025)
- \( T_2 = 0.150 \) (3.81)
- \( T_3 = 0.150 \) (3.81)
- \( T_4 = 0.150 \) (3.81)

Terminal hole size: \( 0.047 \) ± 0.005 x \( 0.078 \) ± 0.005 (1.19 ± 0.13 x 1.98 ± 0.13)

**Note:** Shaft length is measured in outer position

---

**Notes:**

1. Cermet Plating - Terminals 1 & 3: .025 ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015 ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)

   CP Plating - Terminal 2: .015 ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.


4. All drawings are shown with 3/8” dia. bushing with 1/4” dia. shaft. 1/4” dia. bushing with 1/8” dia. shaft is available. Locking bushing is also available.

5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.

6. Drawings are not to scale.
Section 4: Triple module, Single Shaft (continued)

12C Single Potentiometer, Rotary Switch, and Push-Pull Switch, Solder Lugs

Switch Option specifications

12C-90° Single Potentiometer, Rotary Switch, and Push-Pull Switch, Solder Lugs (Rotated Switch Module)

Notes:
1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Cermet Plating - Terminal 2: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 2: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
   Refer to Page 70 for Locating Lug options.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±0.016 (0.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
**Section 4: Triple module, Single Shaft (continued)**

### 12C-PC Single Potentiometer, Rotary Switch, and Push-Pull Switch, PC Pins

#### Switch Option specifications

<table>
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<tr>
<th>Switch Option</th>
<th>Specification</th>
</tr>
</thead>
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<td>.362 (9.19)</td>
</tr>
<tr>
<td>Cermet</td>
<td>.345 (8.76)</td>
</tr>
</tbody>
</table>

### 12C-PC-90° Single Potentiometer, Rotary Switch, and Push-Pull Switch, PC Pins (Rotated Switch Module)

#### Dimension Notes:
- T1 = .200±.010 (5.08±.025)
- T2 = .085±.005 (2.16±.013)
- T3 = .015±.002 (0.38±.005)
- T4 = .025±.005 (0.64±.013)

#### Notes:
1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   - CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)

2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (0.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 4: Triple module, Single Shaft (continued)

13A - Dual Potentiometer, Single Rotary Switch, Solder Lugs

**Switch Option specifications**

13A-90° - Dual Potentiometer, Single Rotary Switch, Solder Lugs (Rotated Switch Module)

**Notes:**
1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisper-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisper-Free (RoHS)
   Cermet Plating - Terminal 2: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 2: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
   Refer to Page 70 for Locating Lug options.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (0,40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 4: Triple module, Single Shaft (continued)

13A-PC - Dual Potentiometer, Single Rotary Switch, PC Pins

Switch Option specifications

13A-PC-90° - Dual Potentiometer, Single Rotary Switch, PC Pins (Rotated Switch Module)

Notes:
1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
Cermet Plating - Terminal 2: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
CP Plating - Terminal 2: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Refer to Page 70 for Locating Lug options.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.

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1.462 ± .047 (37.67 ± 1.19)
2.35 (5.97)

Dimension Notes:
T1 = 200 ± 0.010 (5.08 ± 0.25)
T2 = 188 ± 0.010 (4.77 ± 0.25)
T3 = 109 ± 0.010 (2.76 ± 0.25)
T4 = 0.625 ± 0.002 (1.60 ± 0.05)
T5 = 0.500 ± 0.002 (1.27 ± 0.05)
T6 = 0.141 ± 0.005 (3.57 ± 0.13)
Terminal hole size: .047 ± 0.005 x .078 ± 0.005 (1.19 ± 0.13)

3644 ± 0.015 (8.73 ± 0.25)
625 (15.88)

3.464 ± 0.015 (8.73 ± 0.25)
625 (15.88)

CP Element: 362 (9.19)
Cermet: 345 (8.76)
Section 4: Triple module, Single Shaft (continued)

13B - Single Potentiometer, Dual Rotary Switch, Solder Lugs

Switch Option specifications

13B-90° - Single Potentiometer, Dual Rotary Switch, Solder Lugs (Rotated Switch Module)

Notes:
1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 1: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 1: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Refer to Page 70 for Locating Lug options.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 4: Triple module, Single Shaft (continued)

13B-PC - Single Potentiometer, Dual Rotary Switch, PC Pins

Switch Option specifications

13B-PC-90° - Single Potentiometer, Dual Rotary Switch, PC Pins (Rotated Switch Module)

Notes:
1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 2: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
   Refer to Page 70 for Locating Lug options.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (0.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 4: Triple module, Single Shaft (continued)

14A Dual Potentiometer with Multi-Turn Vernier Drive, Single Shaft, Solder Lugs

14A-PC Dual Potentiometer with Multi-Turn Vernier Drive, Single Shaft, Solder Pins

Dimension Notes:
- T1 = .175±.010 (4.45±0.25)
- T2 = .200±.010 (5.08±0.25)
- T3 = CP Element .085±.005 (2.16±0.13); Cermet 125Max
- T4 = CP Element .15 ± .002 (0.38±0.05); Cermet .025±.002 (0.64±0.05)
- T5 = CP Element .345 (8.76); Cermet .362 (9.19)
- Terminal hole size: .047±.005 x .078±.005 (1.19 ±0.13 x 1.98±0.13)

Dimension Notes:
- T1 = .200±.010 (5.08±0.25)
- T2 = .025±.002 (0.64±0.05)

Notes:
1. Cermet Plating - Terminals 1 & 3: .025” ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015” ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025” ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 2: .015” ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8” dia. bushing with 1/4” dia. shaft.  1/4” dia. bushing with 1/8” dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (0.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 5: Triple module, Concentric Shaft

15A Triple Potentiometer, Concentric Shaft, Solder Lugs

As shown, Outer Shaft operates First Section

15A-PC Triple Potentiometer, Concentric Shaft, Solder Pins

As shown, Outer Shaft operates First Section

Notes:
1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 2: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
   Refer to Page 70 for Locating Lug options.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
**Notes:**

1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 2: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.

2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.

3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
   Refer to Page 70 for Locating Lug options.

4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (0.40), except as specified.

5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.

6. Drawings are not to scale.
Section 5: Triple module, Concentric Shaft (continued)

16A-PC Dual Potentiometer, Rotary Switch, Concentric Shaft, PC Pins

Switch Option specifications

16A-PC-90° Dual Potentiometer, Rotary Switch, Concentric Shaft, PC Pins (Rotated Switch Module)

Notes:

1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)  
CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)  
Cermet Plating - Terminal 2: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.  
CP Plating - Terminal 2: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.  
Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.

2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.

3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.

4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (0.40), except as specified.

5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.

6. Drawings are not to scale.

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Section 5: Triple module, Concentric Shaft (continued)

17A Dual Potentiometer, Push-Pull Switch, Solder Lugs

Switch Option specifications

Notes:
1. Cermet Plating - Terminals 1 & 3: .025” ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015” ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
Cermet Plating - Terminal 2: .025” ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
CP Plating - Terminal 2: .015” ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.

2. All drawings are shown with 3/8” dia. bushing with 1/4” dia. shaft. 1/4” dia. bushing with 1/8” dia. shaft is available. Locking bushing is also available.

3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions. Refer to Page 70 for Locating Lug options.

4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±0.016 (0.40), except as specified.

5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.

6. Drawings are not to scale.
Section 5: Triple module, Concentric Shaft (continued)

17A-PC Dual Potentiometer, Push-Pull Switch, Concentric Shaft, Solder Lugs

Switch Option specifications

17A-PC-90° Dual Potentiometer, Push-Pull Switch, Concentric Shaft, Solder Lugs (Rotated Switch Module)

Notes:
1. Cermet Plating - Terminals 1 & 3: .025” ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015” ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025” ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 2: .015” ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8” dia. bushing with 1/4” dia. shaft.  1/4” dia. bushing with 1/8” dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Refer to Page 70 for Locating Lug options.
5. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (.40), except as specified.
6. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
7. Drawings are not to scale.
Section 5: Triple module, Concentric Shaft (continued)

18A Single Potentiometer, Rotary Switch, and Push-Pull Switch, Solder Lugs

Switch Option specifications

18A-90° Potentiometer, Rotary and Push-Pull Switch, Solder Lugs (Rotated Switch) Module

Notes:
1. Cermet Plating - Terminals 1 & 3: .025” ± .001 Soft Copper CDA Alloy 110, Plate 120 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .025” ± .001 Soft Copper CDA Alloy 110, Plate 120 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025” ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 2: .025” ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8” dia. bushing with 1/4” dia. shaft. 1/4” dia. bushing with 3/8” dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Refer to Page 70 for Locating Lug options.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 5: Triple module, Concentric Shaft (continued)

18A-PC Single Potentiometer, Rotary Switch, and Push-Pull Switch, Concentric Shaft, Solder Lugs

Switch Option specifications

18A-PC-90° Potentiometer, Rotary and Push-Pull Switch, Concentric Shaft, Solder Lugs (Rotated Switch Module)

Notes:
1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 2: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4.绘制页70 for Locating Lug options.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 5: Triple module, Concentric Shaft (continued)

19A Dual Potentiometer with Multi-Turn Vernier Drive, Concentric Shaft, Solder Lugs

19A-PC Dual Potentiometer with Multi-Turn Vernier Drive, Concentric Shaft, Solder Pins

Dimension Notes:
- T1 = 191±.010 (4.84±0.25)
- T2 = 300±.010 (7.62±0.25)
- T3 = 181±.010 (4.59±0.25)
- T4 = 0.023±.002 (0.64±0.05)

Notes:
1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 2: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 5: Triple module, Concentric Shaft (continued)

20A - Multi-Turn Vernier, Potentiometer, and Rotary Switch, Concentric Shaft, Solder Lugs

20A-90° - Multi-Turn Vernier, Potentiometer, and Rotary Switch, Concentric Shaft, Solder Lugs (Rotated Switch)

Notes:
   CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 - 200 Microinches Bright Tin, Whisker-Free (RoHS).
   Cermet Plating - Terminal 2: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 2: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Cermet, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
   Refer to Page 68 for Locating Lug options.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (0.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 5: Triple module, Concentric Shaft (continued)

20A-PC - Multi-Turn Vernier, Potentiometer, and Rotary Switch, Solder Lugs

Switch Option specifications

20A-PC-90° - Multi-Turn Vernier, Potentiometer, and Rotary Switch, Solder Lugs (Rotated Switch Module)

Notes:
1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminal 2: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (0,40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
### 23A Quad Potentiometer, Single Shaft, Solder Lugs

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Mounting Surface</td>
</tr>
<tr>
<td>B</td>
<td>Mounting Surface</td>
</tr>
<tr>
<td>T1</td>
<td>0.200 ± 0.010 (5.08 ± 0.25)</td>
</tr>
<tr>
<td>T2</td>
<td>0.200 ± 0.010 (5.08 ± 0.25)</td>
</tr>
<tr>
<td>T3</td>
<td>CP Element: 0.05 ± 0.01 (1.27 ± 0.03); Cermet: 0.125 ± 0.01 (3.18 ± 0.03)</td>
</tr>
<tr>
<td>T4</td>
<td>CP Element: 0.015 ± 0.002 (0.38 ± 0.05); Cermet: 0.025 ± 0.002 (0.64 ± 0.05)</td>
</tr>
<tr>
<td>T5</td>
<td>CP Element: 0.345 (8.76); Cermet: 0.362 (9.19)</td>
</tr>
<tr>
<td>Terminal hole size:</td>
<td>0.047 ± 0.005 x 0.078 ± 0.005 (1.19 ± 0.13 x 1.98 ± 0.13)</td>
</tr>
</tbody>
</table>

### 23A-PC Quad Potentiometer, Single Shaft, Solder Pins

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Mounting Surface</td>
</tr>
<tr>
<td>B</td>
<td>Mounting Surface</td>
</tr>
<tr>
<td>T1</td>
<td>0.200 ± 0.010 (5.08 ± 0.25)</td>
</tr>
<tr>
<td>T2</td>
<td>0.025 ± 0.002 (0.64 ± 0.05)</td>
</tr>
</tbody>
</table>

### Notes:
1. Cermet Plating - Terminals 1 & 3: 0.025” ± 0.001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: 0.015” ± 0.001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: 0.025” ± 0.001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold,
   CP Plating - Terminal 2: 0.015” ± 0.001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8” dia. bushing with 1/4” dia. shaft. 1/4” dia. bushing with 1/8” dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Refer to Page 70 for Locating Lug options.
5. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ± 0.016 (0.40), except as specified.
6. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
7. Drawings are not to scale.
Section 6: Quad module, Single Shaft (continued)

23B - Triple Potentiometer, Push-Pull Switch, Solder Lugs

Switch Option specifications

23B-90° - Triple Potentiometer, Push-Pull Switch, Solder Lugs (Rotated Switch Module)

Notes:
1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 200 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 2: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Refer to Page 70 for Locating Lug options.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 6: Quad module, Single Shaft (continued)

### 23B-PC - Triple Potentiometer, Push-Pull Switch, PC Pins

**Dimension Notes:**

1. **CP Plating - Terminal 2:** .015” ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. **Switches, All Terminals:** Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
3. **Terminal Numbers:** For reference only. Numbers are NOT printed on the device.
4. **Drawings:** Not to scale.

### 23B-PC-90° - Triple Potentiometer, Push-Pull Switch, PC Pins (Rotated Switch Module)

**Dimension Notes:**

1. **Cermet Plating - Terminals 1 & 3:** .025” ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
2. **CP Plating - Terminals 1 & 3:** .015” ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
3. **Cermet Plating - Terminal 2:** .025” ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
4. **Switches:** All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
5. **All drawings:** Shown with 3/8” dia. bushing with 1/4” dia. shaft. 1/4” dia. bushing with 1/8” dia. shaft is available. Locking bushing is also available.
6. **Refer to:** Page 69 for bushing, shaft and hardware dimensions.
7. **Locating Lug options:**
8. **Basic dimensions:** in inches. Dimensions in parentheses are in millimeters. Dimensional tolerance ±.016 (.40), except as specified.
9. **Terminal Numbers:** are for reference only. Numbers are NOT printed on the device.
10. **Drawings:** are not to scale.

### Switch Option Specifications

- **CCW Actuation:** 15°
- **SWITCH ACTUATION:** 15°
- **ALTERNATE SW:**
- **TOTAL ROTATION:** 300°

**Notes:**

1. **Cermet Plating - Terminals 1 & 3:** .025” ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
2. **CP Plating - Terminals 1 & 3:** .015” ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
3. **Cermet Plating - Terminal 2:** .025” ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
4. **Switches:** All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
5. **All drawings:** Shown with 3/8” dia. bushing with 1/4” dia. shaft. 1/4” dia. bushing with 1/8” dia. shaft is available. Locking bushing is also available.
6. **Refer to:** Page 69 for bushing, shaft and hardware dimensions.
7. **Locating Lug options:**
8. **Basic dimensions:** in inches. Dimensions in parentheses are in millimeters. Dimensional tolerance ±.016 (.40), except as specified.
9. **Terminal Numbers:** are for reference only. Numbers are NOT printed on the device.
10. **Drawings:** are not to scale.
23C - Dual Potentiometer, Rotary Switch, Push-Pull Switch, Solder Lugs

23C-90° - Dual Potentiometer, Rotary Switch, Push-Pull, Solder Lugs (Rotated Switch Modules)

Notes:
1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 2: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.

2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.

3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
   Refer to Page 70 for Locating Lug options.

4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (.40), except as specified.

5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.

6. Drawings are not to scale.

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Cage Code: 7A378 http://www.potentiometers.com
Section 6: Quad module, Single Shaft (continued)

23C-PC - Dual Potentiometer, Rotary Switch, Push-Pull, PC Pins

Switch Option specifications

23C-PC-90° - Dual Potentiometer, Rotary Switch, Push-Pull, PC Pins (Rotated Switch Module)

Notes:
1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microniches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microniches Bright Tin, Whisker-Free (RoHS)
2. All drawings are shown with 3/8” dia. bushing with 1/4” dia. shaft. 1/4” dia. bushing with 1/8” dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 6: Quad module, Single Shaft (continued)

23D - Triple Potentiometer, Rotary Switch, Solder Lugs

Switch Option specifications

23D-90° - Triple Potentiometer, Rotary Switch, Solder Lugs (Rotated Switch Module)

Notes:
1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025" ± .001 Soft Copper CDA Alloy 110, Plate 0 Microinches Gold.
   CP Plating - Terminal 2: .015" ± .001 Soft Copper CDA Alloy 110, Plate 0 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 0 Microinches Gold.
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
   Refer to Page 70 for Locating Lug options:
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 6: Quad module, Single Shaft (continued)

23D-PC - Triple Potentiometer, Rotary Switch, PC Pins

Switch Option specifications

23D-PC-90° - Triple Potentiometer, Rotary Switch, PC Pins (Rotated Switch Module)

Notes:
1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 2: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (0,40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 6: Quad module, Single Shaft (continued)

25A Triple Potentiometer with Multi-Turn Vernier Drive, Solder Lugs

25A-PC Triple Potentiometer with Multi-Turn Vernier Drive, Solder Pins

Notes:
1. Cermet Plating - Terminals 1 & 3: .025 ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microniches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015 ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microniches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025 ± .001 Soft Copper CDA Alloy 110, Plate 20 Microniches Gold.
   CP Plating - Terminal 2: .015 ± .001 Soft Copper CDA Alloy 110, Plate 20 Microniches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microniches Gold.
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
   Refer to Page 70 for Locating Lug options.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (0.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 7: Quad module, Concentric Shaft

26A - Quad Potentiometer, Solder Lugs

As shown, Outer Shaft operates First Two Sections

26A-PC - Quad Potentiometer, Solder Pins

As shown, Outer Shaft operates First Two Sections

Notes:
1. Cermet Plating - Terminals 1 & 3: .025” ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminal 1 & 3: .015” ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025” ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold
   CP Plating - Terminal 2: .015” ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8” dia. bushing with 1/4” dia. shaft. 1/4” dia. bushing with 1/8” dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Refer to Page 70 for Locating Lug options.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 7: Quad module, Concentric Shaft (continued)

27A - Triple Potentiometer, Rotary Switch, Solder Lugs

Switch Option specifications

27A-90° - Triple Potentiometer, Rotary Switch, Solder Lugs (Rotated Switch Module)

Notes:
1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 10 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 10 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminal 2: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Refer to Page 70 for Locating Lug options.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 7: Quad module, Concentric Shaft (continued)

27A-PC - Triple Potentiometer, Rotary Switch, PC Pins

Switch Option specifications

27A-PC-90° - Triple Potentiometer, Rotary Switch, PC Pins (Rotated Switch Module)

Notes:
1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ± .016 (0.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 7: Quad module, Concentric Shaft (continued)

28A - Potentiometer, Rotary Switch, Potentiometer, Push-Pull Switch, Solder Lugs

Switch Option specifications

Notes:
1. Cermet Plating - Terminals 1 & 3: .025± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
2. All drawings are shown with 3/8” dia. bushing with 1/4” dia. shaft. 1/4” dia. bushing with 1/8” dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Refer to Page 70 for Locating Lug options.
5. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (0.40), except as specified.
6. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
7. Drawings are not to scale.

28A-90° - Potentiometer, Rotary Switch, Potentiometer, Push-Pull Switch, Solder Lugs (Rotated Switch Module)

Notes:
1. Cermet Plating - Terminals 1 & 3: .025± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
2. All drawings are shown with 3/8” dia. bushing with 1/4” dia. shaft. 1/4” dia. bushing with 1/8” dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Refer to Page 70 for Locating Lug options.
5. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (0.40), except as specified.
6. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
7. Drawings are not to scale.
Section 7: Quad module, Concentric Shaft (continued)

28A-PC - Potentiometer, Rotary Switch, Potentiometer, Push-Pull Switch, PC Pins

Switch Option specifications

28A-PC-90° - Potentiometer, Rotary Switch, Potentiometer, Push-Pull Switch, PC Pins (Rotated Switch Module)

Notes:
1. Cermet Plating - Terminals 1 & 3: .025 ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microniches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015 ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microniches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025 ± .001 Soft Copper CDA Alloy 110, Plate 20 Microniches Gold.
   CP Plating - Terminal 2: .015 ± .001 Soft Copper CDA Alloy 110, Plate 20 Microniches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microniches Gold.
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
   Refer to Page 70 for Locating Lug options.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (0.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
28B - Potentiometer, Rotary Switch, Potentiometer, Rotary Switch, Solder Lugs

Switch Option specifications

Notes:
1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminal 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 2: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Refer to Page 70 for Locating Lug options.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.

28B-90° - Potentiometer, Rotary Switch, Potentiometer, Rotary Switch, Solder Lugs (Rotated Switch Modules)
Section 7: Quad module, Concentric Shaft (continued)

29A - Dual Potentiometer, Dual Rotary Switch, Solder Lugs

Switch Option specifications

Notes:
1. Cermet Plating - Terminals 1 & 3: .025 ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015 ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025 ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 2: .015 ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.

Dimensions:
- T1 = .175 ± .010 (4.45 ± 0.25)
- T2 = .200 ± .010 (5.08 ± 0.25)
- T3 = .321 ± .010 (8.15 ± 0.25)
- T4 = .109 ± .010 (2.77 ± 0.25)
- T5 = .085 ± .005 (2.16 ± 0.13)
- T6 = .015 ± .002 (0.38 ± 0.05)
- T7 = CP Element: .085 ± .005 (2.16 ± 0.13); Cermet: .125 Max
- T8 = CP Element: .015 ± .002 (0.38 ± 0.05); Cermet: .025 ± .002 (0.64 ± 0.05)

Terminal hole size: .047 ± .005 x .078 ± .005 (1.19 ± 0.13 x 1.98 ± 0.13)

Note: Shaft length is measured in outer position.
Section 7: Quad module, Concentric Shaft (continued)

29A-PC - Dual Potentiometer, Dual Rotary Switch, PC Pins

Switch Option specifications

Notes:
1. Cermet Plating - Terminals 1 & 3: .025 ± .001 Soft Copper CDA Alloy 110, Plate 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015 ± .001 Soft Copper CDA Alloy 110, Plate 200 Microinches Bright Tin, Whisker-Free (RoHS)
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft.  1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft, and Hardware dimensions.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.

29A-PC-90 - Dual Potentiometer, Dual Rotary Switch, PC Pins (Rotated Switch Modules)

Dimension Notes:
T1: 2.00 ± .030 (50.8 ± .76)
T2: 2.25 ± .030 (57.15 ± .76)
T3: 1.23 ± .030 (3.12 ± .76)
T4: 1.00 ± .020 (2.54 ± .05)
T5: .075 ± .005 (1.91 ± .013)
Terminal hole size: .047 ± .005 x .075 ± .005 (1.20 ± .13 x 1.91 ± .13)
Note: Shaft length is measured in outer position

Dimension Notes:
T1: 2.00 ± .030 (50.8 ± .76)
T2: 2.25 ± .030 (57.15 ± .76)
T3: 1.23 ± .030 (3.12 ± .76)
T4: 1.00 ± .020 (2.54 ± .05)
T5: .075 ± .005 (1.91 ± .013)
Terminal hole size: .047 ± .005 x .075 ± .005 (1.20 ± .13 x 1.91 ± .13)
Note: Shaft length is measured in outer position

Notes:
1. Cermet Plating - Terminals 1 & 3: .025 ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015 ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft.  1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft, and Hardware dimensions.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 7: Quad module, Concentric Shaft (continued)

30A - Dual Potentiometer, Rotary and Push-Pull Switch, Solder Lugs

Switch Option specifications

30A-90° - Dual Potentiometer, Rotary and Push-Pull Switch, Solder Lugs (Rotated Switch) Module

Dimension Notes:

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<th>Top View</th>
<th>Rear View</th>
<th>Front View</th>
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<td>T2: 2.00±0.010 (5.08±0.25)</td>
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<td>T3: 3.96±0.010 (10.06±0.25)</td>
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<td>T4: 5.0±0.010 (12.7±0.25)</td>
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<tr>
<td>T5: 0.05±0.025 (1.27±0.64)</td>
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<td>T6: CP Element .05±0.025 (1.27±0.64)</td>
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<tr>
<td>Terminal hole size: .047±0.005 x .078±0.005 (1.19±0.13 x 1.98±0.13)</td>
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</tbody>
</table>

Note: Shaft length is measured in outer position.

Notes:

1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 - 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)

2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 59 for Bushing, Shaft and Hardware dimensions.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (0.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 7: Quad module, Concentric Shaft (continued)

30A-PC - Dual Potentiometer, Rotary and Push-Pull Switch, PC Pins

**Switch Option specifications**

30A-PC-90° - Potentiometer, Rotary and Push-Pull Switch, PC Pins (Rotated Switch) Module

**Notes:**
1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
Cermet Plating - Terminal 2: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
CP Plating - Terminal 2: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8” dia. bushing with 1/4” dia. shaft. 1/4” dia. bushing with 1/8” dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (0.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
**Section 7: Quad module, Conentric Shaft (continued)**

**31A - Triple Potentiometer, Push-Pull Switch, Solder Lugs**

**Switch Option specifications**

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**31A-90° Triple Potentiometer, Push-Pull Switch, Solder Lugs (Rotated Switch Module)**

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**Notes:**

1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 200 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 2: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.

2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.

3. Refer to Page 69 for **Bushing, Shaft and Hardware dimensions**.

4. Refer to Page 70 for **Locating Lug options**.

5. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±0.016 (0.40), except as specified.

6. Terminal Numbers are for reference only. Numbers are NOT printed on the device.

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Cage Code: 7A378 http://www.potentiometers.com

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Section 7: Quad module, Concentric Shaft (continued)

31A-PC - Triple Potentiometer, Push-Pull Switch, PC Pins

Switch Option specifications

31A-PC-90° Triple Potentiometer, Push-Pull Switch, PC Pins (Rotated Switch Module)

Notes:
1. Cermet Plating - Terminals 1 & 3: .025" ± 0.001 Soft Copper CDA Alloy 110, Plate 50 - 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015" ± 0.001 Soft Copper CDA Alloy 110, Plate 50 - 200 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025" ± 0.001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 2: .015" ± 0.001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
   Refer to Page 70 for Locating Lug options.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±0.016 (.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 7: Quad module, Concentric Shaft (continued)

32A Triple Potentiometer with Multi-Turn Vernier Drive, Solder Lugs

![Diagram of 32A Triple Potentiometer]

32A-PC Triple Potentiometer with Multi-Turn Vernier Drive, Solder Pins

![Diagram of 32A-PC Triple Potentiometer]

Dimension Notes:

- **T1**: 175 ± 0.10 (4.45 ± 0.25)
- **T2**: 275 ± 0.10 (6.98 ± 0.25)
- **T3**: 200 ± 0.10 (5.08 ± 0.25)
- **T4**: 100 ± 0.10 (2.54 ± 0.25)
- **T5**: CP Element ± 0.005 (2.16 ± 0.13); Cermet .125Max
- **T6**: CP Element ± 0.002 (0.64 ± 0.05)
- **T7**: CP Element .345 (8.76); Cermet .362 (9.19)

Terminal hole size: .047 ± .005 x .078 ± .005 (1.19 ± 0.13 x 1.98 ± 0.13)

Notes:

1. Cermet Plating - Terminals 1 & 3: .025” ± .001 Soft Copper CDA Alloy 110, Plate 20 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015” ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025” ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 2: .015” ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8” dia. bushing with 1/4” dia. shaft. 1/4” dia. bushing with 1/8” dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Refer to Page 70 for Locating Lug options.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
Section 7: Quad module, Concentric Shaft (continued)

33A - Dual Potentiometer with Multi-Turn Vernier Drive, Rotary Switch, Solder Lugs

Switch Option specifications

33A-90° - Dual Potentiometer with Multi-Turn Vernier Drive, Rotary Switch, Solder Lugs (Rotated Switch Module)

Notes:
1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 50 – 200 Microinches Bright Tin, Whisker-Free (RoHS)
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Switch Option specifications
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±0.016 (0.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
33A-PC - Dual Potentiometer with Multi-Turn Vernier Drive, Rotary Switch, PC Pins

Switch Option specifications

33A-PC-90° - Dual Potentiometer with Vernier Drive, Rotary Switch, PC Pins (Rotated Switch Module)

Notes:
1. Cermet Plating - Terminals 1 & 3: .025" ± .001 Soft Copper CDA Alloy 110, Plate 200 Microinches Bright Tin, Whisker-Free (RoHS)
   CP Plating - Terminals 1 & 3: .015" ± .001 Soft Copper CDA Alloy 110, Plate 200 Microinches Bright Tin, Whisker-Free (RoHS)
   Cermet Plating - Terminal 2: .025" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   CP Plating - Terminal 2: .015" ± .001 Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
   Switches, All Terminals - Soft Copper CDA Alloy 110, Plate 20 Microinches Gold.
2. All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" dia. bushing with 1/8" dia. shaft is available. Locking bushing is also available.
3. Refer to Page 69 for Bushing, Shaft and Hardware dimensions.
4. Basic dimensions are in inches. Dimensions in parentheses are in millimeters. Dimensional Tolerance ±.016 (.40), except as specified.
5. Terminal Numbers are for reference only. Numbers are NOT printed on the device.
6. Drawings are not to scale.
### DIMENSIONS

**Bushing, Shaft and Hardware Dimensions**

#### 3/8" Plain Bushing

- **Bushing Lengths**: .250 – .375 (6.35 – 9.53mm)
- **Mounting Surface**: .375–32 NEF - 2A Thread
- **Shaft Diameter**: .125 ± .001

#### 3/8" Locking Bushing

- **Bushing Lengths**: .375 – .500 (9.53 – 12.70mm)
- **Mounting Surface**: .375–32 NEF - 2A Thread
- **Slots are Randomly Located**

#### Mounting Hardware for 3/8" Bushing

- **Lock Washer**: M-2898
- **Mounting Nut**: M-2786
- **Lock Nut**: M3838

#### 1/4" Plain Bushing

- **Bushing Lengths**: .250 – .375 (6.35 – 9.53mm)
- **Mounting Surface**: .250–32 NEF - 2A Thread
- **Shaft Diameter**: .125 ± .001

#### 1/4" Locking Bushing

- **Bushing Lengths**: .375 – .500 (9.53 – 12.70mm)
- **Mounting Surface**: .250–32 NEF - 2A Thread
- **Slots are Randomly Located**

#### Mounting Hardware for 1/4" Bushing

- **Lock Washer**: M-4748
- **Mounting Nut**: M-4721
- **Lock Nut**: M4761

---

**Standard Bushing and Shaft Dimensions are shown on Page 11**

---

**Dimensions**

- Basic dimensions are in inches.
- Dimensions shown in parentheses are in millimeters.

**Tolerance**

- Dimensional tolerance ±.016 (0.40mm)
- Angular tolerance ± 5°, except as specified
DIMENSIONS

Bushing, Shaft and Hardware Dimensions (continued)

1/4" Standard Flatted Shaft

1/4" Standard Concentric Flatted Shaft

1/4" Standard Slotted Shaft

1/8" Standard Flatted Shaft

1/8" Standard Concentric Slotted Shaft

1/8" Concentric Shafts

Standard Bushing and Shaft Dimensions are shown on Page 11

Flat will extend to within .031 (0,79) of mounting bushing where shaft length will not permit standard flat.

All shafts are shown in extreme counterclock-wise position. Angle applies to potentiometers only.
**Locating Lug Options – Series 70**

**Options 1, 2 and A**
Option 1 is Standard and is used unless otherwise specified

**Option 1**
- Single left lug

**Option 2**
- Left & right lug

**Option A**
- Single right lug

**Options 3, 5 and B**
Compatible with Mil-Spec RV5

**Option 3**
- Extended left lug

**Option 5**
- Extended left & right lug

**Option B**
- Extended right lug

**Options 6, 7 and C**
No Longer Available

**Option 6**
- Extended left lug

**Option 7**
- Extended left & right lug

**Option C**
- Extended right lug

**Options 8, 9 and D**
Compatible with Mil-Spec RV4

**Option 8**
- Extended left lug

**Option 9**
- Extended left & right lug

**Option D**
- Extended right lug

**Series Available Lug Options**

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</tbody>
</table>

Note: Option 4 = No Locating Lug

**Basic Dimensions in inches.**
Dimensions in parentheses are in millimeters.

**TOLERANCE**
Dimensional Tolerance ±.016 (0.40) except as specified

**NOT TO SCALE**
DIMENSIONS

Locating Lug Options – Series 72

Options 1, A and 4

Option 1 is Standard and is used unless otherwise specified

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<th>DIMENSION E Minimum hole dia</th>
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<td>.406 (10.31)</td>
<td>*</td>
<td>.096 (2.44)</td>
</tr>
<tr>
<td>C</td>
<td>*</td>
<td>.437 (11.10)</td>
<td>.261 (6.63)</td>
<td>.406 (10.31)</td>
<td>*</td>
<td>.128 (3.24)</td>
</tr>
<tr>
<td>D</td>
<td>*</td>
<td>.531 (13.49)</td>
<td>.261 (6.63)</td>
<td>.406 (10.31)</td>
<td>*</td>
<td>.128 (3.24)</td>
</tr>
</tbody>
</table>

Dimension tolerance ± .016 (0.40)

*= Not Required

Dimension C Note:
Solid line is .261 inch diameter
Dashed line is .406 inch diameter
DIMENSIONS

Master Assembly Drawing

All drawings are shown with 3/8" dia. bushing with 1/4" dia. shaft. 1/4" diameter bushing with 1/8" diameter shaft is available. Locking bushing is also available.

Refer to Page 70 for Locating Lug options.

Multi-Turn Vernier Drive module. Only one module of this type can be included in an assembly. A Multi-Turn Vernier Drive module must always be in the front location.

Potentiometer (Pin terminal) module. Up to four modules of this type can be included in an assembly.

Potentiometer (lug terminal) module. Up to four modules of this type can be included in an assembly.

Rotary Switch module. Multiple modules of this type can be included in an assembly. This module can be assembled sideways if needed for easier access to solder lugs.

Refer to Page 70 for Switch options.

Push-Pull / Momentary-Push Switch module includes backplate. Only one module of this type can be included in an assembly. This module must always be in the rear position. This module can be assembled sideways if needed for easier access to solder lugs.

Refer to Page 70 for Switch options.

Spacer D12319, Spacer D12348 (without flange)
- installed in front of either first resistive module or rotary switch coupled to a push-pull or momentary push switch with solid shaft construction.
- placed behind the .075 inch flanged spacer attached to a lug terminal resistive module with concentric shaft construction
- or placed between switch and bushing assembly with solid shaft construction when only a push-pull or momentary push switch is in the build up.

Spacer D12301 is installed between either two lug terminal resistive modules or when a rotary switch follows a rotary switch with concentric shaft construction.

Spacer D12300 is installed between either two pin terminal resistive modules or two rotary switches with concentric shaft.

Spacer D12349 is installed between a pin terminal resistive and/or a rotary switch and a pin terminal resistive module and/or a rotary switch, in any combination, coupled to a push-pull or momentary push switch with concentric shaft.

Backplate D12303 is used except when last module is a push-pull or momentary push switch.
**Request Quotation** online at Potentiometer.com

Customer Name __________________________ Address __________________________

City, State, Zip, Country __________________________ Customer Part Number (When Specified ) __________________________

---

**STEP 1**

<table>
<thead>
<tr>
<th>SERIES TYPE</th>
<th>70</th>
<th>72</th>
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**STEP 2**

<table>
<thead>
<tr>
<th>RESISTANCE ELEMENT (Circle One)</th>
<th>Carbon Plastic</th>
<th>Cermet Composition (no longer available)</th>
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**STEP 3**

<table>
<thead>
<tr>
<th>TERMINALS (Circle One)</th>
<th>Solder Lug</th>
<th>P.C. Pin</th>
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**STEP 4**

<table>
<thead>
<tr>
<th>TAPER (Circle One)</th>
<th>Cermet</th>
<th>Linear</th>
<th>Linear 5% (Special Order)</th>
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**STEP 5**

<table>
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<tr>
<th>TOLERANCE (Insert Tolerance for each Resistance Module)</th>
<th>Cermet: 10% Standard (5% Special Order)</th>
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**STEP 6**

<table>
<thead>
<tr>
<th>RESISTANCE VALUE (Insert For Each Resistance Module)</th>
<th>Nominal Resistance Values in Ohms</th>
</tr>
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**STEP 7**

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<tr>
<th>OPTIONAL MODULES (Insert Designation in Proper Module Box)</th>
<th>Designation</th>
</tr>
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</table>

<table>
<thead>
<tr>
<th>SHADING (Circle Length and Diameter)</th>
<th>Length (Dim. &quot;A&quot;-Inch)</th>
<th>Plain, 1/4&quot;</th>
<th>Plain, ¾&quot;</th>
<th>Locking, ½&quot;</th>
<th>Locking, 1/8&quot;</th>
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</thead>
</table>

**STEP 8**

<table>
<thead>
<tr>
<th>SHAFT* (Check Shaft Diameter Box and Circle Length)</th>
<th>All Plastic on 72-5 Lengths Only</th>
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</table>

**STEP 9**

<table>
<thead>
<tr>
<th>SHAFT ENDING* (Circle One)</th>
<th>Plastic Shafts - 1/8&quot; Diameter Plain End Only and 1/4&quot; Diameter Slotted Only</th>
</tr>
</thead>
</table>

**STEP 10**

<table>
<thead>
<tr>
<th>LOADING LUG OPTIONS* (Circle One)</th>
<th>Series 72 - Single Tab Only - Tab can be rotated to Positions 1, 2, 3, or 4</th>
</tr>
</thead>
</table>

**STEP 11**

<table>
<thead>
<tr>
<th>MOUNTING HARDWARE (Circle One)</th>
<th>Standard Other (Specify)</th>
</tr>
</thead>
</table>

**STEP 12**

<table>
<thead>
<tr>
<th>MARKING (Circle One)</th>
<th>Standard Other (Specify)</th>
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</table>

**STEP 13**

<table>
<thead>
<tr>
<th>QUANTITY</th>
<th>Purchase Order No.</th>
</tr>
</thead>
</table>

---

**REMARKS AND/OR SPECIAL FEATURES** __________________________

---

**ORIGINATOR’S NAME AND PHONE:** __________________________ Date: __________________________

**DISCLAIMER:** Due to the unlimited design combinations, certain designs may not perform in accordance with all of the specifications
<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
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<tbody>
<tr>
<td>Mod-Pot™</td>
<td>Series Options</td>
</tr>
<tr>
<td>5/8&quot; Square</td>
<td>Modular Design</td>
</tr>
<tr>
<td>1/2&quot; Square</td>
<td>Modular Design</td>
</tr>
<tr>
<td>S159</td>
<td>Non-Magnetic Construction</td>
</tr>
<tr>
<td>Technology</td>
<td>Conductive Plastic</td>
</tr>
<tr>
<td></td>
<td>Cermet</td>
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<tr>
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<td>Conductive Plastic</td>
</tr>
<tr>
<td></td>
<td>Cermet</td>
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<tr>
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<td>Conductive Plastic</td>
</tr>
<tr>
<td></td>
<td>Cermet</td>
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</table>

|-------------------|-----------------------------|------------------------------|-----------------|----------|---------------|------------|------------------------------------------|---------------------------------------------|-------------------------------------|----------------------------------|-----------------------------------|----------------------------------------|----------------------------------------|---------------|---------------------|----------------|----------------|-------------------------------|-----------------------------|----------------------------------|--------------------------|------------------------|-----------------------------|
### 70 Series - Resistance / Taper / Terminal

The products listed below are available, but with limited inventory. Alternative devices are shown in the [Custom Potentiometer Selection Guide](http://www.potentiometers.com).

<table>
<thead>
<tr>
<th>Value</th>
<th>Taper</th>
<th>Terminal</th>
<th>Element</th>
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</thead>
<tbody>
<tr>
<td>100</td>
<td>Linear</td>
<td>Lug</td>
<td>Cermet</td>
</tr>
<tr>
<td>100</td>
<td>Modified Linear</td>
<td>Lug</td>
<td>Cermet</td>
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<tr>
<td>200</td>
<td>Linear</td>
<td>Lug</td>
<td>Cermet</td>
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<tr>
<td>200</td>
<td>Linear</td>
<td>PC Pins</td>
<td>Cermet</td>
</tr>
<tr>
<td>250</td>
<td>Linear</td>
<td>Lug</td>
<td>Cermet</td>
</tr>
<tr>
<td>250</td>
<td>Linear</td>
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<td>500</td>
<td>Linear</td>
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<tr>
<td>500</td>
<td>Linear</td>
<td>PC Pins</td>
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<tr>
<td>750</td>
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<td>Lug</td>
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</tr>
<tr>
<td>750</td>
<td>Linear</td>
<td>PC Pins</td>
<td>Ceramic</td>
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<tr>
<td>750</td>
<td>CW Modified Log</td>
<td>Lug</td>
<td>Ceramic</td>
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<tr>
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<td>CW Modified Log</td>
<td>Lug</td>
<td>Ceramic</td>
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<tr>
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<td>Linear</td>
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<td>Linear</td>
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<tr>
<td>200K</td>
<td>Linear</td>
<td>PC Pins</td>
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<tr>
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</tr>
<tr>
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<td>Linear</td>
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<td>Conductive Plastic</td>
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<td>CW Modified Log</td>
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<tr>
<td>750K</td>
<td>Linear</td>
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<td>Ceramic</td>
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<td>750K</td>
<td>Linear</td>
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</tr>
<tr>
<td>2.5MEG</td>
<td>Linear</td>
<td>PC Pins</td>
<td>Ceramic</td>
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</table>

The products listed below are available, but with limited inventory.

<table>
<thead>
<tr>
<th>Value</th>
<th>Taper</th>
<th>Terminal</th>
<th>Element</th>
</tr>
</thead>
<tbody>
<tr>
<td>10K</td>
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<td>PC Pins</td>
<td>Conductive Plastic</td>
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<tr>
<td>10K</td>
<td>Linear</td>
<td>PC Pins</td>
<td>Ceramic</td>
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<td>CCW Modified Log</td>
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<td>Linear</td>
<td>PC Pins</td>
<td>Ceramic</td>
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<td>25K</td>
<td>CCW Modified Log</td>
<td>PC Pins</td>
<td>Conductive Plastic</td>
</tr>
</tbody>
</table>
GLOSSARY OF TERMS

Input and Output Terms

Output Voltage
(e) The voltage between the wiper terminal and the designated reference point. Unless otherwise specified, the designated reference point is the CCW terminal (See 3.1).

Output Ratio
(e/E) The ratio of the output voltage to the designated input reference voltage. Unless otherwise specified, the reference voltage is the total applied voltage.

Rotation and Translation

Total Mechanical Travel
The total travel of the shaft between integral stops, under the specified stop load. In potentiometers without stops, the mechanical travel is continuous.

Mechanical Overtravel - Wirewound
The shaft travel between each End Point (or Theoretical End Point for Absolute Conformity or Linearity units) and its adjacent corresponding limit of Total Mechanical Travel.

Mechanical Overtravel
The shaft travel between each Theoretical End Point and its adjacent corresponding limit of Total Mechanical Travel.

Backlash
The maximum difference in shaft position that occurs when the shaft is moved to the same actual Output Ratio point from opposite directions.

Theoretical Electrical Travel
The specified shaft travel over which the theoretical function characteristic extends between defined Output Ratio limits, as determined from the Index Point.

Electrical Overtravel - Nonwirewound
The shaft travel over which there is continuity between the wiper terminal and the resistance element beyond each end of the Theoretical Electrical Travel.

Electrical Continuity Travel
The total travel of the shaft over which electrical continuity is maintained between the wiper and the resistance element.

Tap Location
The position of a tap relative to some reference. This is commonly expressed in terms of an Output Ratio and/or a shaft position. When a shaft position is specified, the Tap Location is the center of the Effective Tap Width.

Resistance

End Resistance
The resistance measured between the wiper terminal and an end terminal with the shaft positioned at the corresponding End Point.

Temperature Coefficient Of Resistance
The unit change in resistance per degree celsius change from a reference temperature, expressed in parts per million per degree celsius as follows:

\[ T.C. = \frac{R_2 - R_1}{R_1(T_2 - T_1)} \times 10^6 \]

Where:
R1 = Resistance at reference temperature in ohms.
R2 = Resistance at test temperature in ohms
T1 = Reference temperature in degrees celsius.
T2 = Test temperature in degrees celsius.

Conformity and Linearity

Linearity
A specific type of conformity where the theoretical function characteristic is a straight line.

Mathematically:

\[ \frac{e}{E} = f(W) \pm C = A(W) + B \pm C \]

Where:
A is the given slope; B is given intercept at W=0.
W = Angle or slope

Absolute Linearity
The maximum deviation of the actual function characteristic from a fully defined straight reference line. It is expressed as a percentage of the Total Applied Voltage and measured over the Theoretical Electrical Travel. An Index Point on the actual output is required.
The straight reference line may be fully defined by specifying the low and high theoretical end Output Rations separated by the Theoretical Electrical Travel. Unless otherwise specified, these end Output Rations are 0.0 and 1.0 respectively.

**Mathematically:**

\[ \frac{e}{E} = A \left( \frac{W}{W_T} \right) + B \pm C \]

*Where:*
A is the given slope; B is given intercept at W=0.
Unless otherwise specified: A=1; B=0

---

**Independent Linearity**

The maximum deviation, expressed as a percent of the Total Applied Voltage, of the actual function characteristic from a straight reference line with its slope and position chosen to minimize deviations over the Actual Electrical Travel, or any specified portion thereof.

Note: End Voltage requirements, when specified, will limit the slope and position of the reference line.

**Mathematically:**

\[ \frac{e}{E} = P \left( \frac{W}{W_A} \right) + Q \pm C \]

*Where:*
P is unspecified slope; Q is unspecified intercept at W=0. And both are chosen to minimize C but are limited by the End Voltage requirements.

---

**Figure 2**

*Absolute Linearity*

---

**Figure 3**

*Independent Linearity*
General Electrical Characteristics

Noise
Any spurious variation in the electrical output not present in the input, defined quantitatively in terms of an equivalent parasitic, transient resistance in ohms, appearing between the contact and the resistance element when the shaft is rotated or translated. The Equivalent Noise Resistance is defined independently of the resolution, the functional characteristics, and the total travel. The magnitude of the Equivalent Noise Resistance is the maximum departure from a specified reference line. The wiper of the potentiometer is required to be excited by a specified current and moved at a specified speed.

Output Smoothness
(Non-wirewound Potentiometers Only)
Output Smoothness is a measurement of any spurious variation in the electrical output not present in the input. It is expressed as a percentage of the Total Applied Voltage and measured for specified travel increments over the Theoretical Electrical Travel. Output Smoothness includes effects of contact resistance variations, resolution, and other micrononlinearities in the output.

Resolution
A measure of the sensitivity to which the Output Ratio of the potentiometer may be set.

Dielectric Strength
Ability to withstand under prescribed conditions, a specified potential of a given characteristic between the terminals of each cup and the exposed conducting surfaces of the potentiometer, or between the terminals of each cup and the terminals of every other cup in the gang without exceeding a specified leakage current value.

Insulation Resistance
The resistance to a specified impressed DC voltage between the terminals of each cup and the exposed conducting surfaces of the potentiometer, or between the terminals of each cup and the terminals of every other cup in the gang, under prescribed conditions.

Power Rating
The maximum power that a potentiometer can dissipate under specified conditions while meeting specified performance requirements.

Power Derating
The modification of the nominal power rating for various considerations such as Load Resistance, Output Slopes, Ganging, nonstandard environmental conditions and other factors.

Life
The number of shaft revolutions or translations obtainable under specific operating conditions and within specified allowable degradations of specific characteristics.

Mechanical Characteristics

Shaft Runout
The eccentricity of the shaft diameter with respect to the rotational axis of the shaft, measured at a specified distance from the end of the shaft. The body of the potentiometer is held fixed and the shaft is rotated with a specified load applied radially to the shaft. The eccentricity is expressed in inches, TIR.

Lateral Runout
The perpendicularity of the mounting surface with respect to the rotational axis of the shaft, measured on the mounting surface at a specified distance from the outside edge of the mounting surface. The shaft is held fixed and the body of the potentiometer is rotated with specified loads applied radially and axially to the body of the pot. The Lateral Runout is expressed in inches.

Shaft Radial Play
The total radial excursion of the shaft, measured at a specified distance from the front surface of the unit. A specified radial load is applied alternately in opposite directions at a specified point. Shaft Radial Play is expressed in inches.

Shaft End Play
The total axial excursion of the shaft, measured at the end of the shaft with a specified axial load supplied alternately in opposite directions. Shaft End Play is expressed in inches.

Starting Torque
The maximum moment in the clockwise and counterclockwise directions required to initiate shaft rotation anywhere in the Total Mechanical Travel.

Running Torque
The maximum moment in the clockwise and counterclockwise directions required to sustain uniform shaft rotation at a specified speed throughout the Total Mechanical Travel.

Moment of Inertia
The mass moment of inertia of the rotating elements of the potentiometer about their rotational axis.

Static Stop Strength
The maximum static load that can be applied to the shaft at each mechanical stop for a specified period of time without permanent change of the stop positions greater than specified.

Dynamic Stop Strength
The inertia load, at a specified shaft velocity and a specified number of impacts, that can be applied to the shaft at each stop without a permanent change of the stop position greater than specified.
**General Terms and Conditions of Sale**

**Orders**

All orders are subject to acceptance by State Electronics, E. Hanover, NJ. No order or contract shall be deemed accepted unless and until such acceptance is made in writing by State Electronics.

All agreements are more contingent upon strikes, accidents or causes of delay beyond our control.

**Prices and Specifications**

Prices, quotations, specifications and other terms and all statements appearing in the Company's catalogs and advertisements, and otherwise made by the Company, are subject to change without notice. State Electronics reserves the right to make changes in design at any time without incurring any obligation to provide same units previously purchased or to continue to supply discontinued items. The specifications shown in the sales literature are not always the latest version. Certified current specification prints are available upon request.

Unless specifically provided in writing, prices quoted are based upon manufacture of quantities and types originally specified and are subject to revision when interpretation or engineering changes are initiated by the customer. Quoted prices are based upon present cost of materials and labor and are subject to change without notice.

We are not responsible for typographical errors made in any of our publications or for stenographic or clerical errors made in preparations of quotations, all such errors are subject to correction.

**Delivery**

Delivery promise is based on our best estimate of the date material will be shipped from our factory and we assume no responsibility for losses, damage or consequential damages due to delays.

**Terms of Payment**

On approved orders, terms are net thirty (30) days from the date of invoice. The Company may at any time, when in its opinion the financial condition of the customer warrants it, either hold or suspend credit. In cases where credit is not established or satisfactory financial information is not available, the terms are credit card or bank transfer. Each shipment will be considered a separate and independent transaction and payment should be made accordingly.

**Shipments**

All shipments are made F.O.B. shipping point (unless otherwise specified) and packaging for domestic shipment is included in the quoted price. When special domestic or export packaging is specified involving greater expense than is customary, a charge will be made to cover such extra expense. Unless otherwise specified, we will normally use the best, least expensive surface transportation. Reasonable care is exercised in packaging our products for shipment and no responsibility is assumed by the Company for delay, breakage or damage after having made delivery in good order to the carrier. All claims for breakage or damage should be made to the carrier, but will be glad to render all possible assistance in securing satisfactory adjustment of such claims.

**Claims and Rejected Material**

Claims for defective material must be made within 30-days of the customer's receipt of shipment. No products may be returned without a return authorization (RMA).

**Country of Origin**

The 388 / 389 and 70 series Mod-Pot products are assembled in the United States at our facility located in East Hanover, New Jersey, USA, using components parts manufactured by the Sensing and Control Division of Honeywell International headquartered in Morris Township, New Jersey, USA.
DISCLAIMER

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