SPECTRUM SENSORS & CONTROLS INC

A Spectrum Control Business

Precision Position Sensors & Controls

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Precision Position Sensors

Spectrum Sensors & Controls offers a world of high reliability precision position sensors and transducers for rotary and linear motion sensing using potentiometer and hall effect technology. Our niche in the market is to provide solutions for demanding applications where precise sensing and high reliability/long life are absolute requirements. In this arena, Spectrum is first choice of both military and commercial OEMs.

Complementing our diverse product line is a commitment to supporting our customers needs through experienced engineering and responsive customer service. We bring a global perspective to every opportunity through our worldwide network of sales representatives and manufacturing facilities, enabling us to develop economical and logistically flexible programs for each customer. And of course, our reputation for precision and high reliability has been earned only through our unwavering dedication to world class quality.

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Custom Application Specific Solutions

Rarely does a 100% off-the-shelf position sensor satisfy the mechanical, electrical and/or power requirements of a sophisticated OEM design. Our experienced engineers are ready to work with your new product development team to find the ideal technology and packaging to meet your needs. Whether modifying an existing sensor design or working from a "clean sheet" approach, the resulting Spectrum sensor will be tailored to your exact application requirements and push the envelope of product performance.

A World of Precision, High Reliability Applications

Customers turn to Spectrum Sensors & Controls for those position sensing applications where exacting performance and the ability to withstand demanding environmental conditions are common. We design, manufacture and test our potentiometers to MIL-PRF-39023 and many of our hall effect sensors to RTCA/DO-160F aircraft standards.

Military and aerospace applications include aircraft cockpit instruments, engine fuel controls, fin actuators, angle of attack controls, weapons guidance systems, remote piloted vehicle actuators, vehicle joysticks, gun elevation and steering controls. In the commercial/ industrial world our sensors are found in camera positioning controls, robotic joint feedback, medical endoscopy controls, physical therapy equipment, X-ray positioning, surgical instrumentation, wind direction devices, process control valves and automation controls.

Spectrum Control... Your OEM Partner

Spectrum Sensors & Controls is a business unit of Spectrum Control, Inc. In conjunction with our sister businesses - Spectrum Microwave, Spectrum Advanced Specialty Products and Spectrum Power Management Systems, we offer our customers One Source for a Spectrum of high performance solutions. In addition to the confidence of knowing we're experienced in meeting the demands of major OEM programs, your organization may be able achieve a common stated goal of lowering costs by reducing your vendor base. Learn more about the Spectrum family of businesses on the back cover of this catalog.

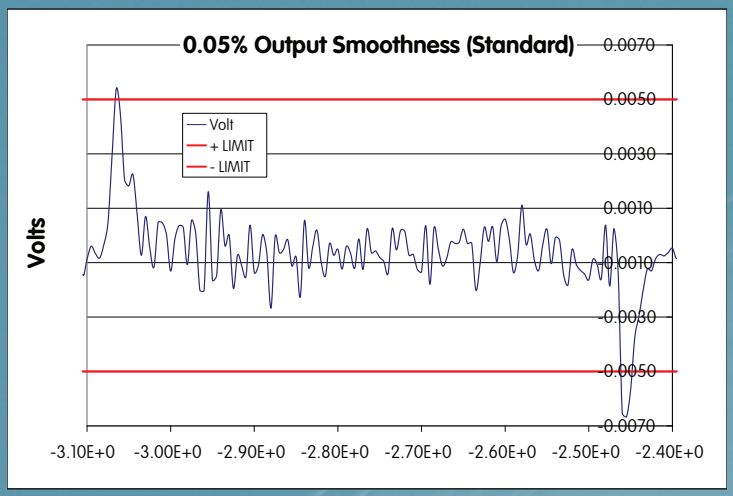
Advanced Thermal Products

In addition to our precision position sensor products, Spectrum Sensors & Controls offers a complete line of high reliability temperature sensing products. Our Advanced Thermal Products Operation produces temperature sensing probes and assemblies, PTC and NTC thermistors and resistive temperature detectors (RTDs) for surface, immersion and air sensing applications. These products are found in the refrigeration, HVAC, pool and spa, food and beverage, military, and renewable energy industries.

The Spectrum Difference...

Precision & High Reliability

Make no mistake there is a clear difference in position sensor performance and suppliers. Spectrum Sensors & Controls is an engineering and technology leader with a proven track record of delivering ultra-precise and highly reliable position sensors. We have consistently invested in the R&D that leads to innovative new products and problem-solving custom solutions. Our application engineers utilize sophisticated simulation software to replicate real-world environments to ensure the performance our customers have come to expect. In addition, we invest in the manufacturing technology and processes that allow us to efficiently and accurately produce our exacting designs.

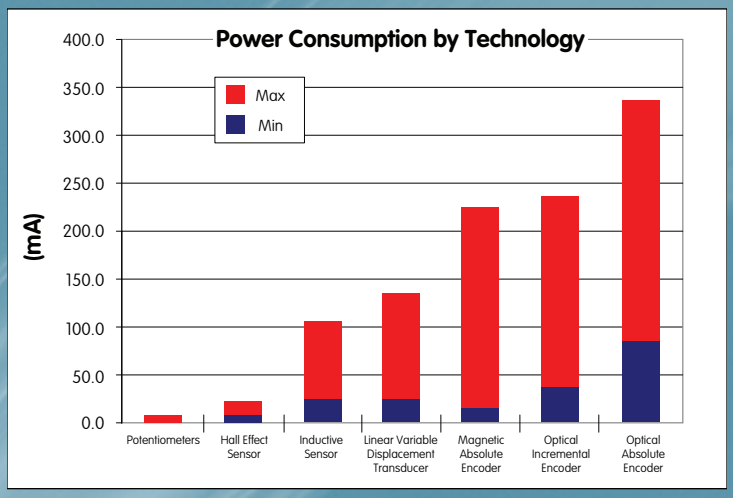


Spectrum Advantages

High Rotational Life is one of the hallmarks of the Spectrum element manufacturing process. Our potentiometers regularly yield more than 100 million cycles, far outdistancing the competition.

Low Noise is achieved through our co-molded element/mating wiper that produces an extremely smooth device. Spectrum offers superior output smoothness of 0.1% max.

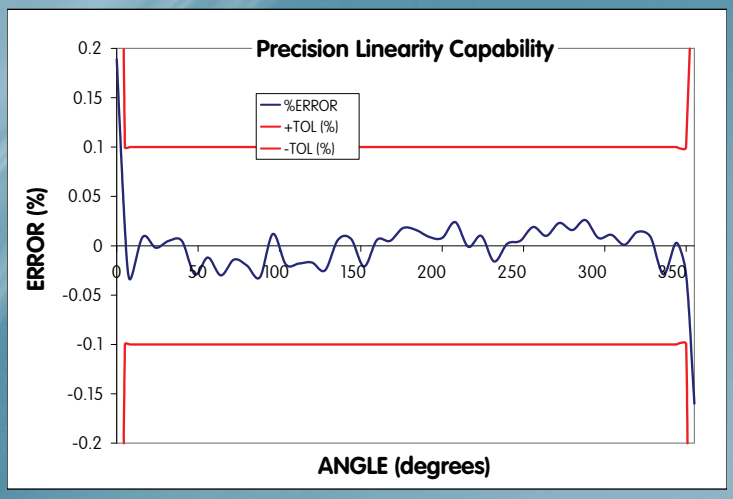
Low Power Consumption many products requiring position sensing feedback are concerned with minimizing power consumption. As the graph at right illustrates, the technologies used by Spectrum significantly outperform others in the industry.



Precise Linearity is essential in many exacting applications and Spectrum's ability to achieve absolute linearities as low as 0.1% make it an unrivaled supplier for precise position sensing.

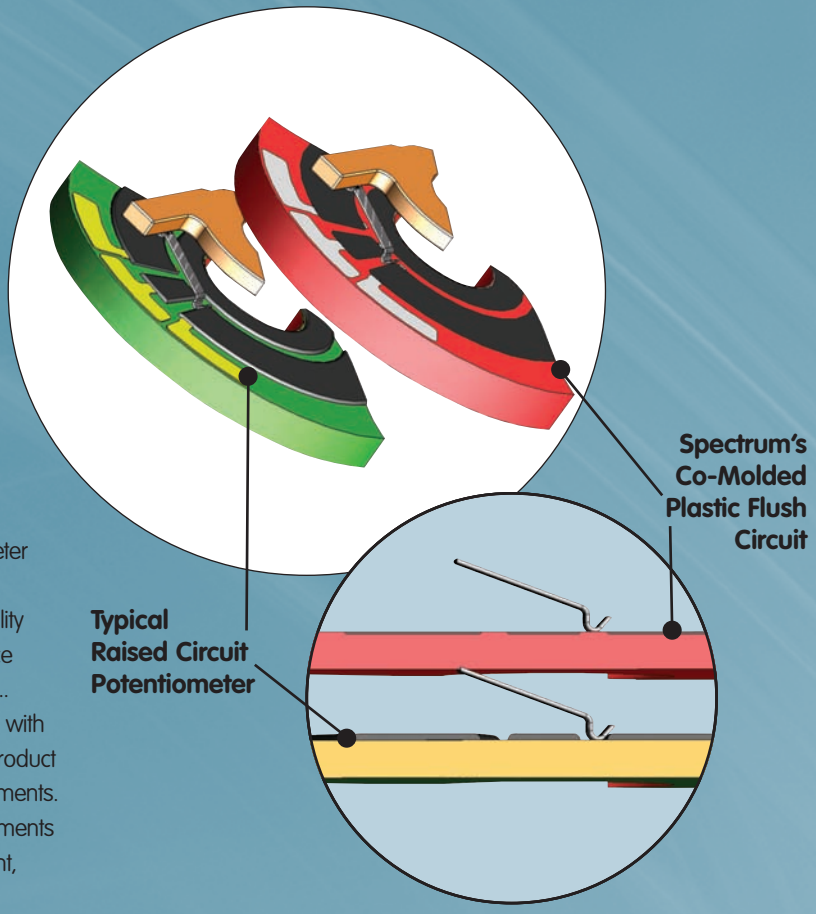
Shock & Vibration Resistant with the highest ratings in the industry, Spectrum Sensors have earned the reputation as durable, highly reliable position sensors ideal for harsh environments. Many of our sensors are qualified to MIL-PRF-39023.

Value is typically defined as the balance between cost and performance. The lower life cycle costs of Spectrum's long-life, highly reliable position sensors coupled with their ultra-precise sensing make cost justification an easy proposition. Spectrum is easily the highest value supplier in the industry.



Potentiometer Technology... A Better Process

For more than 20 years, Spectrum Sensors & Controls has been manufacturing co-molded conductive plastic potentiometer elements. In critical applications this process completely outperforms all competitive methods, delivering greater reliability and a longer life. In our process, the termination and resistance materials are simultaneously molded with the base substrate... resulting in a flush circuit. The hard, smooth surface combined with our multi-finger precious metal contacts, promote ultra-long product life and excellent electrical performance in a variety of environments. The superiority of Spectrum's flush circuit over raised circuit elements (i.e., conductive plastic film screened conductive plastic cerment, hybrid, and wirewound) is most evident in our unrivaled long-term performance and reliability.



Hall Effect Technology

Spectrum Sensors & Controls has developed a line of ultra precise, non-contact Hall Effect position sensors featuring absolute linearity of ±0.1%. These 12 bit resolution devices are qualified to RTCA/DO-160F aircraft standards and come in 1/2" (12.7 mm), 7/8" (22.23 mm) and 7/8" (22.23 mm) dual (double redundant) sizes with high temperature and custom versions available. Spectrum achieves the precise linearity in their sensors through proprietary precision machining, chip-tuning capability and electronic testing processes. Other producers of Hall Effect sensors are capable of linearities ranging from ± 0.5% to ± 1%. Hall Effect sensors convert energy from a magnetic field into an electrical signal, enabling their contact-less operation and yielding nearly unlimited life cycles. These sensors offer a cost effective solution for many harsh environment applications involving temperature, vibration, moisture and dirt, making them ideal for a range of military and aerospace, as well as commercial designs.

Value Added Capabilities

The experienced engineering and production team at Spectrum Sensors & Controls will design, manufacture and test a variety of value-added assemblies tailored for your specific requirements. A packaged Spectrum position sensor will lower your final system costs through improved performance and the most efficient/ economical product available.

- Custom wire and cable assemblies
- Various gauge wire and lengths
- Various terminations and connectors
- Custom mounting plates

Responsive Engineering & Customer Support

We understand the need for speed in today's fast paced product development world. Our engineers are prepared to either modify an existing sensor product or design a new "clean sheet" solution within a timeframe that meets your requirements. Once a general design is agreed upon, we'll conduct simulations to evaluate performance and produce a prototype for final evaluation. And following production release, our customer service group will work with you for a complete delivery program, including schedule sharing.

Vertical Integration

Spectrum Sensors & Controls utilizes extensive in-house resources to produce many of the problem-solving designs and value-added programs we create. Our internal capabilities range from precision machining, welding, and brazing to electrical testing and tuning. Combined with our flexible manufacturing systems, these resources allow us to ramp-up production to meet fast-track delivery requirements and offer shorter lead times.

Global Logistics

Today more than ever, it is imperative suppliers be prepared to support their customers around the world. Spectrum has created a network of sales offices, manufacturing plants and distribution facilities to support the world's major markets. From field sales specialists to engineering and manufacturing to logistics, our key program development personnel are positioned around the world and poised to support our customers, regardless of the location.

World Class Quality

As a business unit of Spectrum Control, Inc., ISO9001:2000 certified Spectrum Sensors & Controls adheres to world class manufacturing techniques ensuring each customer receives the Six Sigma reliability they demand. This commitment to quality has produced a reputation for dependability and resulted in preferred supplier status at many industry leading OEMs.

ISO 9001:2000 CERTIFIED

Flexible Manufacturing

Our lead design and manufacturing center for all of our position sensor products is located in Grass Valley, CA. The facility produces all of our military and aerospace position sensors. To better serve our global customer base, we have established low cost manufacturing facilities in China and Mexico. These state-of-the-art plants complement our North American production capacity and give us great flexibility to meet customer requirements, including separation of our military and commercial manufacturing.

Grass Valley, CA

Guang Dong, China

Juarez, Mexico

SPECTRUM SENSORS & CONTROLS
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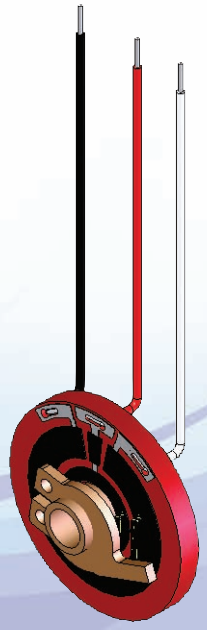
.702" [17.83 mm] Fits Size 9 Diameter Potentiometer Element Rotor/Wiper Kit



6909 Series Standard

Part Number	Resistance
6909-1000-030	1kΩ ±10%
6909-1002-030	5kΩ ±10%
6909-1003-030	10kΩ ±10%
Part Number - Element Only	
6909-1000-070	1kΩ ±10%
6909-1002-070	5kΩ ±10%
6909-1003-070	10kΩ ±10%

Standard Rotor Part Number
6909-0000-060

Standard Insulator Part Number
7040-0005-015

Electrical Characteristics

Resistance:	1kΩ to 10kΩ ±10%
Active Electrical Angle:	320°
Electrical Continuity Angle:	330° Min.
Independent Linearity:	±0.5%
End Voltage:	0.5% Max.
Voltage Resolution:	Virtually Infinite
Output Smoothness:	0.1% Max.
Resistance Temp. Coefficient:	400PPM/°C Max.
Power Rating @ 70°C:	1.0 Watt Max.
Wiper Contact Current:	10 mA Max.

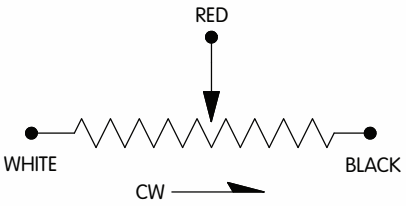
Materials of Construction

Resistance Element:	Co-Molded Conductive Plastic
Grip-Ring Rotor:	Heat-Treated Beryllium Copper
Insulator:	High-Temperature Molded Plastic
Electrical Contacts:	Multi-Finger Precious Metal Directly Welded to Rotor
Lead Wires:	#30 AWG Type ET Stranded Wire Teflon Insulated (250V)

Mechanical Characteristics

Mechanical Rotation:	Continuous
Total Weight (Element Only):	0.75 g Max.
Wire Lead Length:	6.0" [152.4 mm] Nominal
Element Outer Diameter:	0.702" +0.000/-0.004 [17.831 +0.000/-0.102 mm]
Element Inner Diameter:	0.186" +0.002/-0.003 [4.724 +0.051/-0.0762 mm]
Rotor Operating Radius:	0.330" [8.382 mm] Max.
Insulator Inside Diameter:	0.127" ±0.002 [3.226 ±0.051 mm]
Insulator Length:	0.200" +0.000/-0.005 [5.080 +0.000/-0.127 mm]

Schematic Diagram



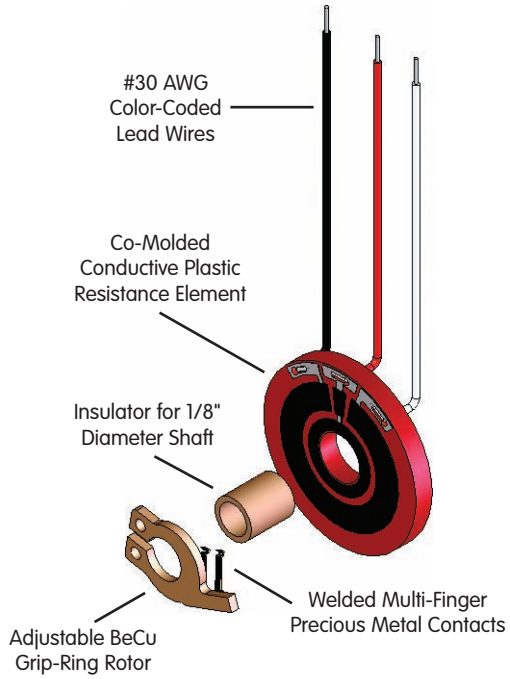
VIEWED FROM MOUNTING SURFACE

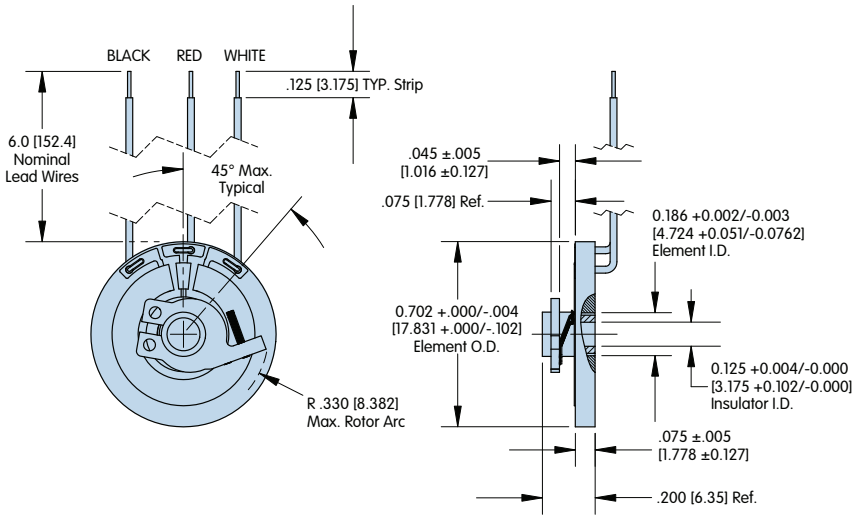
Environmental Characteristics

Operating Temp. Range:	-65°C to +125°C
Rotational Operating Life:	100 x 10^6 Revolutions Min.

.702" [17.83 mm] Fits Size 9 Diameter Potentiometer Element Rotor/Wiper Kit

6909 Series Standard





Dimensions in Inches [mm]

Available Options

- Custom resistance values (500Ω to 50kΩ) and tolerances as low as ±5%.
- Special linearities as low as 0.25%, absolute (indexed) or independent over specified regions.
- Additional taps, current or voltage.
- Special electrical angles up to 350° Max.
- Special wire leads or cables.
- Special terminations or connectors.
- Special transfer functions:
  - Non-linear outputs
  - Load compensation
  - Trig, log, and exponential outputs
- Special element dimensions or features such as locating notches, scribe marks, custom substrate shapes.
- Custom rotor or insulator dimensions and features.
- Custom marking, identification or logo.
- Special environmental capabilities such as high shock and vibration.

See pages 16-17 for more detail on custom options

SPECTRUM SENSORS & CONTROLS
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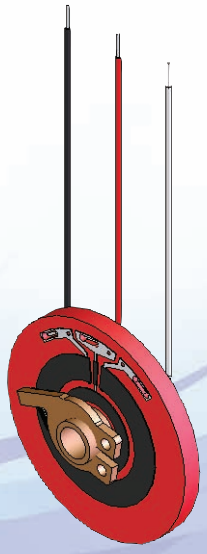
0.888" [22.56 mm] Fits Size 11 Diameter Potentiometer Element Rotor/Wiper Kit



6911 Series Standard

Part Number	Resistance
6911-1000-030	1kΩ ±10%
6911-1002-030	5kΩ ±10%
6911-1003-030	10kΩ ±10%
Element Only Part Number	
6911-1000-070	1kΩ ±10%
6911-1002-070	5kΩ ±10%
6911-1003-070	10kΩ ±10%

Standard Rotor Part Number

6911-0000-060

Standard Insulator Part Number

7040-0005-015

Electrical Characteristics

Resistance:	1kΩ to 10kΩ ±10%
Active Electrical Angle:	340°
Electrical Continuity Angle:	344° Min.
Independent Linearity:	±0.5%
End Voltage:	0.5% Max.
Voltage Resolution:	Virtually Infinite
Output Smoothness:	0.1% Max.
Resistance Temp. Coefficient:	400PPM/°C Max.
Power Rating @ 70°C:	1.25 Watt Max.
Wiper Contact Current:	10 mA Max.

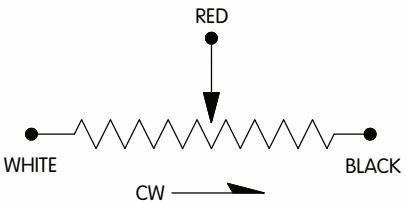
Materials of Construction

Resistance Element:	Co-Molded Conductive Plastic
Grip-Ring Rotor:	Heat-Treated Beryllium Copper
Insulator:	High-Temperature Molded Plastic
Electrical Contacts:	Multi-Finger Precious Metal Directly Welded to Rotor
Lead Wires:	#30 AWG Type ET Stranded Wire Teflon Insulated (250V)

Mechanical Characteristics

Mechanical Rotation:	Continuous
Total Weight (Element Only):	1.25 g Max.
Wire Lead Length:	6.0" [152.4 mm] Nominal
Element Outer Diameter:	0.888" +.000/-.004 [22.56 +.000/-.102 mm]
Element Inner Diameter:	0.186" +0.002/-0.003 [4.724 +0.051/-0.0762 mm]
Rotor Operating Radius:	0.395" [10.033 mm] Max.
Insulator Inside Diameter:	0.127" ±0.002 [3.23 ±0.051 mm]
Insulator Length:	0.200" +0.000/-0.005 [5.08 +0.000/-0.127 mm]

Schematic Diagram

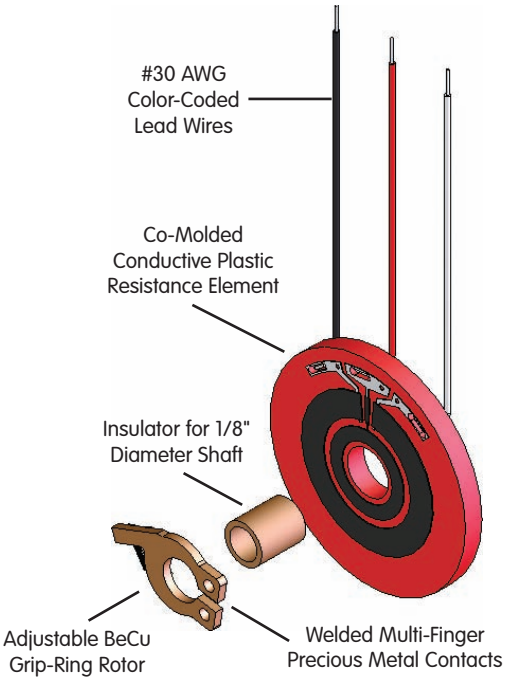


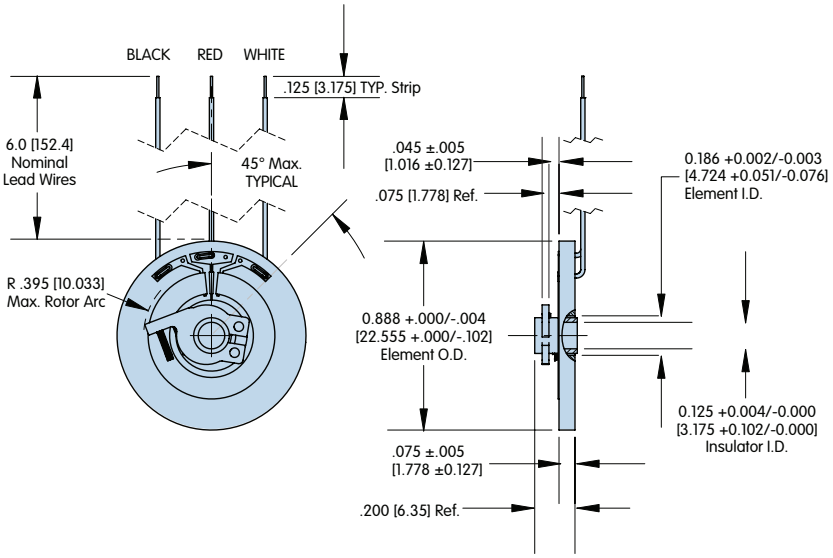
Environmental Characteristics

Operating Temp. Range:	-65°C to +125°C
Rotational Operating Life:	100 x 10^6 Revolutions Min.

0.888" [22.56 mm] Fits Size 11 Diameter Potentiometer Element Rotor/Wiper Kit

6911 Series Standard





Dimensions in Inches [mm]

Available Options

- Custom resistance values (500Ω to 50kΩ) and tolerances as low as ±5%.
- Special linearities as low as 0.2%, absolute (indexed) or independent over specified regions.
- Additional taps, current or voltage.
- Special electrical angles up to 350° Max.
- Special wire leads or cables.
- Special terminations or connectors.
- Special transfer functions:
  - Non-linear outputs
  - Load compensation
  - Trig, log, and exponential outputs
- Special element dimensions or features such as locating notches, scribe marks, custom substrate shapes.
- Custom rotor or insulator dimensions and features.
- Custom marking, identification or logo.
- Special environmental capabilities such as high shock and vibration.

See pages 16-17 for more detail on custom options

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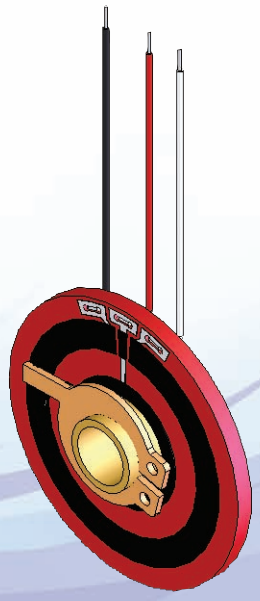
1.252" [31.80 mm] Fits Size 15 Diameter Potentiometer Element Rotor/Wiper Kit



6915 Series Standard

Part Number	Resistance
6915-1000-030	1kΩ ±10%
6915-1002-030	5kΩ ±10%
6915-1003-030	10kΩ ±10%
Element Only Part Number	
6915-1000-070	1kΩ ±10%
6915-1002-070	5kΩ ±10%
6915-1003-070	10kΩ ±10%

Standard Rotor Part Number

6915-0000-060

Standard Insulator Part Number

7040-0002-020

Electrical Characteristics

Resistance:	1kΩ to 10kΩ ±10%
Active Electrical Angle:	340°
Electrical Continuity Angle:	344° Min.
Independent Linearity:	±0.5%
End Voltage:	0.5% Max.
Voltage Resolution:	Virtually Infinite
Output Smoothness:	0.1% Max.
Resistance Temp. Coefficient:	400PPM/°C Max.
Power Rating @ 70°C:	2.0 Watts Max.
Wiper Contact Current:	10 mA Max.

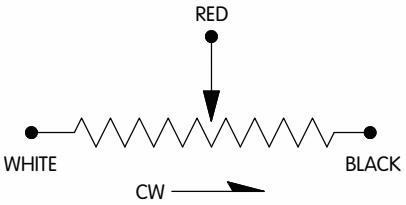
Materials of Construction

Resistance Element:	Co-Molded Conductive Plastic
Grip-Ring Rotor:	Heat-Treated Beryllium Copper
Insulator:	High-Temperature Spun-Cast Epoxy
Electrical Contacts:	Multi-Finger Precious Metal Directly Welded to Rotor
Lead Wires:	#30 AWG Type ET Stranded Wire Teflon Insulated (250V)

Mechanical Characteristics

Mechanical Rotation:	Continuous
Total Weight (Element Only):	2.26 g Max.
Wire Lead Length:	6.0" [152.4 mm] Nominal
Element Outer Diameter:	1.252" +0.000/-0.005 [31.8 +0.000/-0.0127 mm]
Element Inner Diameter:	0.435" ±0.002 [11.05 ±0.051 mm]
Rotor Operating Radius:	0.520" [13.208 mm] Max.
Insulator Inside Diameter:	0.252" ±0.002 [6.4 ±0.051 mm]
Insulator Length:	0.200" +0.000/-0.005 [5.08 +0.000/-0.127 mm]

Schematic Diagram

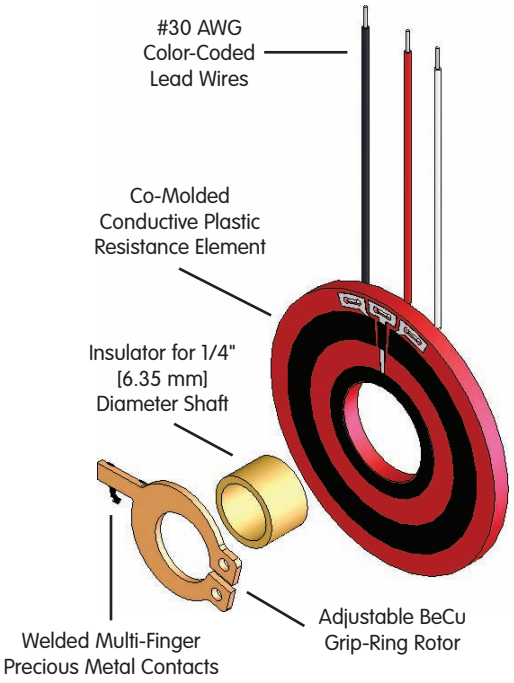


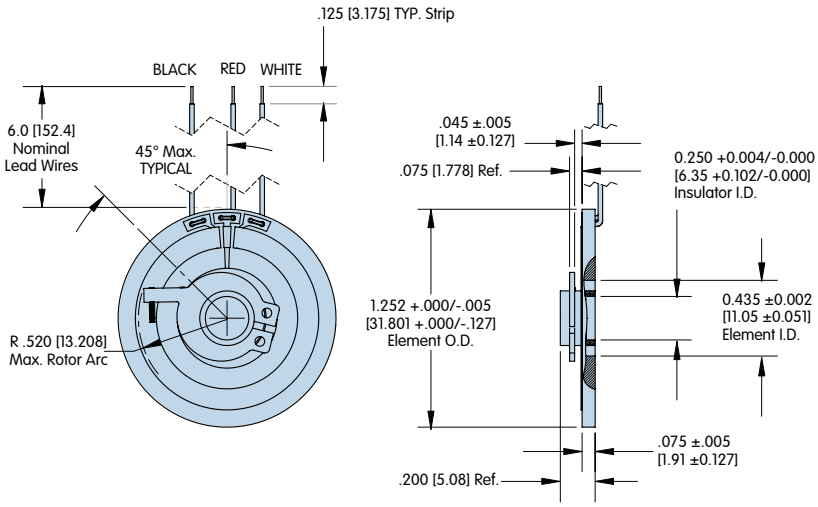
Environmental Characteristics

Operating Temp. Range:	-65°C to +125°C
Rotational Operating Life:	100 x 10^6 Revolutions Min.

1.252" [31.80 mm] Fits Size 15 Diameter Potentiometer Element Rotor/Wiper Kit

6915 Series Standard





Dimensions in Inches [mm]

Available Options

- Custom resistance values (500Ω to 50kΩ) and tolerances as low as ±5%.
- Special linearities as low as 0.15%, absolute (indexed) or independent over specified regions.
- Additional taps, current or voltage.
- Special electrical angles up to 350° Max.
- Special wire leads or cables.
- Special terminations or connectors.
- Special transfer functions:
  - Non-linear outputs
  - Load compensation
  - Trig, log, and exponential outputs
- Special element dimensions or features such as locating notches, scribe marks, custom substrate shapes.
- Custom rotor or insulator dimensions and features.
- Custom marking, identification or logo.
- Special environmental capabilities such as high shock and vibration.

See pages 16-17 for more detail on custom options

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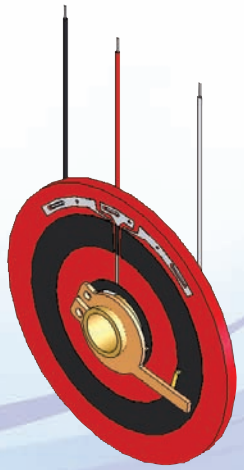
1.805" [45.85 mm] Fits Size 20 Diameter Potentiometer Element Rotor/Wiper Kit



6920 Series Standard

Part Number	Resistance
6920-1000-030	1kΩ ±10%
6920-1002-030	5kΩ ±10%
6920-1003-030	10kΩ ±10%
Element Only Part Number	
6920-1000-070	1kΩ ±10%
6920-1002-070	5kΩ ±10%
6920-1003-070	10kΩ ±10%

Standard Rotor Part Number

6920-0000-060

Standard Insulator Part Number

7040-0002-020

Electrical Characteristics

Resistance, 6920-1000-030:	1kΩ ±10%
6920-1002-030:	5kΩ ±10%
6920-1003-030:	10kΩ ±10%
Active Electrical Angle:	350°
Electrical Continuity Angle:	354° Min.
Independent Linearity:	±0.5%
End Voltage:	0.5% Max.
Voltage Resolution:	Virtually Infinite
Output Smoothness:	0.1% Max.
Resistance Temp. Coefficient:	400PPM/°C Max.
Power Rating @ 70°C:	3.0 Watts Max.
Wiper Contact Current:	10 mA Max.

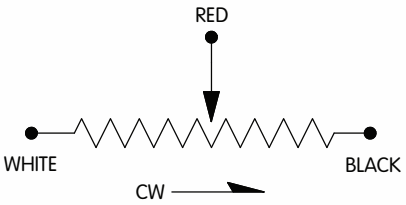
Materials of Construction

Resistance Element:	Co-Molded Conductive Plastic
Grip-Ring Rotor:	Heat-Treated Beryllium Copper
Insulator:	High-Temperature Spun-Cast Epoxy
Electrical Contacts:	Multi-Finger Precious Metal Directly Welded to Rotor
Lead Wires:	#30 AWG Type ET Stranded Wire Teflon Insulated (250V)

Mechanical Characteristics

Mechanical Rotation:	Continuous
Total Weight (Element Only):	5.2 g Max.
Wire Lead Length:	6.0" [152.4 mm] Nominal
Element Outer Diameter:	1.805" +0.000/-0.005 [45.85 +0.000/-0.127 mm]
Element Inner Diameter:	0.435" ±0.002 [11.05 ±0.051 mm]
Rotor Operating Radius:	0.710" [18.034 mm] Max.
Insulator Inside Diameter:	0.252" ±0.002 [6.401 ±0.051 mm]
Insulator Length:	0.200" +0.000/-0.005 [5.08 +0.000/-0.127 mm]

Schematic Diagram



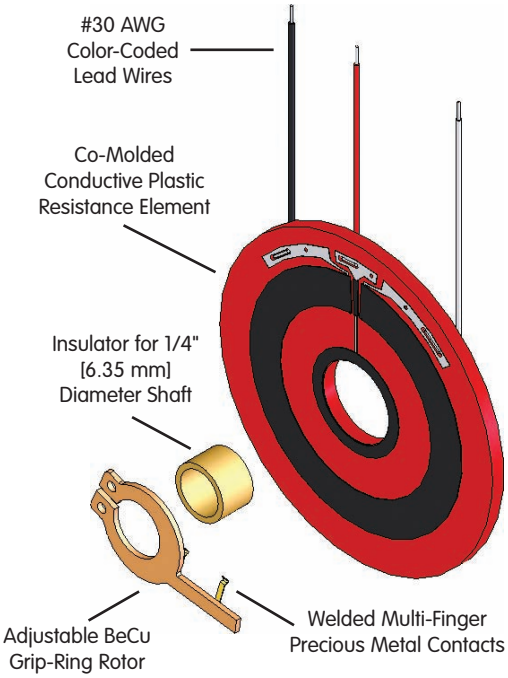
VIEWED FROM MOUNTING SURFACE

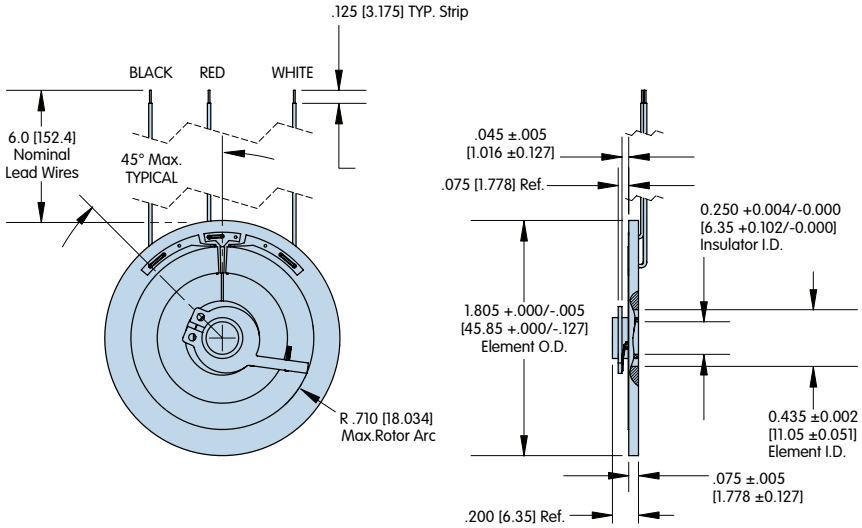
Environmental Characteristics

Operating Temp. Range:	-65°C to +125°C
Rotational Operating Life:	100 x 10^6 Revolutions Min.

1.805" [45.85 mm] Fits Size 20 Diameter Potentiometer Element Rotor/Wiper Kit

6920 Series Standard





Dimensions in Inches [mm]

Available Options

- Custom resistance values (500Ω to 50kΩ) and tolerances as low as ±5%.
- Special linearities as low as 0.10%, absolute (indexed) or independent over specified regions.
- Additional taps, current or voltage.
- Special electrical angles up to 355° Max.
- Special wire leads or cables.
- Special terminations or connectors.
- Special transfer functions:
  - Non-linear outputs
  - Load compensation
  - Trig, log, and exponential outputs
- Special element dimensions or features such as locating notches, scribe marks, custom substrate shapes.
- Custom rotor or insulator dimensions and features.
- Custom marking, identification or logo.
- Special environmental capabilities such as high shock and vibration.

See pages 16-17 for more detail on custom options

SPECTRUM SENSORS & CONTROLS
A Spectrum Control Business

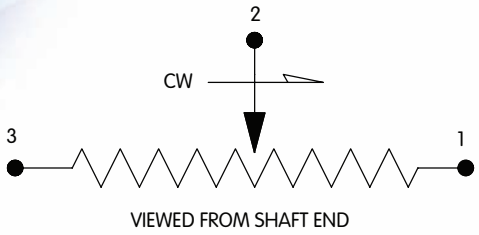
Custom Rotary Element & Wipers Assemblies

Various Value-Added Options Available

Mechanical Characteristics

Element OD:	0.500", 0.702", 0.888", 1.252" and 1.805" [12.7, 17.83, 22.56, 31.8 and 45.85 mm] Diameter
Element ID:	Solid, 0.186" and 0.435" [4.72 and 16.05 mm] Diameter
Shaft Size to Use:	0.125" and 0.250" [3.175 and 6.35 mm] Diameter
Weight (Size Dependent):	0.75 to 5.20 Grams
Wiper Radius (Size Dependent):	0.330" to 0.710" [8.38 to 18.03 mm] Max.

Schematic Diagram



All other general requirements in accordance with MIL-PRF-39023

Environmental Characteristics

Operating Temp. Range:	-65°C to +125°C
Rotational Operating Life:	100 x 10^6 Revolutions Min.
Shock and Vibration per:	MIL-PRF-39023

Materials of Construction

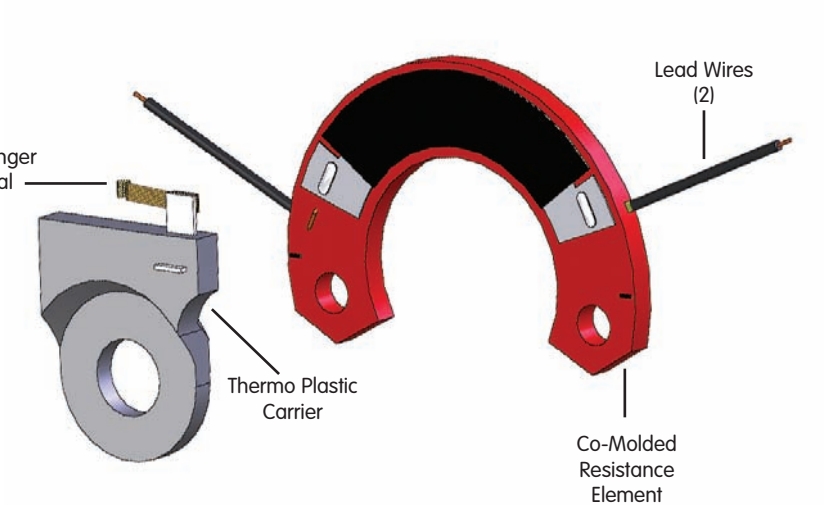
Resistance Position Feedback Element:	Co-Molded Conductive Plastic
Insulator:	Thermo Plastic
Electrical Contacts:	Multi-Finger Precious Metal
Lead Wires or:	30 AWG Teflon - 6" [152.4 mm] Min. Length
Solder Terminals:	Gold Plated Brass

Electrical Characteristics

Resistance (Std, Custom Available):	1kΩ to 20kΩ ±10%
Electrical Angle (Std, Custom Available):	325°, 340° and 350°
Linearity (Std, Custom Available):	±0.5%
Voltage Resolution:	Virtually Infinite
Output Smoothness:	0.1% Max.
Resistance Temp. Coefficient:	400PPM/°C Max.
Power Rating @ 70°C (Size Dependant):	0.5 to 3.0 Watts
Dielectric Strength (Size Dependant):	500 to 1,000 VRMS @ 60Hz
Insulation Resistance:	100 MΩ Min. @ 500VDC

Custom Rotary Element & Wipers Assemblies

6911 Series



Custom Rotary Element & Wipers Assemblies

Custom Features

0.702" [17.83 mm] OD
0.186" [4.72 mm] ID
Multi-Tap Rotary Element Assembly

- 0.702" [17.83 mm] OD/0.186" [4.72 mm] ID, 20kΩ
- Electrical Angle: 340°
- Output Smoothness: 0.1% Max.
- Absolute Linearity: ±2.0%
- Element: Co-Molded Conductive Plastic
- Power Rating: 1.00 Watt @ 70°C

1.556" [39.52 mm] OD
0.435" [11.05 mm] ID
Dual Tracked Element Assembly

- 1.556" [39.52 mm] OD/0.435" [11.5 mm] ID - Track A, 15kΩ, Track B, 4kΩ
- Electrical Angle: 360° Continuous
- Output Smoothness: 0.1% Max.
- Absolute Linearity: ±0.25-4.0%
- Element: Co-Molded Conductive Plastic
- Power Rating: 1.75 Watts @ 70°C

Available Options

- Custom resistance values (1kΩ to 20kΩ) and tolerances as low as ±5%.
- Special linearities as low as 0.25% (Absolute/Independent).
- Special electrical angles up to 355° maximum.
- Custom wire leads or cable with specified lengths and connector options or gold plated terminals.
- Special mounting configurations available.
- Special mounting frames configurations available.

SPECTRUM SENSORS & CONTROLS
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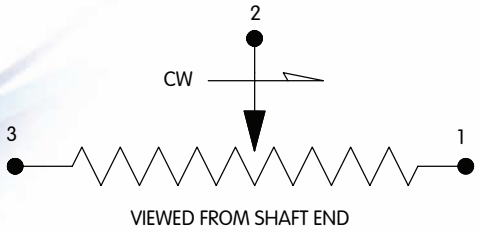
Custom Arc Segment Assemblies

Various OD Element Sizes and Enclosed Options

Mechanical Characteristics

Housing:	1.090" and 1.125" [27.69 and 28.58 mm] Radius
Shaft:	Customer Supplied
Shaft Length:	Customer Supplied
Shaft Radial Play:	Customer Supplied
Mechanical Rotation:	60° - 90° Min. Stop to Stop

Schematic Diagram



All other general requirements in accordance with MIL-PRF-39023

Environmental Characteristics

Operating Temp. Range:	-65°C to +125°C
Operating Life:	50 x 10^6 Cycles Min.
Operating Speed:	500°/Second Max.
Shock and Vibration per:	MIL-PRF-39023

Materials of Construction

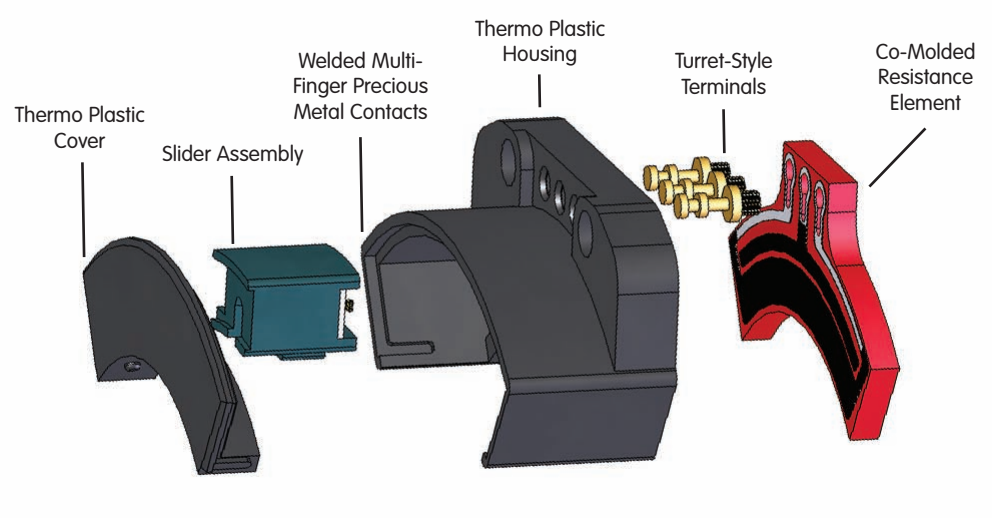
Housing:	Thermo Plastic
Slider:	Thermo Plastic/Stainless Steel Insert
Resistance Position Feedback Element:	Co-Molded Conductive Plastic
Electrical Contacts:	Multi-Finger Precious Metal
Lead Wires or:	28 AWG Teflon - 8" [203.2 mm] Min. Length
Solder Terminals:	Gold Plated Brass

Electrical Characteristics

Resistance (Std, Custom Available):	1kΩ to 20kΩ ±10%
Electrical Angle (Std, Custom Available):	60°
Linearity (Std, Custom Available):	±0.5%
Phasing:	Centered in Mech. Angle ±5°
Voltage Resolution:	Virtually Infinite
Output Smoothness:	0.1% Max.
Resistance Temp. Coefficient:	400PPM/°C Max.
Power Rating @ 70°C (Size Dependant):	0.5 to 3.0 Watts
Dielectric Strength (Size Dependant):	500 to 1,000 VRMS @ 60Hz
Insulation Resistance:	100 MΩ Min. @ 500VDC

Custom Arc Segment Assemblies

6820 Series Enclosed



Custom Arc Segment Assemblies

Custom Features

1.425" [36.2 mm] Radius OD 0.770" [19.56 mm] Radius ID Arc Element Assembly with Turret-Style Terminals

- 1.425" [36.2 mm] Radius OD/0.770" [19.56 mm] Radius ID Front Mounting
- Electrical Angle: 55°
- Absolute Linearity: Bow Tie Tol
- Element: Co-Molded Conductive Plastic
- Terminals, Turret: Ni Plated Brass

1.400" [36.56 mm] Radius OD 0.820" [20.83 mm] Radius ID Enclosed Arc Segment Assembly with 5.0" [127 mm] Long Lead Wires

- 1.400" [36.56 mm] Radius OD/0.820" [20.83 mm] Radius ID Rear Mounting
- Electrical Angle: 70°
- Phasing: Centered Mech. ±1°
- Absolute Linearity: Bow Tie Tol
- Housing/Slider: Thermo Plastic
- Lead Wires: 24 AWG 5.0" [127 mm] Length

Available Options

- Custom resistance values (1kΩ to 20kΩ) and tolerances as low as ±5%.
- Special linearities as low as 0.25% (Absolute/Independent).
- Special electrical angles up to 90° maximum.
- Custom wire leads or cable with specified lengths and connector options or gold plated terminals.
- Special mounting configurations available.
- Enclosed arc segment assemblies available.

SPECTRUM SENSORS & CONTROLS
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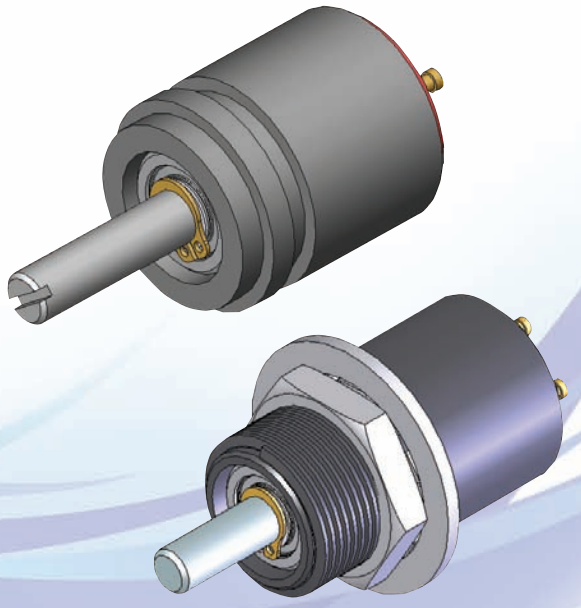
1/2" [12.7 mm] Size 5 Diameter Rotary Precision Position Sensor



6005 Series Servo-Mount

Part Number	Resistance
6005-1000-030	1kΩ ±10%
6005-1002-030	5kΩ ±10%
6005-1003-030	10kΩ ±10%

6205 Series Bushing-Mount

Part Number	Resistance
6205-1000-030	1kΩ ±10%
6205-1002-030	5kΩ ±10%
6205-1003-030	10kΩ ±10%

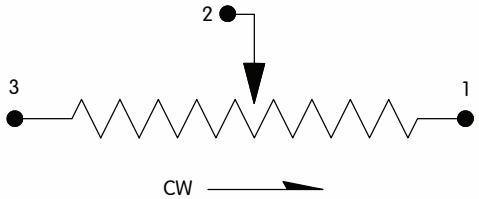
Mechanical Characteristics

Mechanical Rotation:	Continuous
Starting Torque:	0.20 Oz.-In. Max.
Running Torque:	0.15 Oz.-In. Max.
Total Weight:	0.5 Oz. [14.18 g] Max.
Pilot Runout:	0.001" [0.025 mm] TIR
Shaft Runout:	0.001" [0.025 mm] TIR
Shaft End Play:	0.003" [0.076 mm] Max.
Shaft Radial Play:	0.001" [0.025 mm] TIR
Lateral Runout:	0.002" [0.051 mm] TIR

Electrical Characteristics

Resistance:	1kΩ to 10kΩ ±10%
Active Electrical Angle:	325°
Electrical Continuity Angle:	330° Min.
Independent Linearity:	±1.0%
End Voltage:	1.0% Max.
Voltage Resolution:	Virtually Infinite
Output Smoothness:	0.1% Max.
Resistance Temp. Coefficient:	400PPM/°C Max.
Power Rating @ 70°C:	0.5 Watt Max.
Wiper Contact Current:	10 mA Max.
Dielectric Strength:	500 VRMS @ 60Hz
Insulation Resistance:	100 MΩ Min. @ 500VDC

Schematic Diagram



All other general requirements in accordance with MIL-PRF-39023

Materials of Construction

Housing:	Anodized Aluminum
Shaft and Ball Bearings:	Stainless Steel
Resistance Element:	Co-Molded Conductive Plastic
Electrical Contacts:	Multi-Finger Precious Metal
Solder Terminals:	Gold Plated Brass

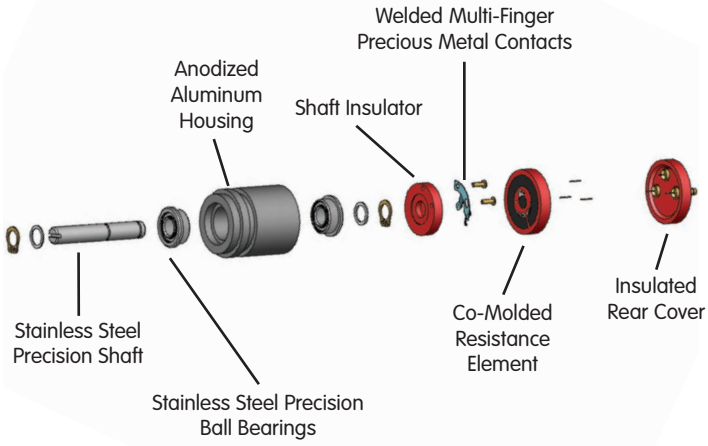
Environmental Characteristics

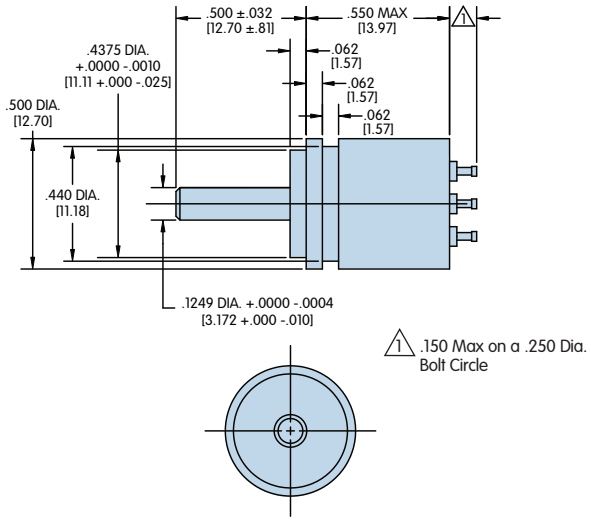
Operating Temp. Range:	-65°C to +125°C
Rotational Operating Life:	50 x 10^6 Revolutions Min.

1/2" [12.7 mm] Size 5 Diameter Rotary Precision Position Sensor

6005 Series Servo-Mount

*Available in single-gang only.



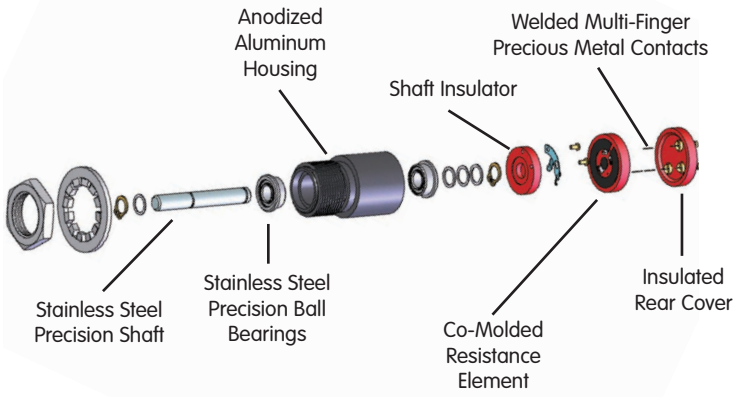


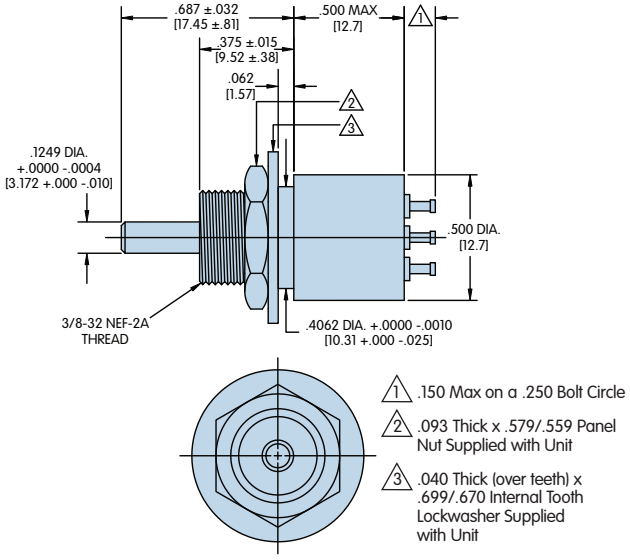
Dimensions in Inches [mm]

1/2" [12.7 mm] Size 5 Diameter Rotary Precision Position Sensor

6205 Series Bushing-Mount

*Available in single-gang only. Mounting hardware furnished.





Dimensions in Inches [mm]

Available Options

- Custom resistance values (500Ω to 30kΩ) and tolerances as low as ±5%.
- Special linearities as low as 0.25%, special electrical angles up to 340° Max.
- Additional tap, current or voltage ratings.
- Wire leads or cable in place of terminals.
- Special shaft lengths, diameters, and mounting dimensions.

See pages 32-37 for more detail on custom options

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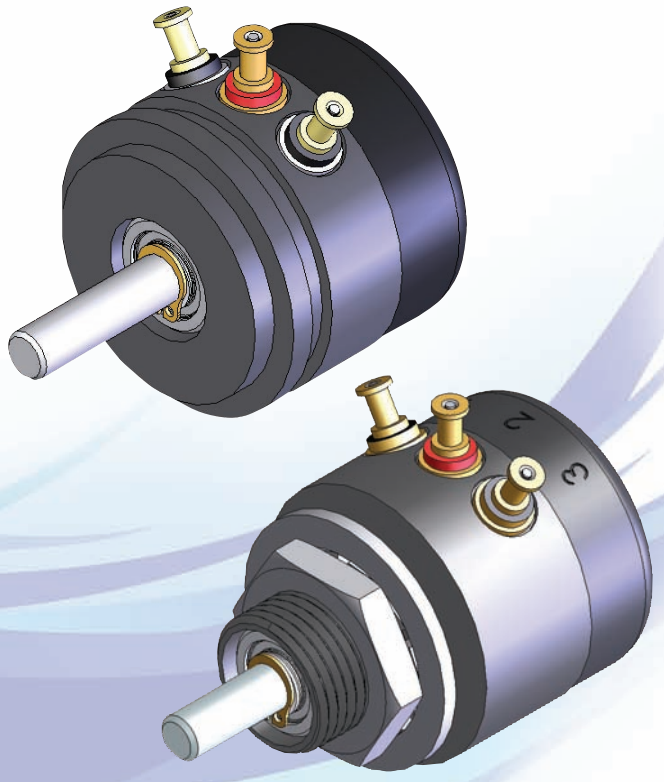
3/4" [19.05 mm] Size 8 Diameter Rotary Precision Position Sensor



6008 Series Servo-Mount

Part Number	Resistance
6008-1000-030	1kΩ ±10%
6008-1002-030	5kΩ ±10%
6008-1003-030	10kΩ ±10%

6208 Series Bushing-Mount

Part Number	Resistance
6208-1000-030	1kΩ ±10%
6208-1002-030	5kΩ ±10%
6208-1003-030	10kΩ ±10%

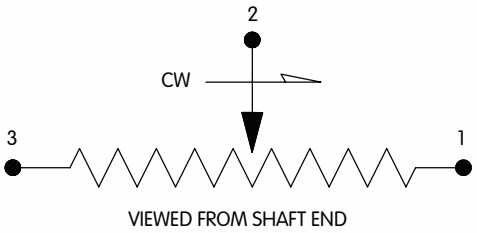
Mechanical Characteristics

Mechanical Rotation:	Continuous
Starting Torque:	0.25 Oz.-In. Max.
Running Torque:	0.20 Oz.-In. Max.
Total Weight:	0.6 Oz. [17.01 g] Max.
Pilot Runout:	0.001" [0.025 mm] TIR
Shaft Runout:	0.001" [0.025 mm] TIR
Shaft End Play:	0.003" [0.076 mm] Max.
Shaft Radial Play:	0.001" [0.025 mm] TIR
Lateral Runout:	0.002" [0.051 mm] TIR

Electrical Characteristics

Resistance:	1kΩ to 10kΩ ±10%
Active Electrical Angle:	340°
Electrical Continuity Angle:	344° Min.
Independent Linearity:	±0.5%
End Voltage:	0.5% Max.
Voltage Resolution:	Virtually Infinite
Output Smoothness:	0.1% Max.
Resistance Temp. Coefficient:	400PPM/°C Max.
Power Rating @ 70°C:	0.75 Watt Max.
Wiper Contact Current:	10 mA Max.
Dielectric Strength:	750 VRMS @ 60Hz
Insulation Resistance:	100 MΩ Min. @ 500VDC

Schematic Diagram



VIEWED FROM SHAFT END

All other general requirements in accordance with MIL-PRF-39023

Materials of Construction

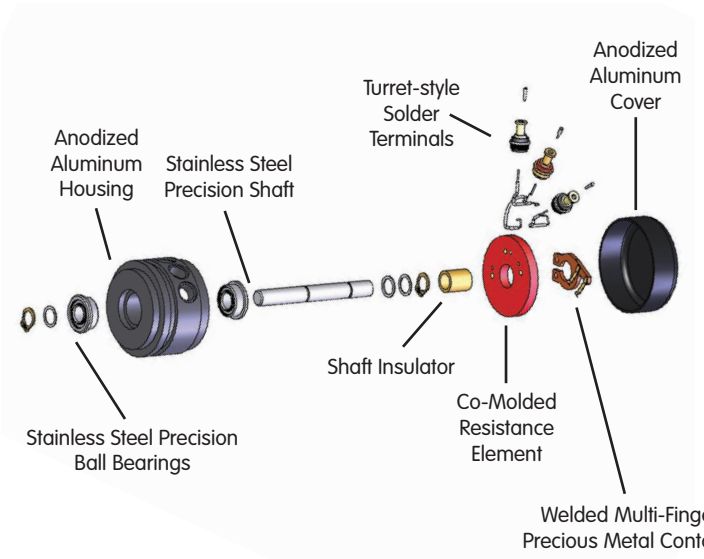
Housing and Cover:	Anodized Aluminum
Shaft and Ball Bearings:	Stainless Steel
Resistance Element:	Co-Molded Conductive Plastic
Electrical Contacts:	Multi-Finger Precious Metal
Solder Terminals:	Gold Plated Brass

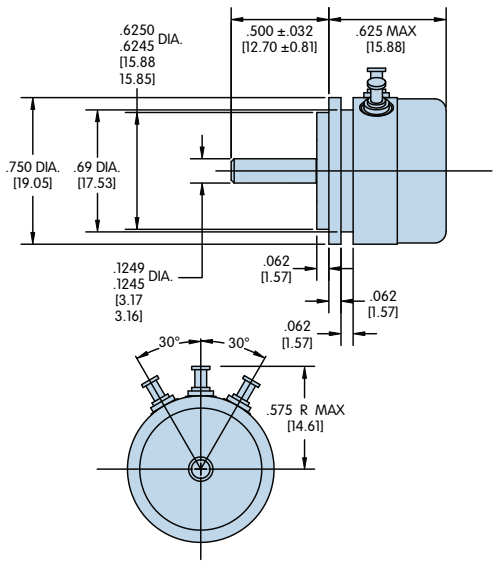
Environmental Characteristics

Operating Temp. Range:	-65°C to +125°C
Rotational Operating Life:	100 x 10^6 Revolutions Min.

3/4" [19.05 mm] Size 8 Diameter Rotary Precision Position Sensor

6008 Series Servo-Mount



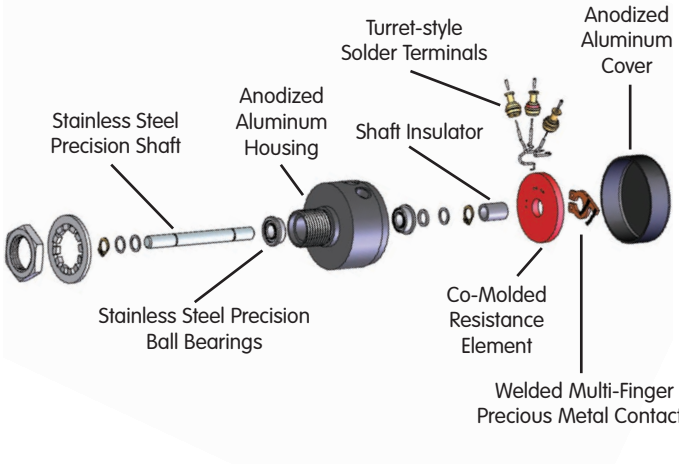


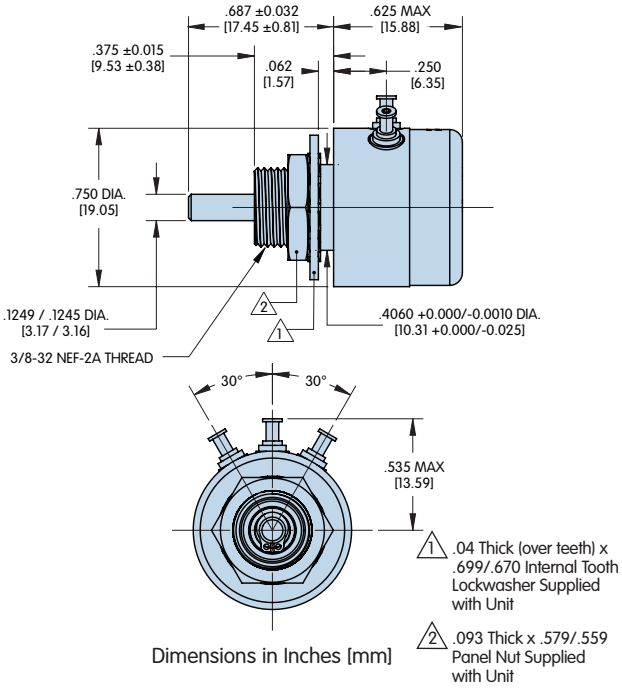
Dimensions in Inches [mm]

3/4" [19.05 mm] Size 8 Diameter Rotary Precision Position Sensor

6208 Series Bushing-Mount

*Mounting hardware furnished.





Dimensions in Inches [mm]

Available Options

- Custom resistance values (500Ω to 30kΩ) and tolerances as low as ±5%
- Special linearities as low as 0.2%; special electrical angles up to 355° Max.
- Additional taps, current or voltage ratings.
- Wire leads or cable in place of terminals.
- Special transfer functions, shaft lengths, and mounting dimensions.
- Multi-gang construction (up to 6) and wire leads or cable in place of terminals.
- Special torque or detent with rotational stops limiting shaft travel.

See pages 32-37 for more detail on custom options

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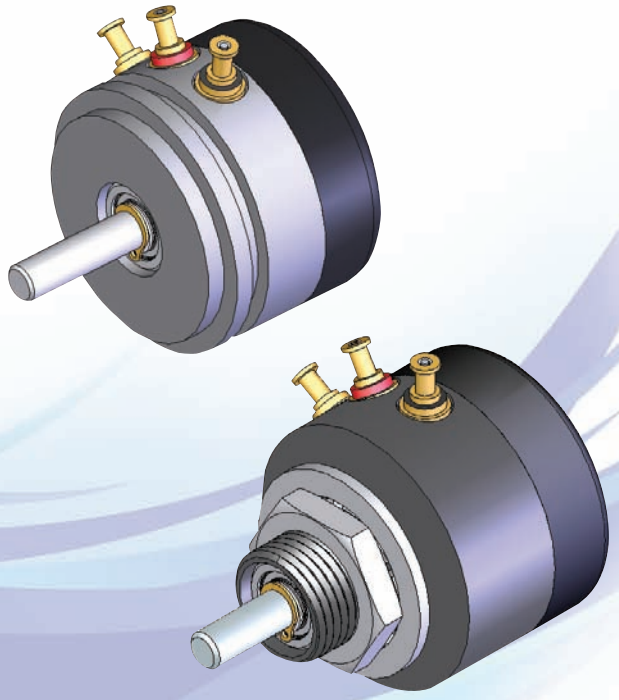
7/8" [22.23 mm] Size 9 Diameter Rotary Precision Position Sensor



6009 Series Servo-Mount

Part Number	Resistance
6009-1000-030	1kΩ ±10%
6009-1002-030	5kΩ ±10%
6009-1003-030	10kΩ ±10%

6209 Series Bushing-Mount

Part Number	Resistance
6209-1000-030	1kΩ ±10%
6209-1002-030	5kΩ ±10%
6209-1003-030	10kΩ ±10%

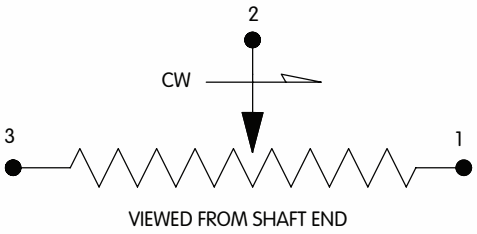
Mechanical Characteristics

Mechanical Rotation:	Continuous
Starting Torque:	0.25 Oz.-In. Max.
Running Torque:	0.20 Oz.-In. Max.
Total Weight:	0.6 Oz. [17.01 g] Max.
Pilot Runout:	0.001" [0.025 mm] TIR
Shaft Runout:	0.001" [0.025 mm] TIR
Shaft End Play:	0.003" [0.076 mm] Max.
Shaft Radial Play:	0.001" [0.025 mm] TIR
Lateral Runout:	0.002" [0.051 mm] TIR

Electrical Characteristics

Resistance:	1kΩ to 10kΩ ±10%
Active Electrical Angle:	340°
Electrical Continuity Angle:	344° Min.
Independent Linearity:	±0.5%
End Voltage:	0.5% Max.
Voltage Resolution:	Virtually Infinite
Output Smoothness:	0.1% Max.
Resistance Temp. Coefficient:	400PPM/°C Max.
Power Rating @ 70°C:	1.0 Watt Max.
Wiper Contact Current:	10 mA Max.
Dielectric Strength:	750 VRMS @ 60Hz
Insulation Resistance:	100 MΩ Min. @ 500VDC

Schematic Diagram



VIEWED FROM SHAFT END

All other general requirements in accordance with MIL-PRF-39023

Materials of Construction

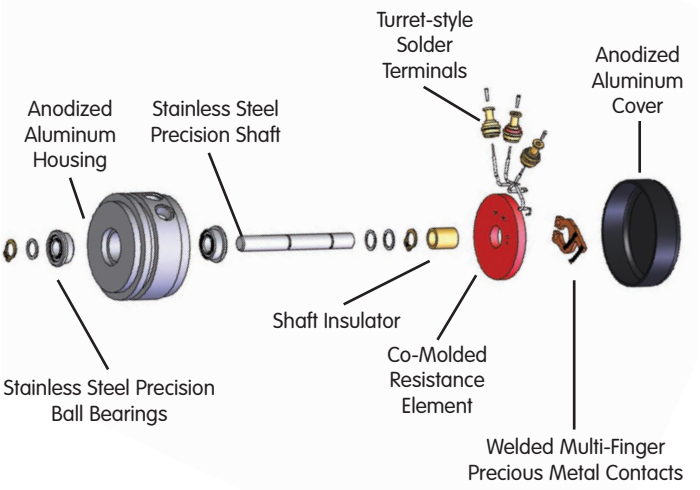
Housing and Cover:	Anodized Aluminum
Shaft and Ball Bearings:	Stainless Steel
Resistance Element:	Co-Molded Conductive Plastic
Electrical Contacts:	Multi-Finger Precious Metal
Solder Terminals:	Gold Plated Brass

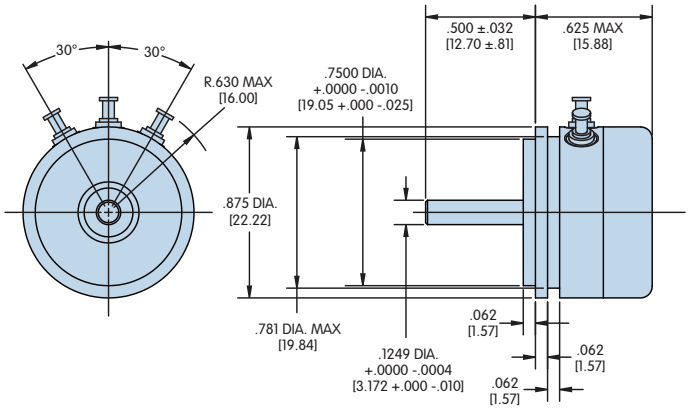
Environmental Characteristics

Operating Temp. Range:	-65°C to +125°C
Rotational Operating Life:	100 x 10^6 Revolutions Min.

7/8" [22.23 mm] Size 9 Diameter Rotary Precision Position Sensor

6009 Series Servo-Mount



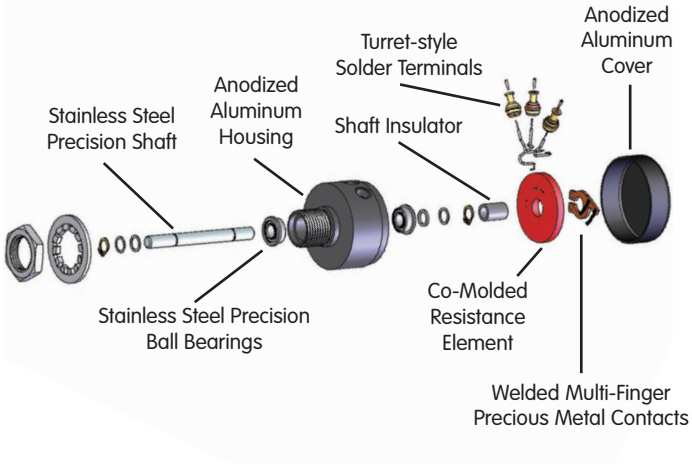


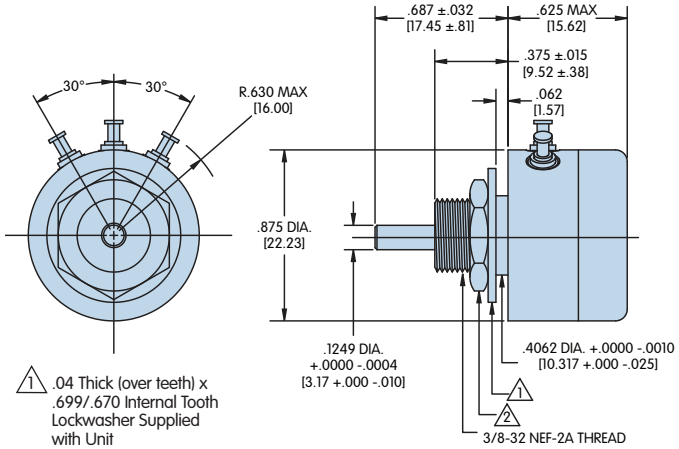
Dimensions in Inches [mm]

7/8" [22.23 mm] Size 9 Diameter Rotary Precision Position Sensor

6209 Series Bushing-Mount

*Mounting hardware furnished.





Dimensions in Inches [mm]

Available Options

- Custom resistance values (500Ω to 30kΩ) and tolerances as low as ±5%.
- Special linearities as low as 0.15%; special electrical angles up to 355° Max.
- Additional taps, current or voltage ratings.
- Current limit resistors and other internal circuit components (caps, diodes, etc.)
- Special transfer functions, shaft lengths, and mounting dimensions.
- Multi-gang constructions (up to 6) and wire leads or cable in place of terminals.
- Special torque or detent with rotational stops limiting shaft travel.

See pages 32-37 for more detail on custom options

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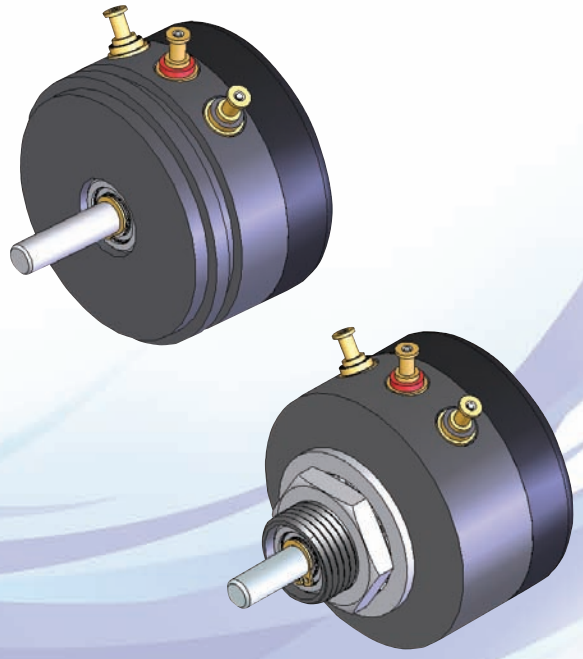
1-1/16" [27 mm] Size 11 Diameter Rotary Precision Position Sensor



6011 Series Servo-Mount

Part Number	Resistance
6011-1000-030	1kΩ ±10%
6011-1002-030	5kΩ ±10%
6011-1003-030	10kΩ ±10%

6211 Series Bushing-Mount

Part Number	Resistance
6211-1000-030	1kΩ ±10%
6211-1002-030	5kΩ ±10%
6211-1003-030	10kΩ ±10%

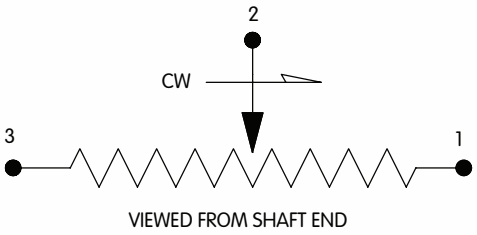
Mechanical Characteristics

Mechanical Rotation:	Continuous
Starting Torque:	0.25 Oz.-In. Max.
Running Torque:	0.20 Oz.-In. Max.
Total Weight:	0.7 Oz. [19.85 g] Max.
Pilot Runout:	0.001" [0.025 mm] TIR
Shaft Runout:	0.001" [0.025 mm] TIR
Shaft End Play:	0.003" [0.076 mm] Max.
Shaft Radial Play:	0.001" [0.025 mm] TIR
Lateral Runout:	0.002" [0.051 mm] TIR

Electrical Characteristics

Resistance:	1kΩ to 10kΩ ±10%
Active Electrical Angle:	340°
Electrical Continuity Angle:	344° Min.
Independent Linearity:	±0.5%
End Voltage:	0.5% Max.
Voltage Resolution:	Virtually Infinite
Output Smoothness:	0.1% Max.
Resistance Temp. Coefficient:	400PPM/°C Max.
Power Rating @ 70°C:	1.25 Watts Max.
Wiper Contact Current:	10 mA Max.
Dielectric Strength:	1000 VRMS @ 60Hz
Insulation Resistance:	100 MΩ Min. @ 500VDC

Schematic Diagram



VIEWED FROM SHAFT END

All other general requirements in accordance with MIL-PRF-39023

Materials of Construction

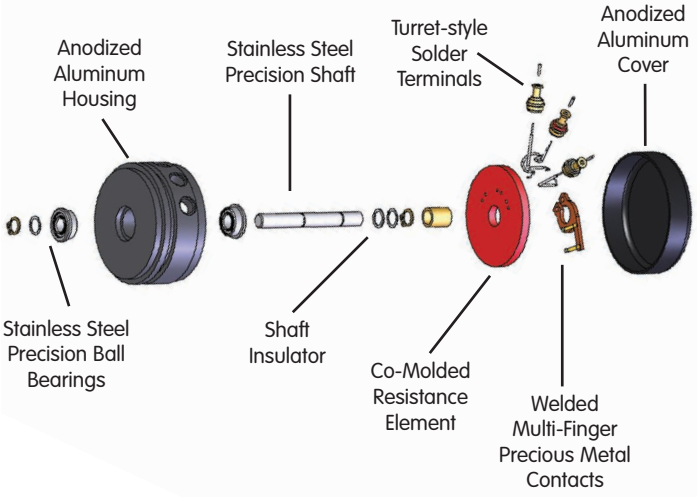
Housing and Cover:	Anodized Aluminum
Shaft and Ball Bearings:	Stainless Steel
Resistance Element:	Co-Molded Conductive Plastic
Electrical Contacts:	Multi-Finger Precious Metal
Solder Terminals:	Gold Plated Brass

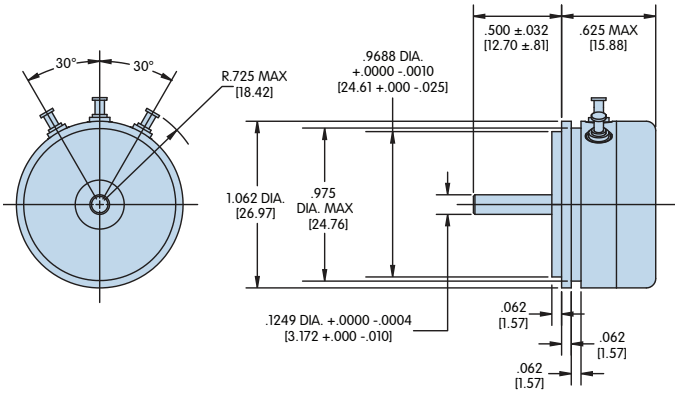
Environmental Characteristics

Operating Temp. Range:	-65°C to +125°C
Rotational Operating Life:	100 x 10^6 Revolutions Min.

1-1/16" [26.99 mm] Size 11 Diameter Rotary Precision Position Sensor

6011 Series Servo-Mount



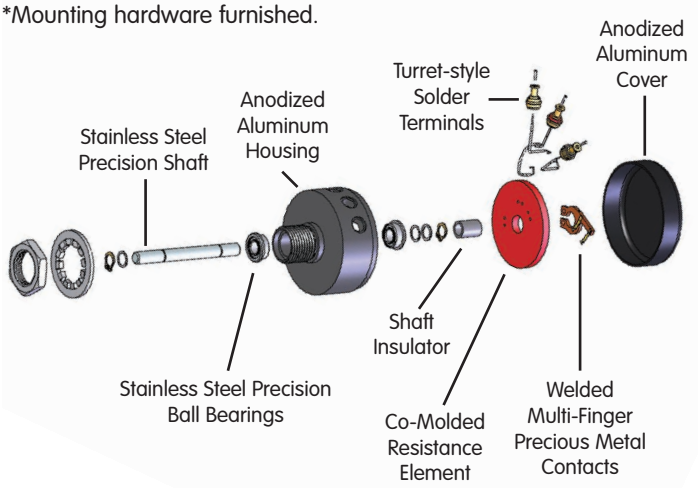


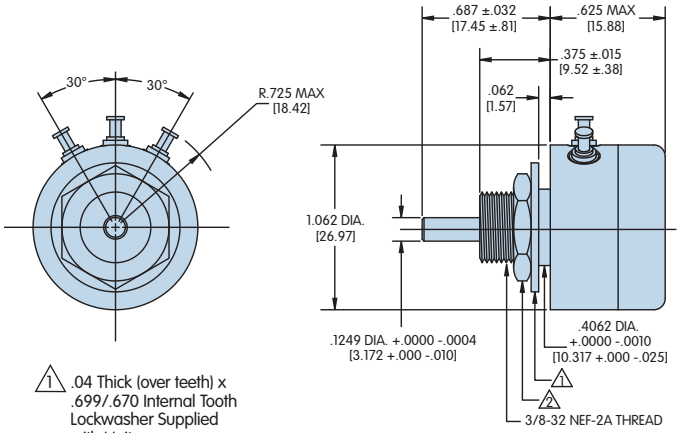
Dimensions in Inches [mm]

1-1/16" [26.99 mm] Size 11 Diameter Rotary Precision Position Sensor

6211 Series Bushing-Mount

*Mounting hardware furnished.





1 .04 Thick (over teeth) x .699/.670 Internal Tooth Lockwasher Supplied with Unit

2 .093 Thick x .579/.559 Panel Nut Supplied with Unit

Dimensions in Inches [mm]

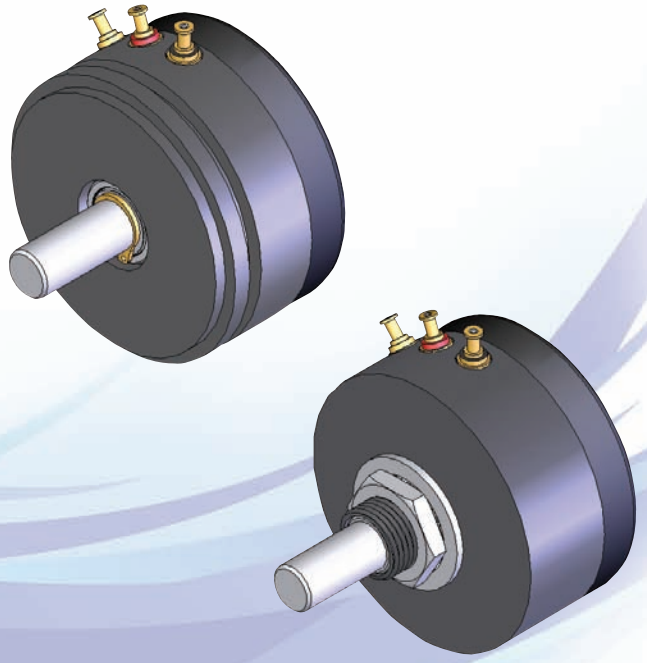
Available Options

- Custom resistance values (500Ω to 50kΩ) and tolerances as low as ±5%.
- Special linearities as low as 0.1%; special electrical angles up to 355° Max.
- Additional taps, current or voltage ratings.
- Current limit resistors and other internal circuit components (caps, diodes, etc.)
- Special transfer functions, shaft lengths, and mounting dimensions.
- Multi-gang constructions (up to 6) and wire leads or cable in place of terminals.
- Special torque or detent with rotational stops limiting shaft travel.

See pages 32-37 for more detail on custom options

SPECTRUM SENSORS & CONTROLS
A Spectrum Control Business

1-7/16" [36.5 mm] Size 15 Diameter Rotary Precision Position Sensor



6015 Series Servo-Mount

Part Number	Resistance
6015-1000-030	1kΩ ±10%
6015-1002-030	5kΩ ±10%
6015-1003-030	10kΩ ±10%

6215 Series Bushing-Mount

Part Number	Resistance
6215-1000-030	1kΩ ±10%
6215-1002-030	5kΩ ±10%
6215-1003-030	10kΩ ±10%

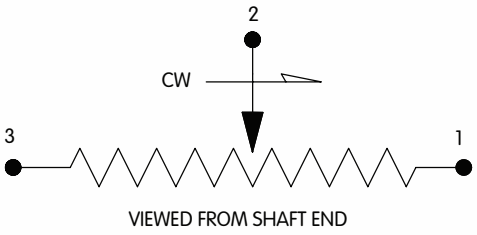
Mechanical Characteristics

Mechanical Rotation:	Continuous
Starting Torque:	0.30 Oz.-In. Max.
Running Torque:	0.20 Oz.-In. Max.
Total Weight:	2.0 Oz. [56.7 g] Max.
Pilot Runout:	0.001" [0.025 mm] TIR
Shaft Runout:	0.001" [0.025 mm] TIR
Shaft End Play:	0.003" [0.076 mm] Max.
Shaft Radial Play:	0.001" [0.025 mm] TIR
Lateral Runout:	0.002" [0.051 mm] TIR

Electrical Characteristics

Resistance:	1kΩ to 10kΩ ±10%
Active Electrical Angle:	340°
Electrical Continuity Angle:	344° Min.
Independent Linearity:	±0.5%
End Voltage:	0.5% Max.
Voltage Resolution:	Virtually Infinite
Output Smoothness:	0.1% Max.
Resistance Temp. Coefficient:	400PPM/°C Max.
Power Rating @ 70°C:	2 Watts Max.
Wiper Contact Current:	10 mA Max.
Dielectric Strength:	1,000 VRMS @ 60Hz
Insulation Resistance:	100 MΩ Min. @ 500VDC

Schematic Diagram



VIEWED FROM SHAFT END

All other general requirements in accordance with MIL-PRF-39023

Materials of Construction

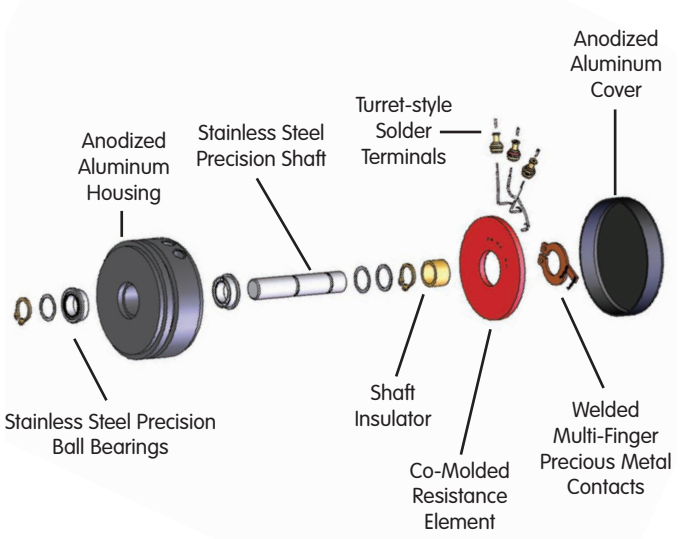
Housing and Cover:	Anodized Aluminum
Shaft and Ball Bearings:	Stainless Steel
Resistance Element:	Co-Molded Conductive Plastic
Electrical Contacts:	Multi-Finger Precious Metal
Solder Terminals:	Gold Plated Brass

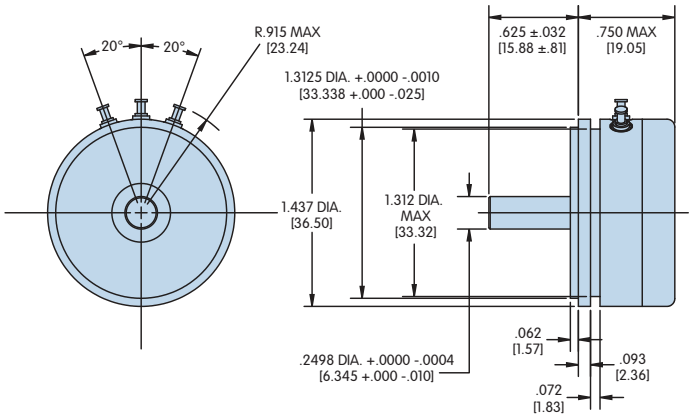
Environmental Characteristics

Operating Temp. Range:	-65°C to +125°C
Rotational Operating Life:	100 x 10^6 Revolutions Min.

1-7/16" [36.51 mm] Size 15 Diameter Rotary Precision Position Sensor

6015 Series Servo-Mount



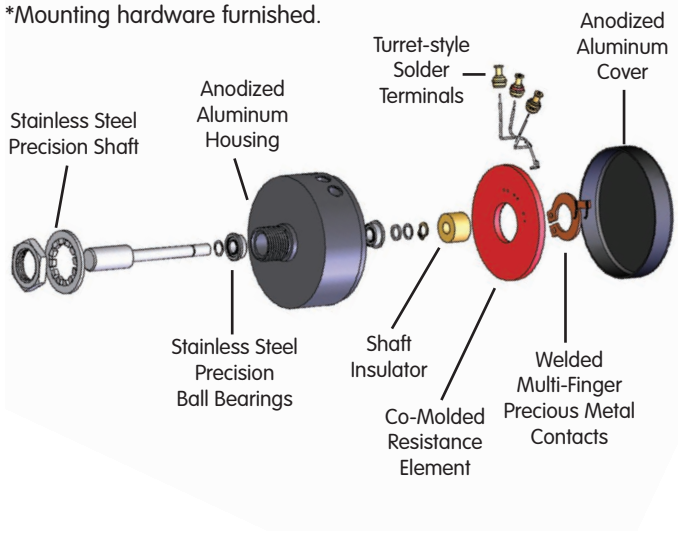


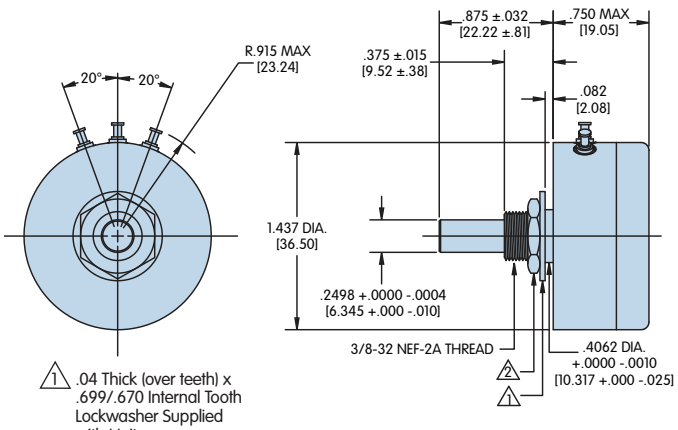
Dimensions in Inches [mm]

1-7/16" [36.51 mm] Size 15 Diameter Rotary Precision Position Sensor

6215 Series Servo-Mount

*Mounting hardware furnished.





1. .04 Thick (over teeth) x .699/.670 Internal Tooth Lockwasher Supplied with Unit
2. .093 Thick x .579/.559 Panel Nut Supplied with Unit

Dimensions in Inches [mm]

Available Options

- Custom resistance values (500Ω to 60kΩ) and tolerances as low as ±5%.
- Special linearities as low as 0.075%; special electrical angles up to 355° Max.
- Additional taps, current or voltage ratings.
- Current limit resistors and other internal circuit components (caps, diodes, etc.)
- Special transfer functions, shaft lengths, and mounting dimensions.
- Multi-gang construction (up to 6) and wire leads or cable in place of terminals.
- Special torque or detent with rotational stops limiting shaft travel

See pages 32-37 for more detail on custom options

SPECTRUM SENSORS & CONTROLS
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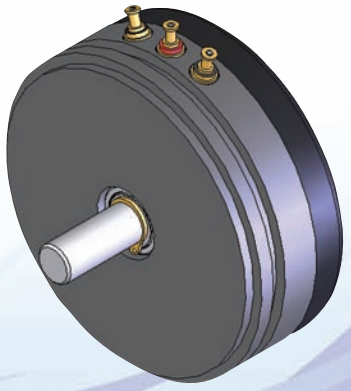
2" [50.8 mm] Size 20 Diameter Rotary Precision Position Sensor



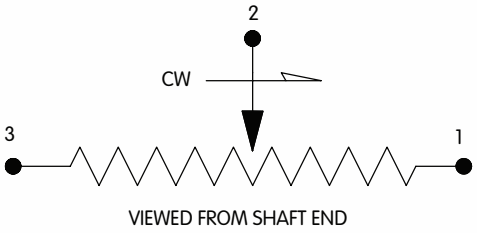
6020 Series Servo-Mount

Part Number	Resistance
6020-1000-030	1kΩ ±10%
6020-1002-030	5kΩ ±10%
6020-1003-030	10kΩ ±10%

Mechanical Characteristics

Mechanical Rotation:	Continuous
Starting Torque:	0.50 Oz.-In. Max.
Running Torque:	0.40 Oz.-In. Max.
Total Weight:	3.5 Oz. [99.22 g] Max.
Pilot Runout:	0.001" [0.025 mm] TIR
Shaft Runout:	0.001" [0.025 mm] TIR
Shaft End Play:	0.003" [0.076 mm] Max.
Shaft Radial Play:	0.001" [0.025 mm] TIR
Lateral Runout:	0.002" [0.051 mm] TIR

Schematic Diagram



All other general requirements in accordance with MIL-PRF-39023

Environmental Characteristics

Operating Temp. Range:	-65°C to +125°C
Rotational Operating Life:	100 x 10^6 Revolutions Min.

Electrical Characteristics

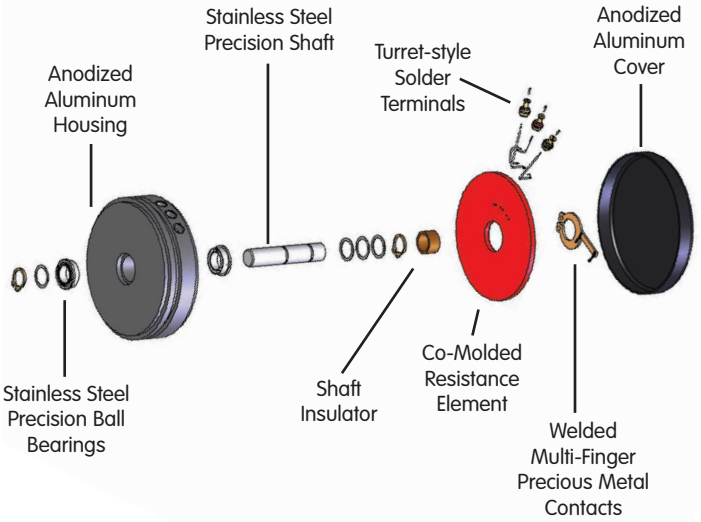
Resistance:	1kΩ to 10kΩ ±10%
Active Electrical Angle:	350°
Electrical Continuity Angle:	354° Min.
Independent Linearity:	±0.5%
End Voltage:	0.5% Max.
Voltage Resolution:	Virtually Infinite
Output Smoothness:	0.1% Max.
Resistance Temp. Coefficient:	400PPM/°C Max.
Power Rating @ 70°C:	3.0 Watts Max.
Wiper Contact Current:	10 mA Max.
Dielectric Strength:	1,000 VRMS @ 60Hz
Insulation Resistance:	100 MΩ Min. @ 500VDC

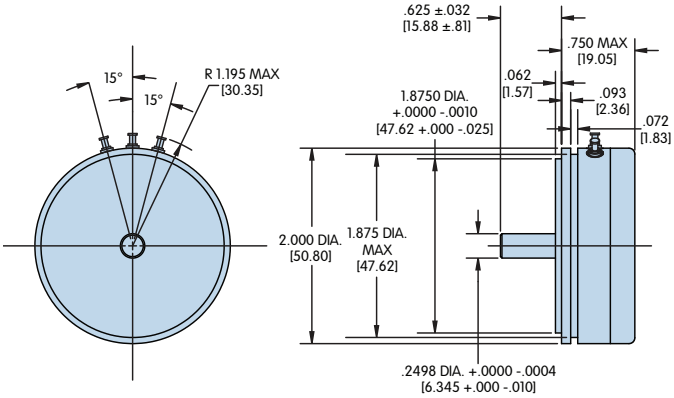
Materials of Construction

Housing and Cover:	Anodized Aluminum
Shaft and Ball Bearings:	Stainless Steel
Resistance Element:	Co-Molded Conductive Plastic
Electrical Contacts:	Multi-Finger Precious Metal
Solder Terminals:	Gold Plated Brass

2" [50.8 mm] Size 20 Diameter Rotary Precision Position Sensor

6020 Series Servo-Mount





Dimensions in Inches [mm]

Available Options

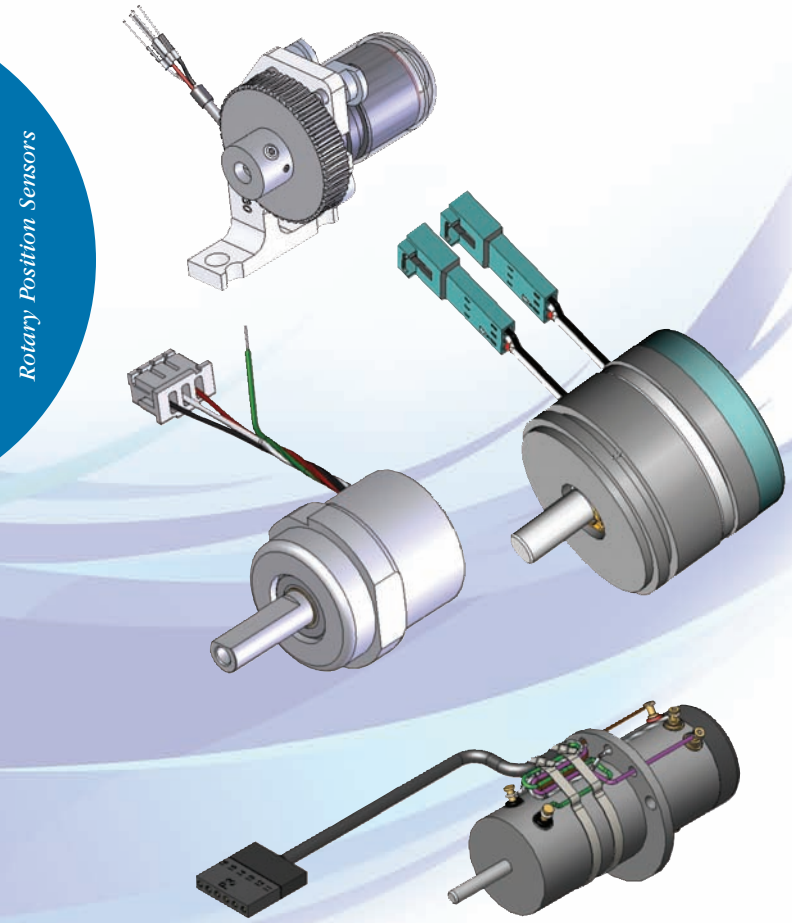
- Custom resistance values (500Ω to 100kΩ) and tolerances as low as ±5%.
- Special linearities as low as 0.05%, absolute (indexed) or independent over specified regions.
- Additional taps, current or voltage ratings.
- Current limit resistors and other internal circuit components (caps, diodes, etc.)
- Special electrical angles up to 356° Max.
- Wire leads or cable in place of terminals.
- Special transfer functions:
  Non-linear outputs
  Load compensation
  Trig, log, and exponential outputs
- Multi-gang construction (up to 6) on a common shaft or concentric shafting (add 0.320" [8.128 mm] length per gang).
- Special shaft lengths and features such as flats, slots and steps.
- Special torque or detent requirements.
- Special mounting dimensions or features including anti-rotation pins, bolt flanges, and threaded holes.
- Rotational stops limiting shaft travel.
- Ancillary devices such as spring returns, clutches, brakes, and switches.
- Special environmental capabilities such as moisture seals, high shock and vibration.

See pages 32-37 for more detail on custom options

SPECTRUM SENSORS & CONTROLS
A Spectrum Control Business

Custom Rotary Position Sensor

Various Value-Added Options Available

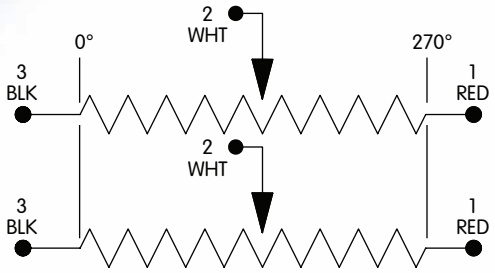


Mechanical Characteristics

Housing (Std, Custom Available):	0.500", 0.625", 0.875", 1.062" and 1.437" [12.7, 15.88, 22.23, 26.98 and 36.5 mm] Diameter
Housing Styles:	Servo, Bushing & Flange Mount
Shaft (Std, Custom Available):	0.125" and 0.250" [3.175 and 6.35 mm] Diameter
Shaft Length:	Servo: 0.500" [12.7 mm], Bushing: 0.688" [17.48 mm]
Starting Torque:	0.20 to 0.50 Oz-In.
Running Torque:	0.15 to 0.40 Oz-In.

** Note: Shaft end options - Screw Driver, Flat and Through-hole (Gear mounting options available)*

Schematic Diagram



VIEWED FROM SHAFT END
(Dual Tracked Section Option)

All other general requirements in accordance with MIL-PRF-39023

Environmental Characteristics

Operating Temp. Range:	-65°C to +125°C
Rotational Operating Life:	100 x 10^6 Revolutions Min.
Shock and Vibration per:	MIL-PRF-39023

Materials of Construction

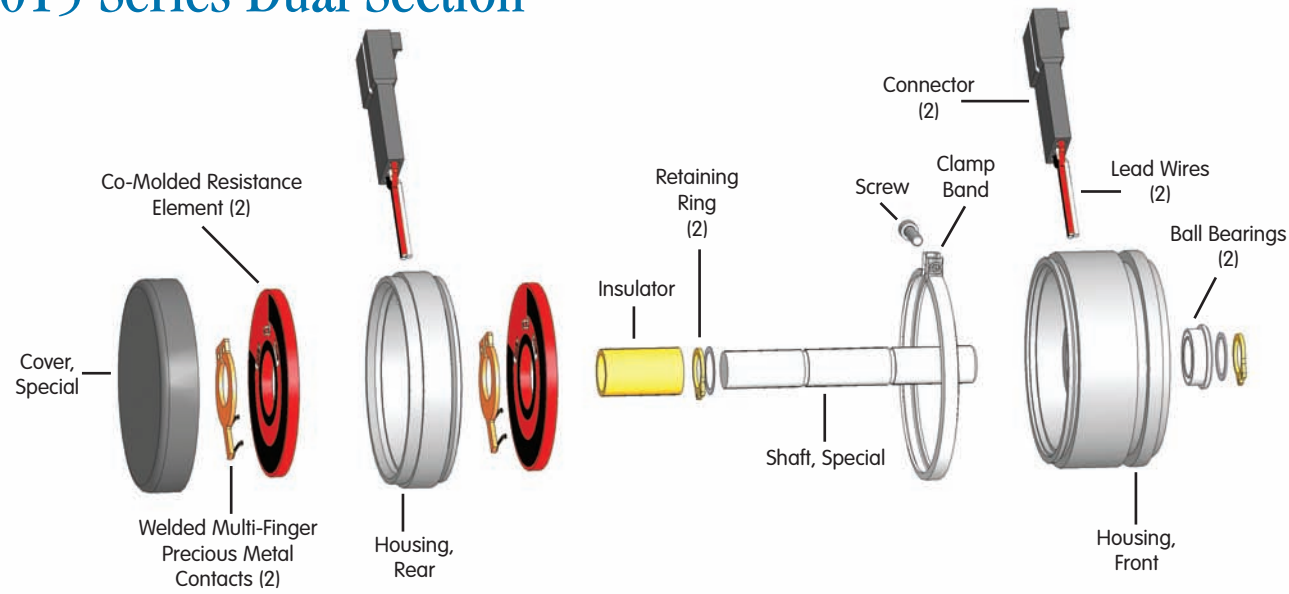
Housing:	Anodized Aluminum or Thermo Plastic
Cover:	Anodized Aluminum or Thermo Plastic
Shaft:	Stainless Steel
Resistance Position Feedback Element:	Co-Molded Conductive Plastic
Electrical Contacts:	Multi-Finger Precious Metal
Lead Wires or:	30 AWG Teflon - 6" [152.4 mm] Min. Length
Solder Terminals:	Gold Plated Brass

Electrical Characteristics

Resistance (Std, Custom Available):	1kΩ to 20kΩ ±10%
Electrical Angle (Std, Custom Available):	325°, 340° and 350°
Linearity (Std, Custom Available):	±0.5%
Phasing/Tracking:	±0.5% between Cups
Voltage Resolution:	Virtually Infinite
Output Smoothness:	0.1% Max.
Resistance Temp. Coefficient:	400PPM/°C Max.
Power Rating @ 70°C (Size Dependant):	0.5 to 3.0 Watts
Dielectric Strength (Size Dependant):	500 to 1,000 VRMS @ 60Hz
Insulation Resistance:	100 MΩ Min. @ 500VDC

Custom Rotary Position Sensor

6015 Series Dual Section



Custom Rotary Position Sensor

Custom Features

0.875" [22.23 mm] Diameter Rotary Dual Cup Potentiometer with 18" [457.2 mm] Lead Wires

- 0.875" [22.23 mm] Diameter Servo Mount
- Electrical Angle: 130° ±1° (Two (2) cups)
- Absolute Linearity: ±0.25%
- Special Tracking: 0.5%
- Lead Wires: Side Located with Terminal Guards, 26 AWG, 18" [457.2 mm] Length

0.875" [22.23 mm] Diameter Rotary Potentiometer with Spur Gear Assembly

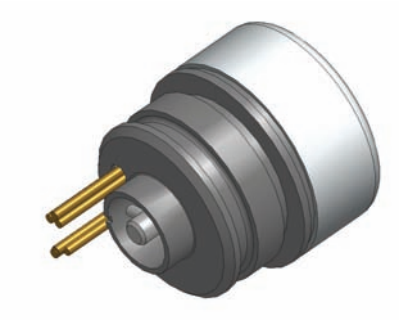
- 0.875" [22.23 mm] Diameter/1.500" [38.1 mm] Diameter Flange Mount
- Electrical Angle: 240° ±2°
- Absolute Linearity: ±0.5%
- Housing: Anodized Aluminum
- Shaft: Stainless Steel, Special Spur Gear Assembly
- Lead Wires: Side Located, 26 AWG, 17" [431.8 mm] Length

Available Options

- Custom resistance values (1kΩ to 20kΩ) and tolerances as low as ±5%.
- Special linearities as low as 0.25% (Absolute/Independent).
- Special electrical angles up to 355° maximum.
- Special multi-sections available with tracking.
- Custom wire leads or cable with specified lengths and connector options or gold plated terminals.
- Special mounting configurations available.
- Special gear and mounting frames configurations available.

Custom Rotary Position Sensor

Custom Mounting Options



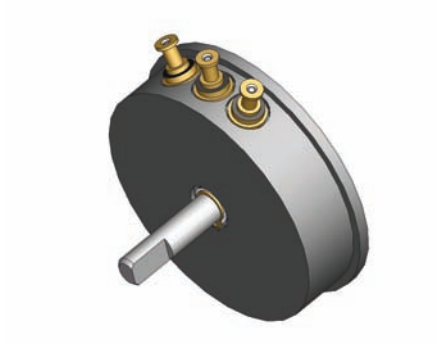
Special Pilots and Shrouds

Flanges and
Mounting Holes

Threaded Face

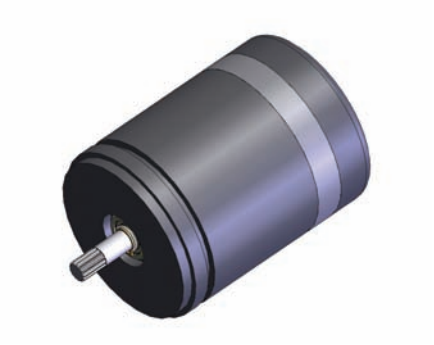
Custom Rotary Position Sensor

Custom Shaft Options

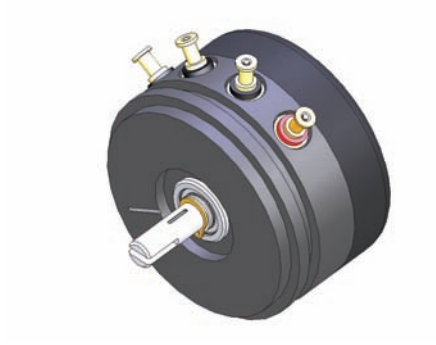


Flats

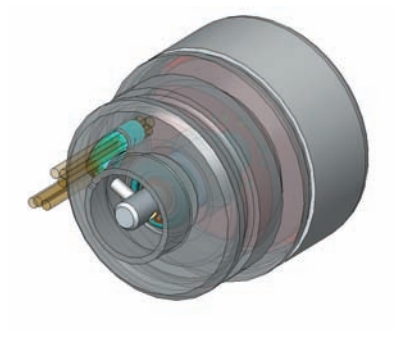
Thru Holes



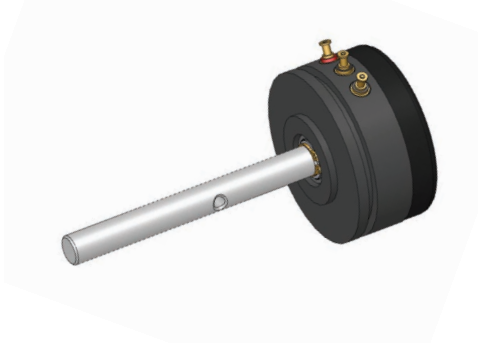
Knurled/Spline



Split Shaft w/Index



Cross Pin



Special Diameter/
Custom Lengths

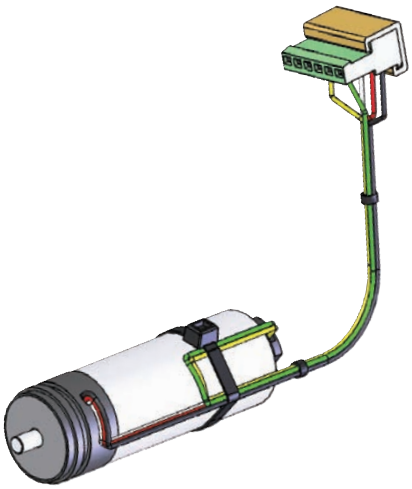
Custom Rotary Position Sensor

Custom Termination Options

Potted Lead Exits - Wire type, color gauge - custom exit locations

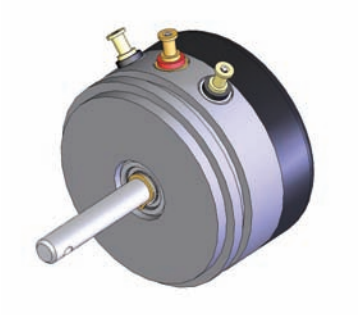
Custom Rotary Position Sensor

Custom Connector Options



Custom Rotary Position Sensor

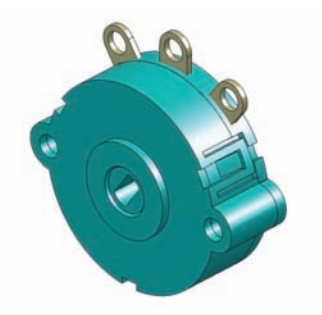
Custom Terminal Options



Radial Turret

Rear Terminal

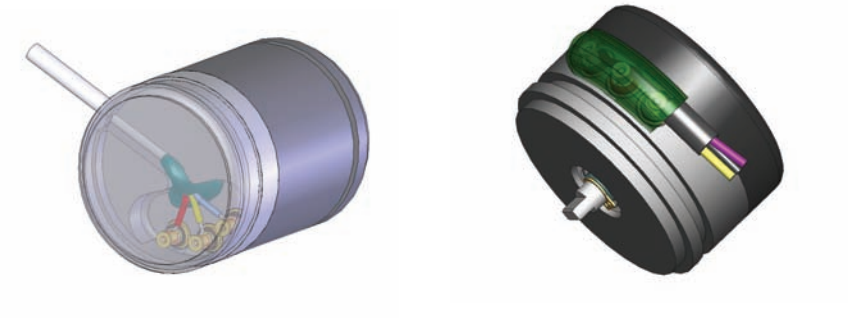
Special Locations



Plated Solder Lugs

Custom Rotary Position Sensor

Custom High Strain Relief Options



High Strain Relief Designs

Available Options

- Special Functions
- Custom Electrical Angles
- Special Resistance
- Log Taper
- Piecewise Linear
- Sine/Cosine
- Mechanical/Electrical Index or Phasing
- Multi-Cup Tracking

Custom Rotary Position Sensor

Custom Features

1.132" [28.75 mm] Diameter Rotary Potentiometer with Turret Terminals

- 1.132" [28.75 mm] Diameter Rear Servo Mount
- Electrical Angle: 350° ±3°
- Independent Linearity: ±0.25%
- Output Smoothness: 0.05% Max.
- Housing: Anodized Aluminum, 0.300" [7.62 mm] Thickness Max.
- Shaft: Stainless Steel
- Terminals: Three (3) Gold Plated Brass

Custom Rotary Position Sensor

Custom Features

0.906" [23.01 mm] Diameter Rotary Potentiometer with Clutch and Spring Return

- 0.906" [23.01 mm] Diameter/1.313" [33.35 mm] Diameter Flange Mount
- Electrical Angle: 340°
- Absolute Linearity: ±0.50% at Center Tap
- Housing: Anodized Aluminum, 0.300" [7.62 mm] Thickness Max.
- Shaft: Stainless Steel
- Terminals: Five (5) Gold Plated Brass
- Special Mechanical: Clutch and Spring Return

Custom Rotary Position Sensor

Custom Features

0.875" [22.23 mm] Diameter Rotary Potentiometer with Flange Mount/Terminals

- 0.875" [22.23 mm] Diameter with 1.9375" [49.21 mm] Diameter Flange Mount
- Electrical Angle: 189° ±2°
- Absolute Linearity: ±2.0%
- Housing: Anodized Aluminum
- Shaft: Stainless Steel, Special Screw Driver Slot
- Terminals: Four (4) Gold Plated Brass

Custom Features

2.810" [71.37 mm] Diameter Rotary Potentiometer with Special Leads and Connector

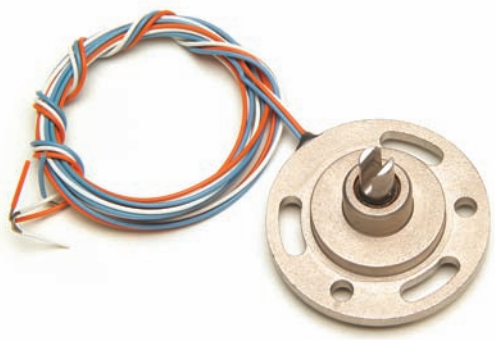
- 2.810" [71.37 mm] Diameter Flange Mount
- Electrical Angle: 340° ±3°
- Absolute Linearity: ±0.5%
- Power Rating: 1.0 Watt @70°C
- Housing: Anodized Aluminum
- Shaft: Stainless Steel
- Lead Wires: 20 AWG 5.0" [127.0 mm] Length with Matrix Connector

Custom Rotary Position Sensor

Custom Features

1.650" [41.91 mm] Diameter Rotary Potentiometer with Plastic Metalized Housing with 45" [1,143 mm] Lead Wires

- 1.650" [41.91 mm] Diameter Flange Mount
- Electrical Angle: 50° ±2°
- Independent Linearity: ±0.25%
- Special Contact Phasing
- Housing: Electro-Nickel Plated, Thermo Plastic
- Shaft: Stainless Steel
- Lead Wires: Side Located, 24 AWG, 45" [1,143 mm] Length



Custom Rotary Position Sensor

Custom Features

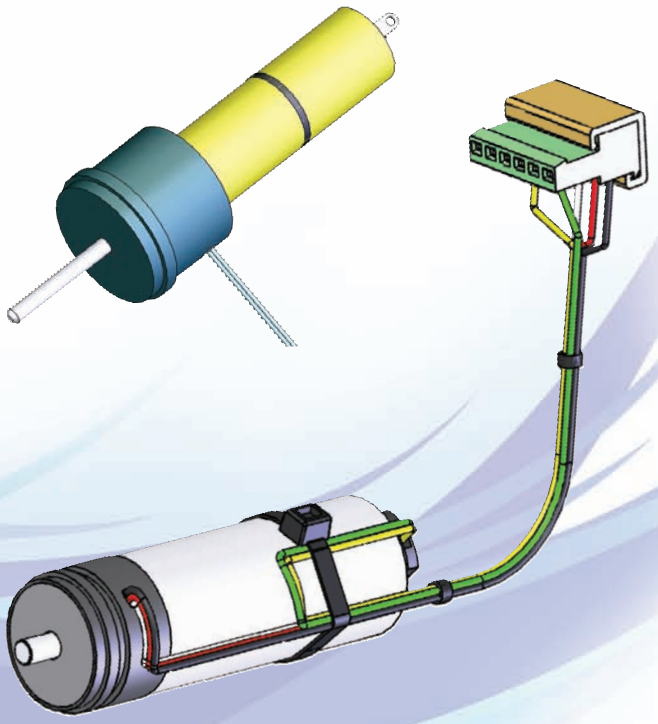
1.250" [31.75 mm] Diameter Rotary Six (6) Cup Potentiometer with Special Taps

- 1.250" [31.75 mm] Diameter Servo Mount
- Electrical Angle: 250° to 315°, (Six (6) Cups with Multiple Taps)
- Independent Linearity: ±2% Over Six (6) Cups
- Housing: Anodized Aluminum
- Shaft: Stainless Steel, Special Screw Driver Slot
- Terminals: Gold Plated Brass

SPECTRUM SENSORS & CONTROLS
A Spectrum Control Business

Custom Motorized Potentiometers

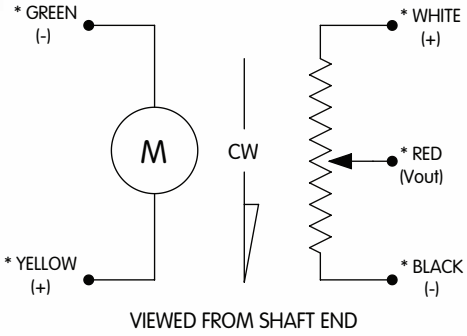
Bushing and Servo Mount Available



Mechanical Characteristics

Housing:	0.675", 0.875", 1.062" and 1.437" [17.15, 22.23, 26.98 and 36.5 mm] Diameter
Shaft:	0.0785", 0.094", 0.125" and 0.25" [1.99, 2.39, 3.18 and 6.35 mm] Diameter
Shaft Length:	Specify
Mechanical Rotation:	360°
Motor Gear Head Rotation (Motor Dependant):	3.1:1 to 983,477:1
Motor Full Volt Speeds (Motor Dependant):	0 to 17,000 RPM
Motor Stall Torque (Motor Dependant):	up to 2.6 Oz. In.

Schematic Diagram



VIEWED FROM SHAFT END

All other general requirements in accordance with MIL-PRF-39023

Electrical Characteristics

Resistance (Std, Custom Available):	1kΩ to 20kΩ ±10%
Active Electrical Angle (Std, Custom Available):	340°
Independent Linearity (Std, Custom Available):	±0.5%
End Voltage:	1.0% Max.
Voltage Resolution:	Virtually Infinite
Output Smoothness:	0.1% Max.
Resistance Temp. Coefficient:	400PPM/°C Max.
Power Rating @ 70°C (Size Dependant):	0.5 to 3.0 Watts Max.
Dielectric Strength (Size Dependant):	500 to 1,000 VRMS @ 60Hz
Insulation Resistance:	100 MΩ Min. @ 500VDC
DC Motor Supply Voltage (Motor Dependant):	1.5 to 40.0 VDC

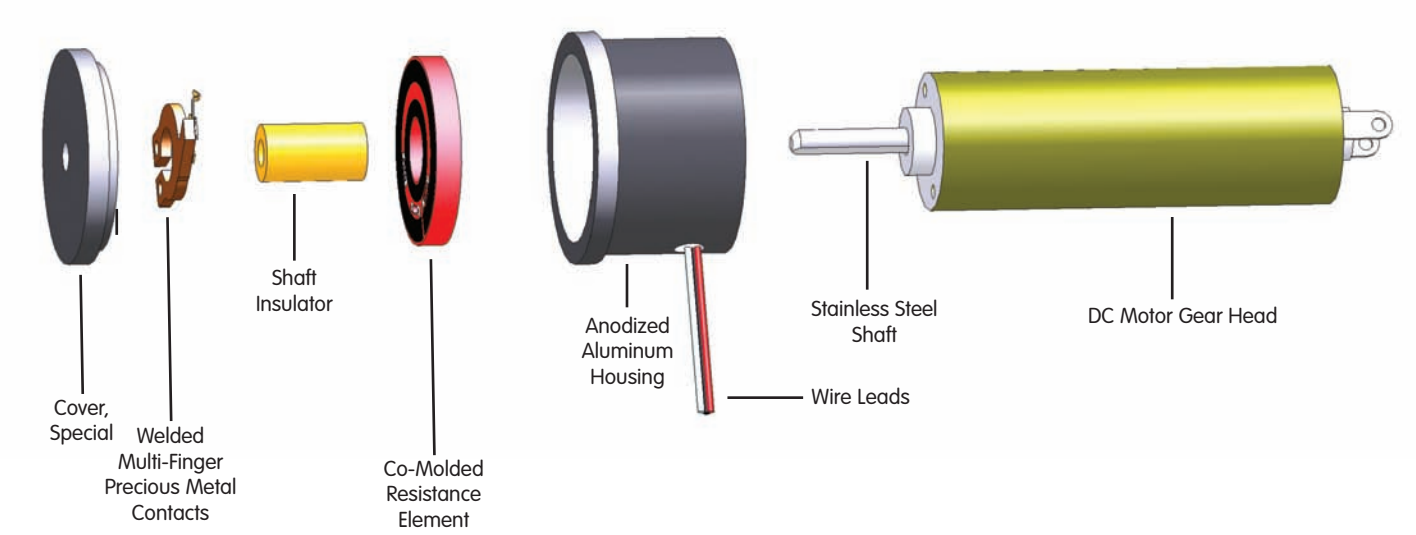
Environmental Characteristics

Operating Temp. Range:	-65°C to +125°C
Rotational Operating Life:	100 x 10^6 Revolutions Min.
Shock and Vibration per:	MIL-PRF-39023

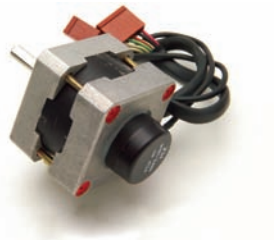
Materials of Construction

Housing:	Anodized Aluminum
Shaft:	Stainless Steel
Resistance Position Feedback Element:	Co-Molded Conductive Plastic
Electrical Contacts:	Multi-Finger Precious Metal
Lead Wires or:	28 AWG Teflon - 8" [203.2 mm] Min. Length
Solder Terminals:	Gold Plated Brass

6409 Series Servo-Mount



Custom Features



0.675" [17.15 mm] Diameter Motorized Potentiometer with Wire Leads

- 0.674" [17.15 mm] Diameter with Servo Mount
- Electrical Angle: 340° ±1°
- Independent Linearity: ±.5%
- Housing: Anodized Aluminum
- Shaft: Passivated Stainless
- Motorized Design: Micro Motor

1.550" [39.37 mm] Square Motorized Potentiometer with Stepper Motor

- 1.550" [39.37 mm] Square Mounting Flange
- Electrical Angle: 340° ±1°
- Absolute Linearity: ±5%
- Power Rating: 1.0 Watt @ 70°C
- Stepper Motor Design: 200 Steps

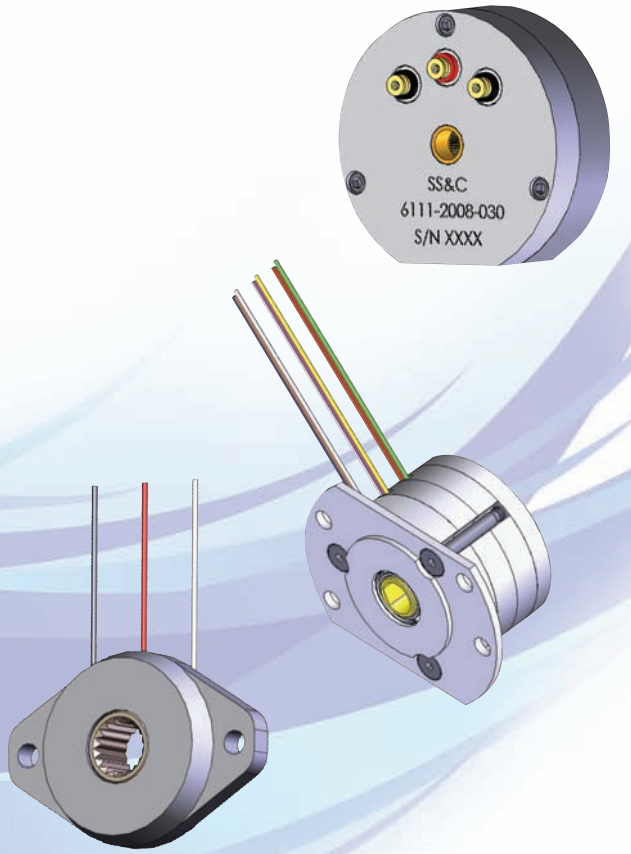
Available Options

- Custom resistance values (500Ω to 30kΩ) and tolerances as low as ±5%.
- Special linearities as low as 0.25% (Absolute/Independent).
- Special electrical angles up to 355° Max.
- Custom wire leads or cable with specified lengths with connector options or gold plated terminals.
- Special shaft lengths, diameters and mounting dimensions.
- Special DC/AC motors with optional gear heads available.
- Spring returns and/or stops available.

SPECTRUM SENSORS & CONTROLS
A Spectrum Control Business

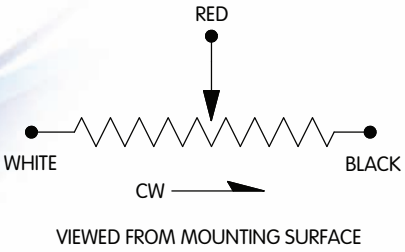
Custom Hollow Shaft Potentiometers

Various OD Body Sizes, ID Shafts & Sections



Mechanical Characteristics

Housing (Std, Custom Available):	0.570", 0.875", 1.062" and 1.437" [14.48, 22.23, 26.98 and 36.5 mm] Diameter
Shaft (Std, Custom Available):	Specify (ID - Flat and Knurled/Spline)
Shaft Length:	Specify
Shaft Radial Play:	0.0015" [.04 mm] Min.
Mechanical Rotation:	360°



Schematic Diagram

All other general requirements in accordance with MIL-PRF-39023

Environmental Characteristics

Operating Temp. Range:	-65°C to +125°C
Rotational Operating Life:	5 - 100 x 10^6 Revolutions Min.
Shock and Vibration per:	MIL-PRF-39023

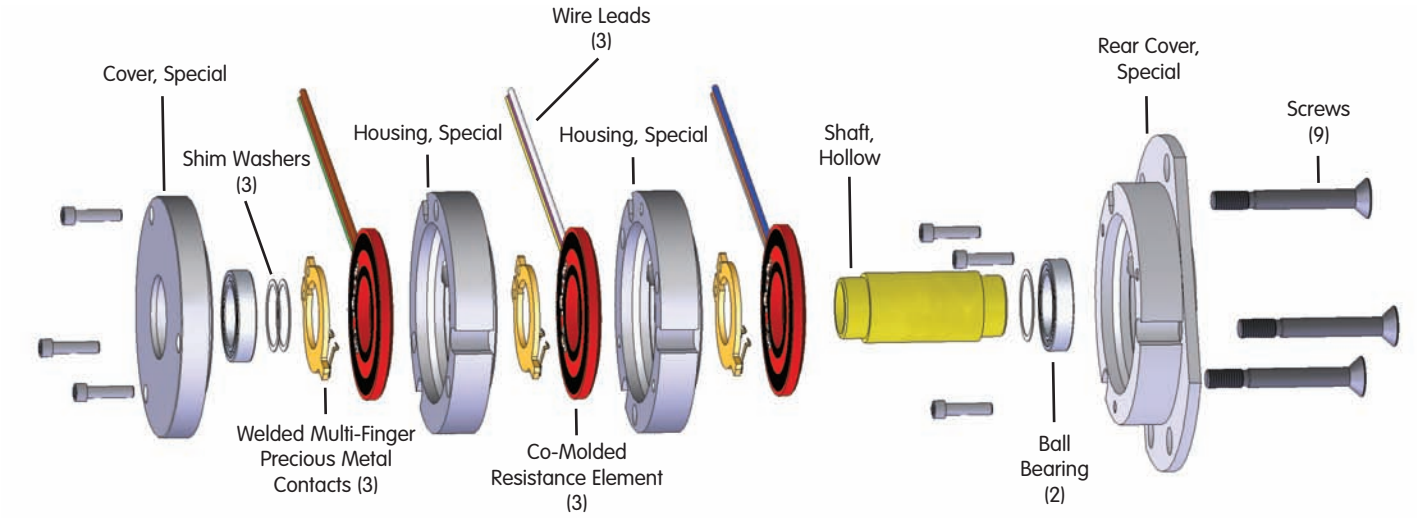
Materials of Construction

Housing:	Anodized Aluminum or Thermo Plastic
Shaft:	Stainless Steel or Nickel Plated Brass or Thermo Plastic
Resistance Position Feedback Element:	Co-Molded Conductive Plastic
Electrical Contacts:	Multi-Finger Precious Metal
Lead Wires or:	28 AWG Teflon - 8" [203.2 mm] Min. Length
Solder Terminals:	Gold Plated Brass

Electrical Characteristics

Resistance (Std, Custom Available):	1kΩ to 20kΩ ±10%
Electrical Angle (Std, Custom Available):	340°
Linearity (Std, Custom Available):	±0.5%
End Voltage:	1.0% Max.
Voltage Resolution:	Virtually Infinite
Output Smoothness:	0.1% Max.
Multi-sections (Available):	Up to Three (3) Sections
Resistance Temp. Coefficient:	400PPM/°C Max.
Power Rating @ 70°C (Size Dependant):	0.5 to 3.0 Watts
Dielectric Strength (Size Dependant):	500 to 1,000 VRMS @ 60Hz
Insulation Resistance:	100 MΩ Min. @ 500VDC

6111 Series Three (3) Section



Custom Features

1.250" [31.75 mm] Diameter with Triple Section Redundancy

- 1.250" [31.75 mm] Diameter Front/1.740" [44.2 mm] Diameter Flange Mount Rear
- Electrical Angle: 355°, Center Indexed ±177.5°
- Absolute Linearity: ±1.0%
- Special Tracking: ±2.0%
- Three (3) Cup Design

2.620" [66.55 mm] Diameter with 20" [508 mm] Lead Wires

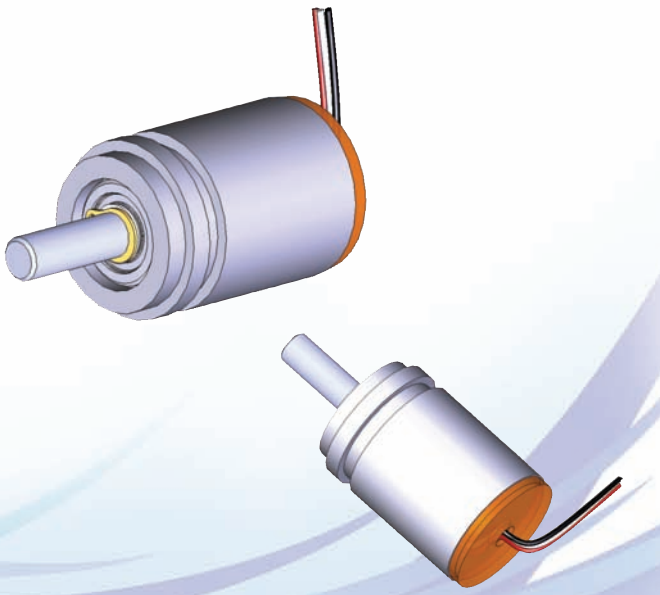
- 2.620" [66.55 mm] Diameter Front Mount
- Electrical Angle: 26°±1° (2 Cups)
- Function: Square Law (Cascaded)
- Housing: Anodize AL
- Shaft: Stainless Steel
- Lead Wires: 24 AWG 20" [508 mm] Length
- Rotational Life: 100 Million Min.

Available Options

- Custom resistance values (1kΩ to 20kΩ) and tolerances as low as ±5%.
- Special linearities as low as 0.25% (Absolute/Independent).
- Special electrical angles up to 355° maximum.
- Custom wire leads or cable with specified lengths and connector options or gold plated terminals.
- Special shaft inner diameters and mounting dimensions.
- Up to three (3) section redundancy available.

SPECTRUM SENSORS & CONTROLS
A Spectrum Control Business

1/2" [12.7 mm] Size 5 Diameter Hall Effect Precision Position Sensor



Hall Effect Position Sensor

H005 Series

Part Number	Output	Temperature
H005-1000-030 (A)	Analog	-40° to 125°C
H005-1000-03T (A)	Analog	-40° to 150°C
H005-1000-130 (A)	Serial	-40° to 125°C
H005-1000-13T (A)	Serial	-40° to 150°C
H005-1000-230 (A)	*PWM	-40° to 125°C
H005-1000-23T (A)	*PWM	-40° to 150°C
H005-1001-030 (C)	Analog	-40° to 125°C
H005-1001-130 (C)	Serial	-40° to 125°C
H005-1001-230 (C)	*PWM	-40° to 125°C

Notes: * Pulse-width modulation
(A) Aerospace - Qualified to RTCA/DO-160F
(C) Commercial - Shaft un-sealed

Electrical Characteristics

Electrical Angle:	1°-359°/Dead Zone: 1°-359°
Increasing Function:	Either CW or CCW
Linearity:	±0.1% Absolute at 25°C ±0.3% Over full temperature range (Temperature customization available)
Power Rating @ 25°C:	0.080 Watt Max.
Resolution:	12 Bit
Sampling Rate:	600µs Standard or 200µs Digital High Speed Available
Nominal Supply Voltage (Vdd):	4.5 - 5.5 V
Nominal Supply Current (Idd):	8.5 mA to 11 mA Standard, 13.5 mA to 16 mA Digital High Speed
Output Options:	
Analog - Ratiometric:	Rail to Rail
Digital - PWM:	500 Hz (100-1,000 Hz Available)
- Serial:	3 Wire Protocol (14 bit resolution)
Absolute Maximum Ratings:	
Reverse Voltage Protection:	-10V
Maximum Supply Voltage (overvoltage):	+20V
Positive Output Voltage:	+10V
Output Current (Iout):	±30 mA
Reverse Output Voltage:	-0.3V
Reverse Output Current:	-50 mA

Mechanical Characteristics

Rotation:	Continuous 360°
Torque - Starting/Running:	
Aerospace - Sealed	< 2.0 Oz.-In.
Commercial - Un-sealed	< 0.05 Oz.-In.
Axial Play:	< 0.001" [0.025 mm]

Environmental Characteristics

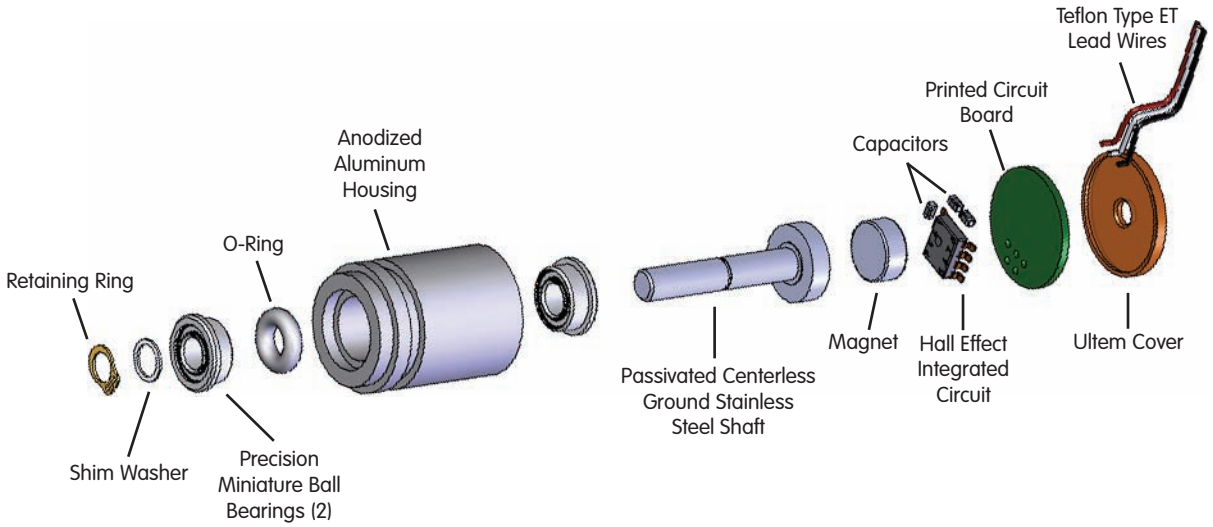
Rotational Life:	> 100 Million Revolutions (Standard bearing life - Custom Available)
Electrical Life:	> 2,500 Hours @ 150°C
Storage Temperature:	-40°C to +150°C *
Operating Temperature:	-40°C to +125°C (150°C opt.) *
Mechanical Shock:	Sawtooth 20G Peak
Electrostatic Discharge:	15kV (Human Body Model)
Vibration:	High Frequency, Swept 3 to 2,000 Hz, 30G Peak
Magnetic Field Emission:	At 30 CM, Less than 1° Effect on Compass
EMI Immunity:	120 A-m Magnetic Field and 5,400 V-m Electric Field
RF Emissions:	Zero Emission, Swept 0.15 MHz to 6,000 MHz

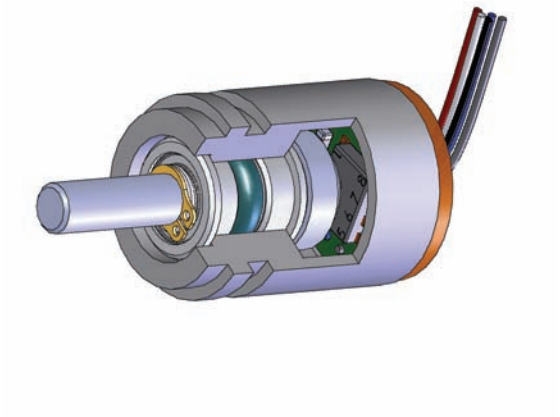
* Exposure to maximum rated conditions for extended periods may affect device reliability.

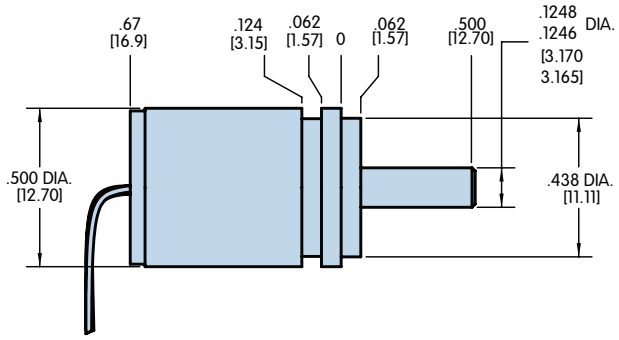
Materials of Construction (RoHS Compliant)

Housing:	Anodized Aluminum
Shaft:	Passivated Centerless Ground Stainless Steel
Bearings:	Precision Miniature Ball
Lead Wires:	Teflon Type ET (Optional AWG, Lead Lengths and Terminations)
Printed Circuit Board:	HR370 High TG (FR-5 Available)
Terminals/Connectors Available:	JST, Molex

H005 Series







Dimensions in Inches [mm]

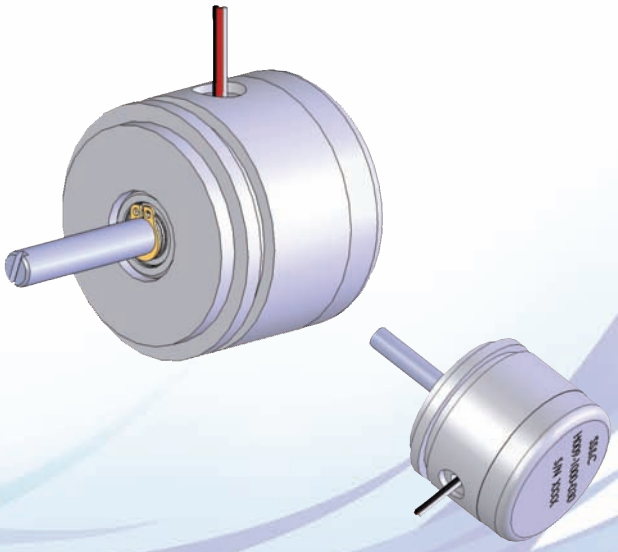
Available Options

- Lead wires, lead lengths and terminations available.
- HR370 High TG Printed Circuit Board available.
- JST and Molex terminals/connectors available.
- Special linearities, such as electrical function and various angles.
- Special shaft configurations (screwdriver, slotted, thru-hole and custom flats).
- Special flange mounting configurations available.
- Special gear and mounting frame configurations available.

See pages 48-49 for more detail on custom options

SPECTRUM SENSORS & CONTROLS
A Spectrum Control Business

7/8" [22.23 mm] Size 9 Diameter Single Output Hall Effect Precision Position Sensor



H009 Series Single Output

Part Number	Output	Temperature
H009-1000-030 (A)	Analog	-40° to 125°C
H009-1000-03T (A)	Analog	-40° to 150°C
H009-1000-130 (A)	Serial	-40° to 125°C
H009-1000-13T (A)	Serial	-40° to 150°C
H009-1000-230 (A)	*PWM	-40° to 125°C
H009-1000-23T (A)	*PWM	-40° to 150°C
H009-1001-030 (C)	Analog	-40° to 125°C
H009-1001-130 (C)	Serial	-40° to 125°C
H009-1001-230 (C)	*PWM	-40° to 125°C

Notes: * Pulse-width modulation
(A) Aerospace - Qualified to RTCA/DO-160F
(C) Commercial - Shaft un-sealed

Hall Effect Position Sensor

Electrical Characteristics

Electrical Angle:	1°-359°/Dead Zone: 1°-359°
Increasing Function:	Either CW or CCW
Linearity:	±0.1% Absolute at 25°C ±0.3% Over full temperature range (Temperature customization available)
Power Rating @ 25°C:	0.080 Watt Max.
Resolution:	12 Bit
Sampling Rate:	600µs Standard or 200µs Digital High Speed Available
Nominal Supply Voltage (Vdd):	4.5 - 5.5 V
Nominal Supply Current (Idd):	8.5 mA to 11 mA Standard, 13.5 mA to 16 mA Digital High Speed
Output Options:	
Analog - Ratiometric:	Rail to Rail
Digital - PWM:	500 Hz (100-1,000 Hz Available)
- Serial:	3 Wire Protocol (14 bit resolution)
Absolute Maximum Ratings:	
Reverse Voltage Protection:	-10V
Maximum Supply Voltage (overvoltage):	+20V
Positive Output Voltage:	+10V
Output Current (Iout):	±30 mA
Reverse Output Voltage:	-0.3V
Reverse Output Current:	-50 mA

Mechanical Characteristics

Rotation:	Continuous 360°
Torque - Starting/Running:	
Aerospace - Sealed	< 2.0 Oz.-In.
Commercial - Un-sealed	< 0.05 Oz.-In.
Axial Play:	< 0.001" [0.025 mm]

Environmental Characteristics

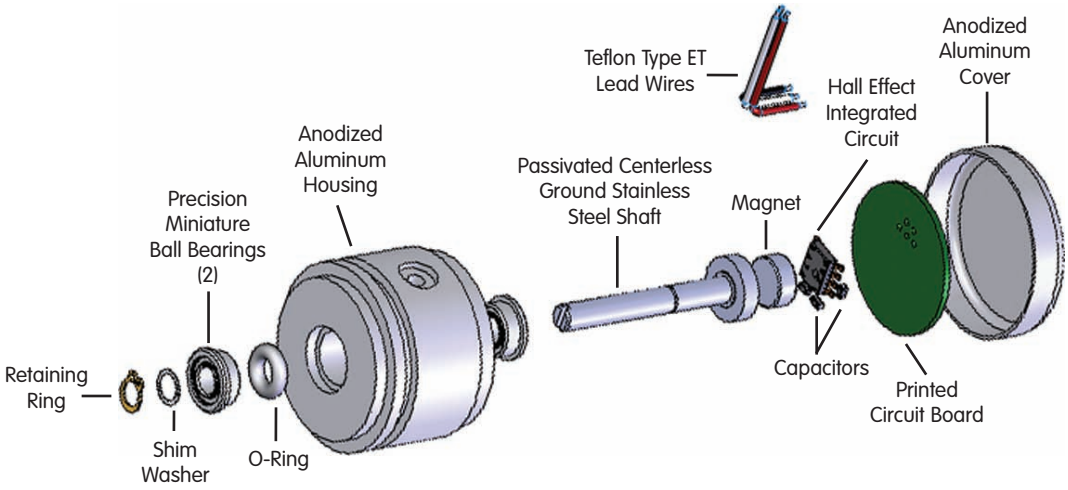
Rotational Life:	> 100 Million Revolutions (Standard bearing life - Custom Available)
Electrical Life:	> 2,500 Hours @ 150°C
Storage Temperature:	-40°C to +150°C *
Operating Temperature:	-40°C to +125°C (150°C opt.) *
Mechanical Shock:	Sawtooth 20G Peak
Electrostatic Discharge:	15kV (Human Body Model)
Vibration:	High Frequency, Swept 3 to 2,000 Hz, 30G Peak
Magnetic Field Emission:	At 30 CM, Less than 1° Effect on Compass
EMI Immunity:	120 A-m Magnetic Field and 5,400 V-m Electric Field
RF Emissions:	Zero Emission, Swept 0.15 MHz to 6,000 MHz

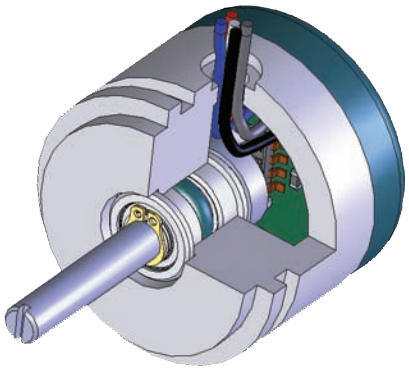
* Exposure to maximum rated conditions for extended periods may affect device reliability.

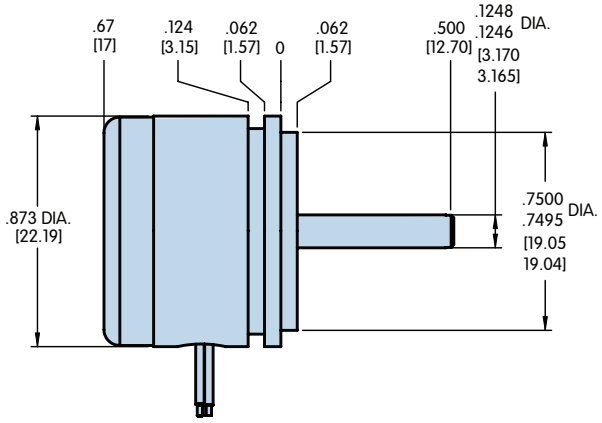
Materials of Construction (RoHS Compliant)

Housing:	Anodized Aluminum
Shaft:	Passivated Centerless Ground Stainless Steel
Bearings:	Precision Miniature Ball
Lead Wires:	Teflon Type ET (Optional AWG, Lead Lengths and Terminations)
Printed Circuit Board:	HR370 High TG (FR-5 Available)
Terminals/Connectors Available:	JST, Molex

H009 Series Single Output







Dimensions in Inches [mm]

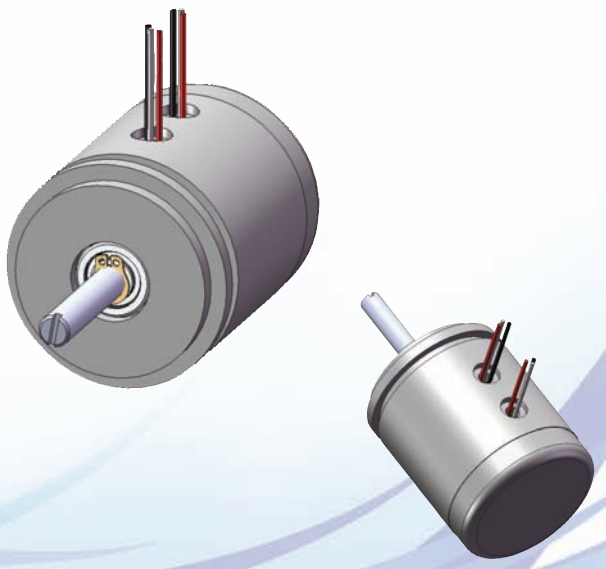
Available Options

- Lead wires, lead lengths and terminations available.
- HR370 High TG Printed Circuit Board available.
- JST and Molex terminals/connectors available.
- Special linearities, such as electrical function and various angles.
- Special shaft configurations (screwdriver, slotted, thru-hole and custom flats).
- Special flange mounting configurations available.
- Special gear and mounting frame configurations available.

See pages 48-49 for more detail on custom options

SPECTRUM SENSORS & CONTROLS
A Spectrum Control Business

7/8" [22.23 mm] Size 9 Diameter Dual Output Hall Effect Precision Position Sensor



Hall Effect Position Sensor

H009 Series Dual Output

Part Number	Output	Temperature
H009-1200-030 (A)	Analog	-40° to 125°C
H009-1200-03T (A)	Analog	-40° to 150°C
H009-1200-130 (A)	Serial	-40° to 125°C
H009-1200-13T (A)	Serial	-40° to 150°C
H009-1200-230 (A)	*PWM	-40° to 125°C
H009-1200-23T (A)	*PWM	-40° to 150°C
H009-1201-030 (C)	Analog	-40° to 125°C
H009-1201-130 (C)	Serial	-40° to 125°C
H009-1201-230 (C)	*PWM	-40° to 125°C

Notes: * Pulse-width modulation
(A) Aerospace - Qualified to RTCA/DO-160F
(C) Commercial - Shaft un-sealed

Electrical Characteristics

Electrical Angle:	1°-359°/Dead Zone: 1°-359°
Increasing Function:	Either CW or CCW
Linearity:	±0.2% Absolute at 25°C ±0.4% Over full temperature range (Temperature customization available)
Tracking:	±0.3%
Power Rating @ 25°C:	0.080 Watt Max.
Resolution:	12 Bit
Sampling Rate:	600µs Standard or 200µs Digital High Speed Available
Nominal Supply Voltage (Vdd):	4.5 - 5.5 V
Nominal Supply Current (Idd):	8.5 mA to 11 mA Standard, 13.5 mA to 16 mA Digital High Speed
Output Options:	
Analog - Ratiometric:	Rail to Rail
Digital - PWM:	500 Hz (100-1,000 Hz Available)
- Serial:	3 Wire Protocol (14 bit resolution)
Absolute Maximum Ratings:	
Reverse Voltage Protection:	-10V
Maximum Supply Voltage (overvoltage):	+20V
Positive Output Voltage:	+10V
Output Current (Iout):	±30 mA
Reverse Output Voltage:	-0.3V
Reverse Output Current:	-50 mA

Mechanical Characteristics

Rotation:	Continuous 360°
Torque - Starting/Running:	
Aerospace - Sealed	< 2.0 Oz.-In.
Commercial - Un-sealed	< 0.05 Oz.-In.
Axial Play:	< 0.001" [0.025 mm]

Environmental Characteristics

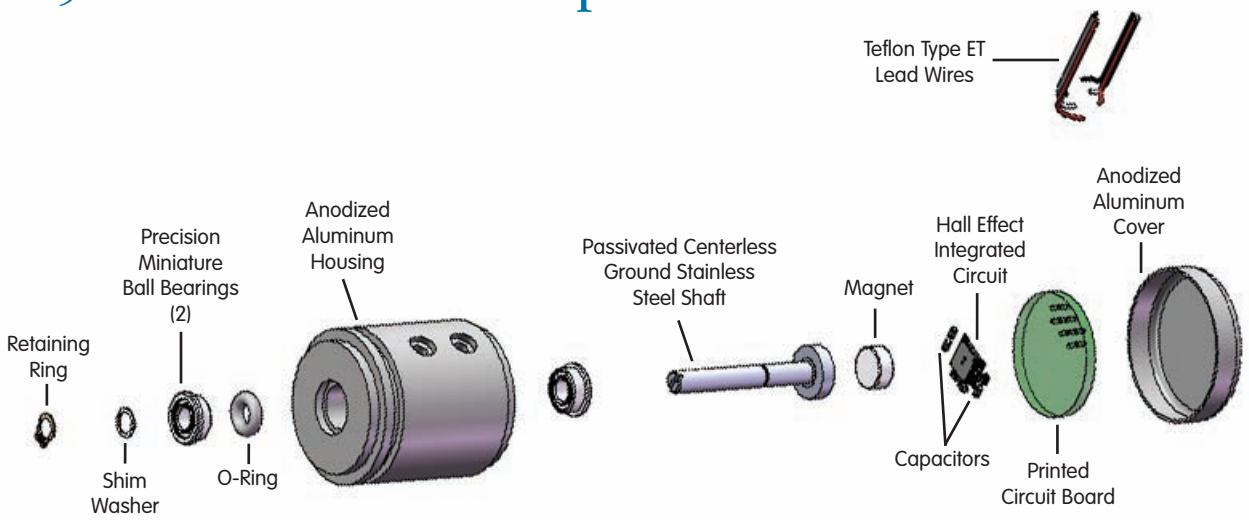
Rotational Life:	> 100 Million Revolutions (Standard bearing life - Custom Available)
Electrical Life:	> 2,500 Hours @ 150°C
Storage Temperature:	-40°C to +150°C *
Operating Temperature:	-40°C to +125°C (150°C opt.) *
Mechanical Shock:	Sawtooth 20G Peak
Electrostatic Discharge:	15kV (Human Body Model)
Vibration:	High Frequency, Swept 3 to 2,000 Hz, 30G Peak
Magnetic Field Emission:	At 30 CM, Less than 1° Effect on Compass
EMI Immunity:	120 A-m Magnetic Field and 5,400 V-m Electric Field
RF Emissions:	Zero Emission, Swept 0.15 MHz to 6,000 MHz

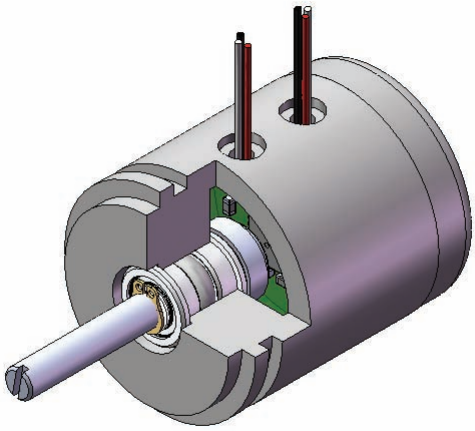
* Exposure to maximum rated conditions for extended periods may affect device reliability.

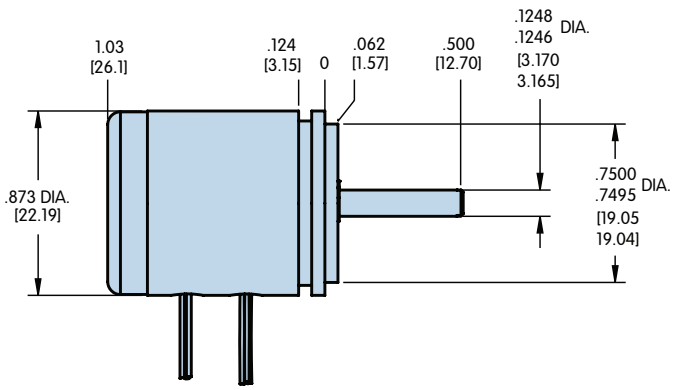
Materials of Construction (RoHS Compliant)

Housing:	Anodized Aluminum
Shaft:	Passivated Centerless Ground Stainless Steel
Bearings:	Precision Miniature Ball
Lead Wires:	Teflon Type ET (Optional AWG, Lead Lengths and Terminations)
Printed Circuit Board:	HR370 High TG (FR-5 Available)
Terminals/Connectors Available:	JST, Molex

H009-1200 Series Dual Output







Dimensions in Inches [mm]

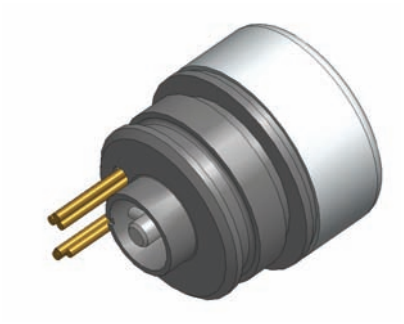
Available Options

- Lead wires, lead lengths and terminations available.
- HR370 High TG Printed Circuit Board available.
- JST and Molex terminals/connectors available.
- Special linearities, such as electrical function and various angles.
- Special shaft configurations (screwdriver, slotted, thru-hole and custom flats).
- Special flange mounting configurations available.
- Special gear and mounting frame configurations available.

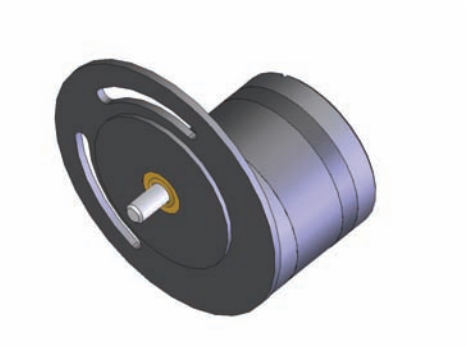
See pages 48-49 for more detail on custom options

Hall Effect Position Sensors

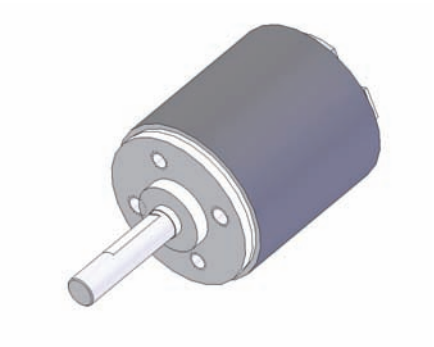
Custom Mounting Options



Special Pilots and Shrouds



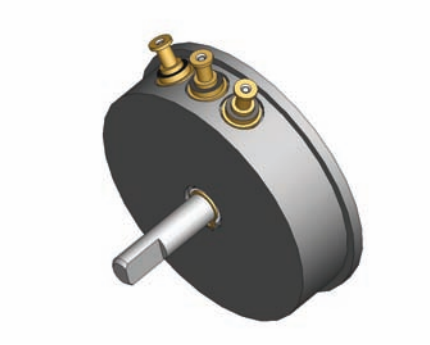
Flanges and
Mounting Holes



Threaded Face

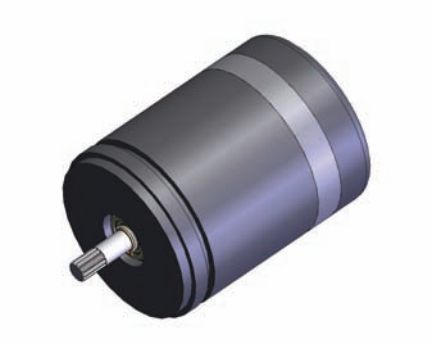
Hall Effect Position Sensors

Custom Shaft Options

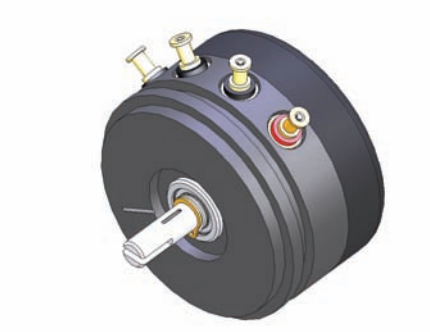


Flats

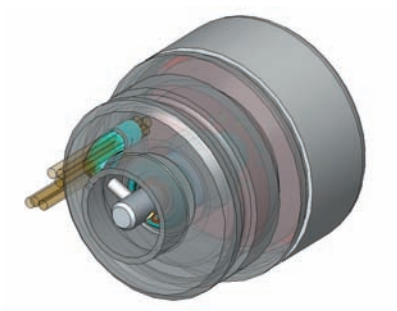
Thru Holes



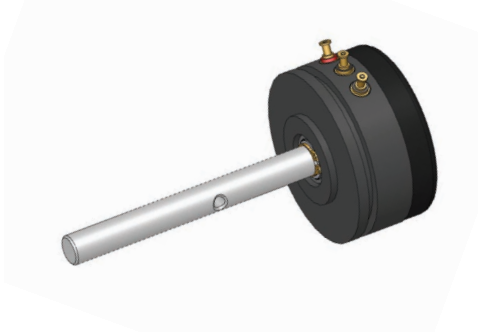
Knurled/Spline



Split Shaft w/Index



Cross Pin

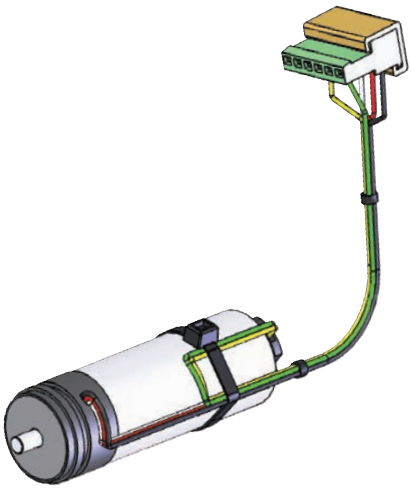


Special Diameter/
Custom Lengths

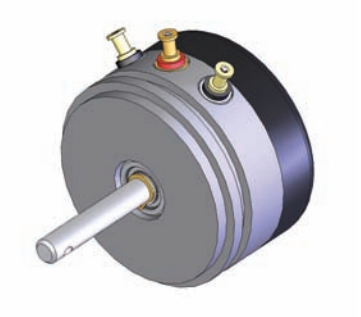
Custom Termination Options

Potted Lead Exits - Wire type, color gauge - custom exit locations

Custom Connector Options



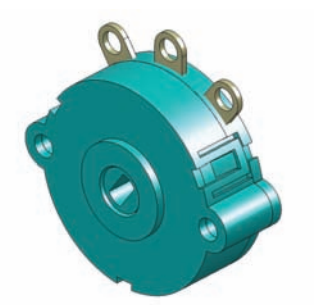
Custom Terminal Options



Radial Turret

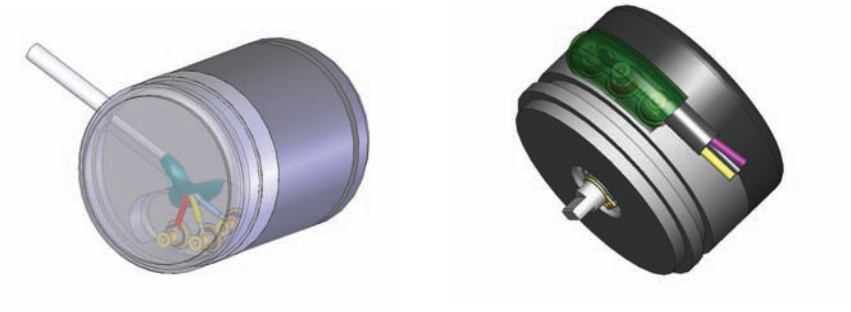
Rear Terminal

Special Locations



Plated Solder Lugs

Custom High Strain Relief Options



High Strain Relief Designs

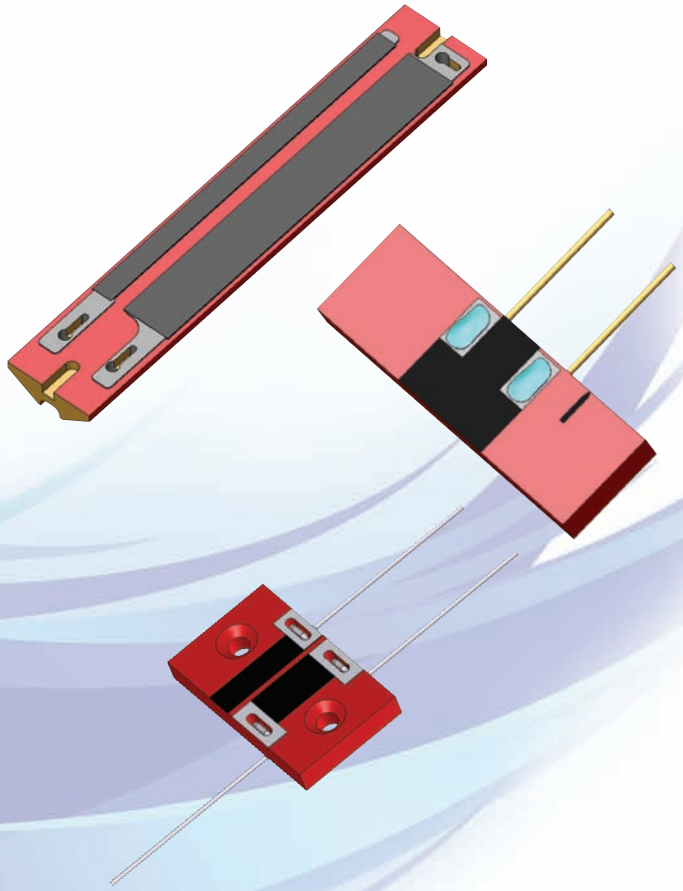
Available Options

- Special Functions
- Custom Electrical Angles
- Log Taper
- Mechanical/Electrical Index or Phasing
- Multiple Turns and Counters
- Dual Resolution Output

SPECTRUM SENSORS & CONTROLS
A Spectrum Control Business

Custom Linear Element & Wiper Assemblies

Various Body Sizes, Linear Assemblies and Terminations

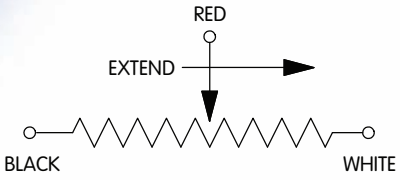


Linear Position Sensor

Mechanical Characteristics

Element Length (Std, Custom Available):	0.500" to 4.500" [12.7 to 114.3 mm]
Element Width (Std, Custom Available):	0.250" to 0.750" [6.35 to 19.05 mm]
Shaft Size to Use:	0.125" [3.175 mm] Diameter
Weight (Size Dependant):	0.75 to 5.20 g
Wiper Travel (Redundancy Available):	0.500" to 4.000" [12.7 to 101.6 mm] Length

Schematic Diagram



All other general requirements in accordance with MIL-PRF-39023

Materials of Construction

Resistance Position Feedback Element:	Co-Molded Conductive Plastic
Wiper Carrier:	Thermo Plastic
Electrical Contacts:	Multi-Finger Precious Metal
Lead Wires or:	30 AWG Teflon - 6" [152.4 mm] Min. Length
Solder Terminals:	Gold Plated Brass

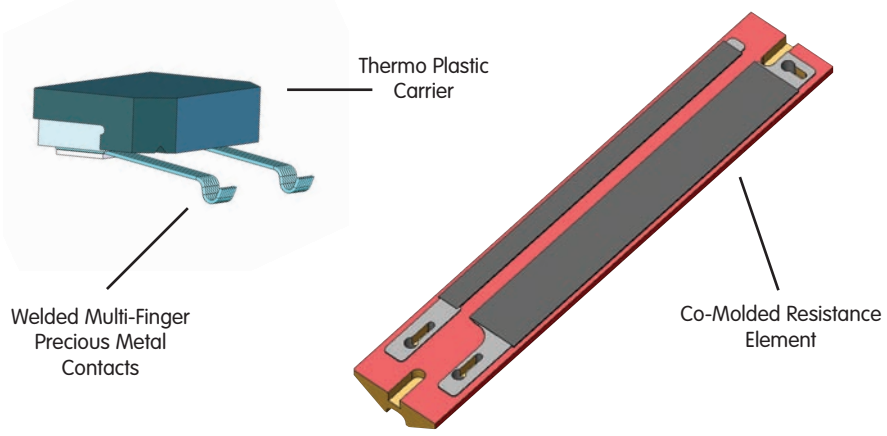
Environmental Characteristics

Operating Temp. Range:	-65°C to +125°C
Operating Life:	100 x 10^6 Strokes Min.
Shock and Vibration per:	MIL-PRF-39023

Electrical Characteristics

Resistance (Std, Custom Available):	1kΩ to 20kΩ ±10%
Electrical Travel (Std, Custom Available):	0.500" to 4.000" Length
Linearity (Std, Custom Available):	±1.0%
Voltage Resolution:	Virtually Infinite
Output Smoothness:	0.1% Max.
Resistance Temp. Coefficient:	400PPM/°C Max.
Power Rating @ 70°C (Size Dependant):	0.25 to 3.0 Watts
Dielectric Strength (Size Dependant):	500 to 1,000 VRMS @ 60Hz
Insulation Resistance:	100 MΩ Min. @ 500VDC

5903 Series



Custom Features

0.600" x 0.460" [15.24 x 11.68 mm] Linear Element Assembly with 2 x 0.064" [1.63 mm] Diameter Mounting Holes

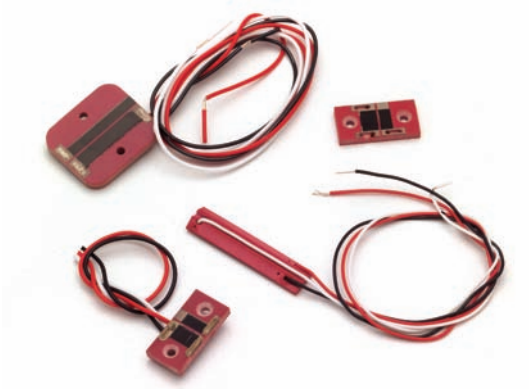
- 0.600" x 0.460" [15.24 x 11.68 mm] Linear Element - 1kΩ
- Electrical Travel: 0.350" [8.89 mm]
- Output Smoothness: ±0.1%
- Independent Linearity: ±5.0%
- Element: Co-Molded Conductive Plastic
- Power Rating: 0.500W @ 70°C

0.600" x 0.350" [15.24 x 8.89 mm] Linear Element Assembly with 2 x 0.064" [1.63 mm] Diameter Mounting Holes

- 0.600" x 0.350" [15.24 x 8.89 mm] Linear Element - 1kΩ
- Electrical Travel: 0.240" [6.1 mm]
- Output Smoothness: ±0.1%
- Independent Linearity: ±5.0%
- Element: Co-Molded Conductive Plastic
- Power Rating: 0.500W @ 70°C

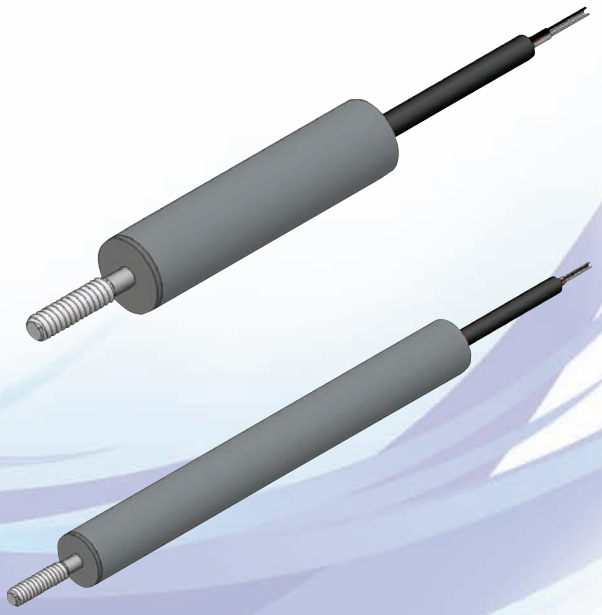
Available Options

- Custom resistance values (1kΩ to 20kΩ) and tolerances as low as ±5%.
- Special linearities as low as 0.25% (Absolute/Independent).
- Special electrical travel lengths up to 4.00" [101.6 mm] maximum.
- Custom wire leads or cable with specified lengths and connector options or gold plated terminals.
- Special mounting configurations available.
- Special mounting frames configurations available.



SPECTRUM SENSORS & CONTROLS
A Spectrum Control Business

5/16" [7.94 mm] Diameter Linear Precision Potentiometers



5903 Series

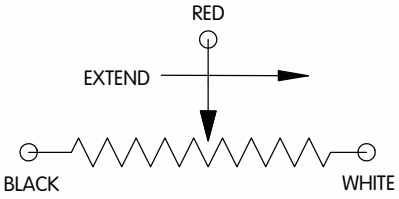
Electrical Characteristics

Resistance:	1kΩ to 10kΩ ±10%
Active Electrical Stroke:	0.50" - 2.0" [12.7 - 50.8 mm] Nominal
Electrical Continuity Stroke:	Over Mech. Stroke
Independent Linearity:	±1.0%
End Voltage:	0.5% Max.
Voltage Resolution:	Virtually Infinite
Output Smoothness:	0.1% Max.
Resistance Temp. Coefficient:	400 PPM/°C Max.
Power Rating @ 70°C:	0.75 - 2.0 Watts Max.
Wiper Contact Current:	10 mA Max.
Dielectric Strength:	500 VRMS
Insulation Resistance:	100 MΩ Min.

Mechanical Characteristics

Mechanical Stroke:	0.570 - 2.070 ±0.020 [14.48 - 52.58 ±0.51 mm]
Actuating Force:	0.75 Oz. [21.26 g] Max.
Shaft Rotation:	Continuous (No Effect)
Total Weight:	0.70 - 1.0 Oz. [19.85 - 28.35 g] Max.
Allowable Shaft Play:	0.005" [0.127 mm] Max. Misalignment

Schematic Diagram



Linear Position Sensor

Materials of Construction

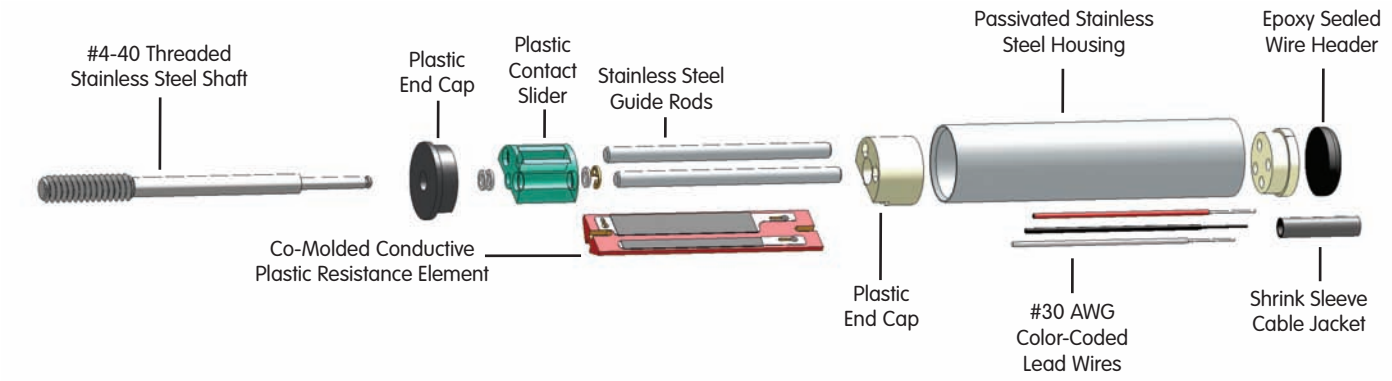
Housing:	Stainless Steel (Tubing)
Shaft and Guide Rods:	Stainless Steel
Resistance Element:	Co-Molded Conductive Plastic
Electrical Contacts:	Multi-Finger Precious Metal
Bearings:	Vectra E130i Plastic
Lead Wires/Jacket:	#30 AWG Type ET (Teflon) Shrink Tubing Jacket

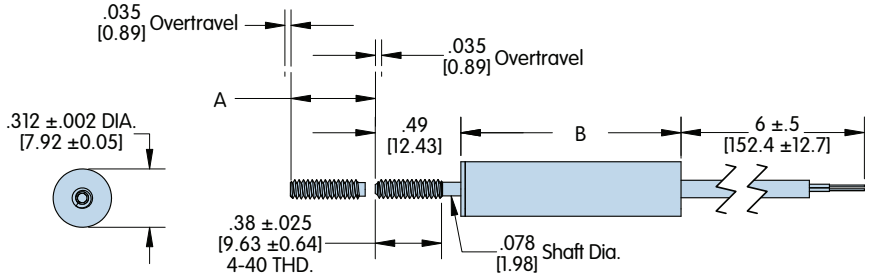
Environmental Characteristics

Operating Temp. Range:	-65°C to +125°C
Operating Life:	100 x 10^6 Strokes Min. 50 x 10^6 Cycles

5/16" [7.94 mm] Diameter Linear Precision Position Sensor

5903 Series





Part Number	Resistance	"A" Electrical Stroke In. [mm]	"B" Body Length In. [mm]	Power Rating Max. (Watts)	Mechanical Stroke In. [mm]	Total Weight Max. Oz. [g]
5903-0105-030	1kΩ ±10%	0.50 [12.70]	1.26 [32.00]	0.75	0.570 ±.020 [14.48 ±.51]	0.70 [19.85]
5903-0505-030	5kΩ ±10%			0.75		
5903-1005-030	10kΩ ±10%			0.75		
5903-0108-030	1kΩ ±10%	0.75 [19.05]	1.51 [38.35]	1.00	0.820 ±.020 [20.83 ±.51]	0.75 [21.26]
5903-0508-030	5kΩ ±10%			1.00		
5903-1008-030	10kΩ ±10%			1.00		
5903-0110-030	1kΩ ±10%	1.00 [25.40]	1.76 [44.70]	1.00	1.070 ±.020 [27.18 ±.51]	0.75 [21.26]
5903-0510-030	5kΩ ±10%			1.00		
5903-1010-030	10kΩ ±10%			1.00		
5903-0115-030	1kΩ ±10%	1.50 [38.10]	2.26 [57.40]	1.25	1.570 ±.020 [39.88 ±.51]	1.00 [28.35]
5903-0515-030	5kΩ ±10%			1.25		
5903-1015-030	10kΩ ±10%			1.25		
5903-0120-030	1kΩ ±10%	2.00 [50.80]	2.76 [70.10]	2.00	2.070 ±.020 [52.58 ±.51]	1.00 [28.35]
5903-0520-030	5kΩ ±10%			2.00		
5903-1020-030	10kΩ ±10%			2.00		

Available Options

- Custom resistance values (500Ω to 30kΩ) and tolerances as low as ±5%.
- Special linearities as low as 0.2% absolute (indexed) or independent over specified regions.
- Special electrical strokes (3.5" [88.9 mm] Max.).
- Special cable or connectors.
- Special shaft lengths and features such as flats, slots, steps, yokes, clamps and rod ends.
- Special environmental capabilities such as moistures seals, high shock and vibration capabilities.

SPECTRUM SENSORS & CONTROLS
A Spectrum Control Business

Custom Linear Precision Potentiometer

Various Value-Added Options Available

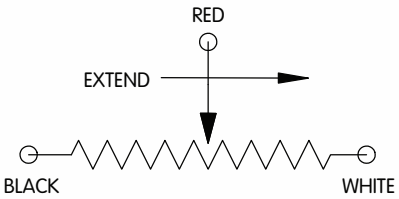
Linear Position Sensor

Mechanical Characteristics

Housing (Std, Custom Available):	0.312" and 0.500" [7.93 and 12.7 mm] Diameter
Shafts (Std, Custom Available):	0.078" and 0.125" [1.98 and 3.18 mm] Diameter
Housing Length (Std, Custom Available):	1.550" to 5.250" [39.37 to 133.35 mm]
Stroke Length (Std, Custom Available):	0.500" to 4.000" [12.7 to 101.6 mm]
Shaft Length (Std, Custom Available):	Varies by Stroke Length
Shaft End (Std, Custom Available)*:	#4-40 UNC-2A Threaded
Weight Activation Force:	2.0 Oz. [56.7 g] Nominal

** Note: Shaft end options - Various Threads, Rod Ends, Yokes and Ball Joints*

Schematic Diagram



All other general requirements in accordance with MIL-PRF-39023

Environmental Characteristics

Operating Temp. Range:	-65°C to +125°C
Operating Life:	100 x 10^6 Strokes Min.
Shock and Vibration per:	MIL-PRF-39023

Materials of Construction

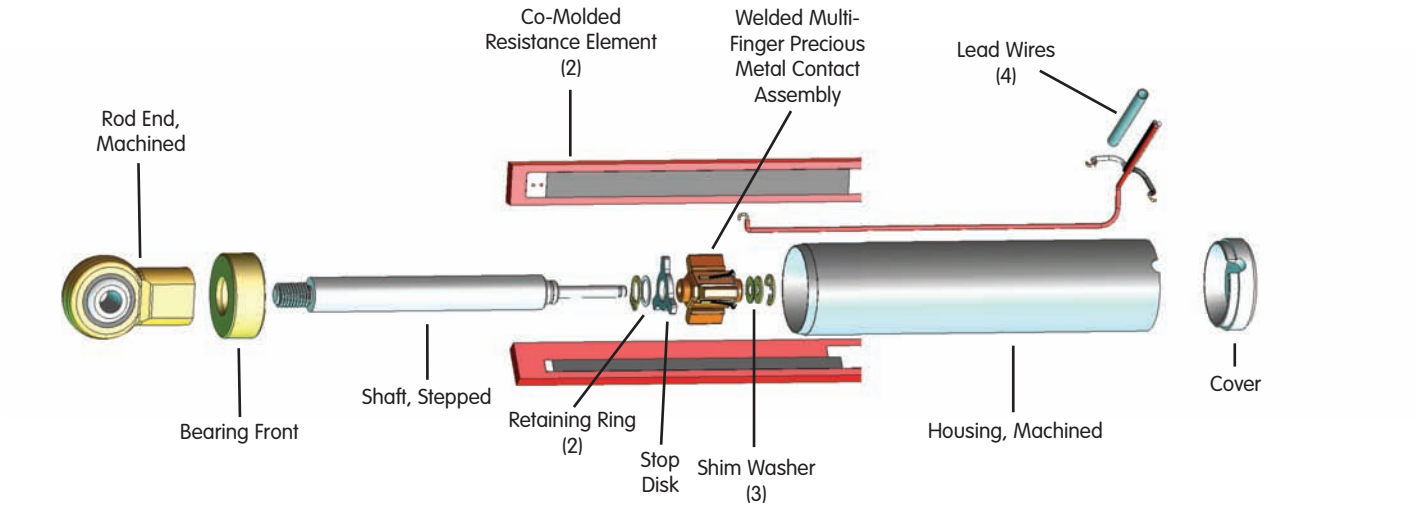
Housing:	Stainless Steel
Shaft:	Stainless Steel
Resistance Position Feedback Element:	Co-Molded Conductive Plastic
Cover:	Anodized Aluminum
Electrical Contacts:	Multi-Finger Precious Metal
Lead Wires or:	30 AWG Teflon - 6" [152.4 mm] Min. Length
Mounting Options:	T-Clamps and Custom Mounting Options

Electrical Characteristics

Resistance (Std, Custom Available):	1kΩ to 20kΩ ±10%
Electrical Travel (Std, Custom Available):	0.500" to 4.000" [12.7 - 101.6 mm] Length
Linearity (Std, Custom Available):	±1.0%
Voltage Resolution:	Virtually Infinite
Output Smoothness:	0.1% Max.
Resistance Temp. Coefficient:	400 PPM/°C Max.
Power Rating @ 70°C (Size Dependant):	0.25 to 3.0 Watts Max.
Dielectric Strength (Size Dependant):	500 to 1,000 VRMS @ 50Hz
Insulation Resistance:	100 MΩ Min. @ 500VDC

Custom Linear Precision Potentiometer

5905 Series



Custom Linear Precision Potentiometer

Custom Features

0.500" [12.7 mm] OD/2.500" [63.5 mm] Length Linear Potentiometer Sensor with Ball Rod Ends

- 0.500" [12.7 mm] Diameter OD/2.500" [63.5 mm] Length - 1kΩ
- Electrical Stroke: 1.500" [38.1 mm] Long
- Output Smoothness: 0.1% Max
- Independent Linearity: ±1.0%
- Element: Co-Molded Conductive Plastic
- Lead Wires: 26 AWG, 60" [1,524 mm] Length
- Shaft End: Ball Rod Ends

0.500" [12.7 mm] OD/5.826" [147.98 mm] Length Linear Dual Tracked Potentiometer Sensor

- 0.500" [12.7 mm] Diameter OD/5.826" [147.98 mm] Length - Dual Tracked 10kΩ
- Electrical Stroke: 3.500" [88.9 mm] Long
- Tracking: Dual Outputs Within ±2.0%
- Independent Linearity: ±1.0%
- Element: Co-Molded Conductive Plastic
- Lead Wires: 26 AWG, 18" [457.2 mm] Length
- Shaft End: #8-32UNC-3A Thread

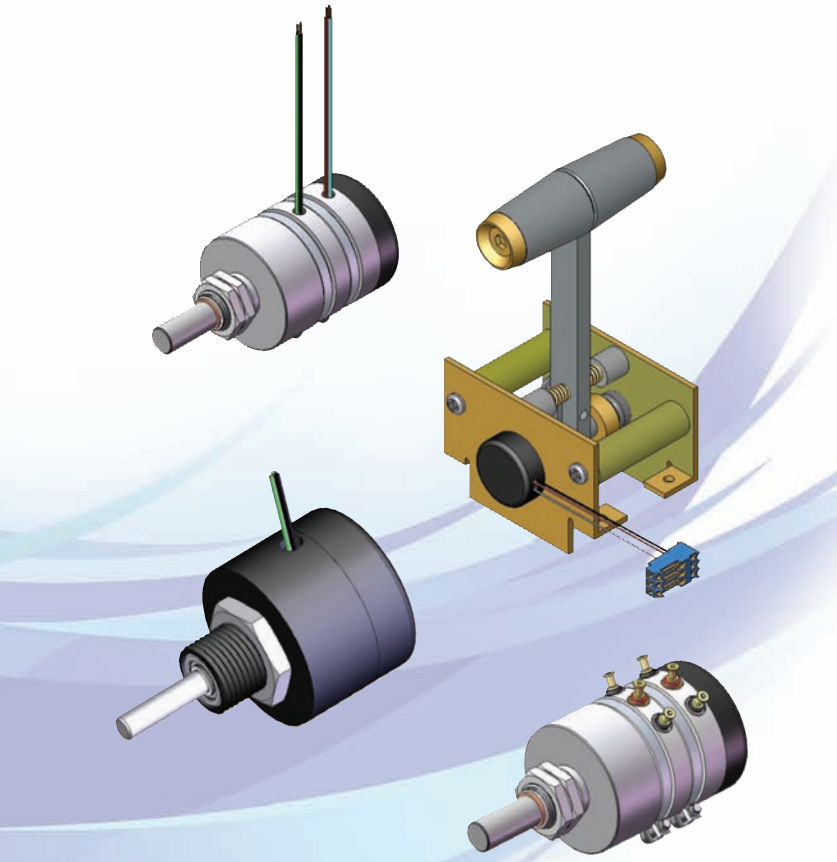
Available Options

- Custom resistance values (1kΩ to 20kΩ) and tolerances as low as ±5%.
- Special linearities as low as 0.25% (Absolute/Independent).
- Special electrical travel lengths up to 4" [101.6 mm] Max.
- Special dual tracks for redundancy options available.
- Custom wire leads or cable with specified lengths and connector options or gold plated terminals.
- Special mounting configurations available.
- Special shaft end options available.

SPECTRUM SENSORS & CONTROLS
A Spectrum Control Business

Custom Panel Input Controls

Professional Precision Audio and Video Controls

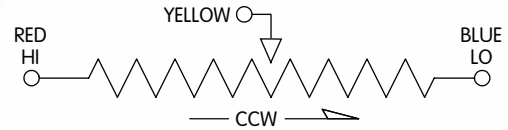


Mechanical Characteristics

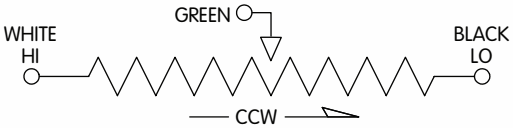
Housing (Std, Custom Available):	0.500", 0.625", 0.875", 1.062" and 1.437" [12.7, 15.875, 22.23, 26.98 and 36.5 mm] Diameter
Housing Styles (Std, Custom Available):	Bushing, Lever Arm Bracket
Shaft (Std, Custom Available)*:	0.125" and 0.250" [3.175 and 6.35 mm] Diameter
Shaft Length:	Servo: 0.500" [12.7 mm], Bushing: 0.688" [17.48 mm]
Torque, Start:	2 Oz.-In. (Ref)
Torque, Running:	4 Oz.-In. (Ref)

** Note: Shaft end options - Screw Driver, Flat and Through-hole (Gear mounting options available)*

Schematic Diagram



CUP 1



CUP 2

VIEWED FROM SHAFT END
(Dual Tracked Section Option)

All other general requirements in accordance with MIL-PRF-39023

Electrical Characteristics

Resistance (Std, Custom Available):	1kΩ to 20kΩ ±10%
Electrical Angle (Std, Custom Available):	325°, 340° and 350°
Linearity (Std, Custom Available):	±0.5%
Electrical Output Slope Function:	Linear and Audio Tapers
Phasing/Tracking (Custom Available):	±0.5% Between Cups
Voltage Resolution:	Virtually Infinite
Output Smoothness:	0.1% Max.
Resistance Temp. Coefficient:	400 PPM/°C Max.
Power Rating @ 70°C (Size Dependant):	0.5 to 2.0 Watts Max.
Dielectric Strength (Size Dependant):	500 to 1,000 VRMS @ 50Hz
Insulation Resistance:	100 MΩ Min. @ 500VDC

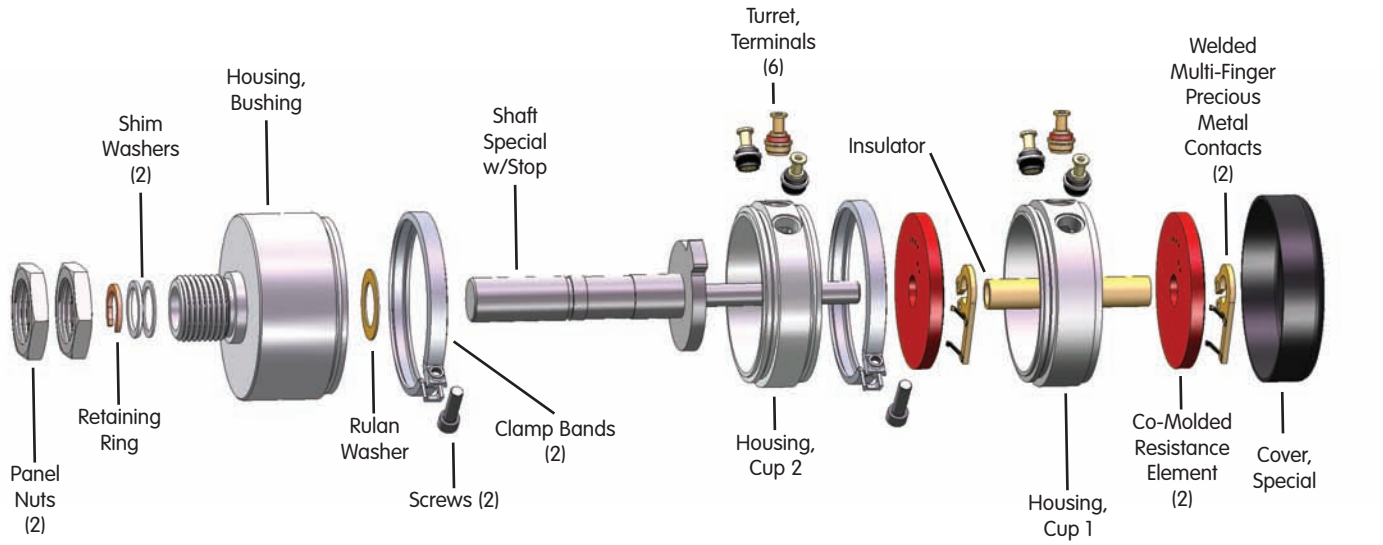
Environmental Characteristics

Operating Temp. Range:	-65°C to +125°C
Rotational Operating Life:	100 x 10^6 Revolutions Min.
Shock and Vibration per:	MIL-PRF-39023

Materials of Construction

Housing:	Anodized Aluminum or Thermo Plastic
Cover:	Anodized Aluminum or Thermo Plastic
Shaft:	Stainless Steel
Cover:	Anodized Aluminum
Resistance Position Feedback Element:	Co-Molded Conductive Plastic
Electrical Contacts:	Multi-Finger Precious Metal
Lead Wires or:	30 AWG Teflon - 6" [152.4 mm] Min. Length
Solder Terminals:	Gold Plated Brass

6211 Series Dual Section Audio Potentiometer



Custom Features

1.062" [26.98 mm] OD Triple Section Precision Audio Control with Turret Style Terminals

- 1.062" [26.98 mm] OD
- Electrical Angle: 320° (All Cups)
- Electrical Function: Servo Feedback/Audio Taper
- Tracking: Audio Cups within ±0.5 dB through -10 to -50
- Output Smoothness: ±0.1% (Both Audio Cups)
- Element: Co-Molded Conductive Plastic
- Terminals, Turret: Ni Plated Brass

Lever Arm Fader Potentiometer Assembly with Brushed Aluminum Handle/Arm

- 0.875" [22.23 mm] OD Element Housing/Brass Brackets
- Electrical Angle: 130°
- Mechanical Angle: 90°
- Activation Force: Lever Arm 4.8 ±1.0 Oz. [136.1 ±28.35 g]
- Rotational Life: 50 Million Cycles Min.
- Lead Wires: 26 AWG, 3.0" [76.2 mm] Length

Available Options

- Custom resistance values (1kΩ to 20kΩ) and tolerances as low as ±5%.
- Special electrical slope functions available (Linear/Non-Linear).
- Special linearities as low as 0.25% (Absolute/Independent).
- Special electrical angles up to 355° Max.
- Special multi-sections available with tracking.
- Custom wire leads or cable with specified lengths and connector options or gold plated terminals.
- Special mounting configurations available.

SPECTRUM SENSORS & CONTROLS
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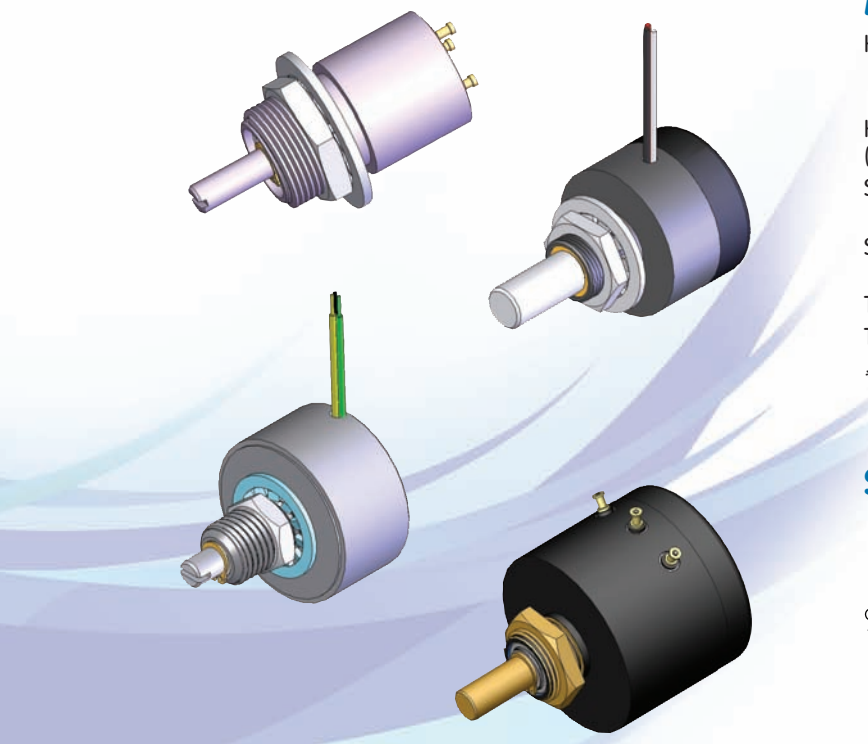
Custom Panel Input Controls

Aerospace High Reliability Instrument Controls

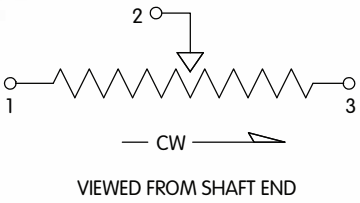


Mechanical Characteristics

Housing (Std, Custom Available):	0.500", 0.625", 0.875", 1.062" and 1.437" [12.7, 15.875, 22.23, 26.98 and 36.5 mm] Diameter
Housing Styles (Std, Custom Available):	Servo and Bushing
Shaft (Std, Custom Available)*:	0.125" and 0.250" [3.175 and 6.35 mm] Diameter
Shaft Length:	Servo: 0.500" [12.7 mm], Bushing: 0.688" [17.48 mm]
Torque, Start:	2 Oz.-In. (Ref)
Torque, Running:	4 Oz.-In. (Ref)

** Note: Shaft end options - Screw Driver, Flat and Through-hole (Gear mounting options available)*

Schematic Diagram



VIEWED FROM SHAFT END

All other general requirements in accordance with MIL-PRF-39023

Electrical Characteristics

Resistance (Std, Custom Available):	1kΩ to 20kΩ ±10%
Electrical Angle (Std, Custom Available):	325°, 340° and 350°
Linearity (Std, Custom Available):	±0.5%
Electrical Output Slope Function:	Linear and Audio Tapers
Phasing/Tracking (Custom Available):	±0.5% Between Cups
Voltage Resolution:	Virtually Infinite
Output Smoothness:	0.1% Max.
Resistance Temp. Coefficient:	400 PPM/°C Max.
Power Rating @ 70°C (Size Dependant):	0.5 to 2.0 Watts Max.
Dielectric Strength (Size Dependant):	500 to 1,000 VRMS @ 60Hz
Insulation Resistance:	100 MΩ Min. @ 500VDC

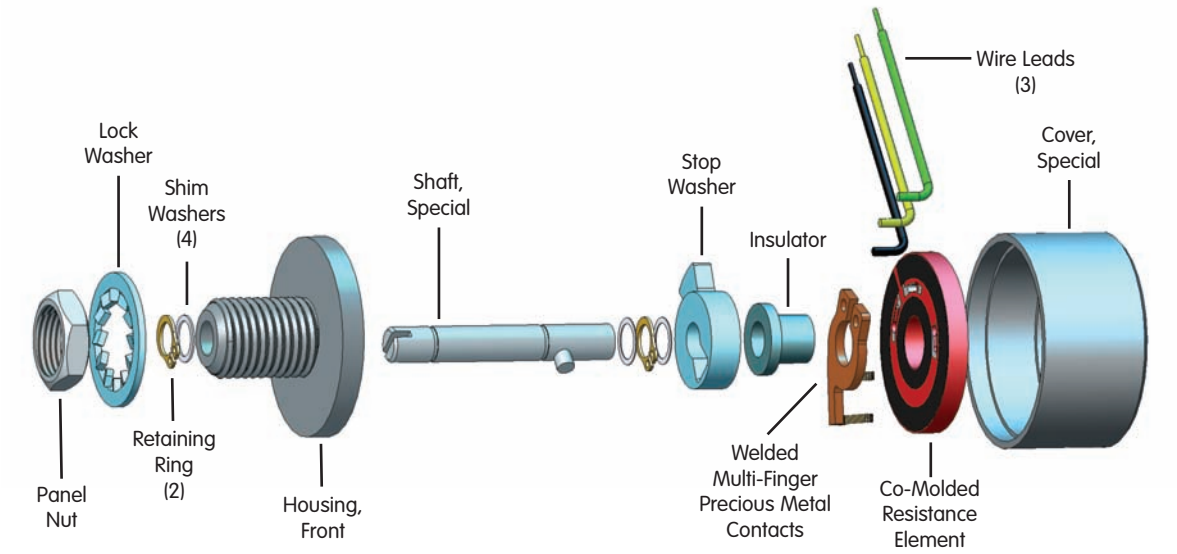
Materials of Construction

Housing:	Anodized Aluminum or Thermo Plastic
Cover:	Anodized Aluminum or Thermo Plastic
Shaft:	Stainless Steel
Cover:	Anodized Aluminum
Resistance Position Feedback Element:	Co-Molded Conductive Plastic
Electrical Contacts:	Multi-Finger Precious Metal
Lead Wires or:	30 AWG Teflon - 6" [152.4 mm] Min. Length
Solder Terminals:	Gold Plated Brass

Environmental Characteristics

Operating Temp. Range:	-65°C to +125°C
Rotational Operating Life:	100 x 10^6 Revolutions Min.
Shock and Vibration per:	MIL-PRF-39023

6308 Series Panel Mount Potentiometer



Custom Features

1.062" [26.98 mm] Diameter Rotary Potentiometer with Turret Terminals

- 1.062" [26.98 mm] Diameter Bushing Mount
- Electrical Angle: 340° ±2°
- Independent Linearity: ±1%
- Power Rating: 1.25 Watts @ 70°C
- Rotational Life: 50 Million Min.
- Terminals, Turret: Gold Plated Brass

1.500" [25.4 mm] Diameter Flange/ 0.890" [22.61 mm] Body Mount Motorized Potentiometer with Wire Leads

- 1.500" [25.4 mm] Diameter Flange Mount/0.866" Motor Body
- Electrical Angle: 340°
- Independent Linearity: ±1%
- Output Smoothness: ±0.25%
- Element: Co-Molded Conductive Plastic
- Motor: 24V, Specific Torque, 3.645 Oz.-In.
- Lead Wires: 30 AWG, 18.0" [457.2 mm] Length

Available Options

- Custom resistance values (1kΩ to 20kΩ) and tolerances as low as ±5%.
- Special linearities as low as 0.25% (Absolute/Independent).
- Special electrical angles up to 355° Max.
- Special multi-sections available with tracking.
- Custom wire leads or cable with specified lengths and connector options or gold plated terminals.
- Special mounting configurations available.

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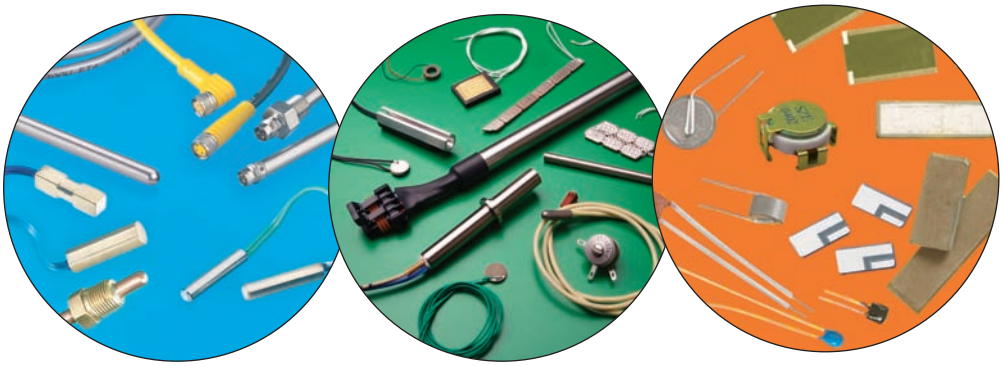

Temperature Sensing Probes & Assemblies

- Heavy duty & lightweight designs
- Surface, immersion & air temperature sensing
- Use variety of sensing elements: NTC & PTC thermistors, RTDs, ICs & digital sensors

Heater Assemblies

- Surface & immersion applications
- PTC & resistive heaters combined with temperature sensor technologies
- Heavy duty & high reliability designs

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- Over-current protection, motor protection sensor & heater applications
- Standard disc, coated chip, glass encapsulated & radial leaded glass encapsulated styles & surge current limiters

Precision Position Sensors Operations

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