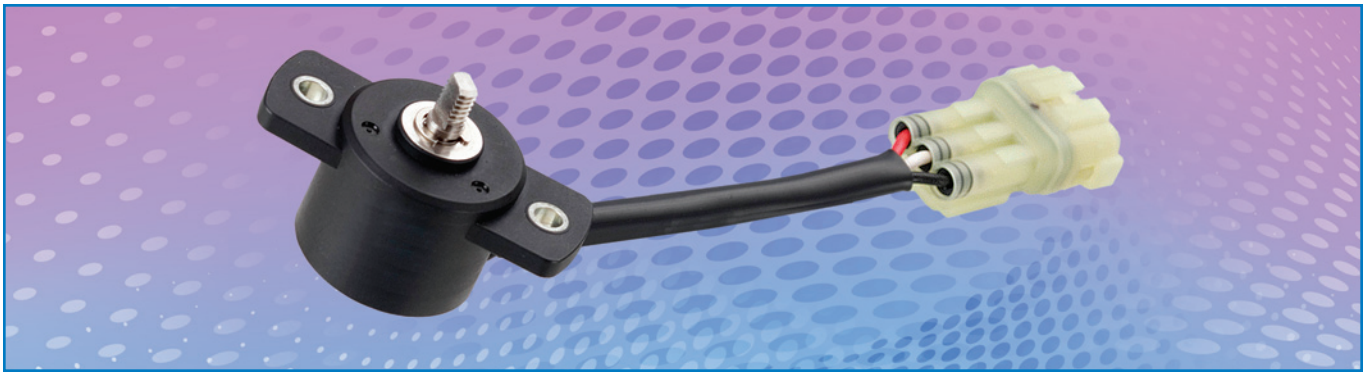
RPA211 Series

TOCOS SENSORS

Rugged, Single Output, Contact Angle/Position Sensors



Features

- Rugged angle/position contact sensor with 3-wire harness and connector offered as a standard assembly
- Detection of objects through direct physical contact resulting in conversion to electrical signals for processing
- Long life of 2.5 million cycles
- Waterproof and dustproof with an IP67 rating
- 0.2W power rating
- Spring return function within mechanical rotational angle of 0° to 120°
- Body is Ø30mm x 36mm deep including threaded shaft
- Resistance value of 2kΩ; resistance tolerance of ±20%
- Flat threaded shaft actuated in the CCW direction for angle/position detection
- Electrical rotational angle can be changed to 60° to 115° as an option
- Screw mount flange with two round (Ø4.6mm) mounting holes (hardware not included)
- RoHS compliant

Applications

- Electric vehicles where speed, steering, orientation, and other movements are controlled by contact sensors
- Angle/position detection by contact sensors for controlling movement found in various robotic systems
- Agricultural/construction vehicles where contact sensors under harsh conditions control operating functions
- Personal mobility vehicles utilizing contact sensors for maneuvering various electric wheelchairs and scooters

Specifications

Basic Characteristics

Input Voltage	5VDC	**Output Guaranteed Range**	101.2° (0.2V to 4.8V)
Power Rating	0.2W at +70°C	**Electrical Rotational Angle**	110°±3°
Output Resolution	∞ (infinite)	**Mechanical Rotational Angle**	120°±5°
Output Characteristics	See *Figure 5*	**Operating Temperature Range**	−30°C to +120°C
Output Inclination	0.045V/degree	**Mounting Hole Pitch**	41mm

Significant Characteristics

Total Resistance	2kΩ±20% before test; ±20% max. resistance change from initial value after test, when measuring between connector pins Vin and GND
Output Linearity	Initial value of ±3% (in percentage of output guaranteed range) before test followed by ±50mV voltage change max. from initial value after test; where deviation of output voltage from referenced straight line (inclination of 0.045V/degree from 0.2V to 4.8V) falls at reference point 2.5V (see *Figure 5*)
Insulation Resistance	1,000MΩ min. before test; 1MΩ min. after test; at 500VDC
Insulation Voltage	750VAC, 1 minute min.
Operating Torque	0.0494N•m minimum at 0V position; 0.137N•m maximum at 5V position (see *Figure 4*)
Lead Wire Pull Strength	Set and hold lead wires at target load of 88.2N for 30 sec. without destruction

Specifications Continued

Endurance Performance

Operating Endurance

*Satisfies basic characteristics after endurance testing.

Operating Temperature (°C)	Tested Rotational Cycles	Tested Operating Angle	Output Voltage Range (V)	Frequency Rate (Hz)	Applied Voltage To Vin Terminal Pin
+120	2.5 million	88°	0.2 to 4.8	4	5V

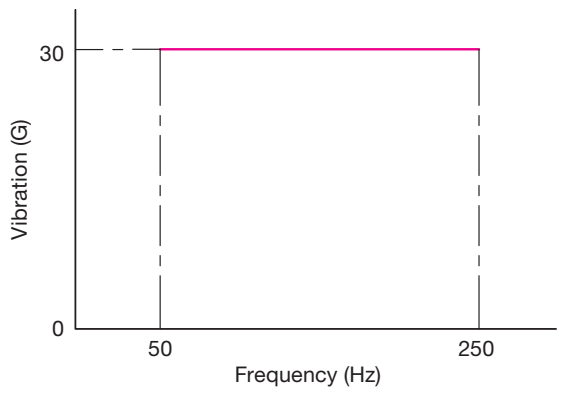
Vibration*	30G, 50-250Hz, X, Y, Z directions, 12 hours (see *Figure 1*)
Temperature Cycle*	−40°C for 1 hour ⇄ +120°C for 1 hour, 20 cycles (see *Figure 2*)
Low Temperature Shelf Life*	−40°C, 96 hours
High Temperature Shelf Life*	+120°C, 96 hours
Humidity*	60°C, 90-95%RH, 500 hours
Salt Water Mist Test*	JIS-Z-2371, 96 hours
Moisture, Rain, and Spray	Expose sensor to water at +80°C for 0.5 hour ⇄ +20°C for 0.5 hour, 10 cycles No internal water intrusion after test as described in IP67 IEC standard
Oil Test*	Completely coat sensor with oil (JIS 2 grade), place in an oven at +40°C, 72 hours
Temperature Coefficient of Resistance	400ppm/°C, based on range of −40°C to +120°C for tests
Drop Test*	Drop height: 1m, landing area: concrete floor, X, Y, Z directions, 1 time each

Precautions

1. In a circuit where resistance undergoes electrical output, set the connecting impedance over 100 times greater than the total resistance value of the sensor (1MΩ recommended value). See *Figure 3* for evaluation circuit schematic.
2. All items except the basic specifications shall not be covered under warranty.
3. Use the recommended output guaranteed range of 0.2V to 4.8V. See *Figure 5*.
4. Do not apply excessive load on the internal stopper.
5. Do not use materials that generate hazardous gas (chloride gas, sulfide gas, etc.) when assembling components in sensor.

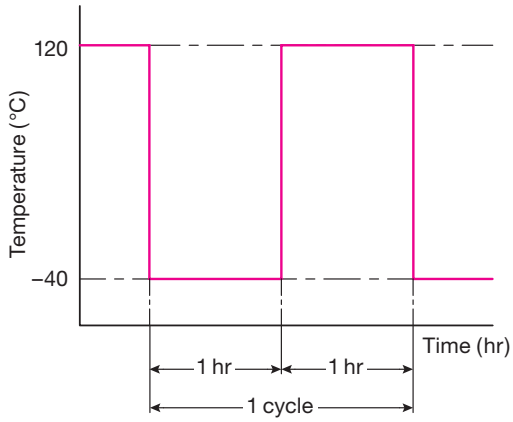
Vibration Test

Figure 1: **Vibration Test Graph**



Temperature Test

Figure 2: **Temperature Test Graph**



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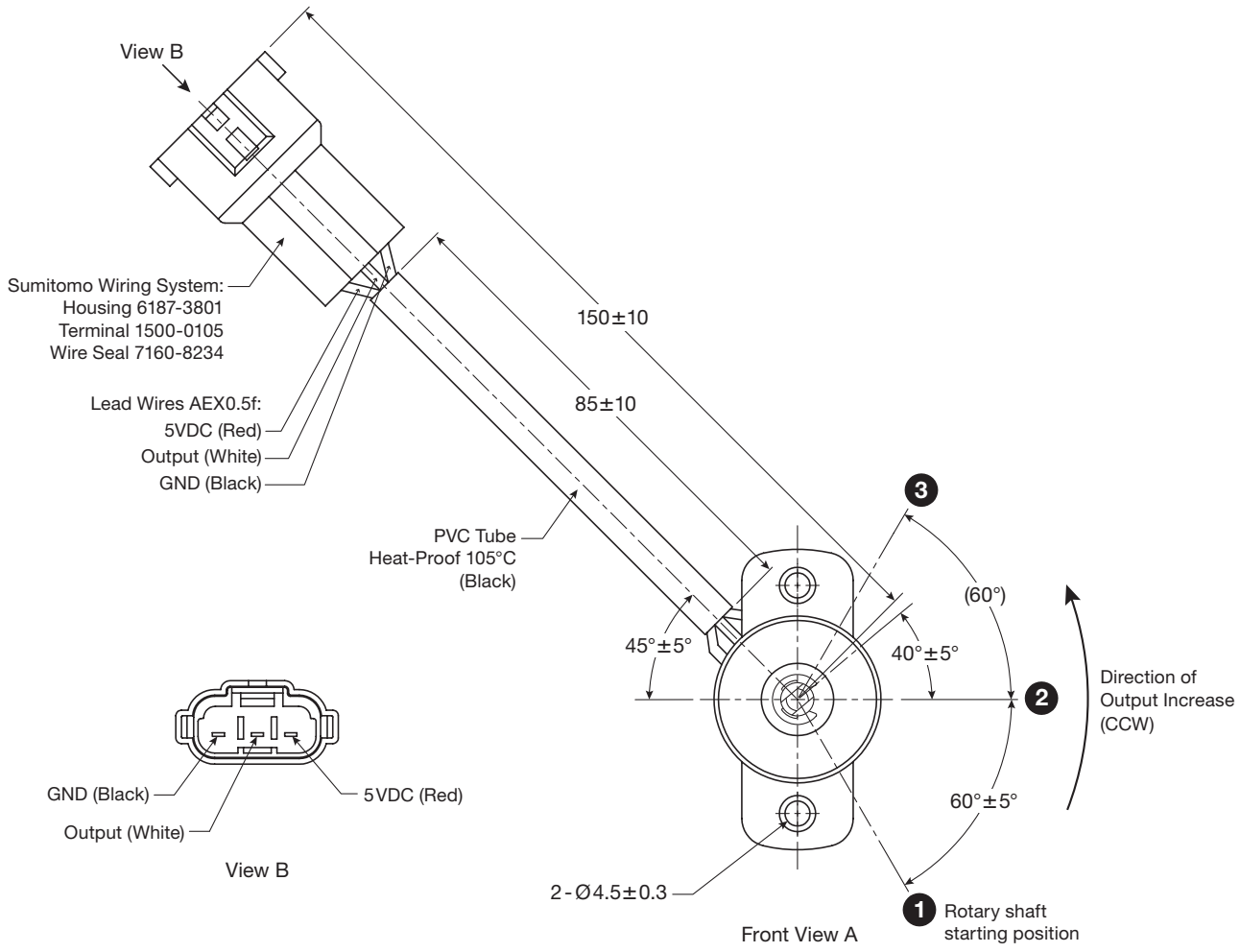
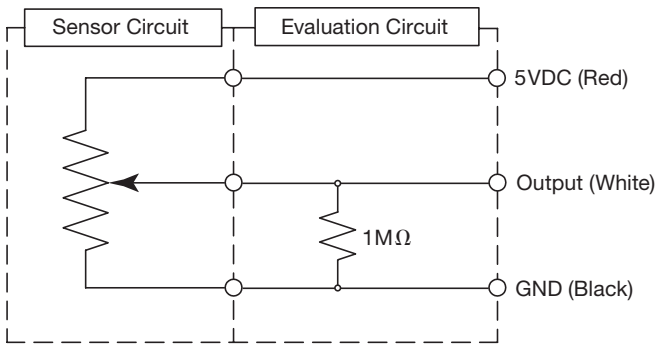
Dimensional Drawings of Front View A with Wire Harness and Connector

Unit: mm



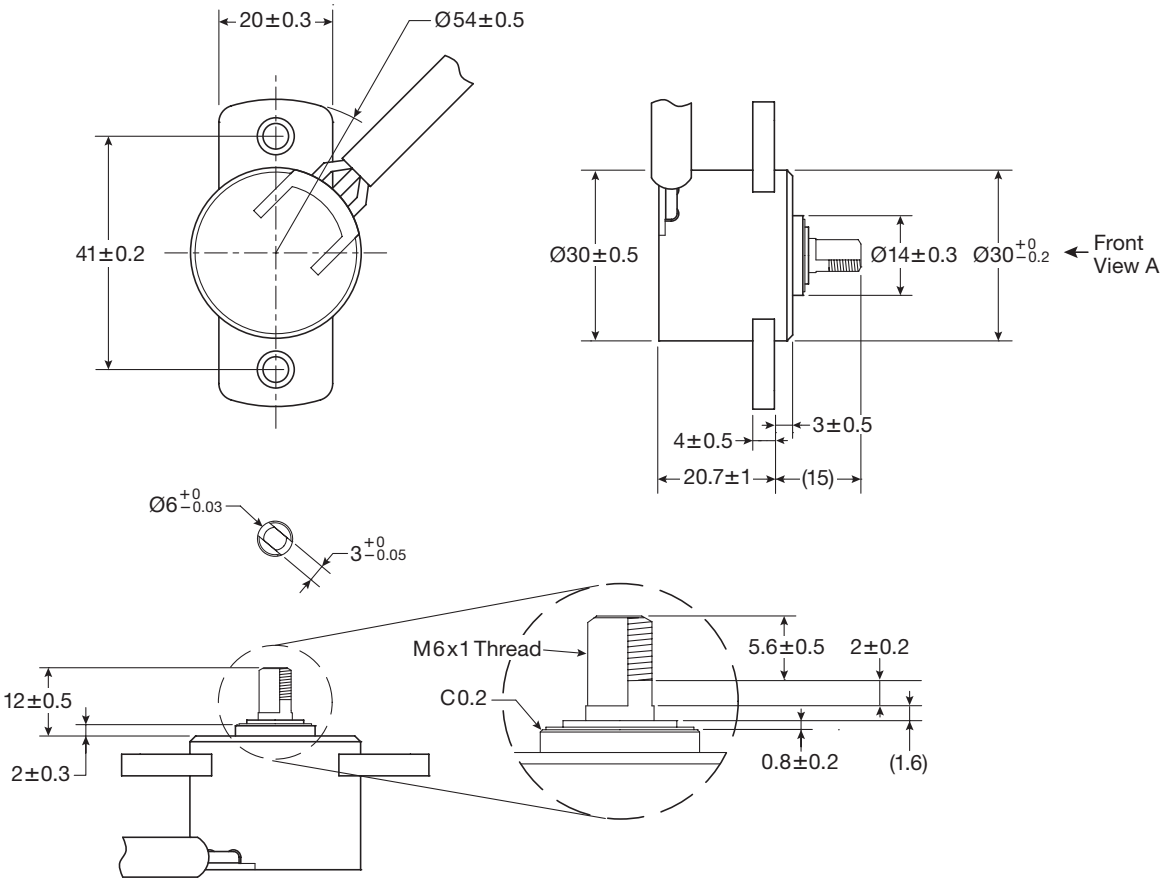
Electrical Schematic

Figure 3: **Measurement-Evaluation Circuit**



Dimensional Drawings of Back, Side, and Shaft

Unit: mm



Rotational Torque

Figure 4: **Operating Torque**

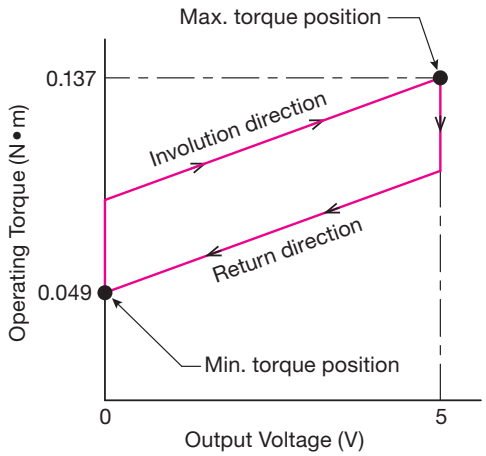


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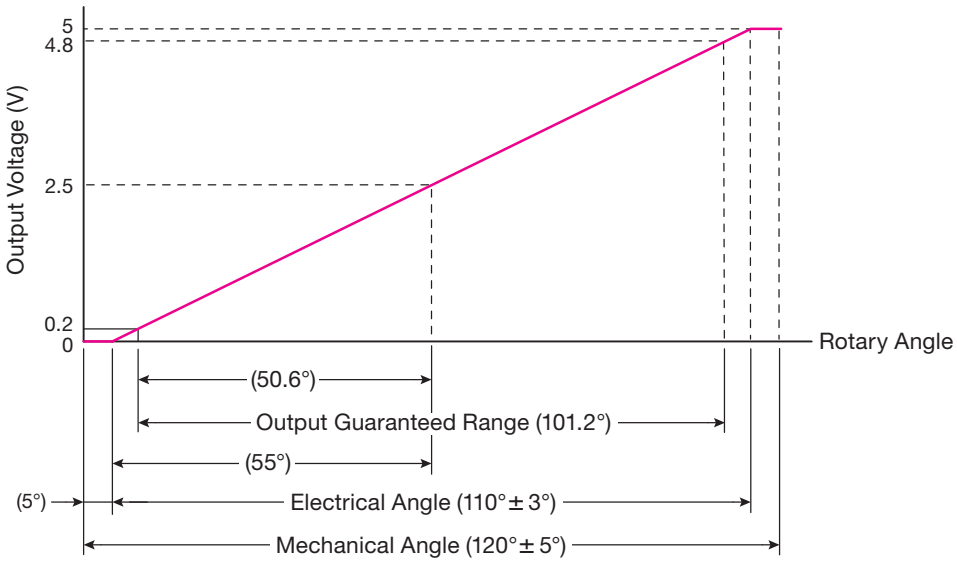
Figure 5: **Output Characteristics**

Unit: mm



Note: The electrical rotational angle can be changed as an option (60° to 115°).
The rotational direction is counterclockwise only. It cannot be changed.

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