

## 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

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

#### Significant Characteristics

<b>Total Resistance</b>	2kΩ ± 20% before test; ± 20% max. resistance change from initial value after test, when measuring between connector pins Vin and GND		
<b>Output Linearity</b>	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)		
<b>Insulation Resistance</b>	1,000MΩ min. before test; 1MΩ min. after test; at 500VDC		
<b>Insulation Voltage</b>	750VAC, 1 minute min.		
<b>Operating Torque</b>	0.0494N·m minimum at 0V position; 0.137N·m maximum at 5V position (see Figure 4)		
<b>Lead Wire Pull Strength</b>	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

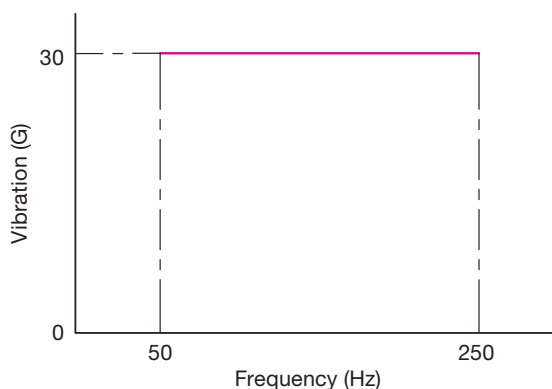
**Drop Test\*** Drop height: 1m, landing area: concrete floor, X, Y, Z directions, 1 time each

### 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.

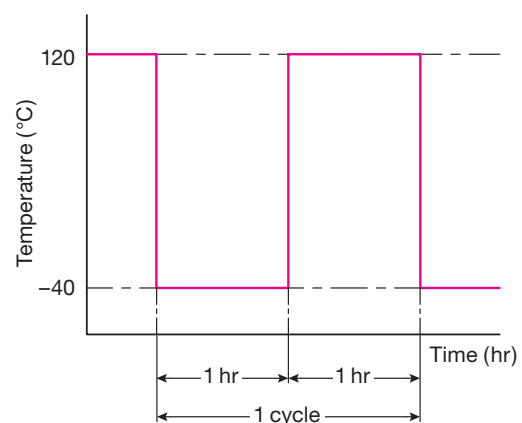
### Vibration Test

**Figure 1: Vibration Test Graph**



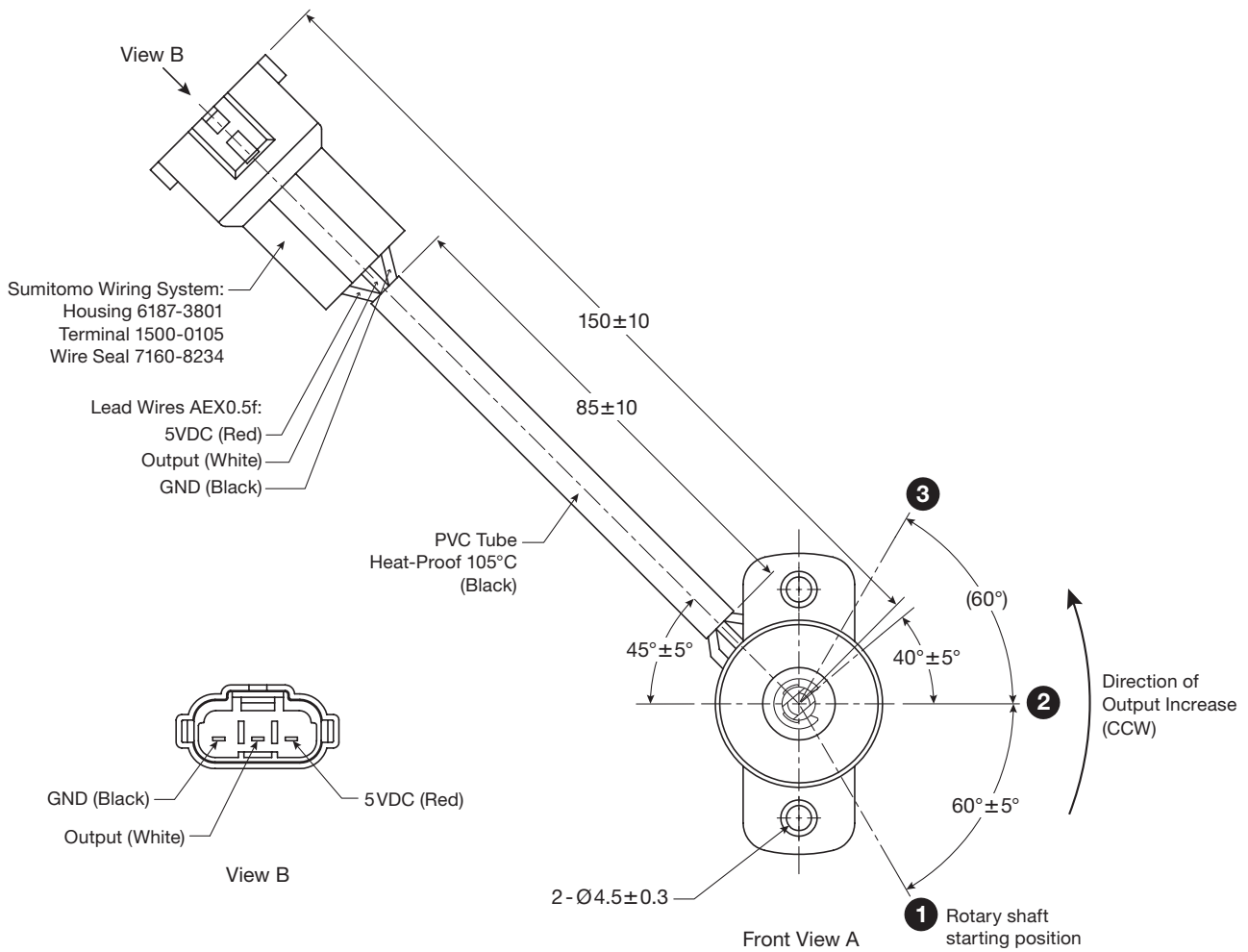
### Temperature Test

**Figure 2: Temperature Test Graph**



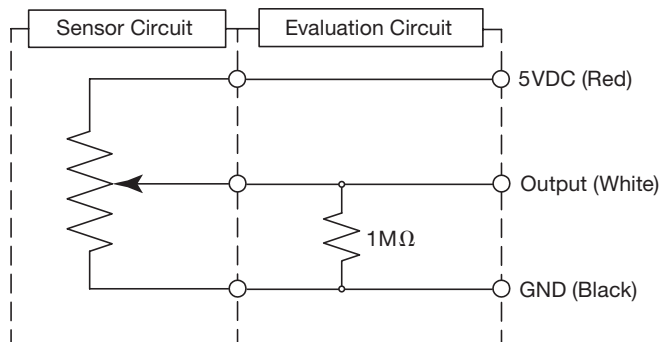
Dimensional Drawings of Front View A with Wire Harness and Connector

Unit: mm



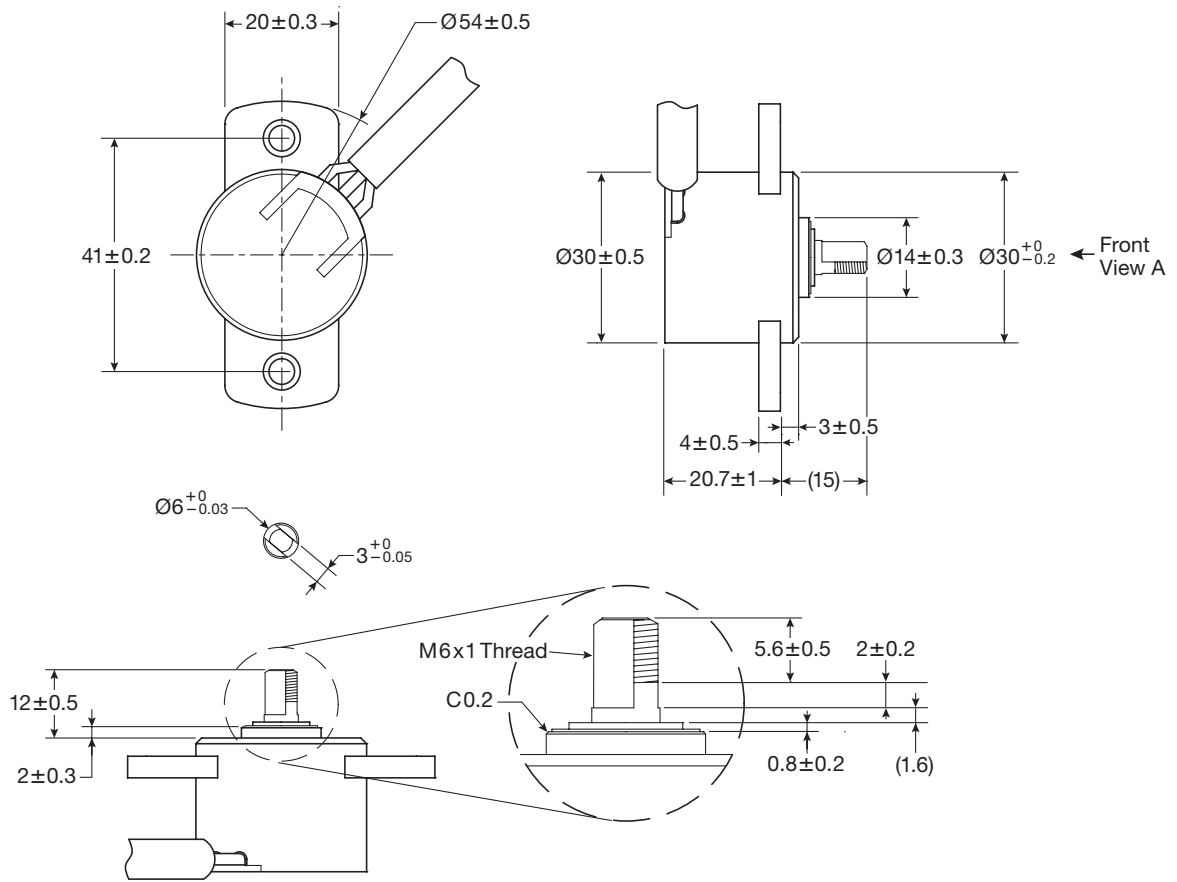
Electrical Schematic

Figure 3: Measurement-Evaluation Circuit



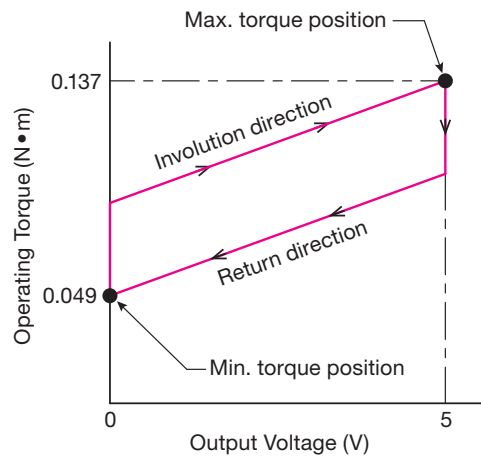
Dimensional Drawings of Back, Side, and Shaft

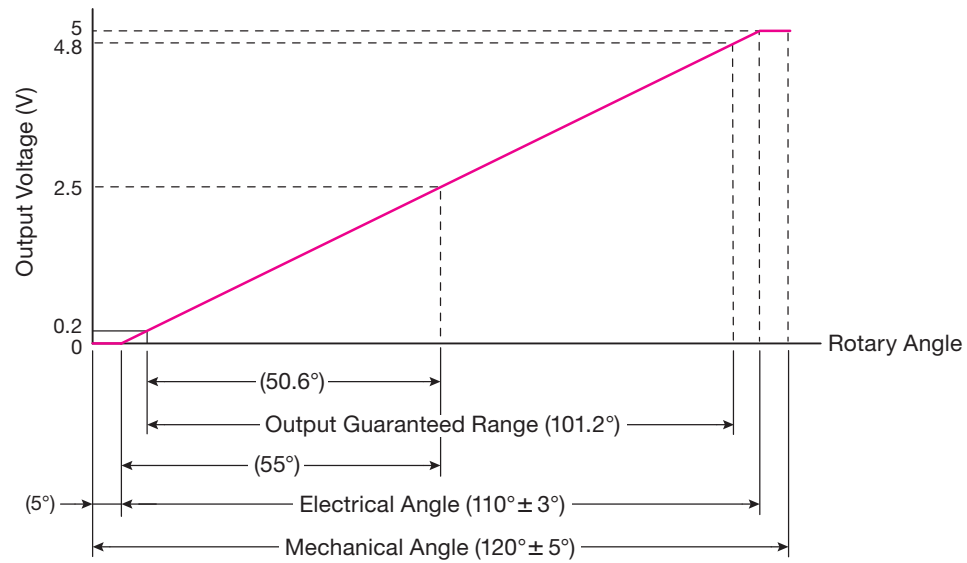
Unit: mm



Rotational Torque

Figure 4: Operating Torque



**Figure 5: Output Characteristics**

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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