

All-in-One, Single Output, Contact Angle/Position Sensors



Features

- All-in-one housing includes single output angle/position sensor, rotational lever, and integral male connector
- Detection of objects through direct physical contact resulting in conversion to electrical signals for processing
- Potentiometric angle/position sensor with a long life of 2 million cycles
- Resistance value of 5k Ω ; resistance tolerance of $\pm 20\%$
- Rotational function of lever within mechanical rotational angle of 117 degrees
- 0.05W power rating
- Operating temperature range of -30°C to $+120^{\circ}\text{C}$
- Compatible female E03FBR connector recommended to connect with integral male E03MBR connector of sensor
- Angle/position detection operates in CCW direction only
- Optional customizable angle/position setting within the 60° to 115° range
- Lever metal strength – HRA: 70-84 rating using Rockwell hardness test and elasticity test for an E: 0.5-0.75 rating
- Pulling strength of lever: 98N minimum
- Screw mount flange (approximately 16mm deep) with two oval mounting slots (hardware not included)
- RoHS compliant

Applications

- Angle/position detection in electronically controlled devices found in many manufacturing/industrial assembly lines
- Personal mobility vehicles utilizing contact sensors for maneuvering electric wheelchairs and scooters
- Angle/position detection by contact sensors for controlling movement found in various robotic systems
- Contact sensors for controlling various operations in off-road vehicles, i.e. golf carts, ATVs, and snowmobiles

Specifications

Basic Characteristics

Rated Voltage	5VDC	Output Guaranteed Range	90° (0.5V to 4.5V)
Maximum Rated Voltage	16VDC	Electrical Rotational Angle	112.5°
Power Rating	0.05W	Mechanical Rotational Angle	117°
Measurement Circuit	See Figure 2	Operating Temperature Range	-30°C to $+120^{\circ}\text{C}$
Output Characteristics	See Figure 4	Stopper Strength	98N minimum
Output Inclination	0.044V/degree	Mounting Hole Pitch	48mm

Significant Characteristics

Total Resistance	Initial value of $5\text{k}\Omega \pm 20\%$ before test; 5k$\Omega \pm 30\%$ after test ; when measuring between terminal 1 and 3
Angle at 0.5V	Initial value of $55^{\circ} \pm 4.5^{\circ}$ before test; 55° \pm 7° after test ; (see Figure 4)
Output Linearity	Initial value of $\pm 0.1\text{V}$ before test; $\pm 0.2\text{V}$ after test ; where deviation of output voltage from referenced straight line (inclination of 0.044V/degree) falls between 0.5V to 4.5V guaranteed range (see Figure 4)
Hysteresis	Initial value of $\pm 30\text{mV}$ before test; $\pm 40\text{mV}$ after test ; results based on difference of output voltage from hysteresis loop (origin curve and return curve) between 55° and 90° guaranteed range

Specifications Continued

Significant Characteristics Continued

Insulation Resistance	Initial value of 100M Ω min. before test; 10M Ω min. after test; 500VDC
Temperature Characteristic	± 50 mV, -30°C to $+120^{\circ}\text{C}$ (reference temperature of $+25^{\circ}\text{C}$)
Operating Torque - Minimum at 0V	Initial value of 0.0049N•m min. before test; 0.0010N•m min. after test (see Figure 3)
Operating Torque - Maximum at 5V	Initial value of 0.1471N•m max. before test; 0.1961N•m max. after test (see Figure 3)

Endurance Performance

Operating Temperature ($^{\circ}\text{C}$)	Tested Rotational Cycles	Tested Operating Angle	Output Voltage Range (V)	Frequency Rate (Hz)	Applied Voltage To Input Terminal
+25	3 million	90°	0.5 to 4.5	4	5V
+100	2 million	90°	0.5 to 4.5	4	5V
-40	1 million	90°	0.5 to 4.5	4	5V
+110	10 million	4.5°	2.4 to 2.6	30	5V

Constant Vibration 2.5V reference point at $+25^{\circ}\text{C}$, 25G (O-P), 200Hz, 100 hours (applied voltage to Vin connector pin)

Sweep Vibration 2.5V reference point at $+25^{\circ}\text{C}$, 10G (O-P), 20-130Hz; 20G, 130-200Hz; (20-200Hz, 5 minutes); 100 hours

Temperature Cycle -30°C for 1 hour \rightleftharpoons $+120^{\circ}\text{C}$ for 1 hour, 100 cycles (with E03FBR connector)

Low Temperature Shelf Life -30°C , 200 hours (with E03FBR connector)

High Temperature Shelf Life $+120^{\circ}\text{C}$, 200 hours (with E03FBR connector)

Humidity $80 \pm 3^{\circ}\text{C}$, $95 \pm 5\%$ RH, 100 hours (with E03FBR connector)

Salt Water Mist Test JIS-Z-2371, 240 hours (with E03FBR connector)

Moisture, Rain and Spray JIS-D-0203-D3, No load

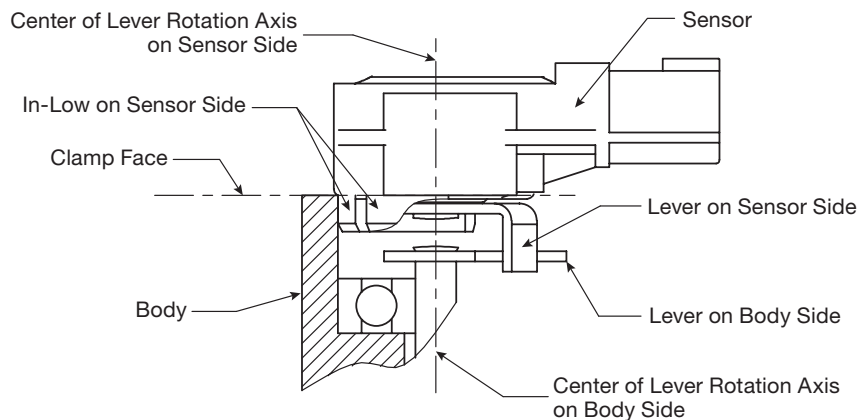
Drop Test Drop height: 1m, landing area: concrete floor, X, Y, Z directions, 3 times each (Do not allow lever to hit the concrete floor.)

Installation Notes

1. Use in-low lever position of sensor when installing to body. See Figure 1.
2. Use center of sensor lever rotation axis to align with lever axis on body. See Figure 1.

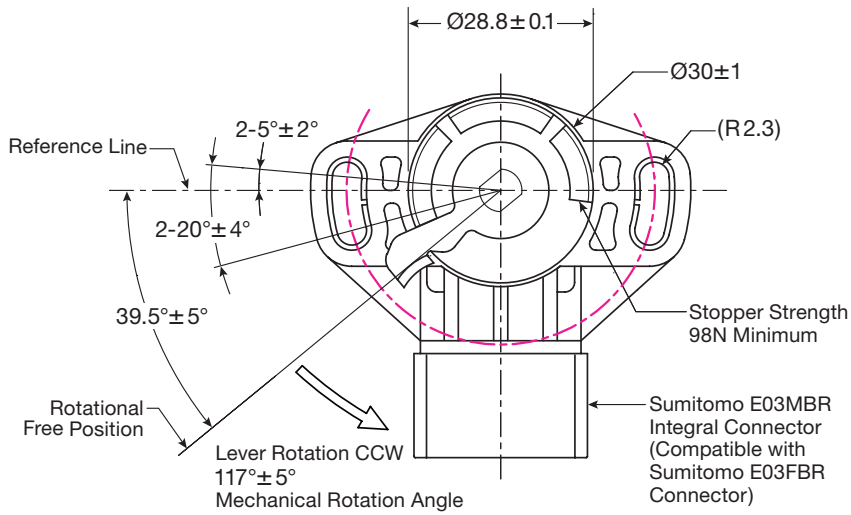
Installation Guidelines

Figure 1: Cutaway for Installation Conditions

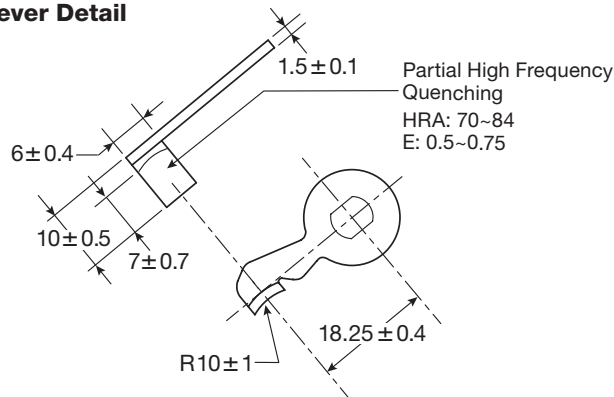


Dimensional Drawings of Front View A and Lever Detail

Unit: mm

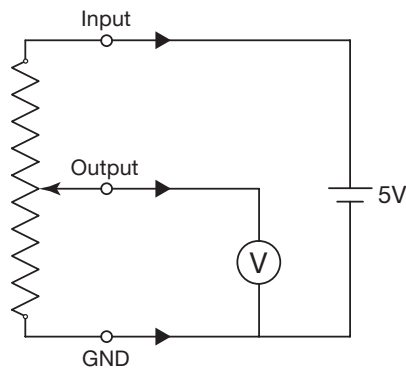


Lever Detail



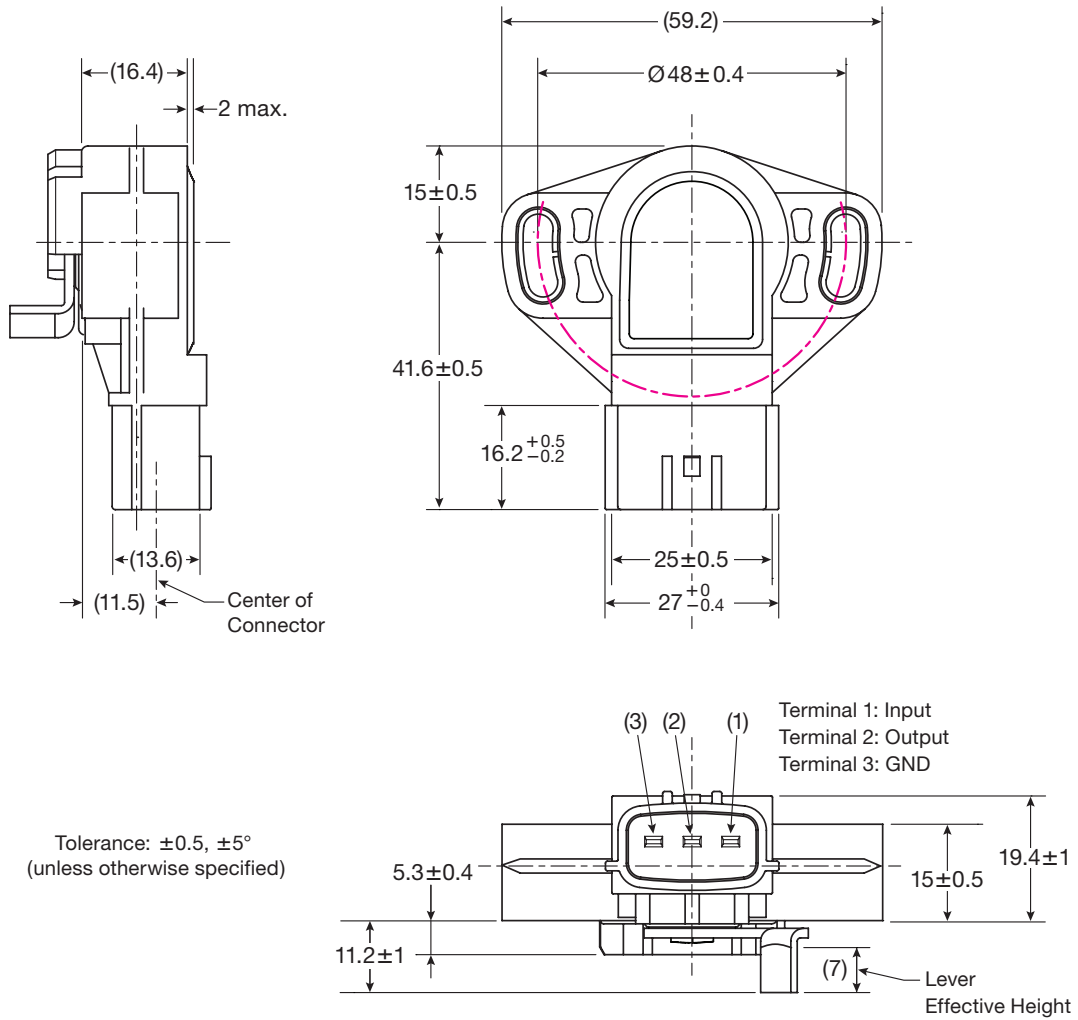
Electrical Schematic

Figure 2: Measurement Circuit



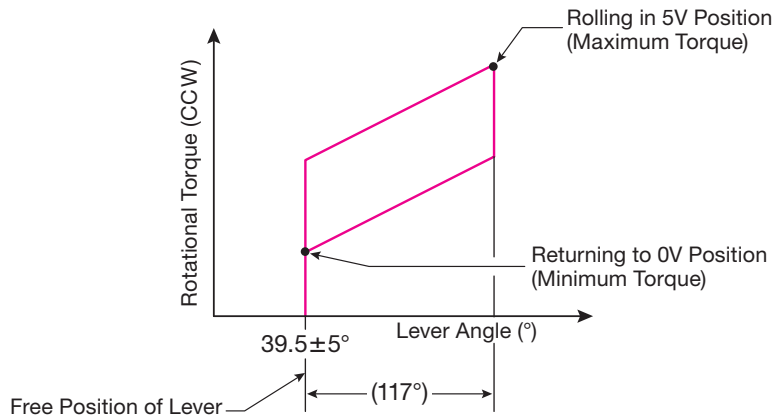
Dimensional Drawings of Back, Side, and Terminal End Views

Unit: mm



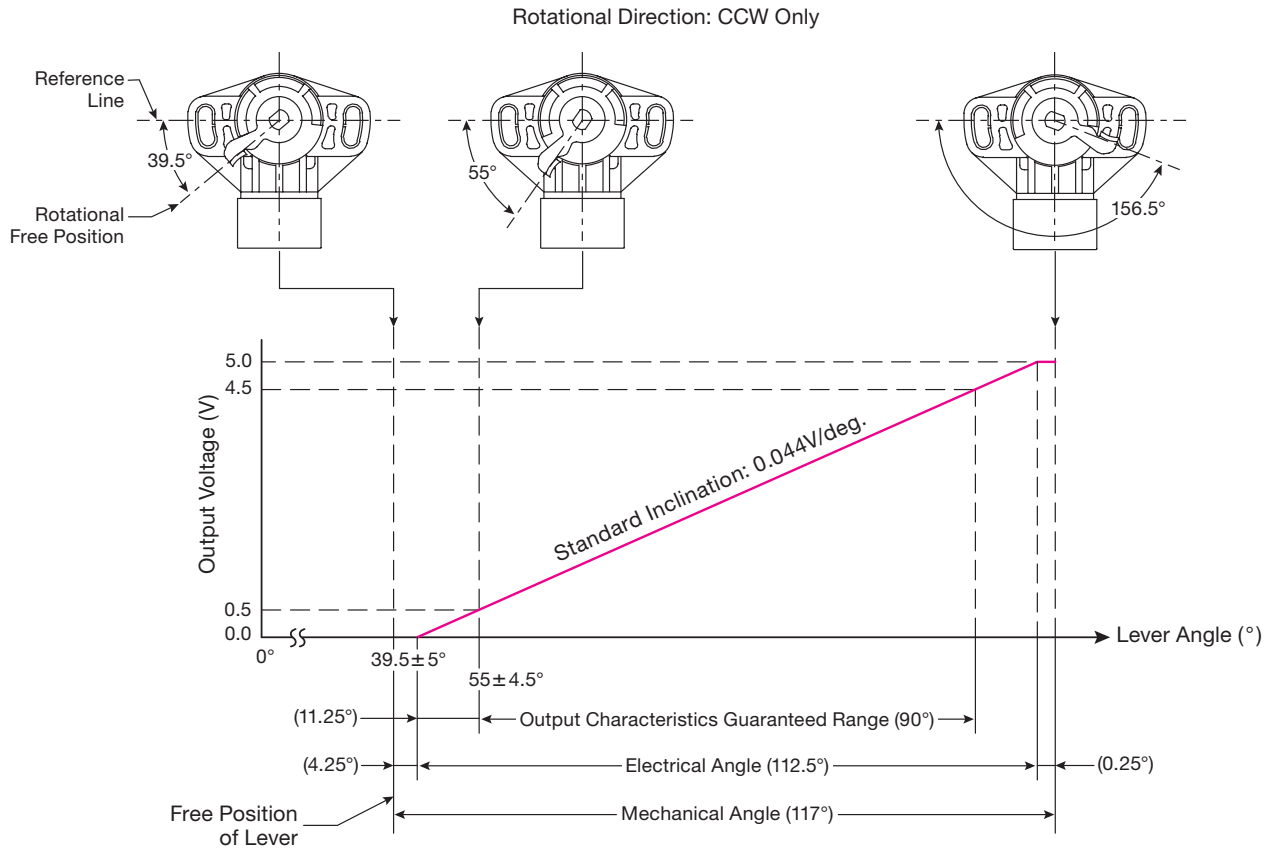
Rotational Torque

Figure 3: Operating Torque



Unit: mm

Figure 4: 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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