



# 640 Series Thru-Shaft Potentiometers

Potentiometers convert rotary motion into a change of resistance, supplying a smooth transition of voltage or current levels. The resulting voltage output may be used to control position transducers in a wide variety of potential applications.

The 640 Series Thru-Shaft Potentiometers are actuated by a customer-provided actuator shaft instead of by a shaft/bushing integral to the sensor. The low-profile housing allows use where space is at a premium.

All versions are sealed for dust. Splash-sealed or moisture-sealed options feature O-ring seals between the rotor and housing and cover; and epoxy sealing between the leadwires, the housing and the cover.

The 640 Series are available in resistances from 1 kOhm to 1 MOhm, inclusive. Tapers include linear and a 360° quadrature voltage to meet a wide range of application requirements.

A dual-contact version allows for two mechanically-tracking electrical actions, or true 360° quadrature voltage output.

## Key Features and Benefits

- **Thru-shaft configuration actuated by customer-provided actuator shaft:** Allows use in space-constrained applications where there may not be enough room for a shaft/bushing integral to the sensor
- **Reinforced, low-profile housing:** Allows use in rugged environments where space constraints may be present
- **Dust sealed with splash- or moisture-sealed options:** Designed to provide protection against dust or moisture ingress
- **Long rotational life of greater than one million cycles:** Promotes extended life in the application

## Potential Applications

### TRANSPORTATION

Position and movement detection in construction/agricultural vehicles/equipment:

- Vehicle manual controls (e.g., gear shifters, joysticks, and throttles)
- Pedals
- Steering equipment

### INDUSTRIAL

- Audio/visual equipment dial control
- Industrial vehicle attachment position (e. g. forklift truck forks)
- Machine control joystick position
- Robotic arm position
- Valve actuator position
- Material handling equipment position

# Thru-Shaft Potentiometers, 640 Series

Table 1. Electrical Specifications

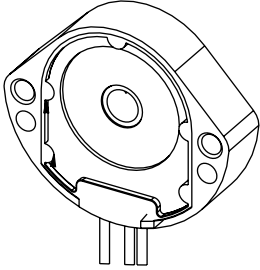
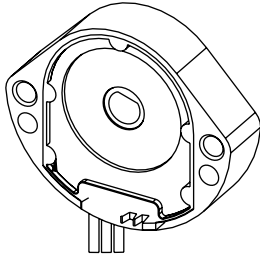
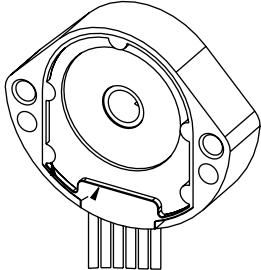
Characteristic	Parameter		
	640CS103A06NAAAY 640ES103A06NAAAY	640GS103B06NBAY 640GS103B06NBBY	640009M9405
	 Table 640-A	 Table 640-B	 Table 640-C
Supply voltage	350 Vdc, max.		
Dielectric withstanding voltage	500 Vac RMS		
Effective electrical travel (approx.)	80°, 170°, 350°, 155° (dual) 350° (See Order Guide Tables on pp. 5, 6.)		
Resistance	1 kOhm to 1 MOhm		
Resistance tolerance	±15, ±10, ±5, ±2 (laser trimmed) (See Order Guide Tables on pp. 5, 6.)		
Linearity (independent)	±5%		±1% (laser trimmed)
Power	0.5 W, max.		

Table 2. Mechanical Specifications

Characteristic	Parameter		
	640CS103A06NAAAY 640ES103A06NAAAY	640GS103B06NBAY 640GS103B06NBBY	640009M9405
Thru hole	6,53 mm [0.25 in] dia. with 2,67 mm x 2,29 mm [0.105 in x 0.090 in] deep slot	6,53 mm [0.25 in] dia. with 5,54 mm [0.218 in] D-flat	6,53 mm [0.25 in] dia. with 2,67 mm x 2,29 mm [0.105 in x 0.090 in] deep slot
Mechanical travel with stops	90°, 180°	360°/continuous	
Stop torque	5 in lb min.		
Rotational life	>1 million full cycles >5 million dither cycles (2 degree stroke, 60 strokes/s) result in <10% total resistance change		
Operating torque: splash sealed moisture sealed	42 mN m [6 oz-in] (See Order Guide Tables on pp. 5, 6.) 71 mN m [10 oz-in] (See Order Guide Tables on pp. 5, 6.)		
Leadwires	20 AWG, SAE J-1560 type TXL stranded (7 x 28 AWG), 152,4 mm [6 in] long		
Material: housing, cover, rotor leadwires	reinforced thermoplastic 20 AWG, SAE J-1560 type TXL stranded (7 x 28 AWG); header connection option available		

# Thru-Shaft Potentiometers

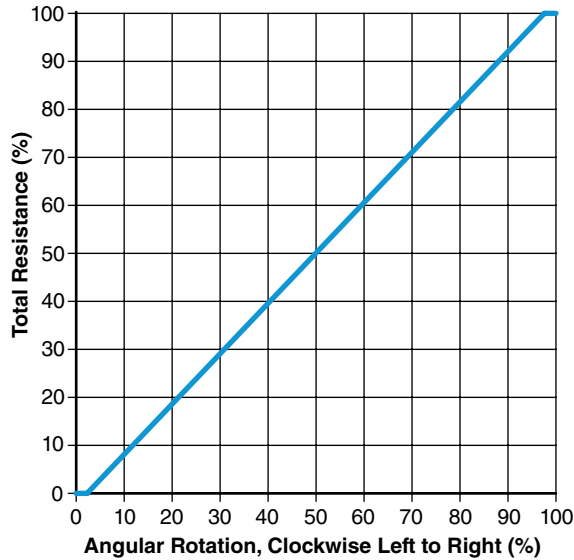
Table 3. Environmental Specifications

Characteristic	Parameter		
	640CS103A06NAAY 640ES103A06NAAY	640GS103B06NBAY 640GS103B06NBBY	640009M9405
Operating temperature	-40 °C to 120 °C [-40 °F to 248 °F]		
Storage temperature	-40 °C to 120 °C [-40 °F to 248 °F]		
Humidity	0% to 95% non-condensing		
Shock	50 g, 11 ms		
Vibration	15 g at 50 Hz to 1000 Hz		
Sealing: dust moisture or splash <sup>1</sup>	All units sealed against dust O-ring seals between rotor and housing and cover; epoxy seal between wires and housing and cover.		

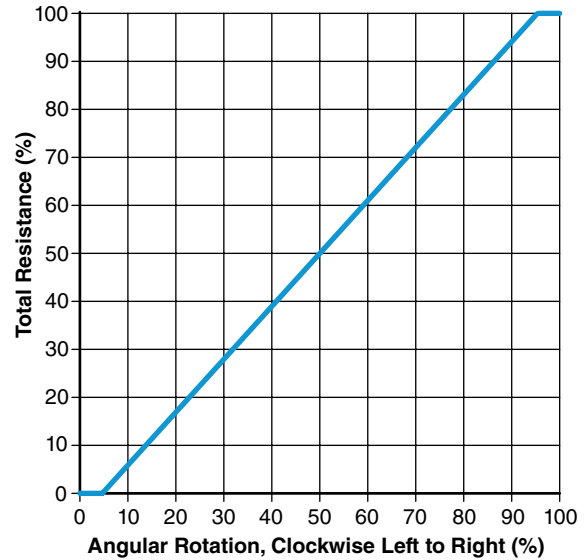
<sup>1</sup> See Order Guide tables for operating torque differences.

Figure 1. Electrical Taper Diagrams (For reference only.)

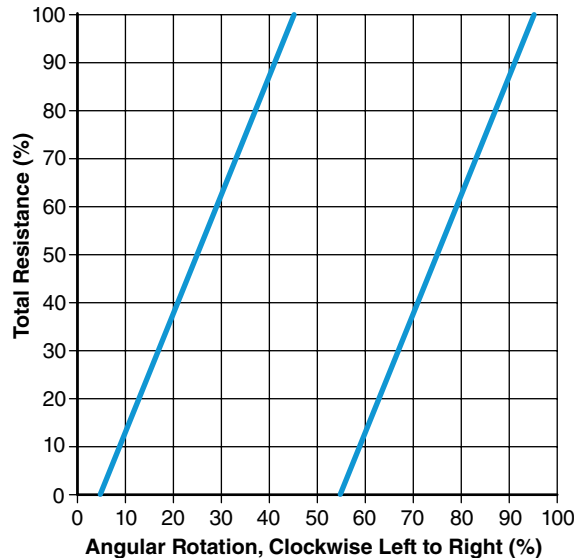
Linear: 2.5% to 97.5% (S-1)



Linear: 5% to 95% (S-2)



Linear: 360° Quadrature (Q)



# 640 Series

Figure 2. General Configuration Guide

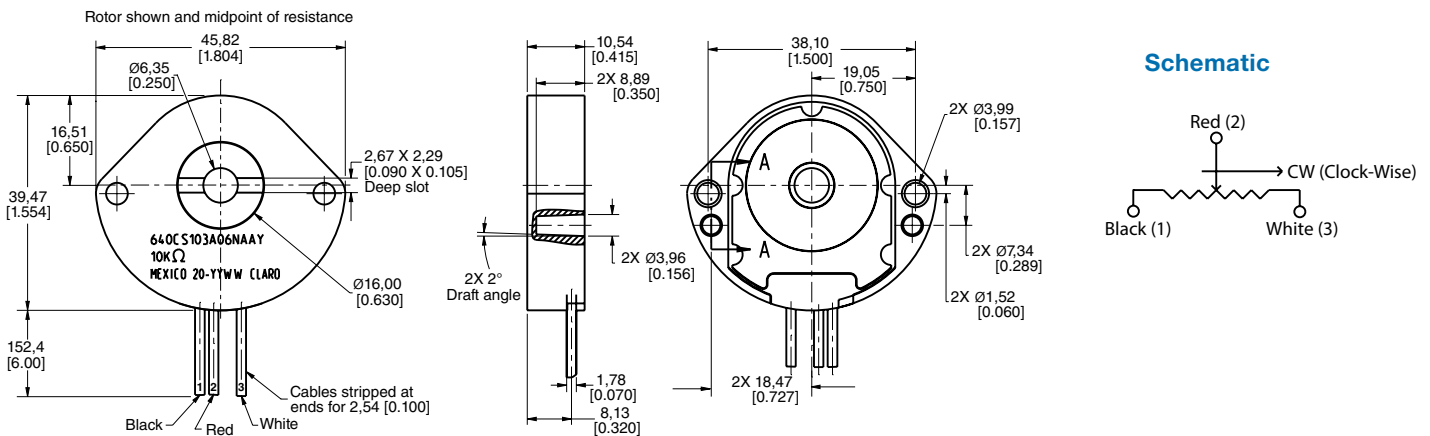
For example, **640CS103A06NAAY** defines a 640 Series Thru-Shaft Position Sensor, 180° mechanical angle, linear electrical taper, 1 kOhm resistance with a tolerance of ±15%, 152,4 mm [6 in] leadwire length, no cable connector, 6,35 mm [0.25 in] thru-hole, splash sealing/71 mN m [10 in-oz], approx. operating torque, complete catalog listing.

640 Series	Mechanical Angle	Electrical Taper	Resistance	Resistance Tolerance	Leadwire Length	Cable Connector	Thru-Hole	Sealing/ Operating Torque	Options
<b>640 Series</b> Thru-Shaft Position Sensor	<b>A</b> 330° <b>B</b> 312° <b>C</b> 180° <b>D</b> 106° <b>E</b> 90° <b>F</b> CW: 81°, 33° CCW: 48° <b>G</b> 360°	<b>S</b> Linear <b>Z</b> Log <b>RZ</b> Reverse log <b>Z</b> 360° quad	--- choose from 1 kOhm to 1 MOhm  (example: <b>103</b> = 10 <sup>3</sup> Ohm)	<b>A</b> ±15% <b>B</b> ±10% <b>C</b> ±5% <b>D</b> ±2%	<b>00</b> Right angle header  --- Length in inches  (example: <b>06</b> = 6 in (152,4 mm))	<b>Y</b> Four position header with polarizing plug, Berg 65039-033 or equivalent  <b>N</b> No connector	<b>A</b> 6,35 mm [0,25 in] thru-hole with 2,67 mm x 2,87 mm [0,105 in x 0,090 in] slot  <b>B</b> 6,35 mm [0,25 in] thru-hole with 5,54 mm [0,218 in] D-flat	<b>A</b> Splash/ 71 mN m [10 in-oz], approx.  <b>B</b> Moisture/ 42 mN m [6 in-oz], approx.	<b>Y</b> Indicates complete catalog listing  <b>X</b> Additional specifications required (contact Honeywell)

Table 640-A Order Guide

Catalog Listing	Electrical					Mechanical		Environmental	RoHS Compliant
	Resistance (Ohm)	Resistance Tolerance (±%)	End Resistance, max. (Ohm)	Effective Electrical Travel, approx. (±%)	Taper	Mechanical Travel (Degree)	Operating Torque (mN m [in-oz])	Sealing	
640CS103A06NAAY	10 k	15	4	170	S-1	180	71 mN m [10 in-oz]	dust and moisture	no
640ES103A06NAAY	10 k	15	4	180	S-2	90	71 mN m [10 in-oz]	dust and moisture	no

Dimensional Drawing (For reference only: mm [in].)



# Thru-Shaft Potentiometers

Table 640-B Order Guide

Catalog Listing	Electrical					Mechanical		Environmental	RoHS Compliant
	Resistance (Ohm)	Resistance Tolerance ( $\pm\%$ )	End Resistance, max. (Ohm)	Effective Electrical Travel, approx. ( $\pm\%$ )	Taper	Mechanical Travel (Degree)	Operating Torque (mN m [in-oz])	Sealing	
640GS103B06NBAY	10 k	10	4	170	S-1	360	71 mN m [10 in-oz]	dust and moisture	no
640GS103B06NBBY	10 k	10	4	180	S-1	360	71 mN m [10 in-oz]	dust and splash	no

Dimensional Drawing (For reference only: mm [in].)

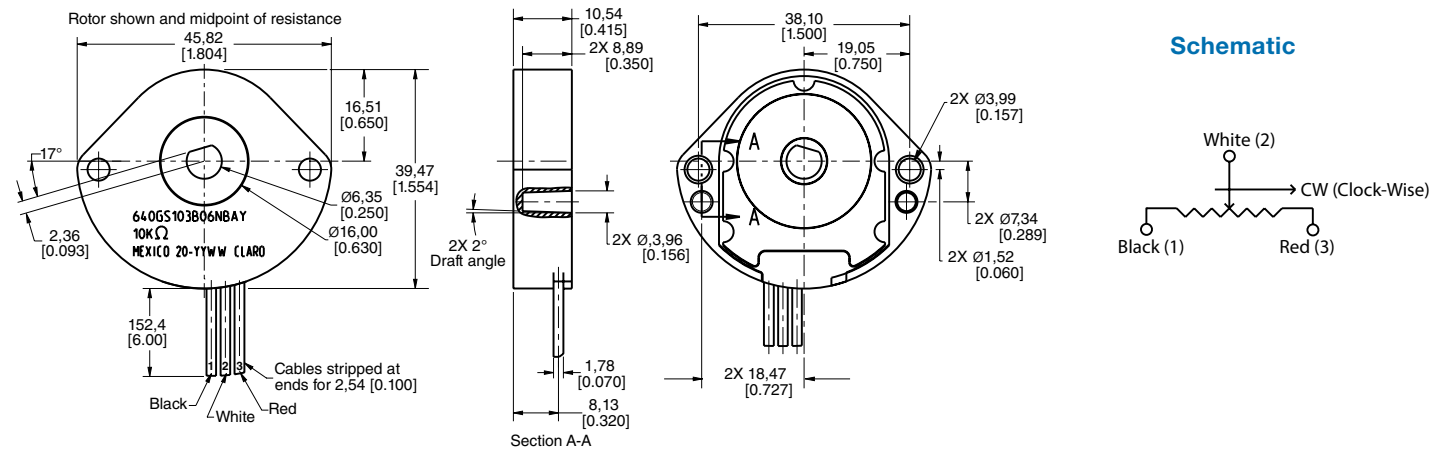
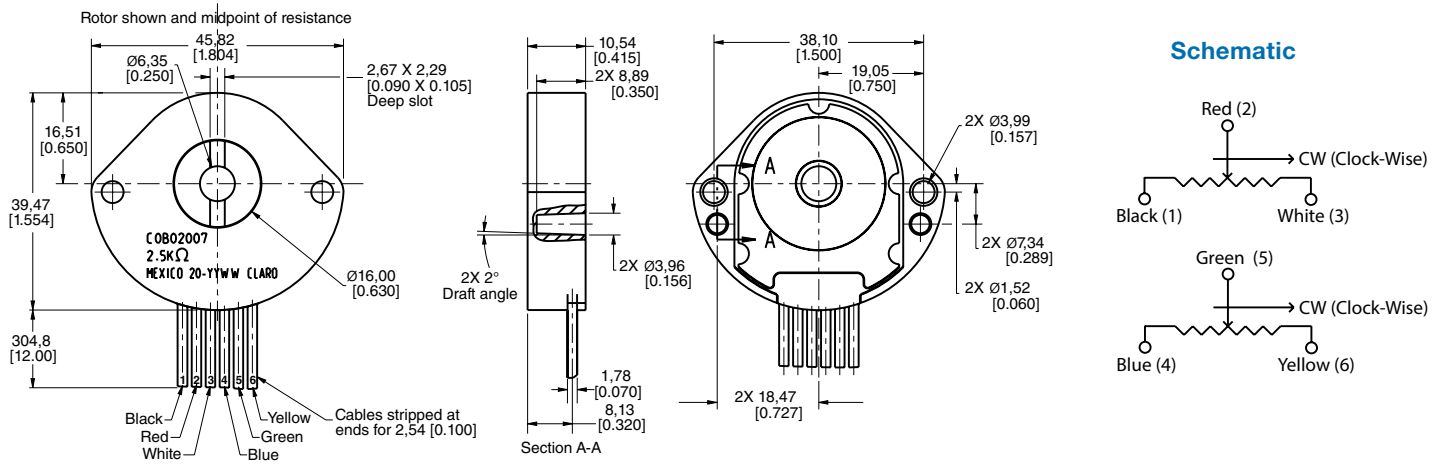


Table 640-C Order Guide

Catalog Listing	Electrical					Mechanical		Environmental	RoHS Compliant
	Resistance (Ohm)	Resistance Tolerance ( $\pm\%$ )	End Resistance, max. (Ohm)	Effective Electrical Travel, approx. ( $\pm\%$ )	Taper	Mechanical Travel (Degree)	Operating Torque (mN m [in-oz])	Sealing	
640009M9405	2.5 k	15	200	dual 155	Q	360	71 mN m [10 in-oz]	dust and moisture	no

Dimensional Drawing (For reference only: mm [in].)



## ADDITIONAL INFORMATION

The following associated literature is available at [sensing.honeywell.com](http://sensing.honeywell.com):

- Product Line Guide
- Product Range Guide
- Product Installation Instructions

### Find out more

Honeywell serves its customers through a worldwide network of sales offices, representatives and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact your local sales office.

To learn more about Honeywell's sensing and control products, call **+1-815-235-6847** or **1-800-537-6945**, visit **[sensing.honeywell.com](http://sensing.honeywell.com)**, or e-mail inquiries to **[info.sc@honeywell.com](mailto:info.sc@honeywell.com)**

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### **⚠ WARNING**

#### **PERSONAL INJURY**

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

**Failure to comply with these instructions could result in death or serious injury.**

### **⚠ WARNING**

#### **MISUSE OF DOCUMENTATION**

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

**Failure to comply with these instructions could result in death or serious injury.**

## WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgement or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items it finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

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