## E16 Features

- Miniature 16 mm kit version for mounting on a motor or other shaft
- Supports 1.5 mm (0.059 in.) and 2 mm (0.079 in.) shaft sizes
- For NEMA 6 and larger motors
- 10 Resolutions from 250 to 4,096 CPR (1,000 to 16,384 PPR)
- A/B/Index quadrature output
- Push-on hub for quick assembly
- Cable with polarized connector (sold separately)

## US Digital E16 Motor Encoder Description

The E16 micro motor encoder is only 16 mm in diameter and mounts directly to a motor or other rotating shaft. This incremental encoder uses a specially patterned optical disk on a precision-machined aluminum hub.

This disk, in combination with a custom detector, creates a system highly tolerant to mechanical misalignment. A push-on hub design and a robust, glass-filled polymer housing provide easy installation in space-limited applications.

The E16 optical rotary encoder offers 10 resolutions and compatibility with two shaft sizes (1.5 mm and 2.0 mm). It comes standard with a two-channel quadrature output with index.

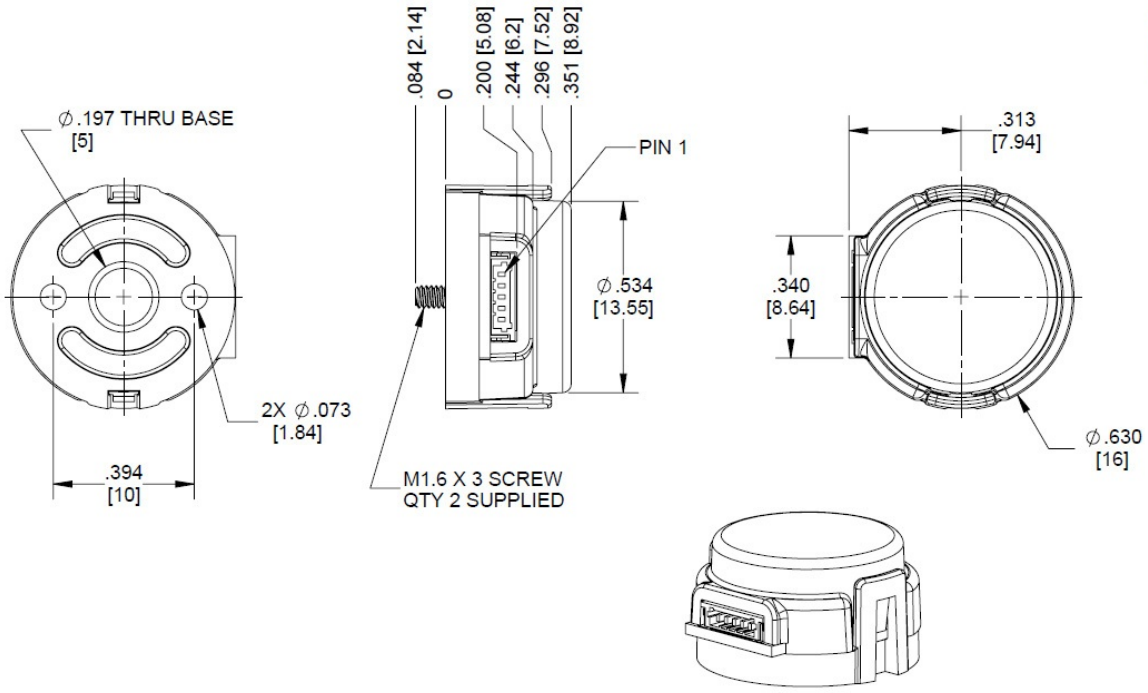
This optical rotary encoder is designed for use with a polarized connector. After making each selection in the Product Configurator, compatible cables will be displayed below and must be purchased separately.

**Please Note**: Due to the E16's design, it is recommended for use as a one-time installation.

## Mechanical Drawings

**E16** Micro Optical Kit Encoder

RELEASE DATE: 07/22/2020

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UNITS: INCHES [MM]
METRIC SHOWN FOR REFERENCE ONLY

# Specifications

## ENVIRONMENTAL

| PARAMETER | VALUE | UNITS |
|---|---|---|
| Operating Temperature | -40 to 100 | C |
| Electrostatic Discharge, IEC 61000-4-2 | ±12 | kV |
| Vibration (10Hz to 2kHz, sinusoidal) | 20 | G |
| Shock (6 milliseconds, half-sine | 75 | G |

## MECHANICAL

| PARAMETER | VALUE | UNITS |
|---|---|---|
| Max. Shaft Axial Play | ±0.010 | in. |
| Max. Shaft Runout | 0.002 T.I.R. | in. |
| Max. Acceleration | 250000 | rad/sec² |
| Maximum RPM, CPR = 250/500/1000/2000 | 48000 | RPM |
| Maximum RPM, CPR = 256/512/1024/2048 | 46875 | RPM |
| Maximum RPM, CPR = 4000 | 27750 | RPM |
| Maximum RPM, CPR = 4096 | 27099 | RPM |
| Codewheel Moment of Inertia | $2.8 \times 10^{-7}$ | oz-in-s² |
| Mounting Screw Size<br>Default (D-option base) | M1.6 x 3 | mm |
| Screw Bolt Circle Diameter | 10 ±0.13 | mm |
| Minimum Shaft Length (1) | 6 | mm |
| Maximum Shaft Length (1) | 7.75 | mm |
| Mounting Screw Torque | 1-2 | in-lbs |
| Technical Bulletin TB1001 - Shaft and Bore Tolerances | | Download *(https://www.usdigital.com/media/yyvb4qsy/tb_1001.pdf)* |

(1) Including axial play.

## ELECTRICAL

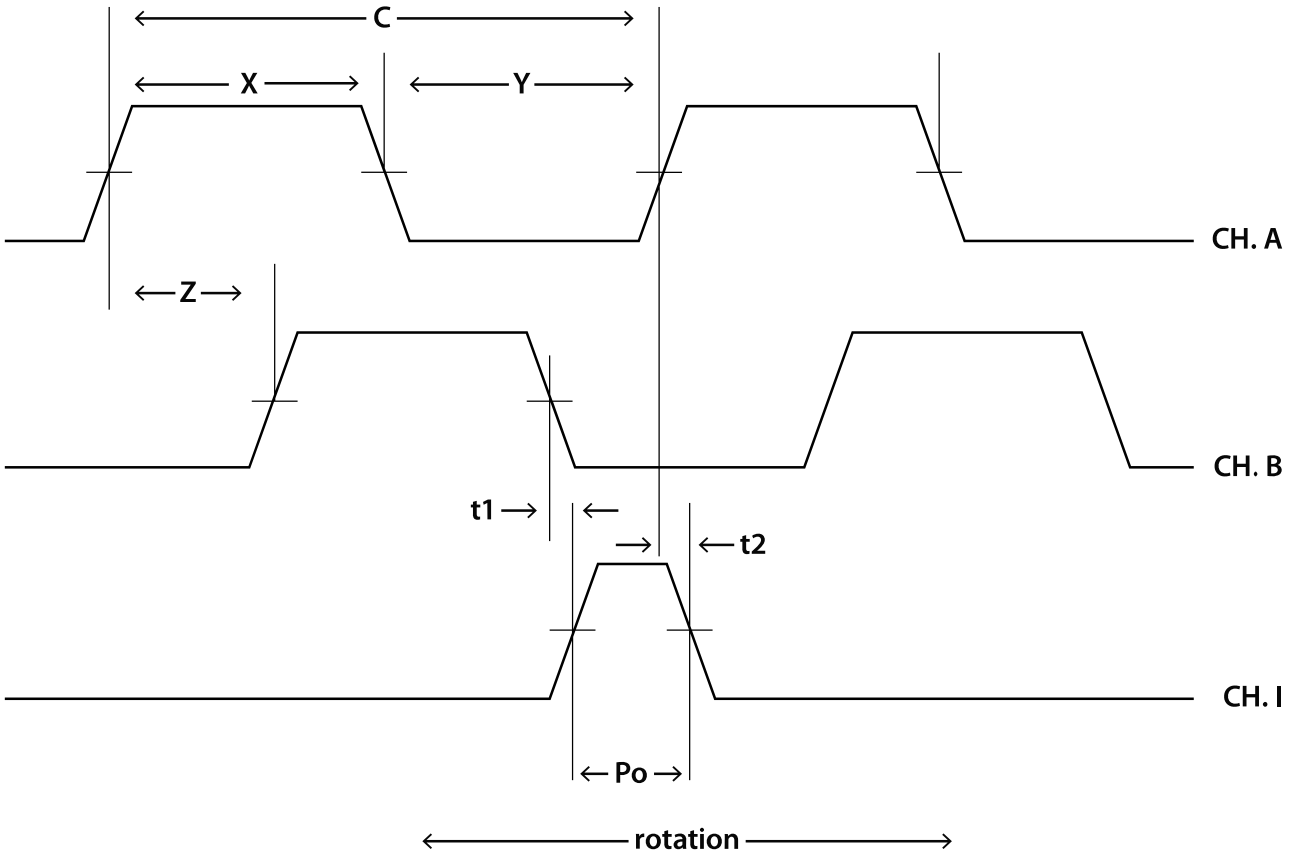
| PARAMETER | MIN. | TYP. | MAX. | UNITS | NOTES |
|---|---|---|---|---|---|
| Supply Voltage | 4.5 | 5.0 | 5.5 | V | |
| Supply Current | | 18 | 26 | mA | no load |
| Low-level Output | | | 0.4 | V | $I_{OL}$= 4 mA, Vcc = 5V |
| | | 0.1 | | V | no load |
| High-level Output | 4.7 | | | V | $I_{OH}$= 4 mA, Vcc = 5V |
| | | 4.9 | | V | no load |
| Output Rise Time | | 80 | 135 | ns | no load |
| Output Fall Time | | 80 | 135 | ns | no load |
| Maximum Output Frequency<br>250/256 CPR<br>500/512 CPR<br>1,000/1,024 CPR<br>2,000/2,048 CPR<br>4,000/4,096 CPR | <br>0.2<br>0.4<br>0.8<br>1.6<br>1.85 | | | <br>MHz<br>MHz<br>MHz<br>MHz<br>MHz | |

## PHASE RELATIONSHIP

- Specifications apply over the entire operating temperature range.
- Values are for the worst error over full rotation.
- Refer to the timing diagram below.

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNITS |
|---|---|---|---|---|---|
| Symmetry | X, Y | 150 | 180 | 210 | °e *(https://www.usdigital.com/support/resources/glossary/#electrical-degree-e)* |
| Quadrature | Z | 60 | 90 | 120 | °e *(https://www.usdigital.com/support/resources/glossary/#electrical-degree-e)* |
| Index Pulse Width | Po | 60 | 90 | 120 | °e *(https://www.usdigital.com/support/resources/glossary/#electrical-degree-e)* |
| Ch. I Rise After Ch. B or Ch. A Fall | t1 | | 10 | | ns |
| Ch. I Fall After Ch. B or Ch. A Rise | t2 | | 10 | | ns |

## TIMING DIAGRAM




A leads B for clockwise shaft rotation, B leads A for counter clockwise shaft rotation viewed from the cover side of the encoder.

## PIN-OUT

| PIN | DESCRIPTION |
|---|---|
| 1 | Ground |
| 2 | Index |
| 3 | A channel |
| 4 | +5VDC power |
| 5 | B channel |

## ACCESSORIES

### 1. CENTERING TOOL*

**Part #: CTOOL-E16-(Shaft Diameter)**

**Description:** This reusable tool is used to accurately center the **E16** base on the shaft.

### 2. SPACER TOOL*

**Part #: SPACER-E16**

**Description:** This reusable tool is used to properly space the codewheel from the encoder.

*Both the CTOOL and SPACER-E16 tools are included with all packaging options.

### 3. SCREWS

**Part #: SCREW-M16-3MM-PH**

**Description:** Pan Head, Philips M1.6-0.35, length 3mm.
**Use:** Base Mounting
**Quantity Required:** 2
Screws are included

## Notes

- Cables and connectors are not included and must be ordered separately.
- US Digital® warrants its products against defects in materials and workmanship for two years. See complete warranty *(https://www.usdigital.com/company/warranty)* for details.

## Configuration Options

| E16 | - | CPR (Cycles Per Revolution) | - | Bore Size | - | Output | - | Cover | - | Base | - | Packaging |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 250 | | 059 (*1.5mm*) | | S (*Single-Ended*) | | D (*Default*) | | D (*Default*) | | Bulk (B) - Includes one centering and spacer tool per order, plus an extra set per 100 encoders. |
| | | 256 | | 079 (*2.0mm*) | | | | | | | | Individual (1) - Includes one centering and spacer tool per order, plus an extra set per 100 encoders. |
| | | 500 | | | | | | | | | | Individual (2) - Includes one centering and spacer tool per encoder. |
| | | 512 | | | | | | | | | | |
| | | 1000 | | | | | | | | | | |
| | | 1024 | | | | | | | | | | |
| | | 2000 | | | | | | | | | | |
| | | 2048 | | | | | | | | | | |
| | | 4000 | | | | | | | | | | |
| | | 4096 | | | | | | | | | | |

**PLEASE NOTE: This chart is for informational use only.** Certain product configuration combinations are not available. Visit the E16 product page *(https://www.usdigital.com/products/E16)* for pricing and additional information.

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