



## E4T Features

- Kit version for mounting on a motor or other shaft
- Supports 11 shaft sizes (2 to 6 mm and 1/8 to 1/4 in.)
- For NEMA 8 to 17 and larger motors
- 19 Resolutions from 100 to 1,000 CPR (400 to 4,000 PPR)
- Single-ended or Optional Differential output
- Choice of 2 base styles and cover options
- Push-on hub for quick assembly
- High retention connector/cable (sold separately)



## US Digital E4T Motor Encoder Description

The US Digital E4T miniature motor encoder 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 E4T mini motor encoder offers 19 available resolutions and compatibility with 11 shaft sizes, 2 base configurations, and 2 cover styles, enabling it to fit a wide range of applications. Users can choose between single-ended or differential outputs.

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

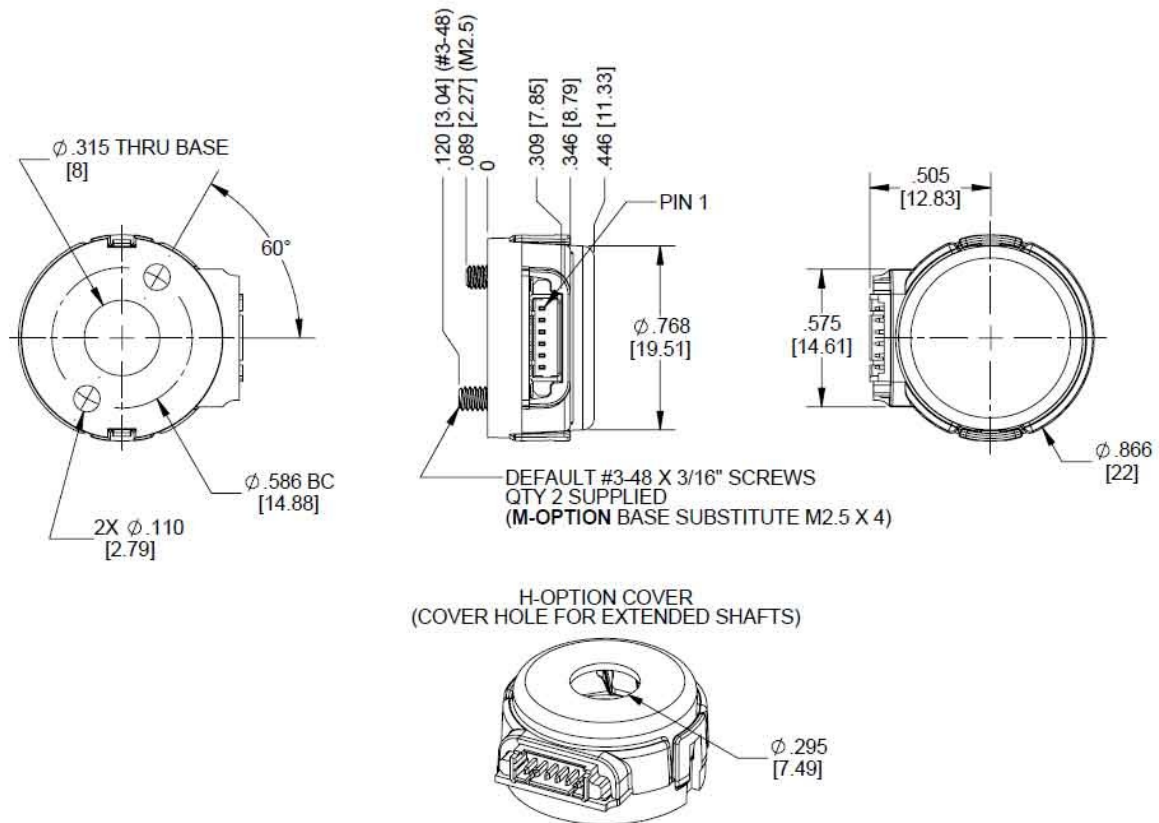
**Please Note:** Due to the E4T's push-on hub design, it is recommended for use as a one-time installation.

## Mechanical Drawings



## E4T Differential Optical Kit Encoder

RELEASE DATE: 07/30/2020



**US DIGITAL** 1400 NE 136th Avenue  
Vancouver, Washington 98684, USA

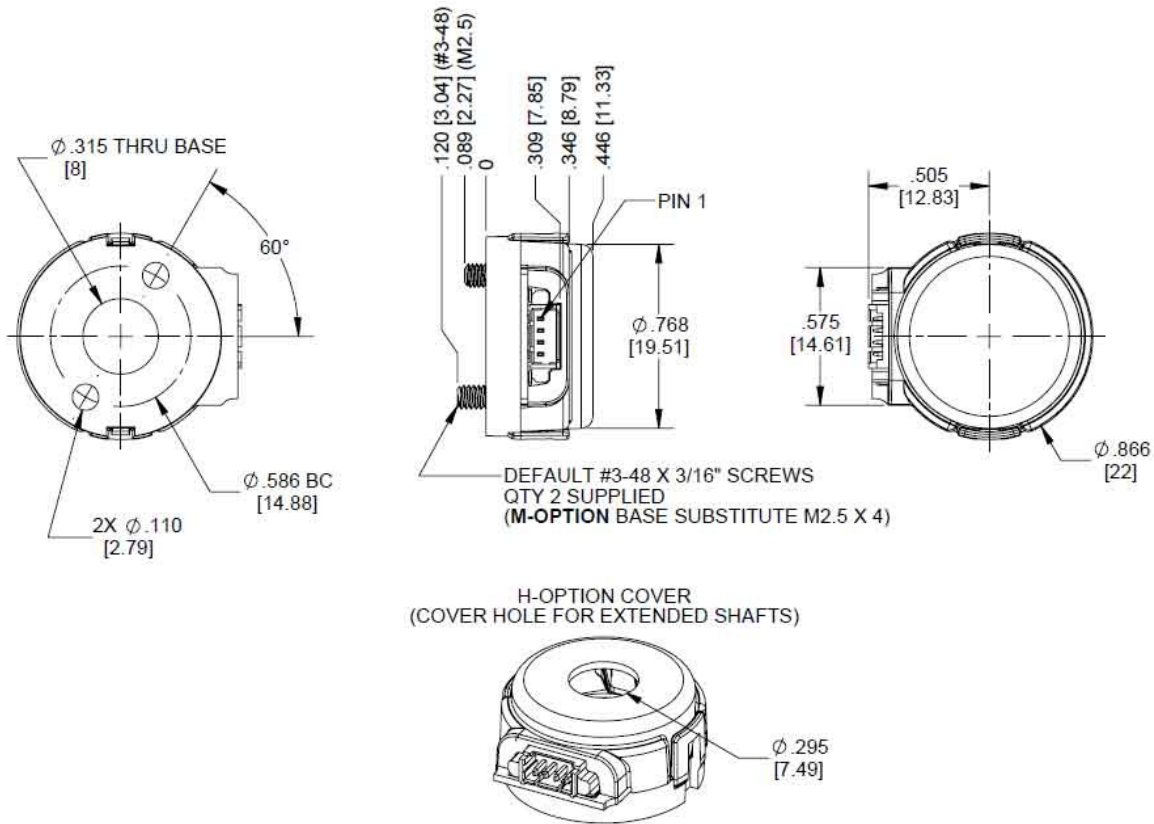
info@usdigital.com  
www.usdigital.com

Local: 360.260.2468  
Toll-free: 800.736.0194

UNITS: INCHES [MM]  
METRIC SHOWN FOR REFERENCE ONLY

## E4T Single-Ended Miniature Optical Kit Encoder

RELEASE DATE: 07/30/2020



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Vancouver, Washington 98684, USA

info@usdigital.com  
www.usdigital.com

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## Specifications

### ENVIRONMENTAL

| PARAMETER                              | VALUE      | UNITS |
|--|------------|-------|
| Operating Temperature                  | -20 to 100 | C     |
| Electrostatic Discharge, IEC 61000-4-2 |            |       |
| Single-ended (-S option)               | ± 12       | kV    |
| Differential (-D option)               | ± 7        |       |
| Vibration (10Hz to 2kHz, sinusoidal)   | 20         | G     |
| Shock (6 milliseconds, half-sine)      | 75         | G     |



## MECHANICAL

| PARAMETER  | VALUE   | UNITS  |
|--|---|--|
| Max. Shaft Axial Play  | ± .010  | in.  |
| Max. Shaft Runout (TIR)  | .002  | in.  |
| Max. Acceleration  | 250,000   | rad/sec <sup>2</sup>   |
| Maximum RPM (1)  | minimum value of ((6 x 10 <sup>6</sup> )/CPR) and (60000) | RPM  |
| Maximum A/B Frequency<br>e.x. CPR = 200,<br>Max. RPM = 30000             | 100   | kHz  |
| Max. Codewheel Moment of Inertia   | 5.1 x 10 <sup>-7</sup>                                    | oz-in-s <sup>2</sup>   |
| Mounting Screw Size<br>Default (D-option base)<br>Metric (M-option base) | #3-48 x 3/16"<br>M2.5, length 4mm                         |  |
| Screw Bolt Circle Diameter   | .586 ±.005  | in.  |
| Minimum Shaft Length (2)   | .275  | in.  |
| Maximum Shaft Length (2)   | .395 (D option) /<br>no limit (H option)                  | in.  |
| Mounting Screw Torque  | 2-3   | in-lbs   |
| Technical Bulletin TB1001 - Shaft and Bore Tolerances                    |   | Download ( <a href="https://www.usdigital.com/support/resources/reference/technical-docs/technical-bulletins/shaft-and-bore-tolerances-tb1001/">https://www.usdigital.com/support/resources/reference/technical-docs/technical-bulletins/shaft-and-bore-tolerances-tb1001/</a> ) |

(1) 60000 RPM is the maximum rpm due to mechanical considerations. The maximum RPM due to the module's maximum frequency response is dependent upon the module's resolution (CPR).

(2) Including axial play.

## SINGLE-ENDED ELECTRICAL

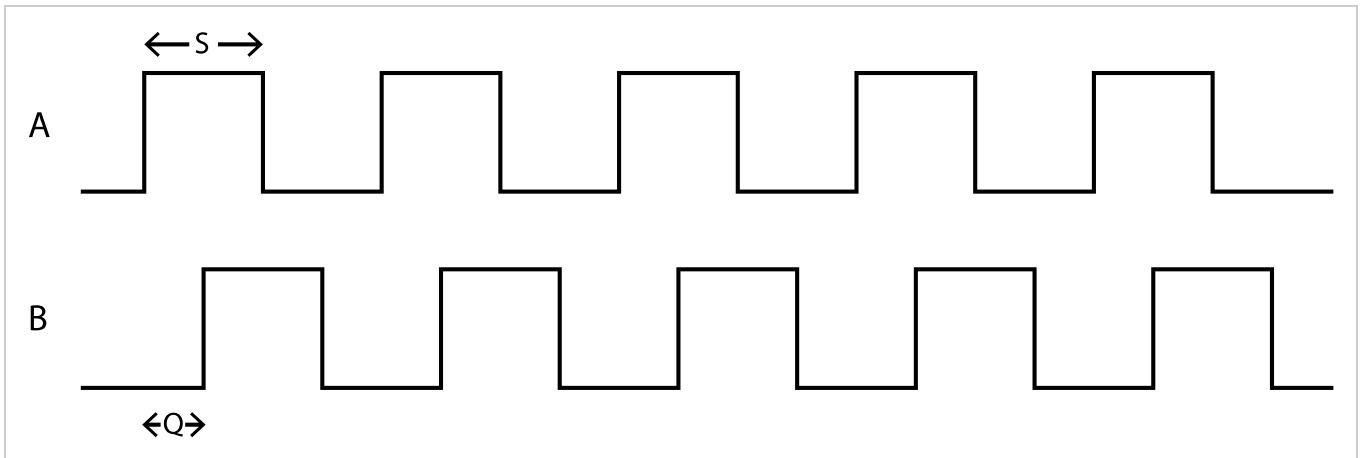
| SPECIFICATIONS    | MIN. | TYP.  | MAX. | UNITS | NOTES                              |
|-------------------|------|-------|------|-------|------------------------------------|
| Supply Voltage    | 4.5  | 5.0   | 5.5  | V     |                                    |
| Supply Current    |      | 25    | 30   | mA    | CPR ≤ 500, no load                 |
|                   |      | 34    | 42   | mA    | CPR > 500, no load                 |
| Low-level Output  |      |       | 0.4  | V     | CPR ≤ 500, I <sub>OL</sub> = 8 mA  |
|                   |      |       |      |       | CPR > 500, I <sub>OL</sub> = 5 mA  |
|                   |      | 0.035 |      | V     | no load                            |
| High-level Output | 2.4  |       |      | V     | CPR ≤ 500, I <sub>OH</sub> = -8 mA |
|                   |      |       |      |       | CPR > 500, I <sub>OH</sub> = -5 mA |
|                   |      | 4.0   |      | V     | no load                            |
| Output Rise Time  |      | 100   |      | ns    | no load                            |
| Output Fall Time  |      | 50    |      | ns    | no load                            |

## DIFFERENTIAL ELECTRICAL

| SPECIFICATIONS                     | MIN. | TYP. | MAX. | UNITS | NOTES                             |
|------------------------------------|------|------|------|-------|-----------------------------------|
| Supply Voltage                     | 4.5  | 5.0  | 5.5  | V     |                                   |
| Supply Current                     |      | 27   | 32   | mA    | CPR ≤ 500, no load                |
|                                    |      | 36   | 44   | mA    | CPR > 500, no load                |
| Single-Ended Output Voltage High   | 4.75 | 5.0  |      | V     | Min. @ 25mA load, Typ. @ no load  |
| Single-Ended Output Voltage Low    |      | 0.25 | 0.60 | V     | Typ. @ no load, Max. @ 4.5mA load |
| Differential Output Voltage        | 3.0  | 3.8  |      | V     | RL = 100 ohm                      |
| Differential Output Rise/Fall Time |      |      | 20   | ns    |                                   |



## PHASE RELATIONSHIP



| PARAMETER           | MIN. | TYP. | MAX. | UNITS              |
|---------------------|------|------|------|--------------------|
| Symmetry, S         | 105  | 180  | 255  | electrical degrees |
| Quadrature Delay, Q | 30   | 90   | 150  | electrical degrees |

- (1) A leads B for clockwise shaft rotation, B leads A for counter clockwise shaft rotation viewed from the cover side of the encoder.
- (2) Typical values represent the encoder performance at typical mounting alignment, whereas the maximum values represent the encoder performance across the range of recommended mounting tolerance.

## PIN-OUT

| 4-PIN SINGLE-ENDED (1) |             | 6-PIN DIFFERENTIAL (2) |             |
|------------------------|-------------|------------------------|-------------|
| Pin                    | Description | Pin                    | Description |
| 1                      | +5VDC power | 1                      | Ground      |
| 2                      | A channel   | 2                      | A channel   |
| 3                      | Ground      | 3                      | A- channel  |
| 4                      | B channel   | 4                      | +5VDC power |
|                        |             | 5                      | B channel   |
|                        |             | 6                      | B- channel  |

- (1) 4-pin single-ended mating connector is CON-MIC4 (<https://www.usdigital.com/products/accessories/connectors/con-mic4/>)
- (2) 6-pin differential mating connector is CON-MIC6 (<https://www.usdigital.com/products/accessories/connectors/con-mic6/>)



## OPTIONS

### H-OPTION (HOLE IN COVER)

The **H**-option adds a 0.295" diameter hole in the cover for the shaft to pass through.

### M-OPTION (METRIC MOUNTING SCREWS)

Provides alternate metric M2.5, length 4mm screws. When **M**-option is NOT specified the default is #3-48 x 3/16" screws.

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## ACCESSORIES

### 1. Centering Tool\*

**Part #: MCTOOL - (Shaft Diameter)**

**Description:** This reusable tool is used to accurately center the **E4T** base on the shaft.

### 2. Spacer Tool\*

**Part #: SPACER-E4T**

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

*\*Both the MCTOOL and SPACER-E4T tools are included with all packaging options.*

### 3. Screws

**Part #: SCREW-348-188-PH**

Description: Pan Head, Philips #3-48 UNC x 3/16"

Use: Base Mounting

Quantity Required: 2

Screws are included with default base option

**Part #: SCREW-M25-4MM-BH**

Description: Button Head Cap, M2.5 x 0.45 x 4mm

Use: Base Mounting

Quantity Required: 2

Screws are included with metric base option

## 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

| E4T | CPR (Cycles Per Revolution) | Bore Size   | Output           | Cover            | Base              | Packaging  |
|-----|-----------------------------|-------------|------------------|------------------|-------------------|--|
|     |                             | 079 (2.0mm) | S (Single-Ended) | D (Default)      | D (Default)       | Bulk (B) - Includes one centering and spacer tool per order, plus an extra set per 100 encoders.       |
|     | 100                         | 091 (2.3mm) | D (Differential) | H (Through-Hole) | M (Metric Screws) | Individual (1) - Includes one centering and spacer tool per order, plus an extra set per 100 encoders. |
|     | 108                         | 098 (2.5mm) |                  |                  |                   | Individual (2) - Includes one centering and spacer tool per order.                                     |
|     | 120                         | 118 (3.0mm) |                  |                  |                   |  |
|     | 125                         | 125 (1/8")  |                  |                  |                   |  |
|     | 128                         | 156 (5/32") |                  |                  |                   |  |
|     | 144                         | 157 (4.0mm) |                  |                  |                   |  |
|     | 200                         | 188 (3/16") |                  |                  |                   |  |
|     | 248                         | 197 (5.0mm) |                  |                  |                   |  |
|     | 250                         | 236 (6.0mm) |                  |                  |                   |  |
|     | 256                         | 250 (1/4")  |                  |                  |                   |  |
|     | 296                         |             |                  |                  |                   |  |
|     | 300                         |             |                  |                  |                   |  |
|     | 360                         |             |                  |                  |                   |  |
|     | 400                         |             |                  |                  |                   |  |
|     | 500                         |             |                  |                  |                   |  |
|     | 512                         |             |                  |                  |                   |  |
|     | 720                         |             |                  |                  |                   |  |
|     | 800                         |             |                  |                  |                   |  |
|     | 1000                        |             |                  |                  |                   |  |

**PLEASE NOTE:** This chart is for informational use only. Certain product configuration combinations are not available. Visit the E4T product page (<https://www.usdigital.com/products/E4T>) for pricing and additional information.