



## E4T Features

- Push-on hub - spring loaded collet design
- Minimum shaft length of .275 in.
- Fits shaft diameters of .079 in. to .250 in.
- 100 to 1,000 cycles per revolution (CPR)
- 400 to 4,000 pulses per revolution (PPR)
- Single +5V supply



## E4T Product Description

The E4T miniature transmissive optical encoder is designed to provide digital quadrature encoder feedback for high volume, limited space applications. The E4T is designed to be a drop-in replacement for the E4P and offers higher maximum speed and increased output drive. The E4T utilizes an innovative, push-on encoder disk that accepts shaft diameters of 2.0mm to .250 in.



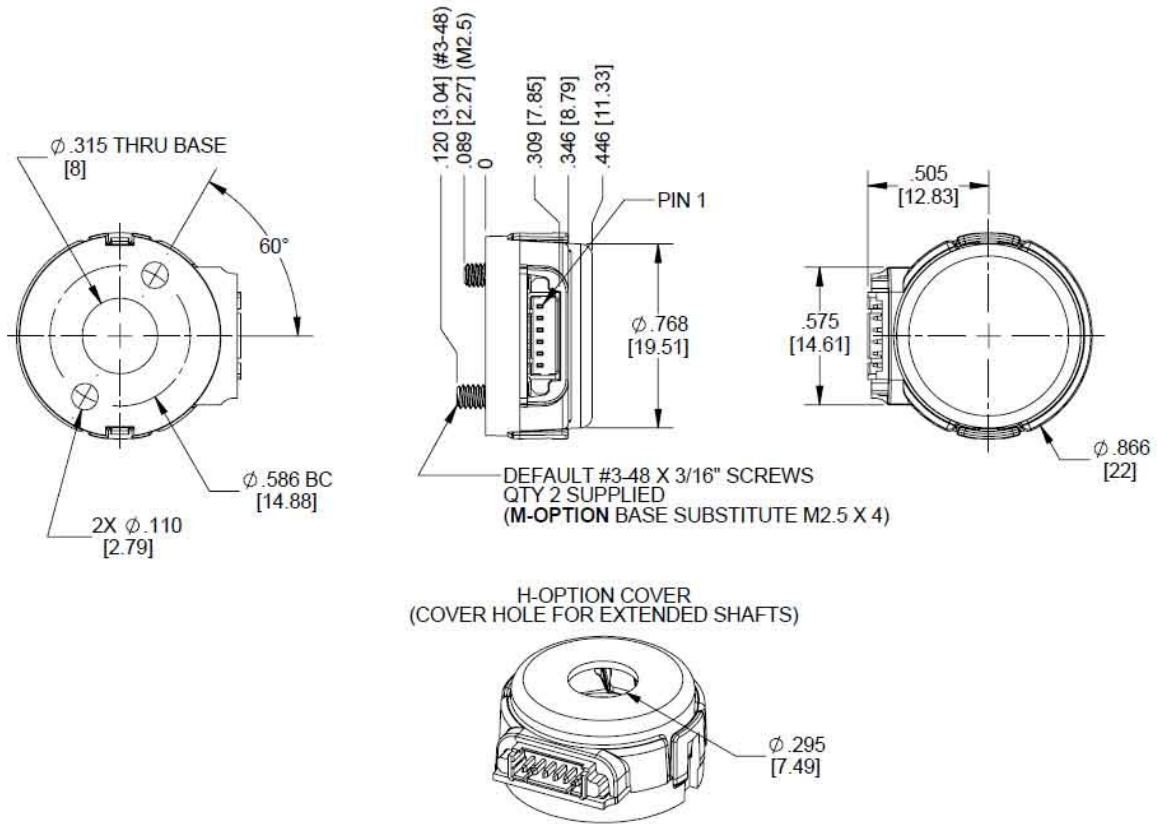
The single-ended output version is connected using a 4-conductor, high retention, polarized, 1.25mm pitch connector. The differential output version uses a similar 6-pin connector. Mating cables and connectors (see the Cables/Connectors web page) are not included and are available separately.

**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

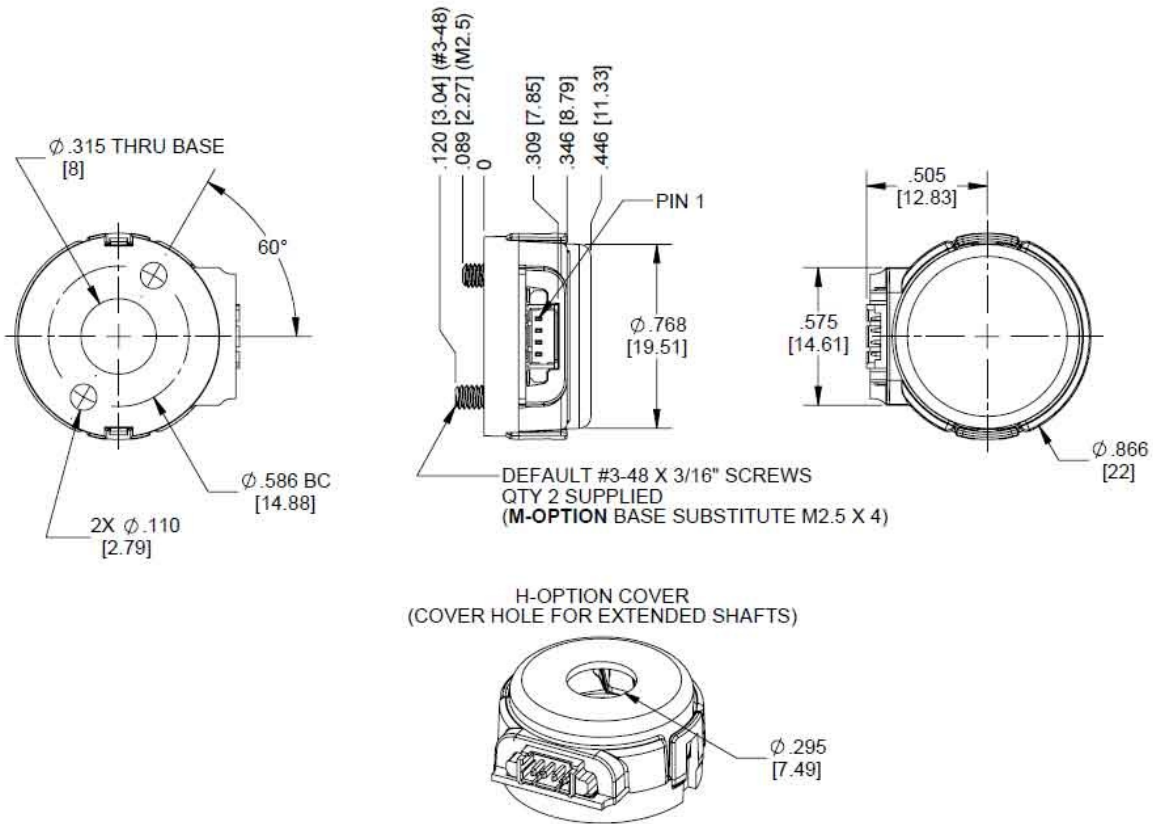
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UNITS: INCHES [MM]  
METRIC SHOWN FOR REFERENCE ONLY

## E4T Single-Ended Miniature Optical Kit Encoder

RELEASE DATE: 07/30/2020



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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 e.x. CPR = 200, 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 Default (D-option base) Metric (M-option base)	#3-48 x 3/16" M2.5, length 4mm	
Screw Bolt Circle Diameter	.586 ±.005	in.
Minimum Shaft Length (2)	.275	in.
Maximum Shaft Length (2)	.395 (D option) / 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.



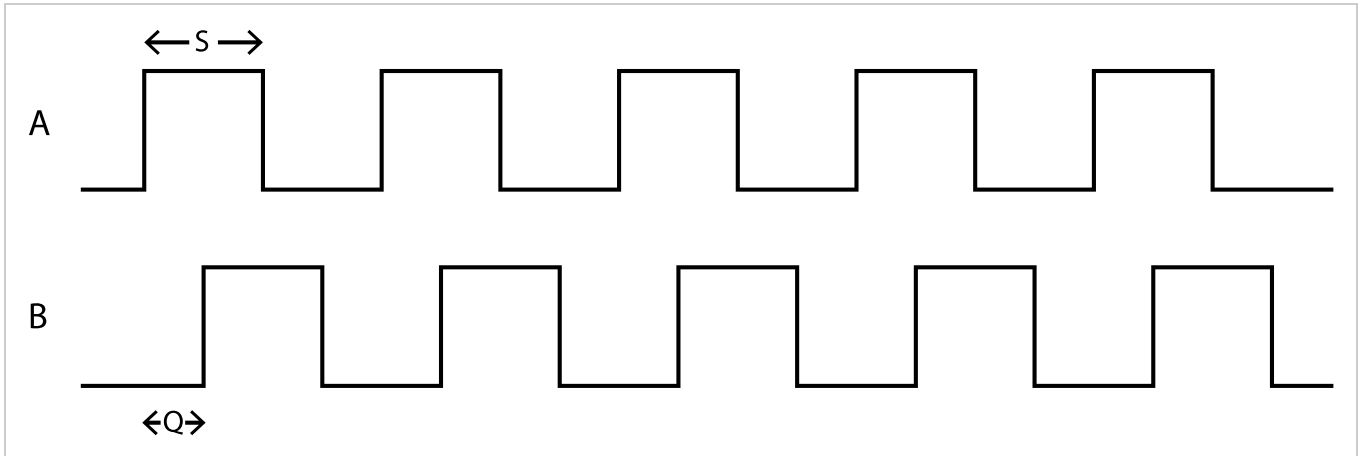
## SINGLE-ENDED ELECTRICAL

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
	100	079 (2.0mm)	S (Single-Ended)	D (Default)	D (Default)	B (Encoders packaged in bulk. Every order includes one centering tool and spacer tool. An additional set of tools is included for each 100 encoders ordered.)
	108	091 (2.3mm)	D (Differential)	H (Through-Hole)	M (Metric Screws)	
	120	098 (2.5mm)				
	125	118 (3.0mm)				
	128	125 (1/8")				
	144	156 (5/32")				
	200	157 (4.0mm)				
	248	188 (3/16")				
	250	197 (5.0mm)				
	256	236 (6.0mm)				
	296	250 (1/4")				1 (Encoders packaged individually. Every order includes one centering tool and spacer tool. An additional set of tools is included for each 100 encoders ordered.)
	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.