E4 Features

- Minimum shaft length of .285 in.
- Fits shaft diameters of .059 in. to .157 in. (1.5mm to 4mm)
- High retention snap-in polarized connector
- Accepts .020 in. (.5mm) axial shaft play
- Off-axis mounting tolerance of .010 in.
- Tracks from 0 to 60,000 cycles/sec
- 100 to 360 cycles per revolution (CPR)
- 400 to 1,440 pulses per revolution (PPR)
- 2 channel quadrature TTL squarewave outputs
- -20 to +100 C operating temperature

The E4 is no longer available for purchase.

The E4 is no longer available for purchase, and has been replaced by our recently released E4T *(/products/encoders/incremental/kit/e4t/)*. The E4T is a redesigned, enhanced version of the E4, and is already available for purchase.

E4 Product Description

The E4 miniature encoder is designed to provide digital quadrature encoder feedback for applications with limited space constraints. The E4 utilizes a traditional set-screw encoder disk which accommodates shaft sizes from 1.5mm to 4mm in diameter.

For high quantity OEM applications, US Digital offers a cost-saving OEM packaging option. When a set screw is not required, the E4P is the ideal choice for high-quality OEM applications (see the E4P *(https://www.usdigital.com/products/discontinued-products/discontinued-encoders/e4p/)* page).

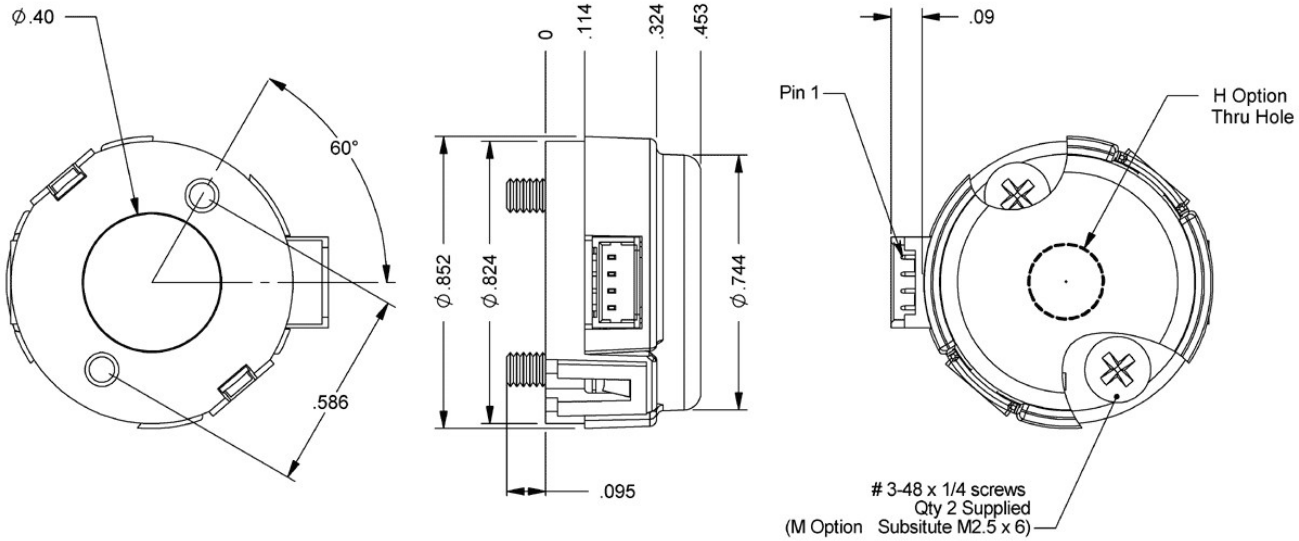
The E4 base provides mounting holes for two #3-48, length 1/4 in. or two M2.5x.45mm, length 6mm screws on a .586 in. bolt circle. When mounting holes are not available, a pre-applied transfer adhesive (with peel-off backing) is available for "stick-on" mounting.

The internal components consist of a precision machined aluminum hub and an encoder circuit board module.

The encoder cover is easily snapped onto the base and is embossed with the connector pin-out.

The E4 series encoder can be connected using a (high retention 4-conductor snap-in polarized 1.25mm pitch) connector. Mating cables and connectors (see the Cables *(https://www.usdigital.com/products/accessories/cables/)*/Connectors *(https://www.usdigital.com/products/accessories/connectors/)* page) are not included and are available separately.

Mechanical Drawings



Specifications

ENVIRONMENTAL

PARAMETER	MIN.	MAX.	UNITS
Vibration (5Hz to 2kHz)	-	20	G
Relative Humidity	-	90	%
Storage Temperature	-40	100	C
Operating Temperature	-20	100	C
ESD (Human Body Model JESD22-A114-A Class 2)	-	3	kV
ESD (Machine Model JESD22-A115-A Class B)	-	300	V

MECHANICAL

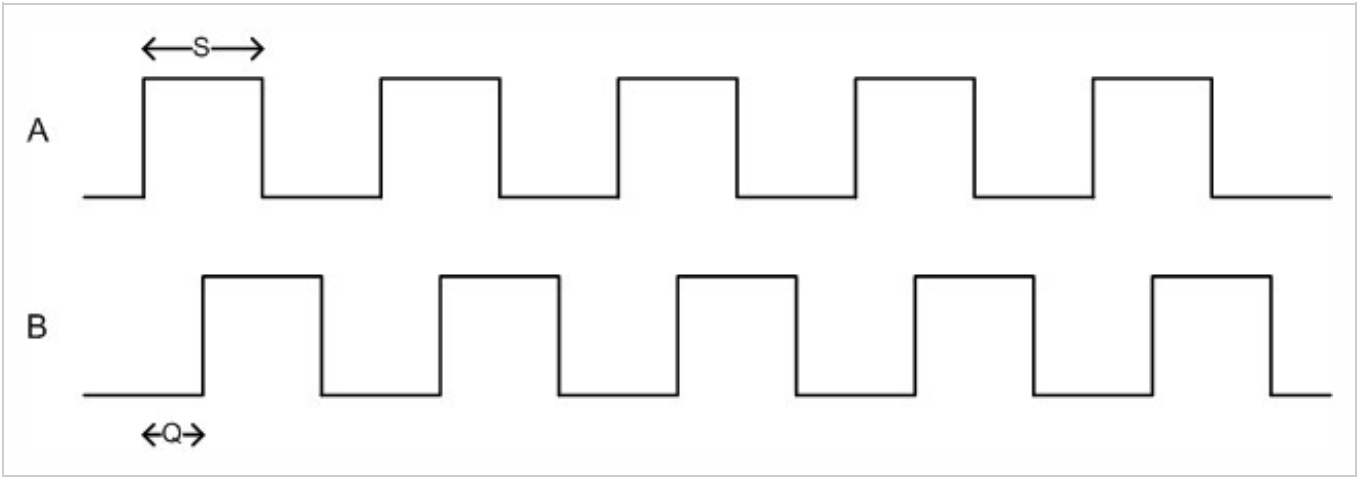
PARAMETER	VALUE	UNITS
Moment of Inertia	7.4 x 10^-6	oz-in-s²
Hub Set Screw Size	#3-48 or #4-48	in.
Hex Wrench Size	.050	in.
Hub Setscrew Torque	1.5-2.0	in.-lbs.
Mounting Screw Size	#3-48 x 1/4"	-
M-option Screw Size	M2.5x.45mm, length 6mm	-
Screw Bolt Circle Diameter	.586 ± .002	in.
Base Mounting Screw Torque	2-3	in.-lbs.
Required Shaft Length (1)	.285 to .395	in.
Shaft Axial Play	± .020	in.
Off-axis Mounting Tolerance	± .010	in.
Shaft to Mounting Surface Perpendicularity	90 ± 1	deg.
Acceleration	250000 max.	rad/sec²
Technical Bulletin TB1001 - Shaft and Bore Tolerances		Download *(https://www.usdigital.com/assets/tbs/TB_1001.pdf)*

(1) Includes axial play.

ELECTRICAL

PARAMETER	MIN.	TYP.	MAX.	UNITS	NOTES
Power Supply Voltage	4.5	5.0	5.5	V	
Power Supply Current	-	21	27	mA	no load on outputs
High Level Output Voltage	2.4	-	-	V	IOH = -1.2 mA
Low Level Output Voltage	-	-	0.4	V	IOL = 6.0 mA
Rise Time	-	500	-	ns	CL = 25pF, RL = 2.7kOhm
Fall Time	-	100	-	ns	

PHASE RELATIONSHIP



PARAMETER	TYP.	UNITS
Symmetry, S	180 ± 16	electrical degrees
Quadrature Delay, Q	90 ± 12	electrical degrees

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

PIN-OUT

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

OPTIONS

H-OPTION (HOLE IN COVER)

The **H**-option adds a hole in the cover for the shaft to pass through:

- For shaft diameters of 1.5mm to 1/8", a 0.170" hole is supplied.
- For shaft diameters of 5/32" and 4mm, a 0.295" hole is supplied.

L-OPTION (LOW POWER STROBE)

L-option To reduce the average power requirements, the L-option version of the **E4P** power can be strobed on just long enough to sample outputs A and B. This option is the same as our standard **E4P**, except the internal power bypass capacitor is not installed. The outputs settling time is typically 200 to 400 nano seconds after power up. The minimum sample frequency must be less than the maximum RPM X the CPR / 10.

M-OPTION (METRIC MOUNTING SCREWS)

Provides alternate metric M2.5x.45mm, length 6mm screws. When **M**-option is NOT specified the default is #3-48 x 1/4" screws.

T-OPTION (TRANSFER ADHESIVE)

When mounting holes are not available, a pre-applied transfer adhesive (with peel-off backing) is available for "stick-on" mounting. Use the centering tool (above) to position the base. **T**-option specifies transfer adhesive.

ACCESSORIES

CENTERING TOOLS

Part #: MCTOOL - (Shaft Diameter*)

Description: This reusable tool provides a simple method for accurately centering the **E4** base onto the shaft.

Material: Aluminum.

Please note: A centering tool is highly recommended when using the **T**-option transfer adhesive.

* See Ordering Information below for available Shaft Diameters.

SPACER TOOL

Part #: SPACER-4216

Description: This reusable tool is used to properly space the codewheel from the encoder base. Nylon. Round. Provides air gap of 0.07" to 0.03".

HEX TOOLS

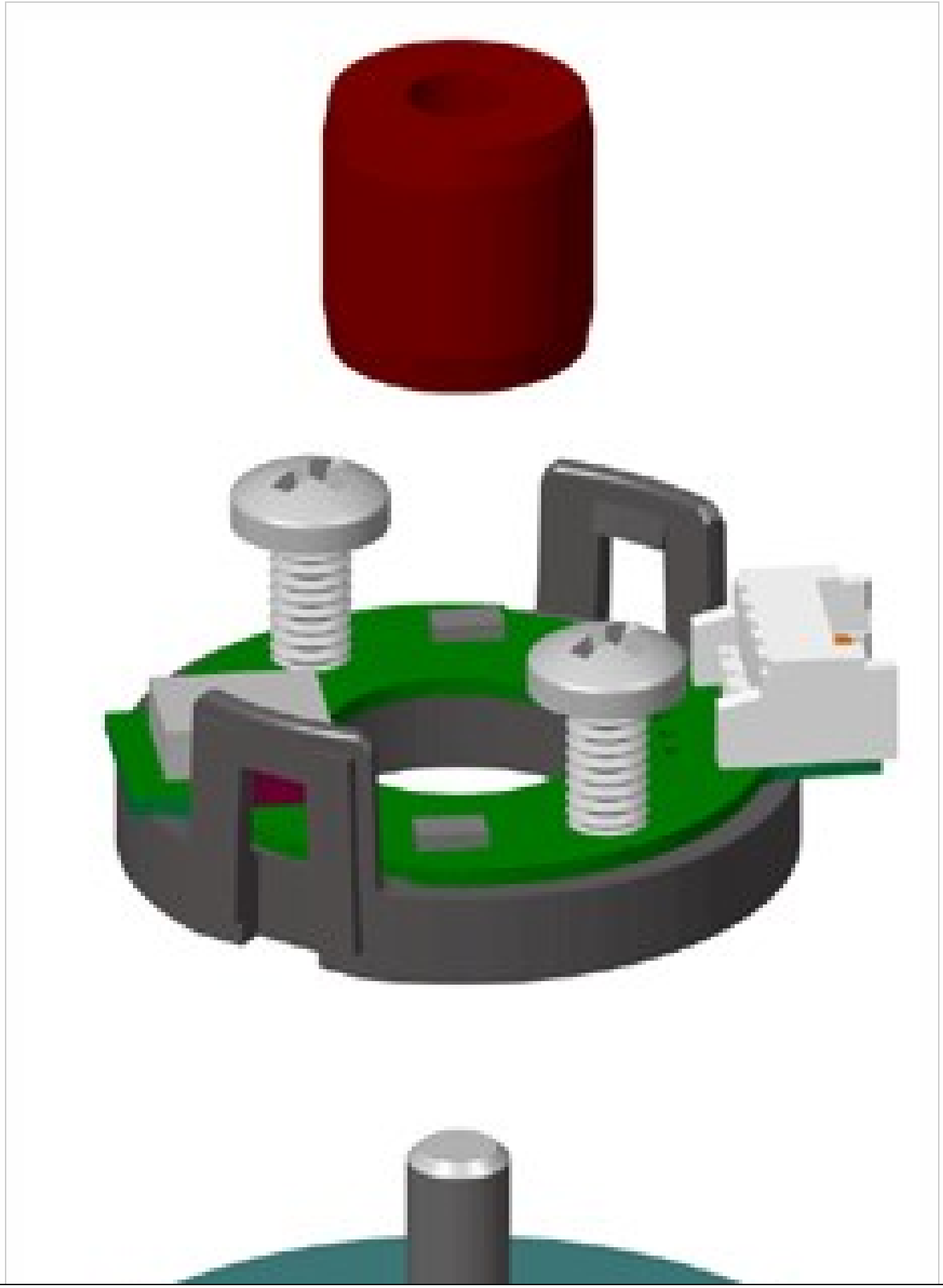
Part #: HEXD-050

Description: Hex driver, .050" flat-to-flat for 3-48 or 4-48 set screws.

Part #: HEXW-050

Description: Hex wrench, .050" flat-to-flat for 3-48 or 4-48 set screws.

ASSEMBLY INSTRUCTIONS



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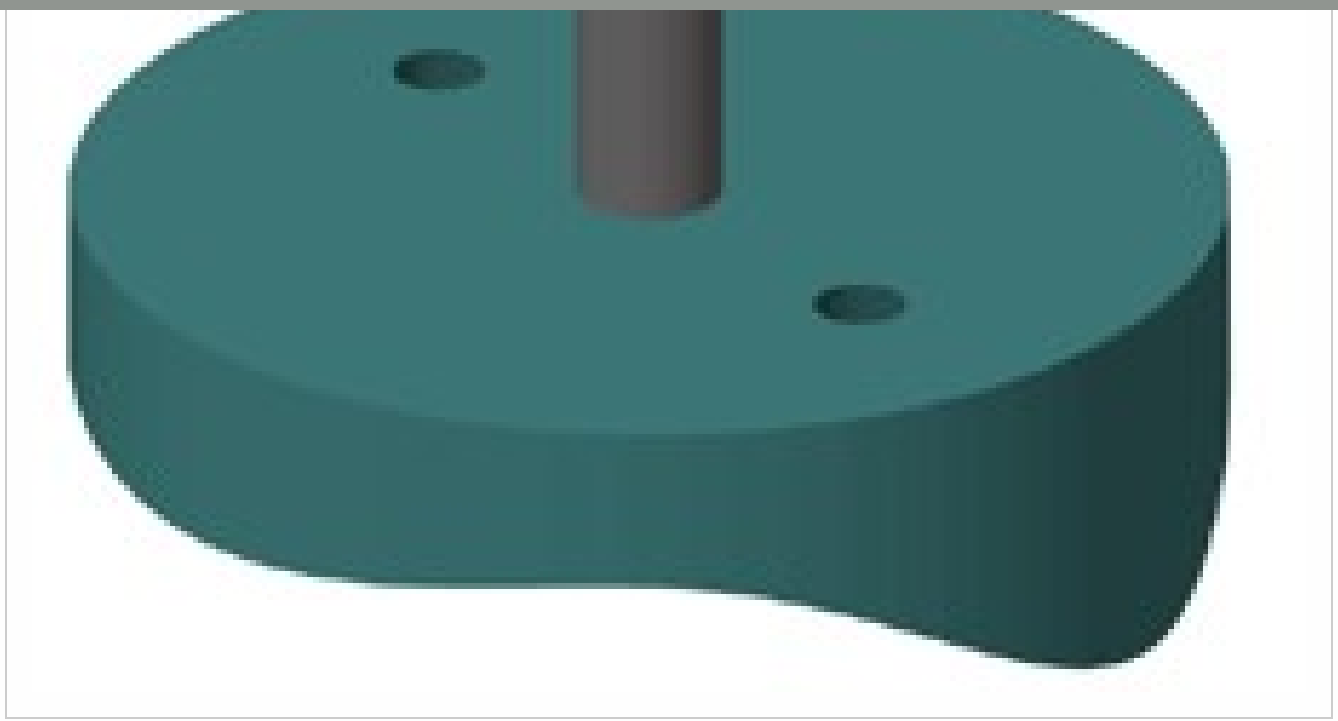
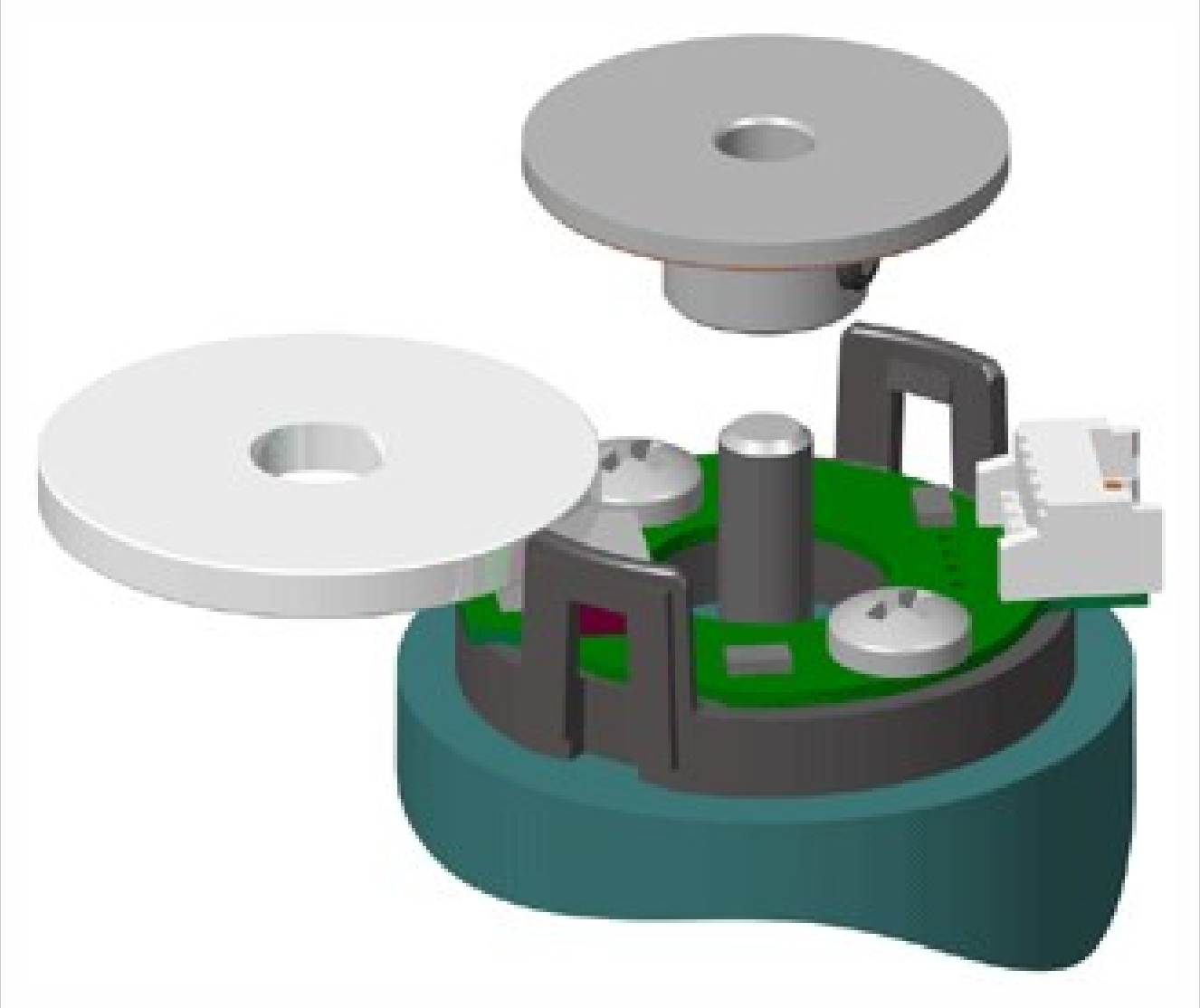


1. Base Mounting

Place base onto shaft. Secure base to mounting surface using two screws.

Transfer Adhesive: Peel off paper backing, place centering tool into center hole of base, slip centering tool onto shaft and slide base and centering tool down onto mounting surface as one piece. Press to form a good bond, then slip centering tool off shaft and continue with standard mounting instructions.



2. Spacer Installation

Place spacer tool on optic module as shown below.

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3. Codewheel Installation

Slip codewheel onto shaft until it bottoms out against spacer tool. Spacer tool provides an air gap of 0.07" 0.03". Tighten set screw with either the hex wrench / hex driver while pressing down on codewheel.

4. Cover Installation

Place housing (cover) on. With thumb and finger, squeeze ears together to insure that cover fully latches.

Notes

- Cables and connectors are not included and must be ordered separately.
- For ordering information please see the Compatible Cables / Connectors section above.
- 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

E4

PLEASE NOTE: This chart is for informational use only. Certain product configuration combinations are not available. Visit the E4 product page *(https://www.usdigital.com/products/E4)* for pricing and additional information.