E2 Features

- Kit version for mounting on a motor or other shaft
- Supports 14 shaft sizes (2 to 10 mm and 1/8 to 3/8 in.)
- For NEMA 17 to NEMA 34 and larger motors
- 26 Resolutions from 32-5,000 CPR (128-20,000 PPR)
- 2 channel quadrature TTL square wave output
- Optional Index channel
- Choice of 5 base styles and 3 cover options
- Mounting compatibility with HEDS-5500
- High retention connector/cable (sold separately)

US Digital E2 Motor Encoder Description

The US Digital E2 motor encoder mounts directly to a motor or other rotating shaft. This optical encoder features a rugged, glass-filled polymer housing and is designed for easy installation and removal.

RoHS COMPLIANT

The E2 rotary encoder contains a precision machined aluminum hub with a specially patterned Mylar disk. This disk, in combination with our proprietary optical encoder module, creates a system that is highly tolerant to mechanical misalignment.

The E2 is available with five base configurations and three cover styles, which allow it to fit a wide range of applications. The output for this optical rotary encoder is single-ended. If your application requires a differential output (due to needing a cable over 10 feet or is located in an electrically noisy environment) you can either add a PC4 *(https://www.usdigital.com/pc4/)* / PC5 *(https://www.usdigital.com/pc5/)* differential line driver or check out our E5 *(https://www.usdigital.com/products/encoders/incremental/kit/e5/)*, which includes an optional differential output. This incremental encoder is designed for use with a high-retention or standard connector/cable, which are sold separately.

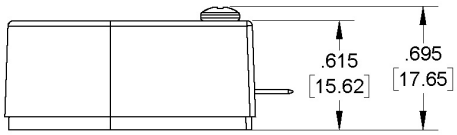
BROADCOM/AVAGO REPLACEMENTS:

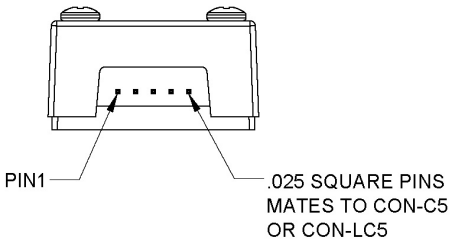
US Digital's E2 encoder may be used as direct replacements *(https://www.usdigital.com/support/resources/reference/compatibility-guides/us-digital-e2-compatibility-guide-for-broadcomavagoagilenthp-heds-5xxx-encoder/)* for Avago HEDM-5500, HEDM-5600, *(https://www.usdigital.com/support/resources/reference/compatibility-guides/e2-cross-reference-guide-hedm-5-0x/)* HEDS-5500, HEDS-5600 *(https://www.usdigital.com/support/resources/reference/compatibility-guides/us-digital-e2-compatibility-guide-for-broadcomavagoagilenthp-heds-5xxx-encoder/)*

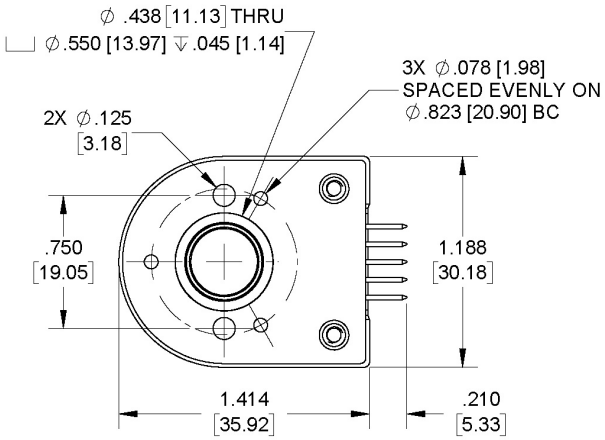
Mechanical Drawings

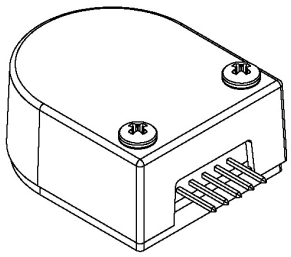
E2 Optical Kit Encoder (Default)

RELEASE DATE: 7/24/2025









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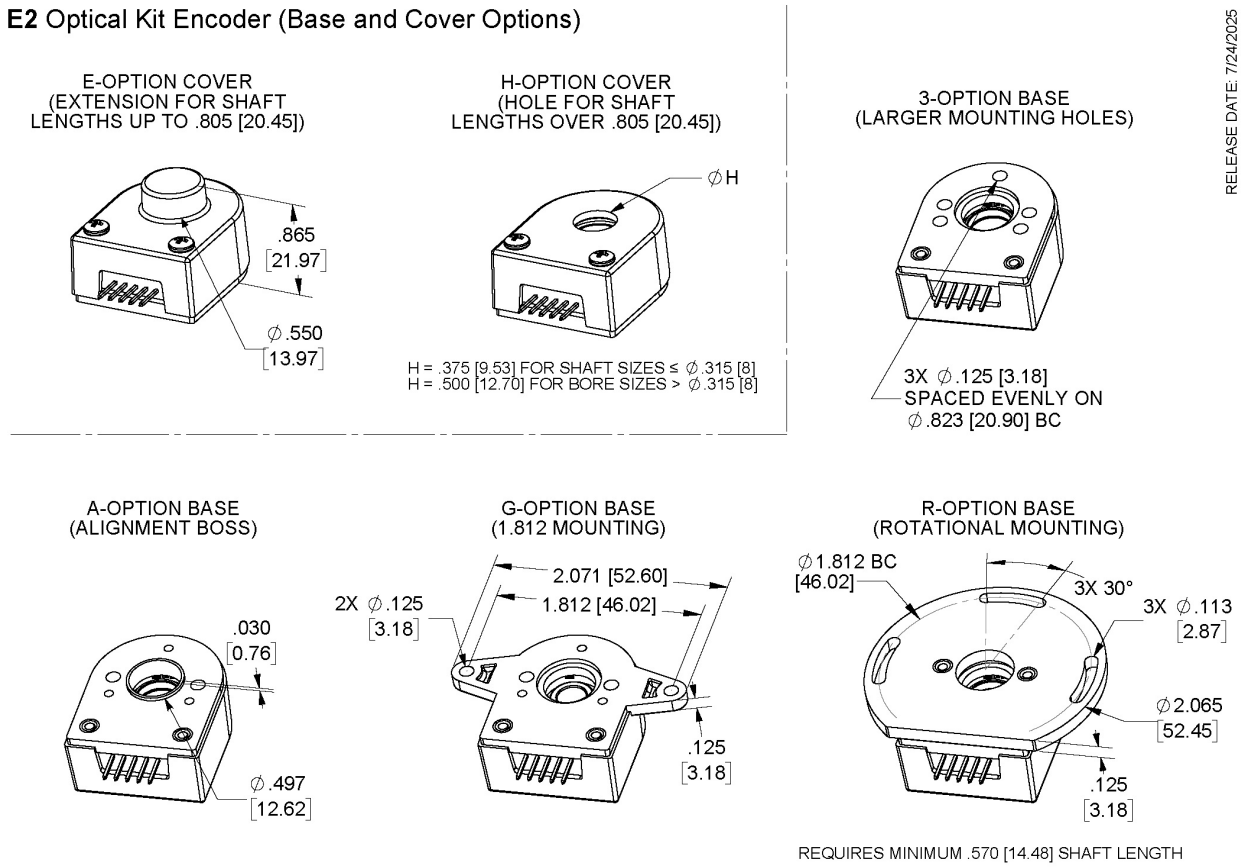
UNITS: INCHES [MM]
METRIC SHOWN FOR REFERENCE ONLY



Specifications

ENVIRONMENTAL

PARAMETER	VALUE	UNITS
Operating Temperature, CPR < 2000	-40 to 100	C
Operating Temperature, CPR ≥ 2000	-25 to 100	C
Electrostatic Discharge, IEC 61000-4-2	± 4	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	0.004 T.I.R.	in.
Max. Acceleration	250000	rad/sec²
For CPR ≤ 1250: Max. RPM (1) Max. A/B Frequency e.x. CPR=1250, Max. RPM=14400 e.x. CPR=100, Max. RPM=60000	 minimum value of ((18 x 10^6) / CPR) and (60000) 300	 RPM kHz
For CPR = 2000, 2048, 2500: Max. RPM (1) Max. A/B Frequency	 minimum value of ((21.6 x 10^6) / CPR) and (60000) 360	 RPM kHz
For CPR = 4000, 4096, 5000: Max. RPM (1) Max. A/B Frequency	 minimum value of ((43.2 x 10^6) / CPR) and (60000) 720	 RPM kHz
Typical Product Weight	0.56	oz.
Codewheel Moment of Inertia	8.0 x 10^-6	oz-in-s²
Hub Set Screw	#4-48	
Hex Wrench Size	0.050	in.
Encoder Base plate Thickness	0.135	in.
3 Mounting Screw Size	#0-80	
2 Mounting Screw Size	#2-56 or #4-40	
3 Screw Bolt Circle Diameter	0.823 ± 0.005	in.
2 Screw Bolt Circle Diameter	0.750 ± 0.005	in.
Required Shaft Length (2)(3) With E-option (3) With H-option	0.445 to 0.575 0.445 to 0.805 > 0.445	in. in. in.
Index Alignment to Hub Set Screw	180 Typical	degrees
Technical Bulletin TB1001 - Shaft and Bore Tolerances		Download *(https://www.usdigital.com/media/yyvb4qsy/tb_1001.pdf)*

(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) Add 0.125" to the required shaft length when using R-option.

(3) Including Axial play.

TORQUE SPECIFICATIONS

PARAMETER	VALUE	TORQUE
Hub Set Screw	2-3	in-lbs
Cover Screw	2-4	in-lbs
Base Mounting Screw (#0-80)	1-2	in-lbs
Base Mounting Screw (#2-56)	2-3	in-lbs
Base Mounting Screw (#4-40)	4-6	in-lbs
Adapter Plate Mounting Surface (#2-56 screws)	2-3	in-lbs
Adapter Plate Mounting Surface (#4-40 screws)	4-6	in-lbs

PHASE RELATIONSHIP

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

ELECTRICAL

- Specifications apply over the entire operating temperature range.
- Typical values are specified at Vcc = 5.0Vdc and 25°C.
- For complete details, see the EM1 *(https://www.usdigital.com/products/encoders/incremental/components/modules/em1/)* or EM2 *(https://www.usdigital.com/products/encoders/incremental/components/modules/em2/)* product pages.

PARAMETER	MIN.	TYP.	MAX.	UNITS	CONDITIONS
Supply Voltage	4.5	5.0	5.5	V	
Supply Current		27	33	mA	CPR < 500, no load
		54	62	mA	CPR ≥ 500 and < 2000, no load
		72	85	mA	CPR ≥ 2000, no load
Low-level Output			0.5	V	I_{OL} = 8mA max., CPR < 2000
			0.5	V	I_{OL} = 5mA max., CPR ≥ 2000
		0.25		V	no load, CPR ≥ 2000
High-level Output	2.0			V	I_{OH} = -8mA max. and CPR < 2000
	2.0			V	I_{OH} = -5mA max. and CPR ≥ 2000
		4.8		V	no load and CPR < 2000
		3.5		V	no load and CPR ≥ 2000
Output Current Per Channel	-8		8	mA	CPR < 2000
	-5		5	mA	CPR ≥ 2000
Output Rise Time		110		nS	CPR < 2000
		50		nS	CPR ≥ 2000, ± 5mA load
Output Fall Time		100		nS	CPR < 2000
		50		nS	CPR ≥ 2000, ± 5mA load

PIN-OUT

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

Note: 5-pin single-ended mating connector is CON-C5 *(https://www.usdigital.com/products/accessories/connectors/con-c5/)* or CON-LC5 *(https://www.usdigital.com/products/accessories/connectors/con-lc5/)*

ACCESSORIES

1. Centering Tool

Part #: CTOOL - (Shaft Diameter)
This reusable tool centers the shaft within the encoder base during assembly. It must be used for the proper functioning of the encoder.

2. Hex Tool

Part #: HEXD-050
Hex driver, 0.050" flat-to-flat for #3-48 or #4-48 set screws. Included with **-B** or **-1** packaging options for order quantities of 10 or more.

Part #: HEXW-050
Hex wrench, 0.050" flat-to-flat for #3-48 or #4-48 set screws. Included with **-B** or **-1** packaging options for order quantities of 9 or less. Included with -**3** packaging option for all order quantities.

3. Spacer Tool

Part #: SPACER-E2
This reusable tool sets the correct spacing between the disk and sensor during assembly. It must be used for the proper functioning of the encoder.

4. Screws

Part #: SCREW-080-250-PH
Description: Pan Head, Philips #0-80 UNF x 1/4"
Use: Base Mounting
Quantity Required: 3
Screws are not included

Part #: SCREW-256-250-PH
Description: Pan Head, Philips #2-56 UNC x 1/4"
Use: Base Mounting
Quantity Required: 2
Screws are not included

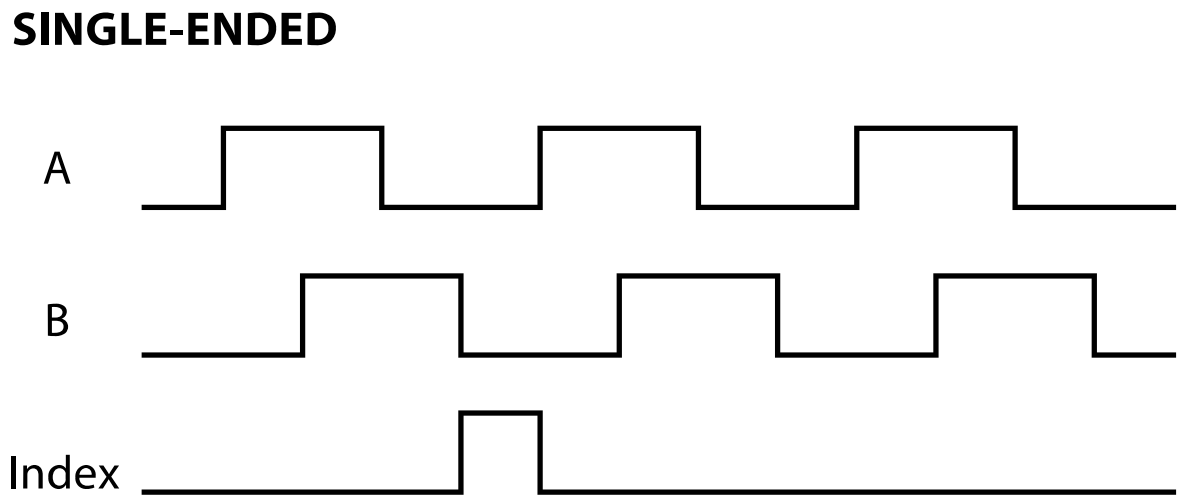
Part #: SCREW-440-250-PH
Description: Pan Head, Philips #4-40 UNC x 1/4"
Use: Base Mounting
Quantity Required: 2
Screws are not included

Part #: SCREW-440-625-PH
Description: Pan Head, Phillips 4-40 UNC x 5/8"
Use: Cover Mounting
Quantity Required: 2
Screws are included

Part #: SCREW-448-063-SS
Description: Socket Head Set Screw, 4-48 UNC x 1/16"
Use: Hub/Disk Mounting for 5/16" - 10mm Bore
Quantity Required: 1
Screw is included

Part #: SCREW-448-125-SS
Description: Socket Head Set Screw, 4-48 UNC x 1/8"
Use: Hub/Disk Mounting for 2mm - 1/4" Bore
Quantity Required: 1
Screw is included

OUTPUT WAVEFORMS



Notes

- 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.
- Cables and connectors are not included and must be ordered separately.

Configuration Options

E2	-	CPR (Cycles Per Revolution)	-	Bore Size	-	Index	-	Cover	-	Base	-	Packaging
		32		079 (*2.0mm*)		IE (*Index*)		D (*Default*)		D (*Default*)		Bulk (B) - Includes one centering, hex and spacer tool per order, plus an extra set per 100 encoders.
		50		118 (*3.0mm*)		NE (*Non-Index*)		E (*Extended*)		3 (*1/8" Mounting Holes*)		Individual (1) - Includes one centering, hex, and spacer tool per order, plus an extra set per 100 encoders.
		96		125 (*1/8"*)				H (*Through-Hole*)		A (*Aligning Shoulder*)		Individual (3) - Includes one centering, hex, and spacer tool with each encoder.
		100		156 (*5/32"*)						G (*1.812" Diameter Bolt Circle*)		
		120		157 (*4.0mm*)						R (*1.812" Diameter Bolt Circle, 3 Slot Rotational Mounting*)		
		192		188 (*3/16"*)								
		200		197 (*5.0mm*)								
		250		236 (*6.0mm*)								
		256		250 (*1/4"*)								
		360		276 (*7.0mm*)								
		400		313 (*5/16"*)								
		500		315 (*8.0mm*)								
		512		375 (*3/8"*)								
		540		394 (*10.0mm*)								
		720										
		800										
		900										
		1000										
		1024										
		1250										
		2000										
		2048										
		2500										
		4000										
		4096										
		5000										

PLEASE NOTE: This chart is for informational use only. Certain product configuration combinations are not available. Visit the E2 product page *(https://www.usdigital.com/products/E2)* for pricing and additional information.