E5 Optical Kit Encoder

Description

The E5 Series rotary encoder has a molded polycarbonate enclosure with either a 5-pin or 10-pin latching connector. This optical incremental encoder is designed to easily mount to and dismount from an existing motor shaft to provide digital feedback information.

The E5 Series is easy to add to existing applications and only consists of five main components: base, cover, hubdisk, optical encoder module and internal differential line driver (differential version only).

The single-ended output version (S-option) is typically used with cables of 10 feet or less. For longer cable lengths, the differential output version (D-option) is recommended.

The base and cover are both constructed of a rugged 20% glass filled polycarbonate. Attachment of the base to a surface may be accomplished by utilizing one of several machine screw bolt circle options. Positioning of the base to the centerline of a shaft is ensured by use of a centering tool (sold separately). The cover is securely attached to the base with two 4-40 flat head screws to provide a resilient package protecting the internal components.

The internal components consist of a mylar disk mounted to a precision machined aluminum hub and an encoder module. The module consists of a highly collimated solid state light source and monolithic phased array sensor, which together provide a system extremely tolerant to mechanical misalignments.

A secure connection to the E5 Series encoder is made through a 5-pin (single-ended versions) or 10-pin (differential versions) latching connector (sold separately). The mating connectors are available from US Digital with several cable options and lengths.

Avago Replacements:

US Digital's E5 encoder may now be used as a replacement for Avago HEDL-5500, HEDL-5600.

Features

- Quick, simple assembly and disassembly
- Rugged screw-together housing
- Positive latching connector
- Accepts .010" axial shaft play
- 32 to 5000 cycles per revolution (CPR)
- 128 to 20000 pulses per revolution (PPR)
- 2 channel quadrature TTL squarewave outputs
- Optional index (3rd channel)
- Mounting compatibility with HEDS-5500

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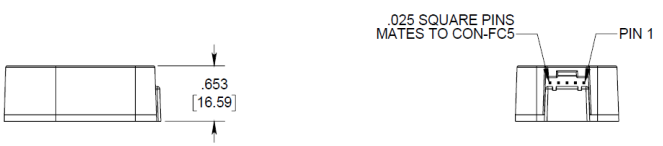
RoHS COMPLIANT

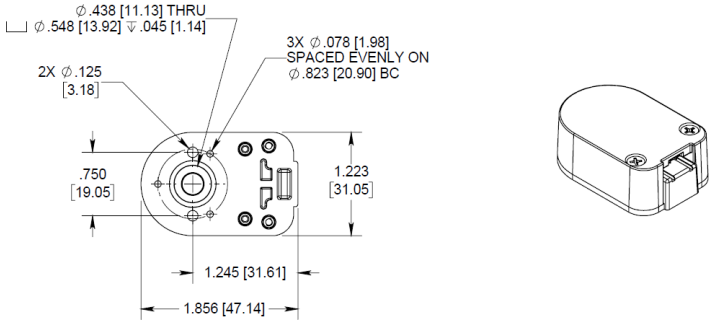
Single-Ended

E5 Optical Kit Encoder



RELEASE DATE: 7/11/2017

DEFAULT BASE & COVER OPTIONS SHOWN



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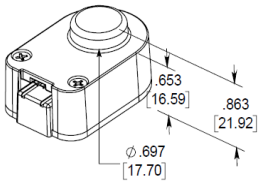
UNITS: INCHES [MM]
METRIC SHOWN FOR REFERENCE ONLY

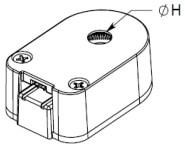
Base & Cover Options

E5 Optical Kit Encoder Base & Cover Options

E-OPTION COVER
(EXTENSION FOR SHAFT LENGTHS .571" TO .750")

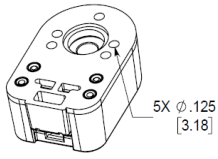


H-OPTION COVER
(COVER HOLE FOR EXTENDED SHAFT LENGTHS)



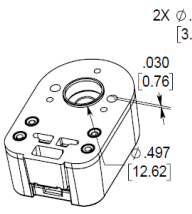
H = .295" [7.49] FOR BORE SIZES 2MM TO 1/4"
H = .438" [11.13] FORE BORE SIZES 5/16" TO 10MM

3-OPTION BASE
(LARGER MOUNTING HOLES)

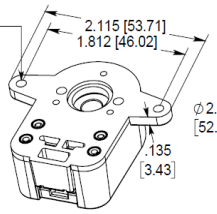


RELEASE DATE: 7/11/2017

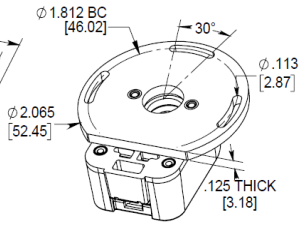
A-OPTION BASE
(ALIGNMENT BOSS)



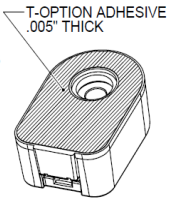
G-OPTION BASE
(1.812" MOUNTING)



R-OPTION BASE
(ROTATIONAL MOUNTING)



T-OPTION BASE
(ADHESIVE MOUNTING)



*REQUIRES ADDITIONAL .125" SHAFT LENGTH

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UNITS: INCHES [MM]
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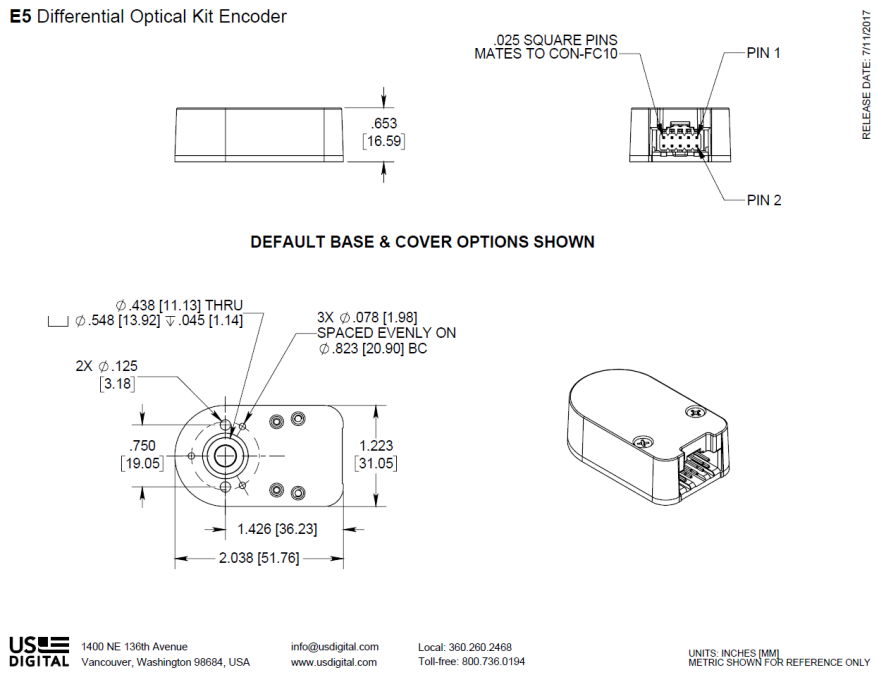
Differential



Environmental

Parameter	Value	Units
Operating Temperature, CPR < 2000	-40 to 100	C
Operating Temperature, CPR ≥ 2000	-25 to 100	C
Vibration (5Hz to 2kHz)	20	G
Electrostatic Discharge Single-ended (-S version), IEC 61000-4-2 Differential (-D, -L version), Human Body Model	 ± 4 ± 2	 kV

Mechanical

Parameter	Value	Units
Max. Shaft Axial Play	±0.010	in.
Max. Shaft Eccentricity Plus Radial Play (1)	0.004	in.
Max. Acceleration	250000	rad/sec²

RoHS COMPLIANT

Parameter	Value	Units
For CPR < 2000 Max. RPM (2) (300 kHz) e.x. CPR=1250, max. rpm=14400 e.x. CPR=100, max. rpm=60000	minimum value of ((18 x 10^6) / CPR) and (60000)	rpm
For CPR >= 2000 and < 4000 Max. RPM (2) (360 kHz)	minimum value of ((21.6 x 10^6) / CPR) and (60000)	rpm
For CPR >= 4000 Max. RPM (2) (720 kHz)	minimum value of ((43.2 x 10^6) / CPR) and (60000)	rpm
Typical Product Weight Single-ended (S-option) Differential (D-option, **L**-option)	 0.82 0.91	 oz.
Codewheel Moment of Inertia	8.0 x 10^-6	oz-in-s^2
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	

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Parameter	Value	Units
3 Screw Bolt Circle Diameter	0.823 ± 0.005	in.
2 Screw Bolt Circle Diameter	0.750 ± 0.005	in.
Required Shaft Length (3) With E-option (3) With H-option (3)	0.445 to 0.570 0.445 to 0.750 > 0.445	in.
Index Alignment to Hub Set Screw	180 Typical	mechanical degrees
Technical Bulletin TB1001 - Shaft and Bore Tolerances		Download

(1) Position inaccuracy is proportional to shaft radial play.

(2) 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). For resolutions of 32 to 1999 CPR the frequency response is 300 kHz, 20 00 to 3999 CPR the frequency response is 360 kHz and 4000 CPR and greater the frequency response is 720 kHz.

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

Torque Specifications

Parameter	Torque
Hub Set Screw to Shaft	2-3 in-lbs
Cover (4-40 screws through cover into base)	2-4 in-lbs
Base to Mounting Surface	4-6 in-lbs
Base to Mounting Adapter Plate	4-6 in-lbs
Adapter Plate to Mounting Surface	4-6 in-lbs
Module to Base	3.5-4 in-lbs

Phase Relationship

Single-Ended (S) / Differential (D) Option:

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

Avago/Agilent compatible pin-out (L) Option:

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

Single-ended Electrical

- Specifications apply over entire operating temperature range.
- Typical values are specified at Vcc = 5.0Vdc and 25 ° C.
- For complete details, see the EM1 or EM2 product pages.

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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

Differential Electrical

- Specifications apply over entire operating temperature range.
- Typical values are specified at Vcc = 5.0Vdc and 25 ° C.
- For complete details, see the EM1 product page.

Parameter	Min.	Typ.	Max.	Units	Conditions
Supply Voltage	4.5	5.0	5.5	V	
Supply Current		29	36	mA	CPR < 500, no load
		56	65	mA	CPR ≥ 500 and < 2000, no load
		74	88	mA	CPR ≥ 2000, no load
Low-level Output		0.2	0.4	V	I_{OL} = 20mA max.
High-level Output	2.4	3.4		V	I_{OH} = -20mA max.
Differential Output Rise/Fall Time			15	nS	

Pin-outs

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5-pin Single-Ended (1)		10-pin Differential, Standard (2)		10-pin Differential, L-option (2,3)	
Pin	Description	Pin	Description	Pin	Description
1	Ground	1	Ground	1	No Connection
2	Index	2	Ground	2	+5VDC power
3	A channel	3	Index-	3	Ground
4	+5VDC power	4	Index+	4	No connection
5	B channel	5	A- channel	5	A- channel
		6	A+ channel	6	A+ channel
		7	+5VDC power	7	B- channel
		8	+5VDC power	8	B+ channel
		9	B- channel	9	Index-
		10	B+ channel	10	Index+

(1) 5-pin single ended mating connector is CON-FC5.
(2) 10-pin differential mating connector is CON-FC10.
(3) Avago / Agilent / HP compatible version.

Accessories

1. Centering Tool

The centering tool is only included with the **-3** packaging option. It has to be ordered separately for other packaging options.

Part #: CTOOL - (Shaft Diameter)
Description: This reusable tool provides a simple method for accurately centering the **E5** base onto the shaft. It is recommended for the following situations:

- When using mounting screws smaller than #4-40.
- When the position of the mounting holes is in question.
- When using the 3-hole mounting pattern.
- When using the **T** - option transfer adhesive.

Instructions: When mounting encoder base, slide centering tool down shaft until it slips into centering hole of encoder base. Tighten mounting screws, then remove centering tool.

2. Hex Tool

Depending on the order packaging option, either a hex driver or hex wrench is included.

Part #: HEXD-050
Description: Hex driver, 0.050" flat-to-flat for #3-48 or #4-48 set screws. Only included with **-B** or **-1** packaging options.

Part #: HEXW-050
Description: Hex wrench, .050" flat-to-flat for #3-48 or #4-48 set screws. Only included with **-2** or **-3** packaging options.

3. Spacer Tool

A spacer tool is included for all packaging options.

Part #: SPACER-E5

4. Screws

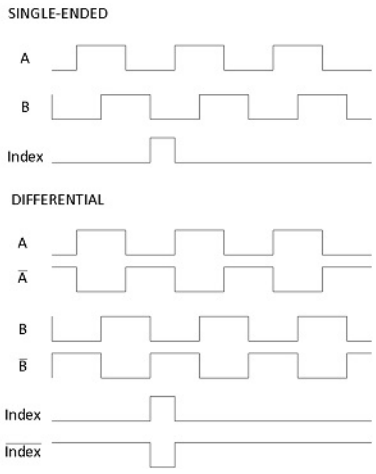
Screws for base mounting must be purchased separately. Screws for mounting the housing to the base are included.

Part #: SCREW-080-250-PH
Description: Pan Head, Philips #0-80 UNF x 1/4"
Quantity Required for Mounting: 3 per encoder

Part #: SCREW-256-250-PH
Description: Pan Head, Philips #2-56 UNC x 1/4"
Quantity Required for Mounting: 2 per encoder

Part #: SCREW-440-250-PH
Description: Pan Head, Philips #4-40 UNC x 1/4"
Quantity Required for Mounting: 2 per encoder

Output Waveforms



Assembly Instructions

E5 Single-Ended Assembly Instructions - http://usdigital.com/assets/assembly/E5S%20Assembly%20Instructions%20v7.pdf
E5 Differential Assembly Instructions - http://usdigital.com/assets/assembly/E5D%20Assembly%20Instructions%20v8.pdf

Ordering Information

E5 - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ]

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RoHS COMPLIANT

CPR
32 =
50 =
96 =
100 =
192 =
200 =
250 =
256 =
360 =
400 =
500 =
512 =
540 =
720 =
900 =
1000 =
1024 =
1250 =
2000 =
2048 =
2500 =
4000 =
4096 =
5000 =

Bore
079 = *2mm*
118 = *3mm*
125 = *1/8"*
156 = *5/32"*
157 = *4mm*
188 = *3/16"*
197 = *5mm*
236 = *6mm*
250 = *1/4"*
276 = *7mm*
313 = *5/16"*
315 = *8mm*
375 = *3/8"*
394 = *10mm*

Index
NE =*No Index*
IE = *Index*

Output
S =*Single-ended*
D =*Differential*
L =*Avago/Agilent compatible pin-out*

Cover
D =*Default*
E =*Cover Extension*
H =*Hole in Cover*

Base
D =*Default*
3 =*Base Mounting Holes become .125"*
A =*Adds self-aligning shoulder to base*
G =*Adds 1.812 mounting "ears" to base*
R =*Adds 3-slot adapter to bottom of base*
T =*Transfer Adhesive*

Packaging
B =*Encoder components packaged in bulk. One spacer tool, hex tool, and centering tool per 100 encoders.*
1 =*Encoders Individually packaged. One spacer tool, hex tool, and centering tool per 100 encoders.*
3 =*Encoders packaged individually with one spacer tool, one hex wrench, and one centering tool per encoder.*

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 completewarranty for details.

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