

Description

The E6 Series rotary encoder has a molded polycarbonate which utilizes either a 5-pin or 10-pin finger-latching connector. This optical incremental encoder is designed to easily mount to and dismount from an existing shaft to provide digital feedback information.

The E6 Series is easy to add to existing applications and only consists of five main components; base, cover, hub/code wheel, 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 shatterproof 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.

For differential versions: the internal differential line driver (26C31) can source and sink 20mA at TTL levels. The recommended receiver is industry standard 26C32. Maximum noise immunity is achieved when the differential receiver is terminated with a 150 Ω resistor in series with a .0047 μ F capacitor placed across each differential pair. The capacitor simply conserves power; otherwise power consumption would increase by approximately 20mA per pair, or 60mA for 3 pairs.

A secure connection to the E6 Series encoder is made through a 5-pin (single-ended versions) or 10-pin (differential versions) finger-latching connector (sold separately). The mating connectors are available from US Digital with several cable options and lengths.

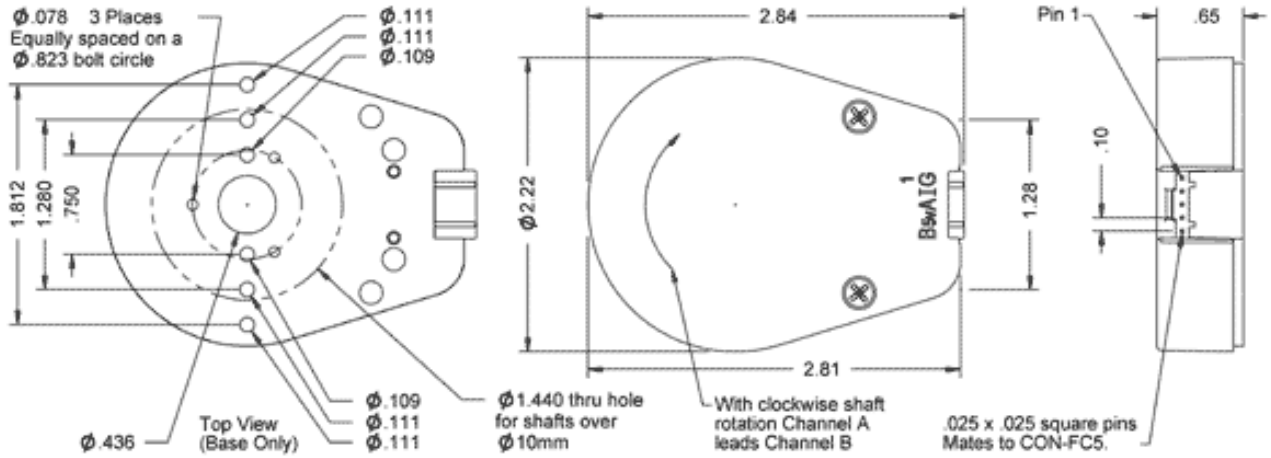


Features

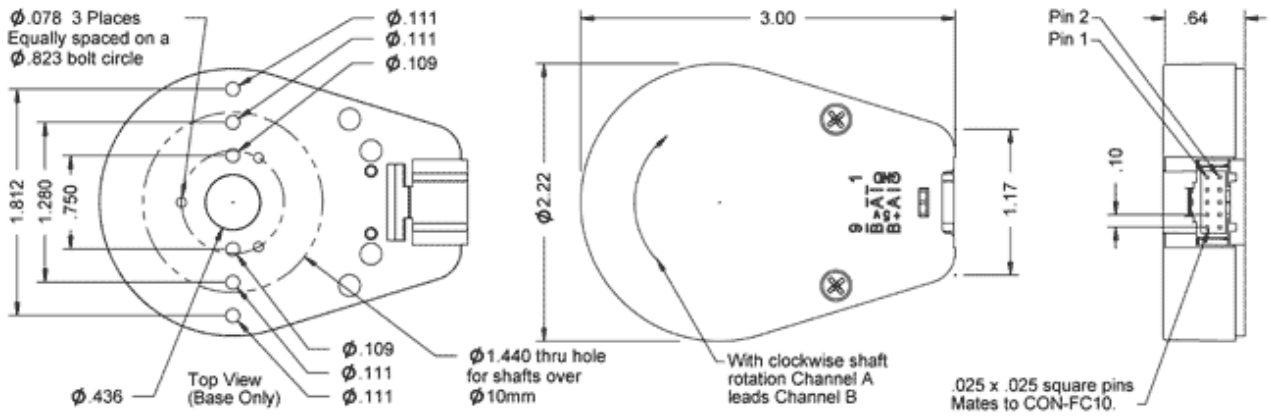
- Quick, simple assembly and disassembly
- Rugged screw-together housing
- Positive finger-latching connector
- Accepts .010" axial shaft play
- Tracks from 0 to 300,000 cycles/sec
- 64 - 10000 CPR
- 2 channel quadrature TTL squarewave outputs
- Optional index (3rd channel)
- -40 to +100C operating temperature
- Fits shaft diameters from 2mm to 1"

Rev. 141006175852

Single-Ended



Differential



Environmental

Parameter	Value	Units
Operating Temperature (CPR < 3600)	-40 to 100	C
Operating Temperature (CPR ≥ 3600)	-25 to 100	C
Vibration (5Hz to 2kHz)	20	G
Electrostatic Discharge, Human Body Model	± 4	kV

Rev. 141006175852


Mechanical

Parameter	Dimension	Units
Max. Shaft Axial Play	±0.010	in.
Max. Shaft Eccentricity Plus Radial Play (1)	0.004	in.
Max. Acceleration	250000	rad/sec ²
Max. RPM (2) (CPR ≤ 2500) e.x. CPR=2500, max. rpm=7200 e.x. CPR=100, max. rpm=60000	minimum value of ((18 x 10 ⁶) / CPR) and (60000)	rpm
Max. RPM (2) (CPR > 2500 and ≤ 5000) e.x. CPR=4096, max. rpm=5273	(21.6 x 10 ⁶) / CPR	rpm
Max. RPM (2) (CPR > 5000) e.x. CPR=10000, max. rpm=4320	(43.2 x 10 ⁶) / CPR	rpm
Typical Product Weight Single-ended (S -option) Differential (D -option, L -option)	1.55 1.83	oz.
Codewheel Moment of Inertia	8.9 x 10 ⁻⁵ for bore < 12mm 4.0 x 10 ⁻⁴ for bore ≥ 12 mm	oz-in-s ²
Hub Set Screw	#3-48 or #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 (3)	0.823 ± 0.005	in.
2 Screw Bolt Circle Diameter	0.750 ± 0.005	in.
Required Shaft Length (4) With E -option (3) With H -option	0.445 to 0.570 0.445 to 0.750 > 0.445	in.
Index alignment to hub set screw	180 ± 5	mechanical degrees


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

Rev. 141006175852

Parameter**Torque**

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 (A, 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 $V_{cc} = 5.0V_{dc}$ and $25^{\circ}C$.
- For complete details, see the EM1 and EM2 product pages.

Parameter	Min.	Typ.	Max.	Units	Conditions
Supply Voltage	4.5	5.0	5.5	V	
Supply Current		27	33	mA	CPR < 1000, no load
		54	62	mA	CPR \geq 1000 and < 3600, no load
		72	85	mA	CPR \geq 3600, no load
Low-level Output			0.5	V	IOL = 8mA max., CPR < 3600
			0.5	mA	IOL = 5mA max., CPR \geq 3600
		0.05		mA	no load, CPR < 3600
		0.25		mA	no load, CPR \geq 3600
High-level Output	2.0			V	IOH = -8mA max., CPR < 3600
	2.0			V	IOH = -5mA max., CPR \geq 3600
		4.8		V	no load, CPR < 3600
		3.5		V	no load, CPR \geq 3600
Output Current Per Channel	-8		8	mA	CPR < 3600
	-5		5	mA	CPR \geq 3600
Output Rise Time		110		nS	CPR < 3600
		50		nS	CPR \geq 3600
Output Fall Time		35		nS	CPR < 3600
		50		nS	CPR \geq 3600

Rev. 141006175852

Differential Electrical

- Specifications apply over entire operating temperature range.
- Typical values are specified at $V_{CC} = 5.0V_{DC}$ and $25^{\circ}C$.
- For complete details, see the EM1 and EM2 product pages.

Parameter	Min.	Typ.	Max.	Units	Conditions
Supply Voltage	4.5	5.0	5.5	V	
Supply Current		29	36	mA	CPR < 1000, no load
		57	65	mA	CPR \geq 1000 and < 3600, no load
		72	85	mA	CPR \geq 3600, no load
Low-level Output		0.2	0.4	V	IOL = 20mA max.
High-level Output	2.4	3.4		V	IOH = -20mA max.
Differential Output Rise/Fall Time			15	nS	

Pin-outs

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

- (1) 5-pin single ended mating connector is CON-FC5.
 (2) 10-pin differential mating connector is CON-FC10.

Options

Index

Provides a single pulse per revolution.

3-option

Rev. 141006175852

3-option makes all five of these hole diameters .125".

View option:

- Single-ended Version



- Differential Version



E-option

The **E**-option provides a cylindrical extension to the cover allowing for longer shafts of up to .750".

Please note: Only available for shaft diameters <.472".

View option:

- Single-ended Version



- Differential Version



H-option

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

- Shafts 2mm to 10mm, a .438" diameter hole is supplied.
- Shafts 12mm to 1", a 1.047" diameter hole is supplied.

View option:

- Single-ended Version



- Differential Version

Rev. 141006175852



L-option

Provides Avago / Agilent / HP differential compatible pin-out. See direct replacement information above.

Please note: Only available for **E6D** and **E6MD** (10-pin versions).

M-option

This adapter plate is for mounting to a 3" diameter bolt circle. Use two 4-40 x 1/4" screws (sold separately) to attach the **E6D** base to the plate. Comes attached when ordered with encoder.

View option:

- Single-ended / Differential Versions



T-option

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 (sold separately) to slide the base into position. **T-option** specifies transfer adhesive on the standard mounting base.

View option:

- Single-ended Version



- Differential 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 **E6** 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.

Rev. 141006175852

- 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, .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-265

Description: For shaft sizes < 0.472"

Part #: SPACER-555

Description: For shaft sizes 12mm to 1"

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, Cross Drive #0-80 UNF x 1/4"

Quantity Required for Mounting: 3 per encoder

Part #: SCREW-256-250-PH

Description: Pan Head, Cross Drive #2-56 UNC x 1/4"

Quantity Required for Mounting: 2 per encoder

Part #: SCREW-440-250-PH

Description: Pan Head, Cross Drive #4-40 UNC x 1/4"

Quantity Required for Mounting: 2 per encoder



Avago Direct Replacement

Avago Direct Replacement:

US Digital's E6 encoder may now be used as a direct replacement for the following Avago encoders:

HEDL-6500, HEDL-6505, HEDL-6540, HEDL-6545.
 HEDM-6500, HEDM-6505, HEDM-6540, HEDM-6545.
 HEDS-6500, HEDS-6505, HEDS-6540, HEDS-6545.

Rev. 141006175852

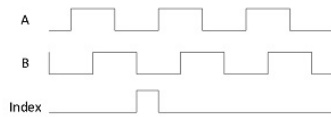
Notes:

▸ In order for the **E6** to be fully compatible, CA-3921-2FT* must also be ordered separately.

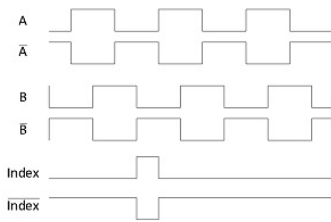
*Custom cable lengths are available (standard length is 2ft).

 **Output Waveforms**

SINGLE-ENDED



DIFFERENTIAL



 **Assembly Instructions**

Rev. 141006175852



E6

Assembly Instructions

For Shafts $\leq .394$ ": Page 10 of 13

Please note: Shown using Polycarbonate Differential version. These instructions are compatible for **all** versions of the **E6**.



1. Base Mounting:

Secure base to mounting surface using two or three screws (sold separately). If a centering tool is used, slide centering tool down shaft until it slips into centering hole of encoder base. Tighten mounting screws, then remove centering tool.

2. Spacer Installation:

Place spacer tool around shaft, flat on base.



3. Hub/Disk Assembly Installation:

Slip hub over shaft until it bottoms out against spacer tool. Tighten set screw with hex wrench provided while pressing down on hub. Remove spacer tool.

4. Encoder Module Installation:

Orient module with thin part of module toward top. Slide module from front to back, being careful not to damage disk. Stop when two alignment pins on base fit into holes of module. Secure with two 4-40 1/2" pan head screws (supplied).



5. Cover Installation:

Place cover over assembly and secure with two 4-40 5/8" flat head screws (supplied).

For shafts $> .394$ ":

Please note: Shown using Polycarbonate Differential version. These instructions are compatible for **all** versions of the **E6**.

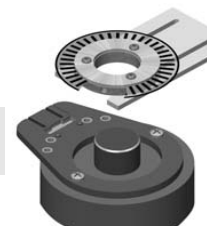


1. Base Mounting:

Secure base to mounting surface using two or three screws (sold separately). If a centering tool is used, slide centering tool down shaft until it slips into centering hole of encoder base. Tighten mounting screws, then remove centering tool.

2. Spacer Installation:

Push spacer tool onto bottom section of hub/disk assembly. Make sure spacer tool snaps only on lower part of hub.



3. Hub/Disk Assembly Installation:

Slip hub over shaft until it bottoms out against spacer tool. Make sure spacer tool clears mounting screws on base. Tighten both set screws with hex wrench provided while pressing down on hub. Remove spacer tool.

4. Encoder Module Installation:

Orient module with thin part of module toward the top. Slide module from front to back, being careful not to damage disk. Stop when two alignment pins on base fit into holes of module. Secure with two 4-40 1/2" pan head screws (supplied).



5. Cover Installation:

Place cover over assembly and secure with two 4-40 5/8" flat head screws (supplied).

US

Rev. 141006175852

Ordering Information

E6 - - - - - - -

CPR	Bore	Index	Output	Cover	Base	Packaging
64 =	079 =	NE =No	S =Single-ended	D =Default	D =Default	B =Encoder components packaged in bulk. One spacer tool and one hex wrench for orders up to 9 units, for orders of 10...
100 =	2mm	Index	D =Differential	E =Cover Extension	3 =0.125" diam. for five base mounting holes	1 =Encoders Individually packaged. One spacer tool and one hex wrench for orders up to 9 units, for orders of 10 units...
200 =	118 =	IE =	L =Avago Compatible Differential	H =Hole in Cover	M =Adds 4-hole mounting adapter plate.	2 =Encoders packaged individually with one spacer tool and one hex wrench per encoder.
400 =	3mm	Index	A =Avago Compatible 10-pin Single-ended		T =Adds transfer adhesive to base	3 =Encoders packaged individually with one spacer tool, one hex wrench, and one centering tool per encoder.
500 =	125 =					
512 =	1/8"					
1000 =	156 =					
1024 =	5/32"					
1800 =	157 =					
2000 =	4mm					
2048 =	188 =					
2500 =	3/16"					
3600 =	197 =					
4000 =	5mm					
4096 =	236 =					
5000 =	6mm					
7200 =	250 =					
8000 =	1/4"					
8192 =	313 =					
10000 =	5/16"					
	315 =					
	8mm					
	375 =					
	3/8"					
	394 =					
	10mm					
	472 =					
	12mm					
	500 =					
	1/2"					
	551 =					
	14mm					
	625 =					
	5/8"					
	750 =					
	3/4"					
	787 =					
	20mm					
	875 =					
	7/8"					
	984 =					
	25mm					
	1000 = 1"					

Rev. 141006175852

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 for details.

Rev. 141006175852

Headquarter Switzerland:
Angst+Pfister Sensors and Power AG

Thurgauerstrasse 66
CH-8050 Zurich
Phone +41 44 877 35 00
sensorsandpower@angst-pfister.com

Office Germany:
Angst+Pfister Sensors and Power
Deutschland GmbH
Edisonstraße 16
D-85716 Unterschleißheim
Phone +49 89 374 288 87 0
sensorsandpower.de@angst-pfister.com



We are here for you. Addresses and Contacts.

Sales Germany & Austria

Geometrical sensors
Other products

Kurt Stritzelberger
Phone +49 89 374 288 87 22
kurt.stritzelberger@angst-pfister.com

Pressure sensors
Other products

Gerhard Vetter
Phone +49 89 374 288 87 26
gerhard.vetter@angst-pfister.com

Gas sensors and modules

Peter Felder
Phone +41 44 877 35 05
peter.felder@angst-pfister.com

Sales Switzerland & Liechtenstein

Postcode 3000 – 9999

Basil Frei
Phone +41 44 877 35 18
basil.frei@angst-pfister.com

Postcode 1000 – 2999

Christian Mohrenstecher
Phone +41 76 444 57 93
christian.mohrenstecher@angst-pfister.com

Sales International Key Accounts

Peter Felder
Phone +41 44 877 35 05
peter.felder@angst-pfister.com

Sales Other Countries / Product Management

Pressure Sensors
Load Cells

Philipp Kistler
Phone +41 44 877 35 03
philipp.kistler@angst-pfister.com

Gas sensors
Gas sensor modules

Dr. Thomas Clausen
Phone +49 89 374 288 87 24
thomas.clausen@angst-pfister.com

Flow / Level / Medical products

Dr. Adriano Pittarelli
Phone +49 89 374 288 87 67
adriano.pittarelli@angst-pfister.com

Power supplies

Sebastiano Leggio
Phone +41 44 877 35 06
sebastiano.leggio@angst-pfister.com

Linear position sensors
Angle sensors

Eric Letsch
Phone +41 44 877 35 14
eric.letsch@angst-pfister.com

Accelerometers
Sensor elements

Christoph Kleye
Phone +49 89 374 288 87 61
christoph.kleye@angst-pfister.com

Drive technology
CH Postcode 5000 – 9999 / DE

Roman Homa
Phone +41 76 444 00 86
roman.homa@angst-pfister.com

Drive technology
CH Postcode 1000 – 4999 / AT / IT / FR

Christian Mohrenstecher
Phone +41 76 444 57 93
christian.mohrenstecher@angst-pfister.com

Harald Thomas
Phone +49 89 374 288 87 23
harald.thomas@angst-pfister.com