

# ENC-A3I Single-Ended High Resolution Encoder with Index Channel



FEATURES

- 100 to 10,000 Cycles Per Revolution (CPR)
- 400 to 40,000 Pulses Per Revolution (PPR)
- Tracks 0 to 300,000 Cycles Per Second
- 2-Channel Quadrature TTL Squarewave Outputs
- Third Channel Index
- Operating Temperature of -40° to +100° C
- Accepts +/- 0.010" Axial Shaft Play
- Powered from a Single +5VDC Power Supply
- RoHS Compliant and REACH Certified



DESCRIPTION

The ENC-A3I, is a high resolution single-ended encoder with an optional third index channel. This encoder requires a minimum shaft length of .445" and can be attached to shaft sizes ranging from .079" to 1" in diameter. The ENC-A3I provides digital feedback information for motion control applications that require position, speed and/or direction control.

### New Optical Encoder Module:

This new transmissive optical encoder module was designed to be an improved replacement for the Avago HEDS-9000 series encoder module. This module is designed to detect rotary position when used with a code wheel. The new module consists of a lensed LED source and a monolithic detector IC enclosed in a small polymer package. The new module uses phased array detector technology to provide superior performance and greater tolerances over traditional aperture mask type encoders. The new module provides digital A & B quadrature outputs with an optional third output index channel. Each module is resolution specific and is matched to the resolution of a code wheel. All standard resolutions offered by the HEDS-9000 series encoder module, as well as additional resolutions, are now supported by the new module. The new module operates with a single 5V supply and provides single ended outputs which are capable of both sinking and sourcing 8mA at TTL levels. An internal 0.1 uF decoupling capacitor is designed into the new module to provide enhanced noise immunity over the HEDS-9000 series encoder modules. Physically, the new module has no external wire loops which can interfere when mounting. The connector pins are 0.051" shorter than HEDS modules, while still providing .30" insertion depth.

ORDERING INFORMATION

**ENC - A3I - 1000 - 394 - H - M**

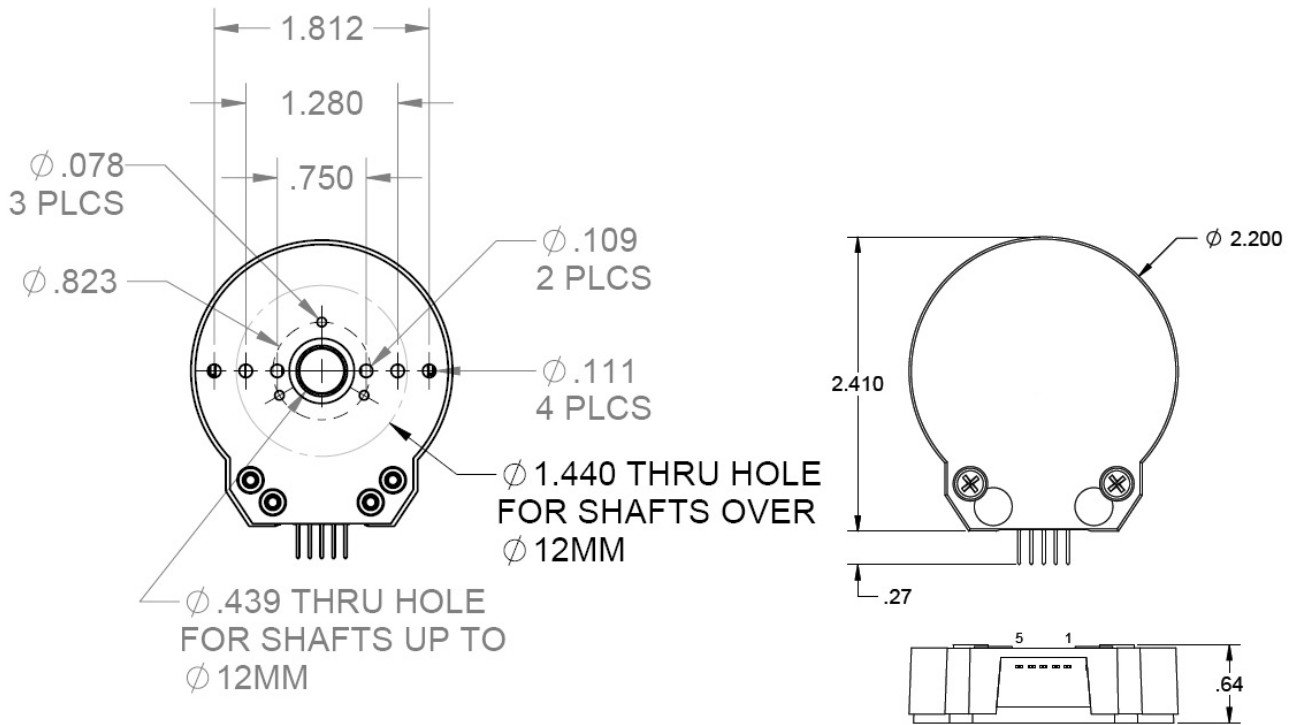
Index	CPR		Bore Size			Cover Options
I = Index (3rd Channel)	0100	2500	079 = 2mm	250 = 1/4"	551 = 14mm	E = Cover Extension
	0200	3600	118 = 3mm	313 = 5/15"	625 = 5/8"	H = Hole in Cover
	0400	4000	125 = 1/8"	315 = 8mm	750 = 3/4"	Blank = Default
	0500	4096	156 = 5/32"	375 = 3/8"	787 = 20mm	
	0512	5000	157 = 4mm	394 = 10mm	875 = 7/8"	
	1000	7200	188 = 3/16"	472 = 12mm	984 = 25mm	
	1024	8000	197 = 5mm	500 = 1/2"	1000 = 1"	
	1800	8192	236 = 6mm			
	2000	10000				
	2048					

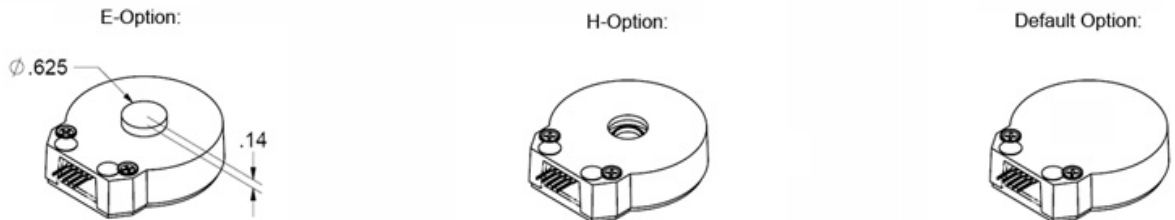
Base Options
M = 4-Hole Mounting Adapter Plate
Blank = Default

Note: Cover must be H or Blank (Default) when Bore size is 472 or greater.

L010724



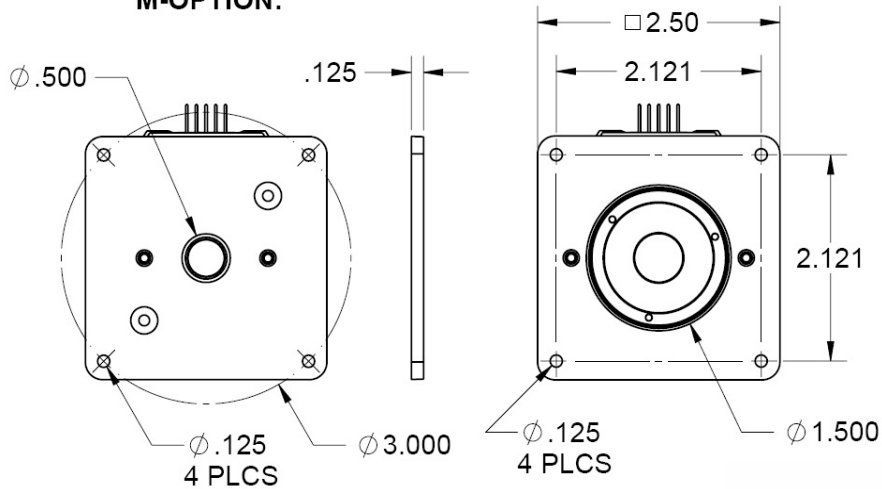
Note: Dimensions are in inches



Note: All Dimensions are in (in)

Cover Options:	Description
E - Option	E-Option provides a cylindrical extension cover for larger shafts. For shaft diameters $\leq$ .472", the required shaft length is .445" to .670". Note: E-option + M-Option the required shaft length is .570" to .795".
H - Option	Shaft $\leq$ 0.5" - a 0.55" diameter hole is used Shaft $>$ 0.5" diameter hole is used Required Shaft Length: $>$ .445" Note: H-Option + M-option the required shaft length is $>$ .570"
Default Option	The required length is .445" to .525" Note: Default Option + M-Option the required shaft length is .570" to .650"

**M-OPTION:**



Note: All Dimensions are in (in)

Base Options:	Description
M - Option	Adds 4-hole mounting adapter plate. Mounting plates requires additional .125" shaft length. A .5" diameter hole is provided for shafts ≤ 10mm and a 1.5" diameter hole is provided for shafts > 10mm.

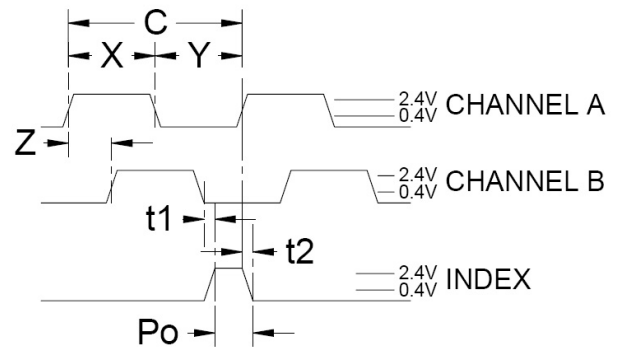
(Note: Base Mounting Screws are NOT included. #2-56 or #4-40 screws can be used to mount the base to your mounting surface.)

**SINGLE-ENDED ENCODER PINOUT**  
TOP OF ENCODER FACING PLUG

Pin #	Function
1	Ground
2	Index
3	Channel A
4	+5VDC Input
5	Channel B

Timing Characteristics	Symbol	Min	Typ	Max	Units
Cycle Error	C	-	3.0	5.5	°e
Symmetry	X,Y	150	180	210	°e
Quadrature	Z	60	90	120	°e
Index Pulse Width	Po	60	90	120	°e
Ch. I Rise After Ch. B or Ch. A Fall	t1	10	100	250	ns
Ch. I Fall After Ch. B or Ch. A Rise	t2	70	150	300	ns

**SINGLE-END ENCODER TIMING DIAGRAMS**



ROTATION:  
CW - A LEADS B, CCW - B LEADS A

Model #	Description
CPR(N):	The Number of Cycles Per Revolution
One Shaft Rotation:	360 mechanical degrees, N cycles
One Electrical Degree (°e):	1/360th of one cycle
One Cycle (C):	360 electrical degrees (°e). Each cycle can be decoded into 1 or 4 codes, referred to as X1 or X4 resolution multiplication
Symmetry:	A measure of the relationship between (X) and (Y) in electrical degrees, nominally 180 °e
Quadrature (Z):	The phase lag or lead between channels A and B in electrical degrees, nominally 90 °e
Index (CH I):	The Index Output goes high once per revolution, coincident with the low states of channels A and B, nominally 1/4 of one cycle (90°e)

Recommended Operating Conditions	Min	Max	Units
Temperature (CPR < 2000)	-40	100	°C
Temperature (CPR ≥ 2000)	-25	100	°C
Load Capacitance	-	100	pF
Count Frequency (CPR ≤ 2500)	-	300	kHz
Count Frequency (CPR > 2500, and ≤ 5000)	-	360	kHz
Count Frequency (CPR 5000+)	-	720	kHz

Parameter	Max	Units
Vibration (5 to 2kHz)	20	g
Shaft Axial Play	+/- 0.01	in.
Shaft Eccentricity Plus Radial Play	0.004	in.
Acceleration	250,000	rad/sec <sup>2</sup>

Parameter	Min	Typ	Max	Units
<b>Supply Voltage</b>	4.5	5.0	5.5	Volts
<b>Supply Current</b>				
CPR < 1000, no load	-	27	33	mA
CPR ≥ 1000 and < 3600, no load	-	54	62	mA
CPR ≥ 3600, no load	-	72	85	mA
<b>Low-Level Output</b>				
I <sub>OL</sub> = 8mA max (CPR < 3600)	-	-	0.5	V
I <sub>OL</sub> = 5mA max (CPR ≥ 3600)	-	-	0.5	V
no load (CPR < 3600)	-	0.25	-	V
no load (CPR ≥ 3600)	-	0.25	-	V
<b>High-Level Output</b>				
I <sub>OL</sub> = 8mA max (CPR < 3600)	2.0	-	-	V
I <sub>OL</sub> = 5mA max (CPR ≥ 3600)	2.0	-	-	V
no load (CPR < 3600)	-	4.8	-	V
no load (CPR ≥ 3600)	-	3.5	-	V
<b>Output Current Per Channel (CPR &lt; 3600)</b>	-8.0	-	8.0	mA
<b>Output Current Per Channel (CPR ≥ 3600)</b>	-5.0	-	5.0	mA
<b>Output Rise Time (CPR &lt; 3600)</b>	-	110	-	nS
<b>Output Rise Time (CPR ≥ 3600)</b>	-	50	-	nS
<b>Output Fall Time (CPR &lt; 3600)</b>	-	36	-	nS
<b>Output Fall Time (CPR ≥ 3600)</b>	-	50	-	nS

\* Unloaded high level output voltage is 4.80V typically, 4.2V minimum.

Speed Calculation		Units
CPR ≤ 1250	18x10 <sup>6</sup> / CPR	RPM
CPR 2000-2500	21.6x10 <sup>6</sup> / CPR	RPM
CPR 4000+	43.2x10 <sup>6</sup> / CPR	RPM

\*60,000 RPM is the maximum RPM due to mechanical limitations.

## Cables:

The following cables are compatible with Anaheim Automation's A3I series encoder. Select a cable length from the table below:

Cable Part Number	Length
ENC-CBL-AA4032	1 ft.
ENC-CBL-AA4032-04	4 ft.
ENC-CBL-AA4032-10	10 ft.

*NOTE: For pricing and other information on cables and centering tools, please visit Accessories on our website.*

## Centering Tools:

Centering tools are optional, but recommended for a more precise installation.

# ENC-CTOOL - 250

Bore Size		
079=2mm	250=1/4"	551=14mm
118=3mm	313=5/15"	625=5/8"
125=1/8"	315=8mm	750=3/4"
156=5/32"	375=3/8"	787=20mm
157=4mm	394=10mm	875=7/8"
188=3/16"	472=12mm	984=25mm
197=5mm	500=1/2"	1000=1"
236=6mm		