

Description:

This optical encoder incremental module is used to detect a linear or rotary position when used together with a codewheel. Each module consists of a lensed LED source and a monolithic detector IC enclosed in a small plastic package. They are available in 2 channel or 3 channel versions. The resolution and index version of the modules and the codewheels must match. They can easily be mounted by using 4-40 screws through the mounting holes. These devices are very reliable when connected properly. Improper connections are the most common cause of failure. For maximum noise immunity or cables longer than 6 feet, add a cable driver option (PC4, EA-D8). For open collector or higher voltage applications, add the PC3 device. The suggested mating connector is AMPMODU 103977-4 or AMP 640442-5. Codewheels, quadrature decoder chips, counter chips, computer interface boards, and mating connectors and cables are also available.

Features:

- Two channel quadrature output with optional index pulse
- Resolution up to 2048 CPR
- No signal adjustment required
- Small size
- -40°C to 100°C operating temperature
- TTL compatible
- Single 5V Supply

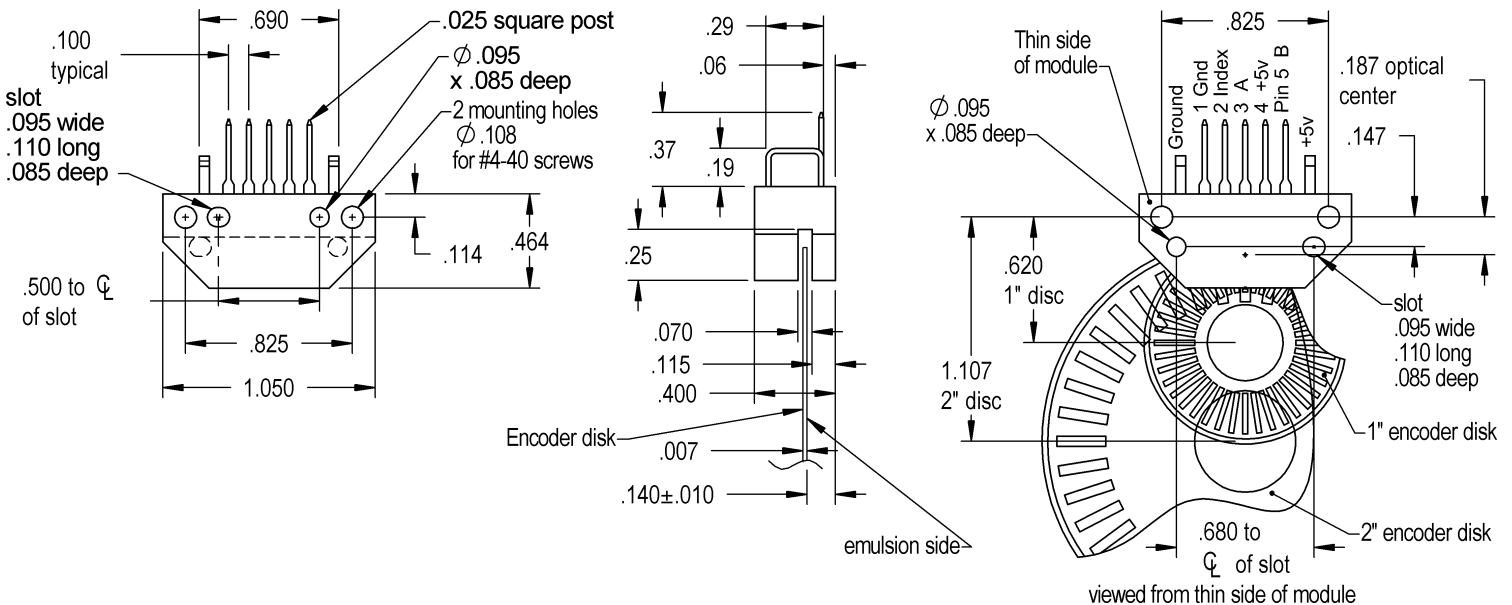
Mechanical Notes:

Parameter	Min.	Max.	Units
Storage temperature	-40	100	°C
Supply voltage, Vcc	-0.5	7.0	V
Output voltage	-0.5	V _{cc}	V
Output current per channel	-1.0	5.0	mA

Recommended Operating Conditions:

Parameter	Min.	Max.	Units	Notes
Temperature	-40	100	°C	
Supply voltage	4.5	5.5	Volts	Ripple < 100V _{p-p}
Load capacitance	-	100	pF	
Count frequency	-	100	kHz	rpm/60 x cycles/rev.

Mechanical Specifications:



Electrical Characteristics:

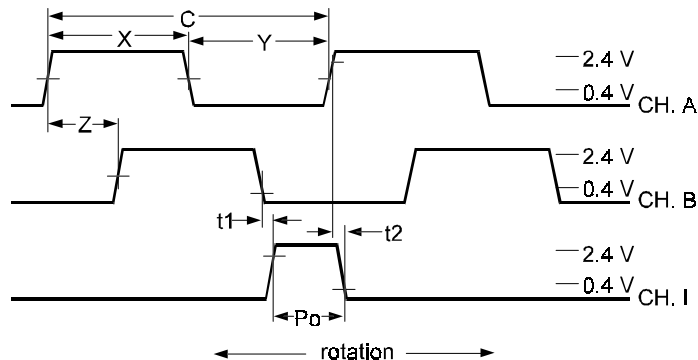
Parameter	Non-Index (2-channel) OR 1" disk < 1000 CPR or 2" disk < 2000 CPR				With Index Option (3-channel) OR 1" disk ≥ 1000 CPR or 2" disk ≥ 2000 CPR				
	Min.	Typ.	Max.	Notes	Min.	Typ.	Max.	Units	Notes
Supply Current	-	17	40		30	57	85	mA	
High Level Output Voltage	2.4	-	-	I _{OH} = -40 μA max. ^[1]	2.4	-	-	Volts	I _{OH} = -200 μA max.
Low Level Output Voltage	-	-	0.4	I _{OL} = 3.2 mA max.	-	-	0.4	Volts	I _{OL} = 3.86 mA max.
Rise Time	-	200	-	25pF, 11KOhm pullup	-	180 ^[2]	-	ns	25pF, 2.7KOhm pullup
Fall Time	-	50	-	25pF, 11KOhm pullup	-	49 ^[2]	-	ns	25pF, 2.7KOhm pullup

➤ Over Recommended Operating Range. Typical values are specified at V_{cc} = 5.0V & 25°C

1. Unloaded high level output voltage is 4.80v typically, 4.2v minimum.

2. 80 nSec for HEDS-9040 #T00 (2000 CPR With Index)

Timing Diagram:



CPR (N): The number of Cycles Per Revolution.

One Shaft Rotation: 360 mechanical degrees, N cycles.

One Electrical Degree ($^{\circ}e$): 1/360 of one cycle.

One Cycle (C): 360 electrical degrees ($^{\circ}e$). 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 $^{\circ}e$.

Quadrature (Z): The phase lag or lead between channels A and B in electrical degrees, nominally 90 $^{\circ}e$.

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 $^{\circ}e$).

Position error: The difference between the actual shaft position and the position indicated by the encoder cycle count.

Cycle error: An indication of cycle uniformity. The difference between an observed shaft angle which gives rise to one electrical cycle, and the nominal angular increment of 1/N of a revolution.

Shaft Rotation for Shafted Encoders:

- 1) View the encoder so the shaft/bushing side is facing up.
- 2) > For encoder **H3** the following is true: A leads B in a clockwise rotation and B leads A in a counterclockwise rotation.
 - > For encoders **H1, H25, S1, S2** and **SP-16** the following is true: B leads A in a clockwise rotation and A leads B in a counterclockwise rotation.

Shaft Rotation for Hollow-Shafted Encoders:

- 1) View the encoder so the cover/label side is facing up.
- 2) > For encoders **E3, E4, E5M** and **E6M** the following is true: A leads B in a clockwise and B leads A in a counterclockwise rotation.
 - > For encoder **E2** the following is true: B leads A in a clockwise rotation and A leads B in a counterclockwise rotation.

Encoder Characteristics:

Parameter	Symbol	Min.	Typ.	Max	Units
Cycle Error			3	5.5	$^{\circ}e$
Symmetry		150	180	210	$^{\circ}e$
Quadrature		60	90	120	$^{\circ}e$
Index Pulse width	Po	60	90	120	$^{\circ}e$
CH. I rise after CH. B or CH. A fall	t1	-300	100	250	ns
CH. I fall after CH. A or CH. B rise	t2	70	150	1000	ns

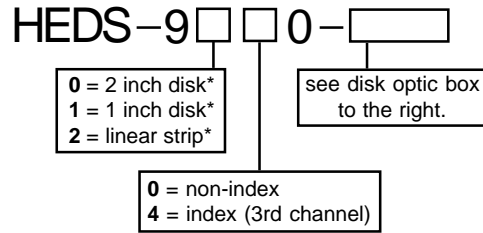
Over Recommended Operating Range. Values are for the worst error over a full rotation.

Encoder Characteristics for HEDS-9040#T00 (2000 CPR, Index):

Parameter	Symbol	Min.	Typ.	Max	Units
Cycle Error			3	7.5	$^{\circ}e$
Symmetry		130	180	230	$^{\circ}e$
Quadrature		40	90	140	$^{\circ}e$
Index Pulse width	Po	40	90	140	$^{\circ}e$
CH. I rise after CH. B or CH. A fall	t1	10	450	1500	ns
CH. I fall after CH. A or CH. B rise	t2	10	250	1500	ns

Over Recommended Operating Range. Values are for the worst error over a full rotation.

Ordering Information:



*These are normally used with disk sizes indicated, but exceptions are made. Please contact our Sales department to confirm disk and module compatibility.

Module Pricing:

	Low Resolution	High Resolution
HEDS-9000	\$25 (<=1000 CPR)	\$28
HEDS-9040	\$28	\$28
HEDS-9100	\$25 (<=500 CPR)	\$28
HEDS-9140	\$28	\$28
HEDS-9200	\$25	\$25

Linear Strip Optics:

CPI	Optics
120	HEDS-9200-L00
125	HEDS-9200-M00
127	HEDS-9200-M00
150	HEDS-9200-P00
180	HEDS-9200-Q00
200	HEDS-9200-R00
300	HEDS-9200-300
360	HEDS-9200-360

Disk Optics:

Disk Resolution	CPR	
	1"	2"
50	S00	-
96	C00	-
100	C00	S00
110	C00*	-
120	C00*	-
192	D00**	-
200	E00	C00
250	F00	-
256	F00	-
360	G00	-
400	H00	D00*
500	A00	A00**
512	I00	A00*
540	R00**	-
1000	B00*	B00
1016	J00*	-
1024	J00*	J00
2000	-	T00
2048	-	U00**

* Index option not yet available.

** **Index Exceptions (1" & 2"):**
192-I uses 9140-E00 module.
500-I uses 9140-F00 module.
2048-I uses 9040-T00 module.

** **Non-index Exceptions (1" & 2"):**
540 uses 9200-R00 module.

Technical Data, Rev. 07.25.00, July 2000
All Information subject to change without notice.