

Description:

The E4 optical kit encoder is a miniature non-contacting rotary to digital position feedback device. This reflective encoder is designed to easily mount to and dismount from an existing shaft. The internal monolithic electronic module converts the real-time shaft angle, speed, and direction into TTL-compatible outputs. Simplicity and low cost make the E4 ideal for both high and low volume motion control applications. Its tiny size makes it an ideal choice for small DC motors.

The reflective sensor incorporates an LED light source and a monolithic photo detector with signal shaping electronics to produce the two channel bounceless quadrature TTL outputs.

The hub of the encoder wheel is available for installation onto shafts from .059" to .197" (1.5mm to 5mm) in diameter. Standard diameters are stocked. A quick turn around time is offered on many special order diameters.

The base provides mounting holes for two 3-48 x 1/4" screws on a .586" bolt circle. When mounting holes are not available, a pre-applied transfer adhesive (with peel-off backing) is available for "stick-on" mounting.

The cover is easily snapped onto the base. It is embossed with the connector pin-out.

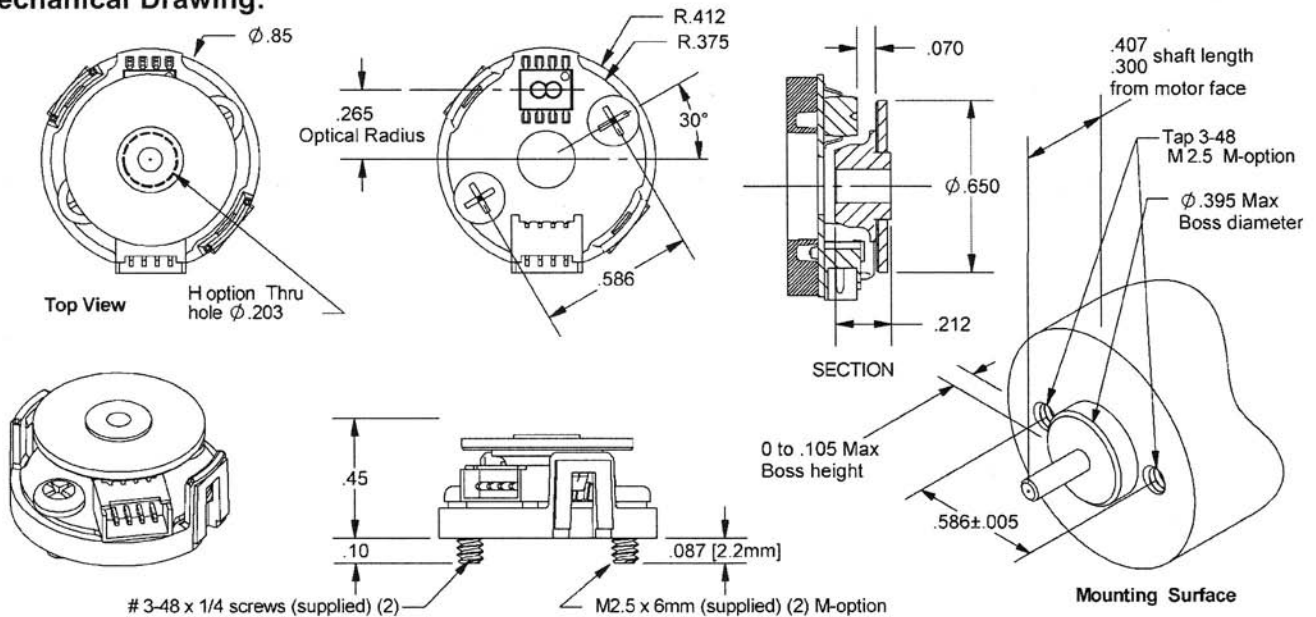
The E4 can be connected by using a high retention 4 conductor snap-in polarized 1.25mm pitch connector. The mating connector is polarized and should attach smoothly to the encoder; do not force. See the third page of this data sheet for Cables & Connectors.

Features:

- > Miniature size
- > Quick, simple assembly and disassembly
- > Low cost
- > High retention snap-in polarized connector
- > Fits shaft diameters of .059" to .197" (1.5mm to 5mm)
- > Fits shaft lengths of .285" to .392"
- > Accepts $\pm .020"$ ($\pm .5mm$) axial shaft play
- > Off-axis mounting tolerance of .010"
- > Tracks from 0 to 30,000 cycles/sec
- > 100 to 300 cycles per revolution (CPR)
- > 400 to 1200 pulses per revolution (PPR)
- > 2 channel quadrature TTL squarewave outputs
- > -10° to +85°C operating temperature
- > Single +5V supply
- > Low power strobe option available
- > Pin-out is engraved on the cover
- > Adhesive option available
- > US Digital warrants its products against defects in materials and workmanship for two years. See complete warranty for details.



Mechanical Drawing:



Compatible Cables & Connectors:

4-pin Micro:

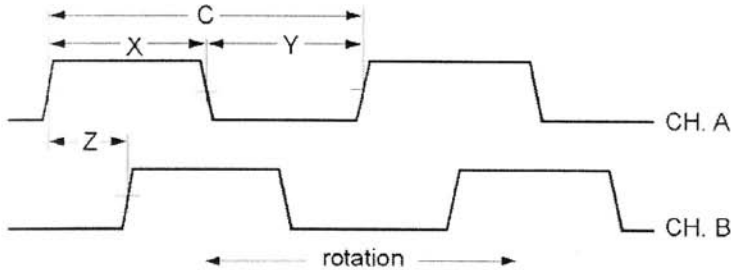
CON-MIC4	Connector
CA-3285	Connector on one end with 4 12" wires
CA-3286	Connector on one end of a 6' round twisted pair cable

Note: See **Cables & Connectors** data sheet for more information.

- > The connector built into the encoder is Molex# 53048-0410.
- > The mating connector is made up of housing (Molex# 51021-0400) and 4 individual crimp-on pins (Molex# 50079-8100).
- > Special crimp tool (Molex# 50079) is needed to install connector pins.

Installation Note:

Connector is polarized and should attach smoothly to the encoder, do not force.



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

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

One Shaft Rotation: 360 mechanical degrees, N cycles.

One Electrical Degree (°e): 1/360 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 & B in electrical degrees, nominally 90°e.

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.

Torque Specifications:

Parameter	Torque
Hub Set Screw to Shaft	1.5-2.0 in.-lbs.
Cover	1.5-2.0 in.-lbs.
Base to Mounting Surface	2-3 in.-lbs.

Electrical Specifications:

Parameter	Min.	Typ.	Max	Units	Notes
Supply Voltage	4.5	5.0	5.5	VDC	Ripple < 100mVp-p. See note 1.
Supply Current	15	21	29	mA	
Load Capacitance	-	-	100	pF	See note 2.
Count Frequency	-	-	30	kHz	RPM/60 x cycles/rev.
High Level Output Voltage	2.4	-	-	VDC	$I_{OH} = -640 \mu A$ max. See note 2.
Low Level Output Voltage	-	-	0.4	VDC	$I_{OL} = 3.86$ mA
Rise Time	-	150	200	ns	25pF. See note 2.
Fall Time	-	50	60	ns	
Operational Temperature	-10°C	-	85°C	-	

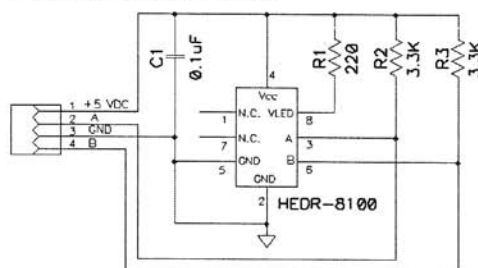
Note 1: Standard internal .1uF bypass capacitor is installed between power and ground.

Note 2: Standard internal 3.3KOhm pull-ups are installed on channels A and B.

Max Shaft Speed:

Electrical		Mechanical	
CPR	RPM	CPR	RPM
100	18000	100	50000
108	16500	108	50000
120	15000	120	50000
125	15000	125	50000
128	15000	128	50000
200	9000	200	50000
250	7200	250	50000
256	7200	256	50000
288	6250	288	50000
300	6000	300	50000

Internal Schematic:



Encoder Characteristics:

Accuracy	Min.	Typ.	Max.	Units
Symmetry	130	180	230	°e
Quadrature	15	90	165	°e
Symmetry*	95	180	265	°e
Quadrature*	5	90	175	°e
Cycle Error	-90	0	+90	arc min.

* For resolutions <110 CPR.