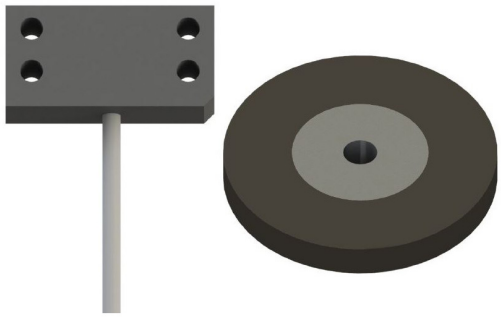
Features and Benefits

- Two channel quadrature output
- Operates in harsh environments
- No moving parts provide robust, trouble-free operation
- Simple two piece design (target magnet + encoder) for easy alignment and installation.
- Options for up to 40 pulse per channel per revolution.
- Customizable lead wires, cables, and or connectors.



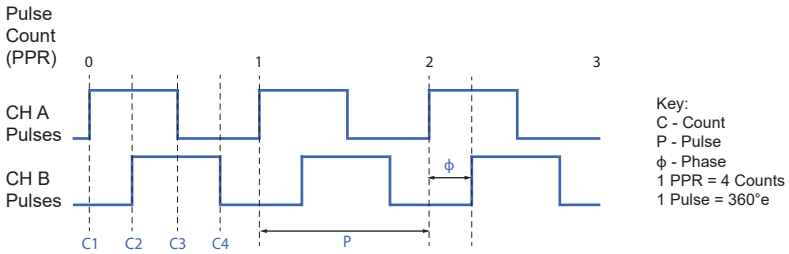
Kit - Encoder with Target Magnet

Resolution - Pulses Per Revolution

1 PPR = 4 Counts

Table 1.1

Output PPR	Maximum Shaft Speed, RPM
1	245,000
2	122,500
3	81,667
4	61,250
5	49,000
6	40,833
7	35,000
8	30,625
9	27,222
10	24,500
12	20,417
14	17,500
15	16,333
16	15,313
17	14,412
18	13,611
19	12,895
20	12,250
22	11,136
25	9,800
26	9,423
30	8,167
32	7,656
40	6,125



Contact sales@phoenixamerica.com for higher shaft speeds.

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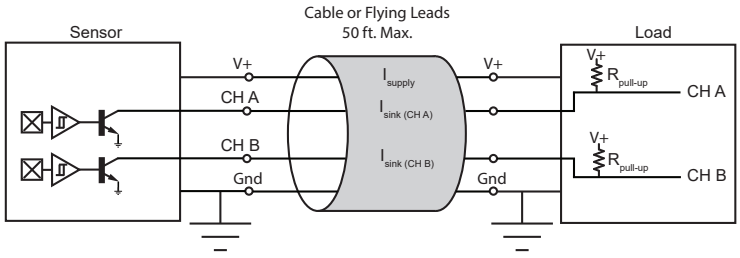
Electrical Circuit



Output channels require customer supplied pull-up resistors unless internal pull-up option is selected. See Table 3.1 for recommended resistor values.

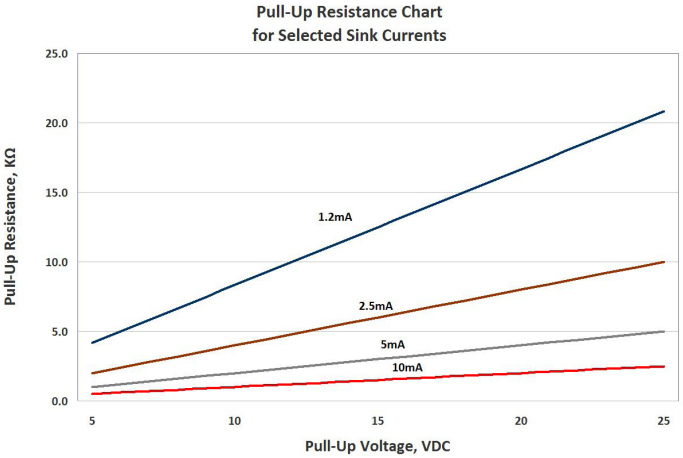


Table 2.1

Recommended Pull-Up Resistor Values			
	Supply Voltage		
Current, I_{sink}	5	12	24
1.2 mA	4.3K	10.0K	20.0K
2.5 mA	2.0K	4.7K	10.0K
5 mA	1.0K	2.4K	4.7K
10 mA	510Ω	1.2K	2.4K

I_{sink} is application dependent. It is recommended to use the lowest possible sink current when selecting a pull-up resistor.

Theoretical Pull-Up Resistor Calculation: $R_{pullup} = \frac{V_{supply}}{I_{sink}}$

Resistance values based on closest standard 5% resistor values

Absolute Maximum I_{sink} = 20mA

4.7 K pull-up is available as a standard option. If an alternative pull-up value is preferred, contact sales@phoenixamerica.com.

Absolute Maximum Ratings

Table 2.2

Characteristic	Symbol	Rating	Units
Forward Supply Voltage	V_{CC}	26.5	V
Reverse Supply Voltage	V_{RCC}	-30	V
Output Off Voltage	V_{OUT}	26	V
Continuous Output Current	I_{OUT}	25	mA
Reverse Output Current	I_{ROUT}	-50	mA
Operating Temperature	T_A	-40 - 125	ºC
Storage Temperature	T_S	-40 - 150	ºC

Electrical Characteristics

Table 2.3

Characteristic	Symbol	Test Conditions	Min.	Typ.[1]	Max.	Unit[2]
Forward Supply Voltage	V_{CC}	Operating, T_J < 165 ºC	3.3	-	24	V
Power-On Time	t_{PO}	V_{CC} > 3.3V	-	-	25	µs
Supply Current	$I_{CC(ON)}$	B > B_{OP}, V_{CC} = 12V	-	-	8	mA
	$I_{CC(OFF)}$	B < B_{RP}, V_{CC} = 12V	-	-	8	mA
Reverse Supply Current	I_{RRC}	V_{RRC} = -30V	-	-	-5	mA

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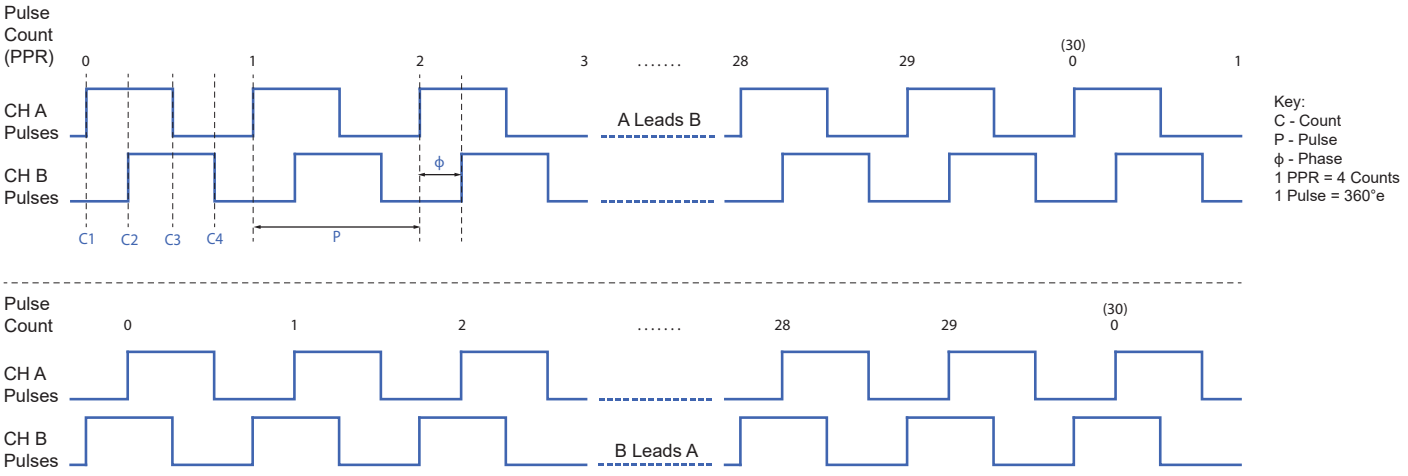
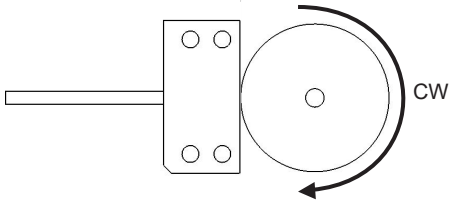
Output Waveforms

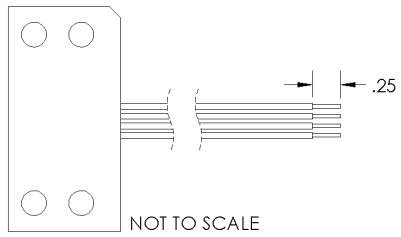




Channel A leads Channel B for clockwise shaft rotation (shaft rotation is defined when looking at the encoder mounting surface).

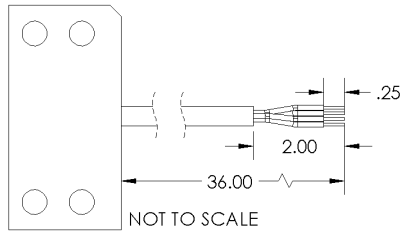
Wiring

FLYING LEADS



- 24 AWG
- 7x32 Strands, Tinned Copper
- PVC Insulation
- UL Type 1430
- Temperature Rating: 105ºC

CABLE



- 24 AWG
- 4 Conductor with Foil Shield and Drain
- Stranded Tinned Copper
- PVC Insulation
- Grey PVC Jacket
- UL Style 2464, CSA
- Temperature Rating: 105ºC

Table 3.1

Standard Wiring			
	Leads	**Cable**	**Connector Pin-Out**
Ch A	Yellow	Brown	1
Ch B	Blue	Orange	2
Gnd	Black	Black	3
Vcc	Red	Red	4

Custom lengths and insulation materials available. Contact sales@phoenixamerica.com.

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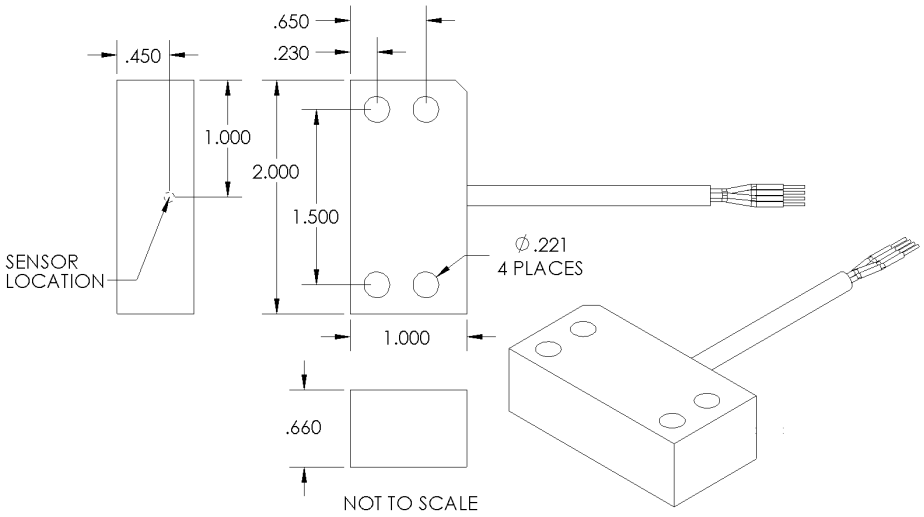
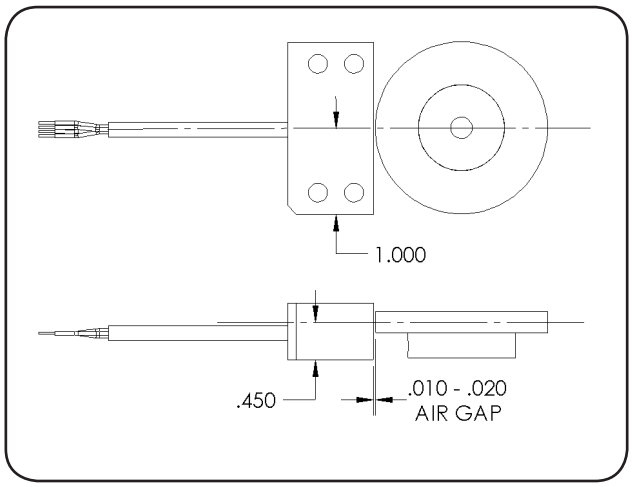
Encoder Physical Outline



Encoder Mounting Guidelines

- Air gap between magnet rotor and encoder housing should be set to the minimum that can be achieved, taking into account radial play and mounting tolerances. 0.010” to 0.020” is a good target. Air gaps greater than 0.040” are acceptable depending on resolution, pole count, and external environment.
- The encoder and rotor should be mounted perpendicular to the shaft the rotor is mounted on.
- The image below shows a two inch magnet rotor, but alignment targets hold true for all magnet rotor sizes.



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Target Rotor Physical Outline - Aluminum Hub (Mounting Style B)

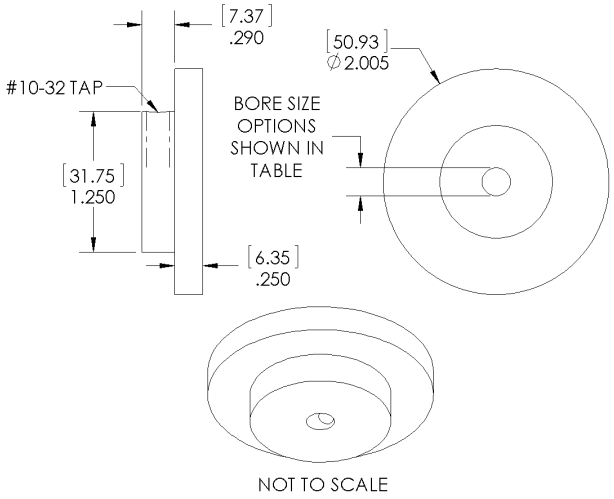


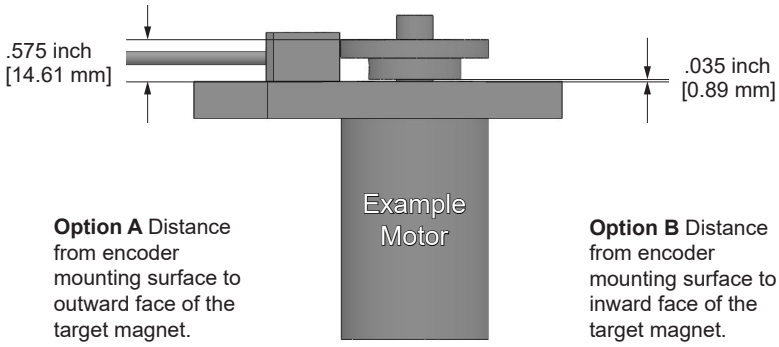
Table 5.1

Bore Size (.inch)	Motor Shaft OD Size (nominal)	NEMA Guide Shaft Tolerance	Magnet Bore MIN. (inch)	Magnet Bore MAX. (inch)
250	1/4 in (.2500")	+0.0000"/-0.0005"	.2507	.2516
276	7 mm (.2758")		.2767	.2778
313	5/16 in (.3125")		.3134	.3145
315	8 mm (.3150")		.3159	.3170
375	3/8 in (.3750")		.3759	.3770
394	10 mm (.3940")		.3949	.3960
473	12 mm (.4728")		.4737	.4748
500	1/2 in (.5000")		.5009	.5020
625	5/8 in (.6250")		.6259	.6270
750	3/4 in (.7500")		.7509	.7520
875	7/8 in (.8750")		.8759	.8770
985	25 mm (.9850")		.9859	.9870

Other bore sizes available upon request.
Contact sales@phoenixamerica.com.

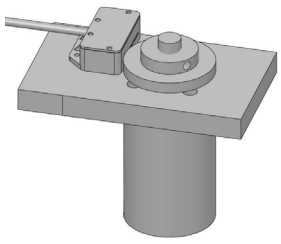
Target Rotor Mounting Guidelines - Aluminum Hub (Mounting Style B)

- Proper alignment of the target rotor to the encoder sensing element is critical for optimal encoder performance. Insure that the rotor is mounted to the specified height using one of the options shown in the diagram below.
- A machined step on the motor shaft provides a quick and repeatable method for positioning the target rotor. Spacers or other fixturing should be used to properly position the rotor if no mechanical locating features are on the shaft.
- While the hub is held in the proper position, use a hex wrench to tighten #10-32 set screw.
- For permanent applications, a threadlocker or retaining compound is advised in conjunction with the set screw.



Option A Distance from encoder mounting surface to outward face of the target magnet.

Option B Distance from encoder mounting surface to inward face of the target magnet.



Images show two inch magnet rotor, but alignment targets hold true for all sizes.

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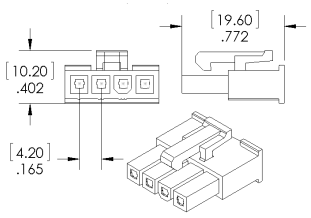
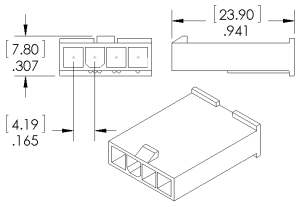
Connector Options *(Single ended option depicted)*

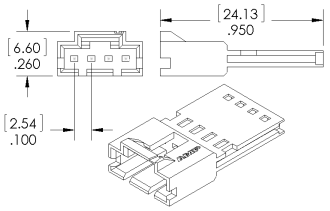
Molex Mini-Fit Jr. (Male)



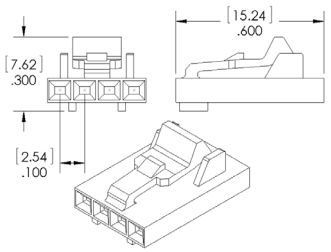
Molex Mini-Fit Jr. (Female)



TE AmpModu MTE (Male)



TE AmpModu MTE (Female)



Need a different connector? Contact sales@phoenixamerica.com.

Part Number Description

M4 – 30 – 375 – N – C – B – F – B – X

Series	PPR	Bore Size	Index	Output Type	Target Magnet Mounting	Wiring	Length (Meters)	Connector
M4	**1** **2** **3** **4** **5** **6** **7** **8** **9** **10** **12** **14** **15** **16** **17** **18** **19** **20** **22** **25** **26** **30** **32** **40**	**250** 1/4 in **276** 7 mm **313** 5/16 in **315** 8 mm **375** 3/8 in **394** 10 mm **473** 12 mm **500** 1/2 in **625** 5/8 in **750** 3/4 in **875** 7/8 in **985** 25 mm	**N** *A,B Quadrature (default)*	**C** *Open Collector (default)* **P** *Open Collector with Internal Pull-Up (4.7K)*	**B** *Aluminum Hub*	**F** *Flying Leads (default)* **C** *Cable*	**A** .5 *(19.685")* **B** 0.914 *(36") (default)* **C** 1 *(39.370")* **D** 2 *(78.740")*	**X** *None (default)* **A1** *TE AmpModu MTE (Male)* **A2** *TE AmpModu MTE (Female)* **M1** *Molex Mini-Fit Jr. (Male)* **M2** *Molex Mini-Fit Jr. (Female)*

Example: M4-30-375-N-D-B-F-B-X

Contact sales@phoenixamerica.com for additional resolutions and rotor configurations.

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