

## Micro Kit Encoder

### Features

- » 1.5 Inch Diameter Kit (Frameless) Encoder
- » True Absolute 24-Bit Position Output
- » Accurate to <30 arcseconds RMS
- » In-Situ Auto-Calibration
- » Health and Status Diagnostic Reporting
- » Radiation tolerant to 50 krad(Si) & >2.4E11n/cm<sup>2</sup>

### Applications

- » Commercial Space Applications
- » Low Earth Orbit
- » CubeSats
- » Miniature DC Motor
- » Robotics



### Description

The Micro Kit Encoder, or MKE, is Quantic BEI's smallest flight-worthy optical encoder. This true-absolute optical encoder delivers high performance rotary sensing in a package well suited for CubeSats & small satellites. The code disk hub is customizable to fit small shafts <5 mm (3/16"), such as common DC motors. The electronic components are commercial grade, but specifically chosen to meet the environmental and radiation demands of low Earth orbit.

Like other encoders in the nanoSeries family, the MKE employs a long-life LED light source to illuminate our high-accuracy code disk. The code patterns constitute radiometric tiers of advancing frequencies to create the high-resolution 24-bit contiguous angular position, all while maintaining positional stability over temperature and time.

	Specification	Units	Min	Max
Performance	Full Revolution Accuracy	arcsec RMS	-	30
	Resolution - Quanta	Bits	24	-
	Resolution - ENOB	Bits	18	-
	Interrogation Rate	Hz	100	1000
	Speed (operating)	RPM	0	1000
	MTBF, MIL-HDBK-217 Parts Count	Hours	100000	-
	Direction of Increasing Count	-	CCW	
Electrical	Input Voltage	VDC	4.3	5.7
	Input Current	mA	-	50
	ESD Sensitivity	V, HBM	8000	-
Environmental	Vibration, MIL-STD-202 Method 214, Cond. B	grms	-	20.7
	Shock, MIL-STD-202, Method 213 B, Cond. A, 11ms half-sine	g's	-	50 <sup>1</sup>
	Operating Temperature	°C	-40	+85
	Storage Temperature	°C	-55	+90
	Low-Outgassing Design	-	-	1.0% TML 0.1% CVCM
	Total Ionizing Dose	krad	-	50
	Displacement Damage	n/cm <sup>2</sup> [1 Mev]	-	> 2.4E11

1. Tested to this limit. Actual limit is much higher. Consult factory.

## Connector Pinout

The standard nanoSeries® Micro Kit Encoder output connector is a 9-socket Micro-D Connector (M83513/04-A\_N type) with the following pinout:

Pin	MNEMONIC	I/O	Description
1	+POS	Out	Position data output
6	-POS	Out	Position data output
3	+CMD	IN	Command word input
8	-CMD	IN	Command word input
2	+CLK	IN	Synchronous clock input
7	-CLK	IN	Synchronous clock input
4	+5 VDC	—	Supply Voltage
9	5V RTN	—	Supply Voltage return
5	CHAS	—	Chassis (case) ground

I/O: LVDS or RS422



## Output Protocol

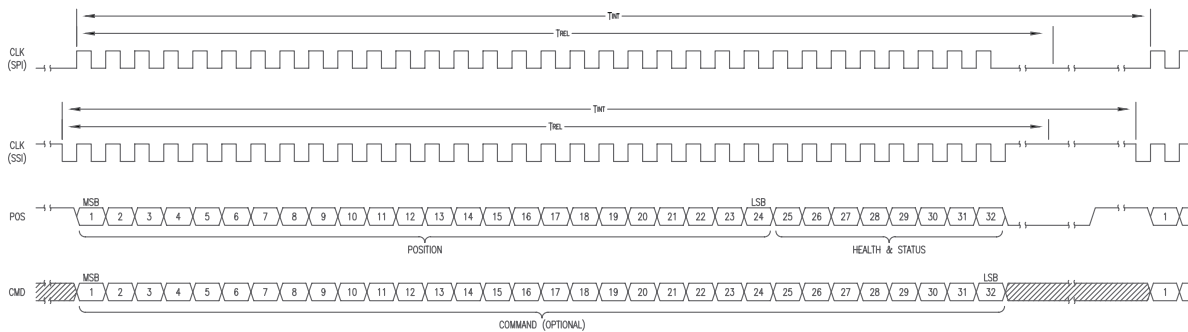


Figure 1.  
Electrical Interface  
Timing Diagram (System)  
Timing Values Per Table 1)

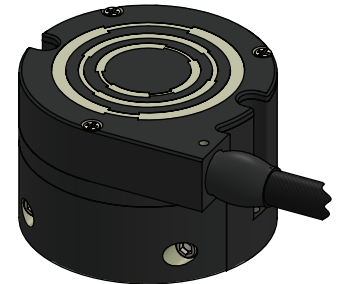
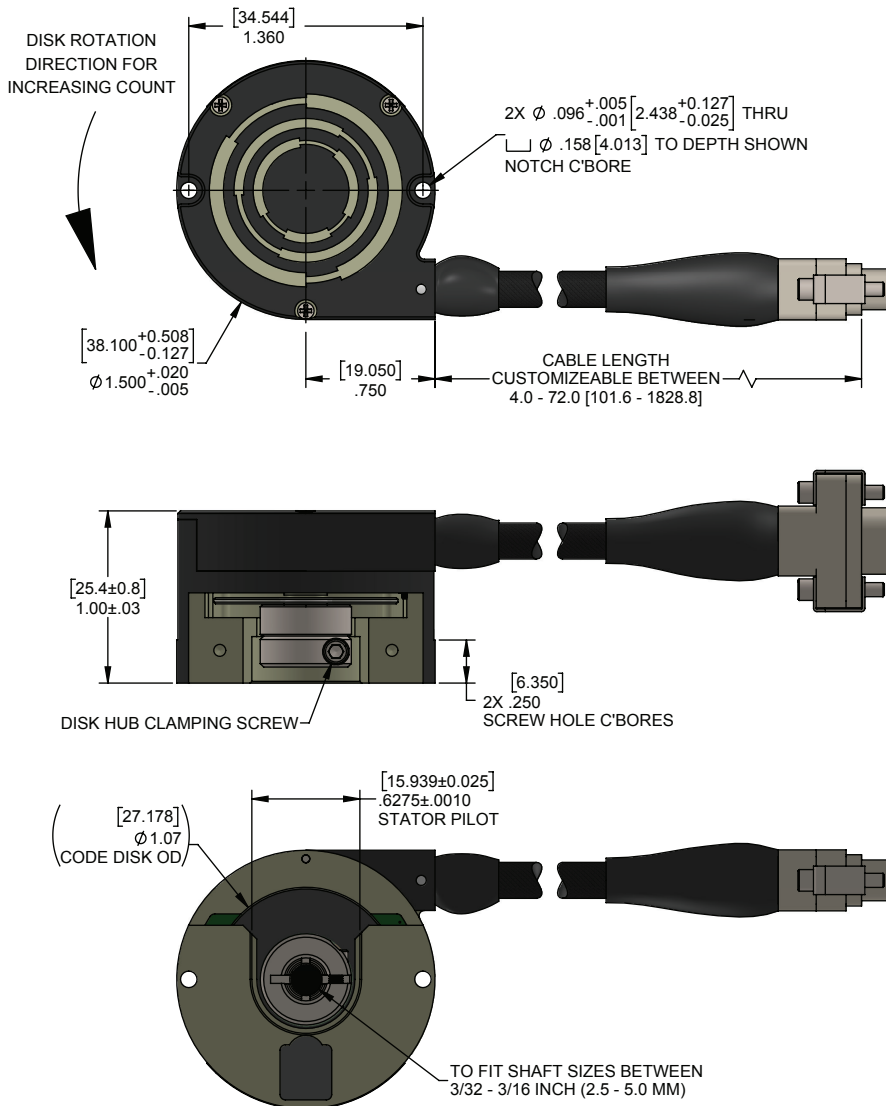
Table 1.  
Electrical Interface Timing Values (See 190-0323-03 For Details)

Parameter	Symbol	Min	Typical	Max	Units
Encoder Data Relevancy*	$T_{REL}$	43	45.5	48	$\mu S$
Encoder Interrogation Period	$T_{INT}$	1000	—	—	$\mu S$
Clock Frequency		1.5	2	2.5	MHz

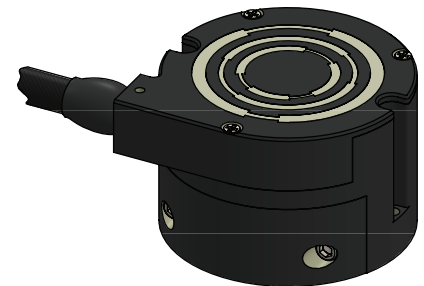
\*Although data is sampled within 45  $\mu S$  (typ) of the CMD pulses, it is not shifted out until the next cycle

## Readhead & Code Disk In Installed State

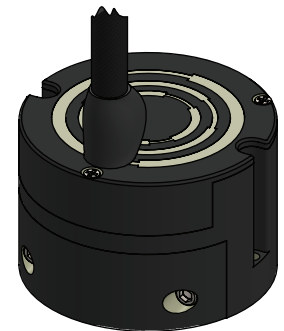
[Right-exit option, shown with front cover removed]



RIGHT-EXIT OPTION



LEFT-EXIT OPTION



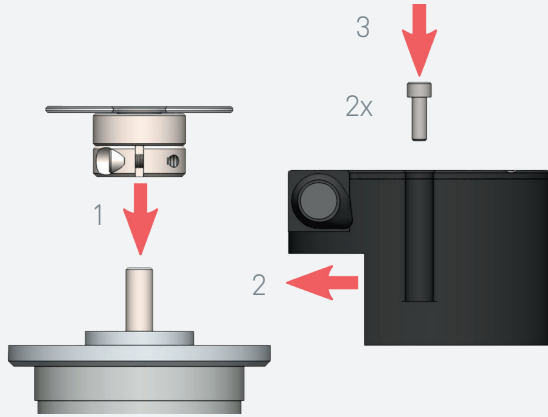
### Notes:

1. See outline drawing 190-0343-01 for complete dimensional specifications and mounting interface recommendations.
2. Unbracketed dimensions are inches and bracketed [x.Xx] dimensions are millimeters.
3. Quantic BEI can provide mounting plates to adapt stator interface to any existing hole pattern. Consult the factory for details.
4. Readhead mass:  $50.3 + 1.35(L)$  grams max,  $L$  = cable length  
 Disk hub mass: 10.8 Grams max

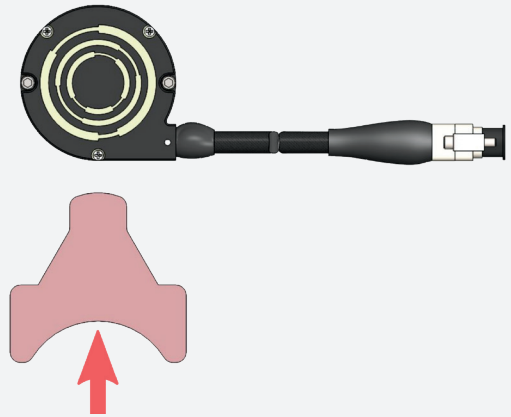


# Installation Sequence

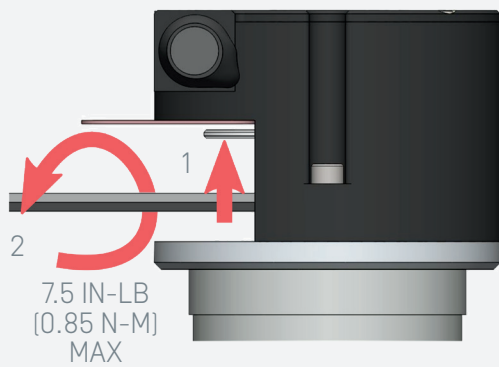
1. Mount Hardware



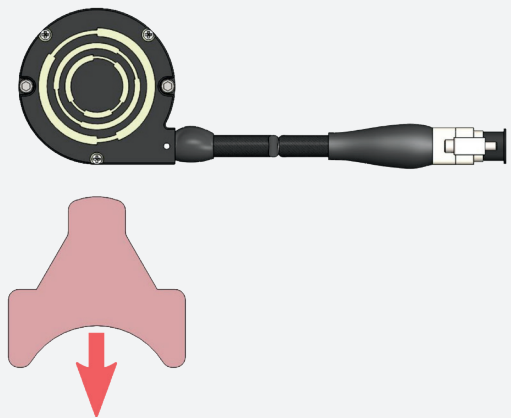
2. Fully Insert Shim



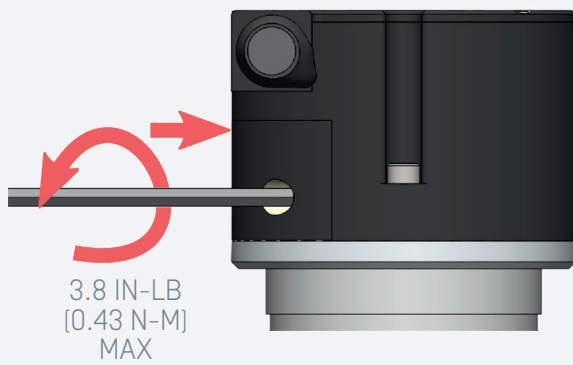
3. Raise Disk to Shim



4. Remove Shim



5 Install Front Cover



## Ordering Information

