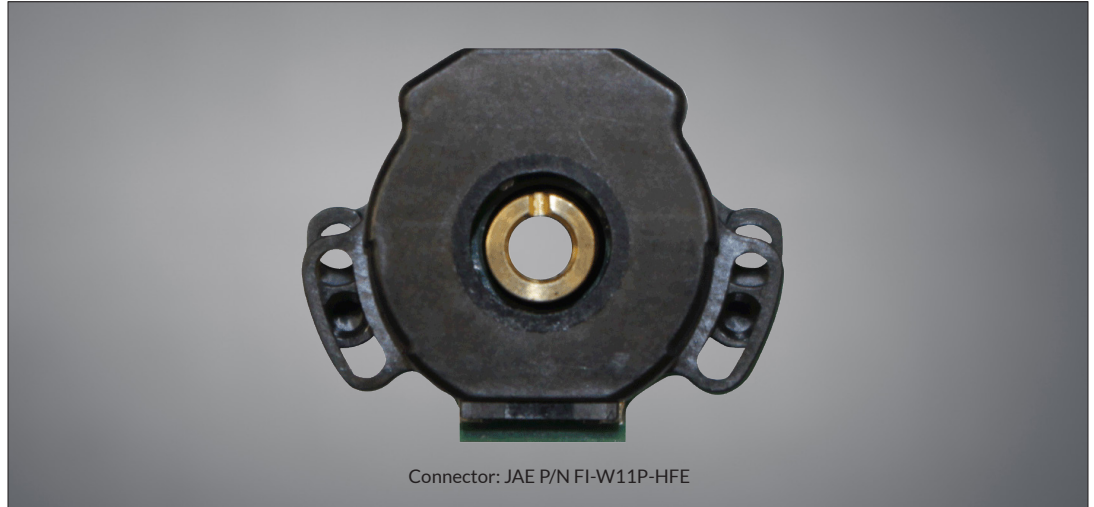


## QM22

### DESIGN FEATURES

- Bearingless modular design
- 4, 6 or 8 pole commutation<sup>2</sup>
- Resolutions to 2500
- Miniature package size
- Easy lock-n-twist assembly feature
- RoHS construction
- Hermetically sealed LED
- High noise immunity



Quantum Devices, Inc. Model QM22 is a high performance, small diameter modular encoder ideal for high volume OEM applications and is priced competitively for all sizes of motion control projects. The QM22's versatile electrical configurations include line counts up to 2500 and several commutation options. The QM22's patented lock-n-twist mechanism simplifies installation; saving production time and money. Perfect for NEMA 11 BLDC servo applications.



### Configuration Options:

Resolution <sup>2</sup>	Commutation <sup>2</sup>	Output	Cover	Bore Size	Mounting	Hardware
A1 = 250 B1 = 256 A2 = 500 B2 = 512 A4 = 1000 B4 = 1024 A6 = 2000 B6 = 2048 A7 = 2500	A = No Comm B = 4 Pole C = 6 Pole D = 8 Pole	A = Line Driver (ABZ only) <sup>3</sup> B = Line Driver (ABZ) / Open Collector (UVW) <sup>4</sup> C = Line Driver (ABZ) / Open Collector with pull-ups (UVW) <sup>5</sup>	A = Hole in Cover	C = 2 mm D = 2.5 mm E = 3 mm F = 4 mm M = 0.125" N = 0.15625"	A = 1.024" BC	Please refer to hardware options on page 4

#### Note:

- 1.) 4 poles has four states per revolution (2 pole pair), or two 360° electrical cycles per revolution
- 2.) Consult factory for configurations not shown (e.g. resolution, commutation, etc.)
- 3.) Use Output option A for No Comm (Commutation option A), compatible with Renco option LD/0 or VC/0
- 4.) Compatible with Renco option LD/VO
- 5.) Compatible with Renco option LD/VC or VC/VC

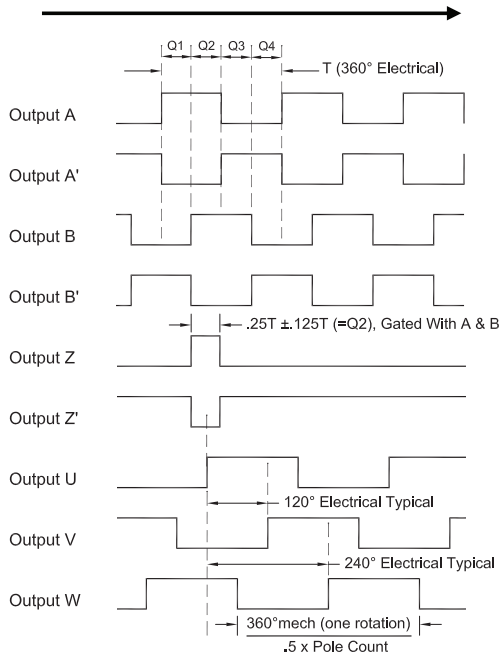
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## OUTPUT WAVEFORMS

CCW Shaft Rotation as Viewed Looking at the Encoder Top



$$Q1 + Q2 = 0.5T \pm 0.125T$$

$$Q2 + Q3 = 0.5T \pm 0.125T$$

$$Qn = 0.25T \pm 0.125T \quad (n = 1, 2, 3, 4)$$

## ELECTRICAL SPECIFICATIONS

Input Voltage	5 VDC $\pm$ 5%
Input Current Requirements	35 mA typical, 50 mA max plus interface loads
Input Ripple	2% peak to peak @ 5 VDC
Incremental Output Circuits (ABZ)	26C31 line driver (RS-422 or single-ended TTL) sink or source 20 mA max
Commutation Output Circuits (UVW)	B = open collector 4 mA sink max, pull up voltage 30 VDC max C = open collector with 2 k $\Omega$ pull-ups, 4 mA sink max
Incremental Output Format	Quadrature with A leading B for CCW rotation viewed from encoder top
Max Operating Frequency	500 kHz or 15,000 RPM
Commutation Format	Three phase 4, 6, 8 or 10 poles (other pole counts upon request)
Commutation Accuracy (UVW)	$\pm$ 2° mechanical
Interpolation Factors	500/512 PPR = 2x      1000/1024 PPR = 4x 2000/2048 PPR = 8x      2500 PPR = 10x

## ENVIRONMENTAL SPECIFICATIONS

Storage Temperature	-40 to 125°C
Operating Temperature	-30 to 115°C
IP Rating	IP40
Humidity	90% non-condensing
Vibration	20 g's @ 25 to 2,000 Hz
Shock	100 g's @ 6 ms duration

## MECHANICAL SPECIFICATIONS

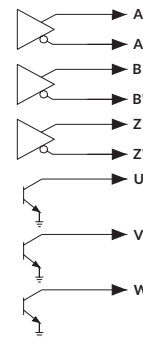
Bore Minimum Diameter	Bore size +0.0002"
Recommended Shaft Tolerance	+0.0000/-0.0005"
Minimum Shaft Engagement	0.490" [12.5 mm]
Allowable Shaft Runout	0.002" [0.05 mm] TIR ( $\pm$ 0.001" shaft radial play from initial shaft position of assembled encoder)
Allowable Axial Shaft Movement	$\pm$ 0.010" [ $\pm$ 0.25 mm]
Mounting	1.024" [26 mm] Bolt Circle
Dynamic Commutation Adjustment Range	26° mechanical
Moment of Inertia	$4.0 \times 10^{-6}$ oz-in-s <sup>2</sup>

## ELECTRICAL PIN FUNCTIONS

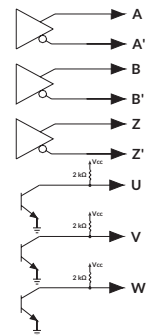
Pin Number	Output Option	
	Option A	Option B & C
1	NC	U
2	NC	V
3	NC	W
4	A	A
5	A'	A'
6	B	B
7	B'	B'
8	Z	Z
9	Z'	Z'
10	Vcc	Vcc
11	GND	GND

## ELECTRICAL OUTPUT CIRCUITS

**Output Option A & B:**  
ABZ = 26C31 line driver (RS-422)  
UVW = open collector



**Output Option C:**  
ABZ = 26C31 line driver (RS-422)  
UVW = open collector, 2 k $\Omega$  pull-ups on UVW

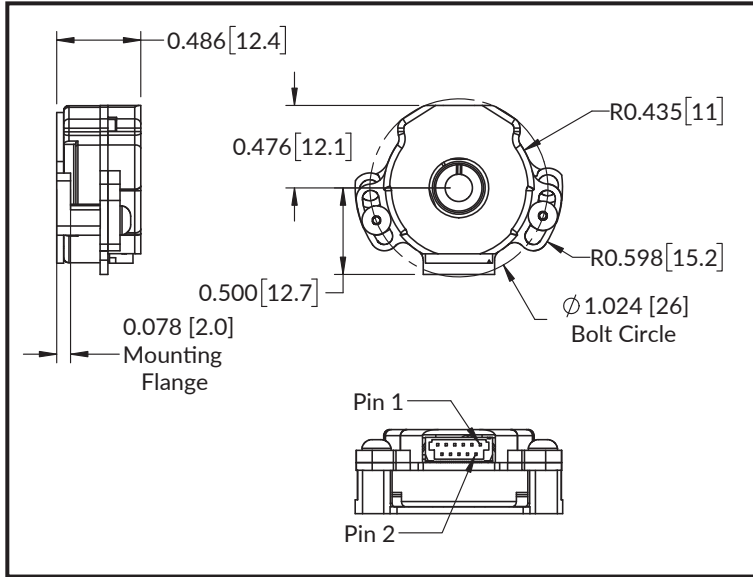


- 26C31 line driver is TTL compatible (can be wired single-ended)
- U, V and W are "no connect" for Output option A

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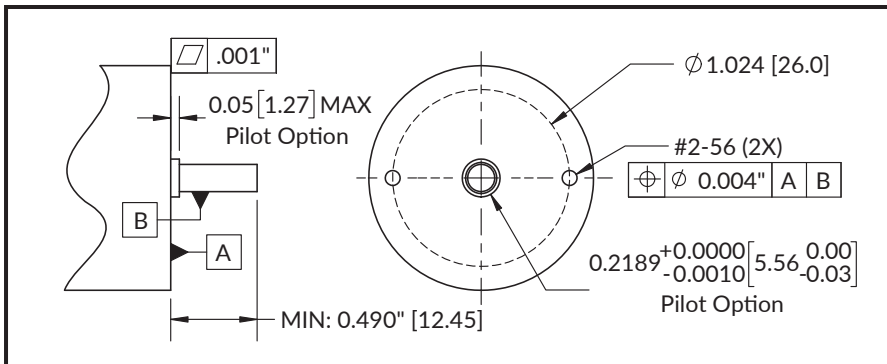
## MECHANICAL DIMENSIONS

Model QM22 - 1.024" Bolt Circle (Mounting Option A)



## MOUNTING REQUIREMENTS

Mounting Option A (1.024" Bolt Circle)



**Patent Protection:**

- US Patent 9,857,205
- US Patent 6,563,108

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**SELECTION CHART**

<b>MOUNTING OPTION A (1.024" BOLT CIRCLE)</b>	
#3-48 x 1/16" Set Screw	
No Thread Lock	With Thread Lock
English	English
<b>Option A</b>	<b>Option D</b>

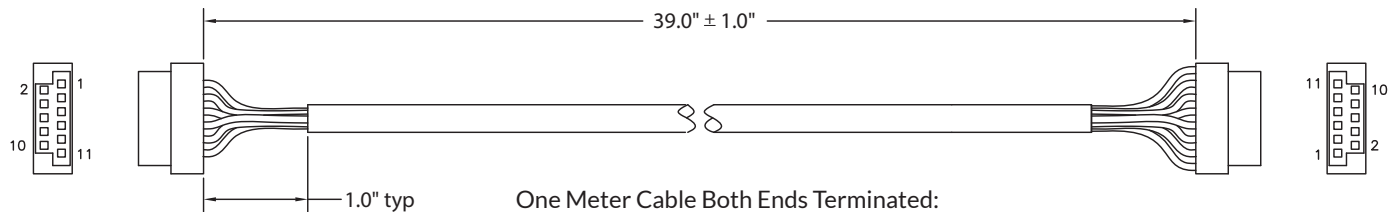
Thread lock is applied to the mounting screws only. This preapplied thread locking product contains a microencapsulated epoxy resin that is suspended in a hardener. The force of thread engagement crushes the microscopic capsules of epoxy resin, mixing the reactant components, and initiating a chemical reaction which locks the parts together. This product series provides consistent and predictable torque values and requires no heat or primers for curing. Product - ND Industries 593S.

**HARDWARE SELECTION BREAKOUT**

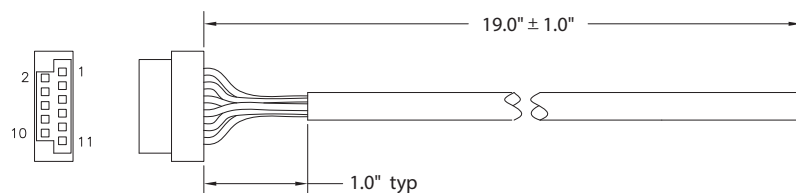
	<b>Option A</b>	<b>Option D</b>
<b>Set Screws (Qty. 1 each)</b>	Black Ox #3-48 x 1/16" 0.050" Hex (Torque = 18 - 22 oz-in) Part Number 1829ZG014	Black Ox #3-48 x 1/16" 0.050" Hex (Torque = 18 - 22 oz-in) Part Number 1829ZG014
<b>Mounting Screws (Qty. 2 each)</b>	#2-56 x 1/4" Button Head, 0.050" Hex (Torque = 45 - 51 oz-in) Part Number 1834ZG002	#2-56 x 1/4" Button Head 0.050" Hex with thread lock (Torque = 45 - 51 oz-in) Part Number 1834AG102
<b>Cover Screws (Qty. 2 each)</b>	Plastite 48-2, thread 2-28, length 1/4", Torx Plus IP7 (Torque = 37 - 43 oz-in) Part Number 1826ZG002	Plastite 48-2, thread 2-28, length 1/4", Torx Plus IP7 (Torque = 37 - 43 oz-in) Part Number 1826ZG002

**CABLE ACCESSORIES**

(2175AG039, 2177AG039, 2176AG019, 2178AG019)  
Consult Factory for Custom Lengths



One Meter Cable Both Ends Terminated:  
2175AG039 = 11 conductor 28 AWG for UVW Commutation  
2177AG039 = 8 conductor 28 AWG for non-Commutation  
Connector = JAE FI-W115



Half Meter Cable One End Terminated:  
2176AG019 = 11 conductor 28 AWG for UVW Commutation  
2178AG019 = 8 conductor 28 AWG for non-Commutation  
Connector = JAE FI-W115

Pin Number	Encoder Pin Function	2175AG039 2176AG019 Wire Color	2177AG039 2178AG019 Wire Color
1	U	Violet	-
2	V	White/Brown	-
3	W	White/Orange	-
4	A	Brown	Brown
5	A'	White	White
6	B	Blue	Blue
7	B'	Green	Green
8	Z	Orange	Orange
9	Z'	Yellow	Yellow
10	Vcc	Red	Red
11	GND	Black	Black

Note:  
1. Cable has internal foil shield with 28 AWG drain wire trimmed to jacket edge  
2. Unused wires to be locally isolated from adjacent signal wires, Vcc and GND to prevent damage to encoder signals

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