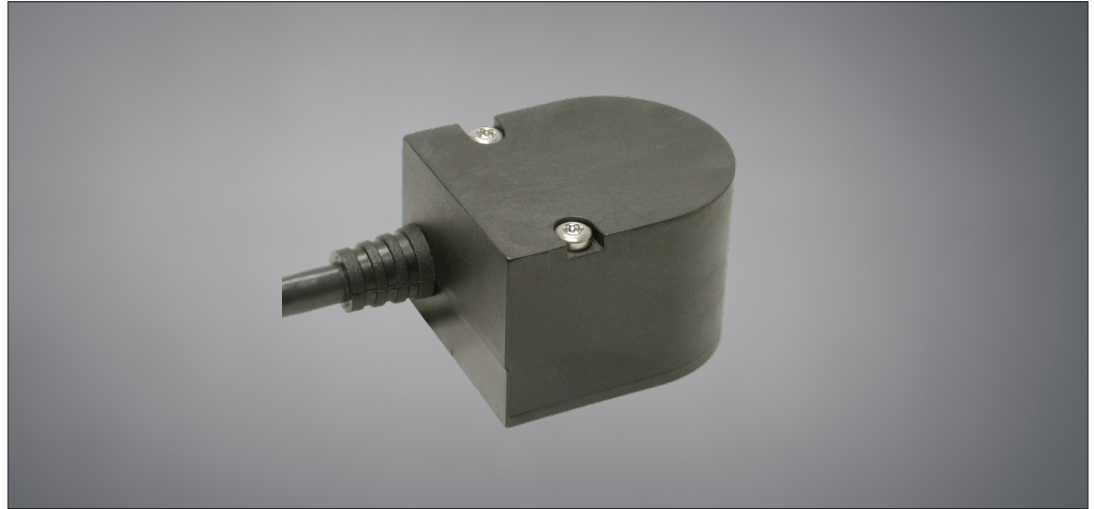


## HR12

### DESIGN FEATURES

- Mount compatible with HEDs encoders
- Bearing design simplifies encoder attachment
- Incremental resolutions up to 20,000 PPR
- 4, 6 or 8 pole commutation<sup>1</sup>
- Differential line drivers
- Protective enclosure
- Multiple bolt circle mounting
- Through bore sizes up to 0.375" (10 mm) diameter
- High noise immunity
- Cost competitive with modular encoders
- 500 kHz frequency response
- RoHS construction
- No centering tools required for easy assembly



Quantum Devices, Inc. Model HR12 provides an improved feedback solution in applications typically using modular encoders. The HR12 provides feedback capabilities where the others leave off – high line count resolution, high temperature operation, rugged bearing construction, large tolerance to radial and axial shaft play, commutation for brushless motor control, with a strain relieved cable. Quadrature output with index pulse and three-phase commutation provided with industrial 26C31 differential drivers. A flexible member allows for much greater tail shaft run out and TIR than can be tolerated by modular encoder designs, plus it provides 30 degrees of rotation for commutation timing.

**HR12** - **1000** - **4** - **A** - **H** - **L** - **H** - **A**

Resolution    Commutation    Output    Hub    Bore Size    Mounting    Index  
Configuration

#### Configuration Options:

Resolution <sup>1</sup>	Commutation <sup>1</sup>	Output <sup>1</sup>	Hub Configuration	Bore Size	Mounting	Index
24 <sup>2</sup> , 256, 360, 500, 512, 1000, 1024, 1250, 2000, 2048, 2500, 4000, 4096, 5000, 8192, 10000, 16384, 20000	0 = 0 4 = 4 Pole 6 = 6 Pole 8 = 8 Pole	A = Line Driver B = Line Driver ABZ / Open Collector UVW	H = HEDS Compatible Configuration	A = 3 mm B = 4 mm C = 5 mm D = 6 mm E = 8 mm F = 10 mm G = 7 mm J = 0.125" K = 0.1875" L = 0.250" M = 0.3125" N = 0.375"	H = HEDS	A = 90° gated to A & B

#### Note:

- 1.) Consult factory for configuration options not shown (e.g. resolution, commutation, output, etc.)
- 2.) 24 PPR only available with No Comm (Commutation option 0)

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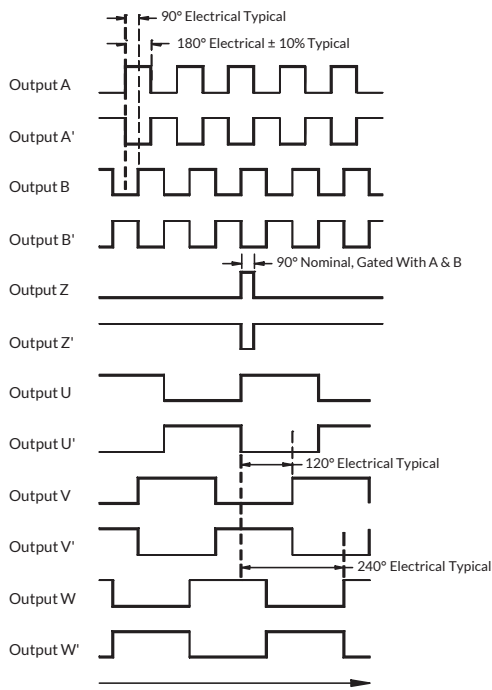
[www.electromate.com](http://www.electromate.com)

[sales@electromate.com](mailto:sales@electromate.com)

**ISO 9001**

CERT. NO. FM 52711

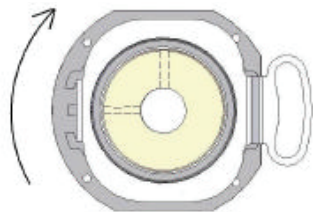
## OUTPUT WAVEFORMS



Clockwise Shaft Rotation as Viewed Looking at the Encoder Face (see figure below)

**Note:** Relationship of Z signals to U, V, W signals is not to scale. A & B signals have no relationship to U, V, W signals.

CW Rotation for Output Waveforms



Hub set screw location at Z index position

## ELECTRICAL SPECIFICATIONS

Input Voltage	5 VDC $\pm$ 5%
Input Current Requirements	65 mA typical, 100 mA max plus interface loads
Input Ripple	2% peak to peak @ 5 VDC
Output Circuits	A = 26C31 line driver (RS-422 or single-ended TTL) B = ABZ 26C31 line driver, UVW open collector (no U' V' W')
Incremental Output Format	Quadrature with A leading B for CW rotation Index pulse true over A and B high
Max Operating Frequency	500 kHz
Symmetry	180° electrical $\pm$ 10% typical
Minimum Edge Separation	<4000 PPR = 54° electrical $\geq$ 4000 PPR = 45° electrical
Commutation Format	Three phase 4, 6 or 8 poles (other pole counts upon request)
Commutation Accuracy	$\pm$ 1° mechanical
Z channel to U channel	$\pm$ 1° mechanical

## ENVIRONMENTAL SPECIFICATIONS

Storage Temperature	-40 to 125°C
Operating Temperature	-20 to 115°C
IP Rating	IP52
Humidity	90% non-condensing
Vibration	20 g's @ 50 to 500 CPS
Shock	50 g's @ 11 ms duration

## MECHANICAL SPECIFICATIONS

Bore Diameter (Tolerance)	0.125", 0.1875", 0.250", 0.3125", 0.375", 3 mm, 4 mm, 5 mm, 6 mm, 7 mm, 8 mm, 10 mm (+0.0006/-0.0000")
Recommended Shaft Engagement	0.500" minimum
Allowable Shaft Runout	0.007" TIR
Axial Shaft Movement	$\pm$ 0.030"
Maximum Shaft Speed	8000 RPM
Interface Connector	Connector: JAE P/N FI-W15P-HFE
Mounting	HEDs Compatible: #0-80 screw 3 places on 0.823" bolt circle #2-56 screw 2 places on 0.750" bolt circle
Moment of Inertia	$9.1 \times 10^{-5}$ oz·in·s <sup>2</sup>
Acceleration	$1 \times 10^5$ radians/s <sup>2</sup>
Accuracy	Instrument error 1.5 arc minutes max

## 15 PIN CONNECTOR JAE P/N: FI-W15P-HFE

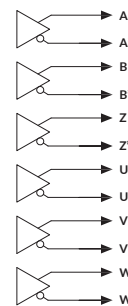
Pin Number	Function
1	A
2	A'
3	B
4	B'
5	Z
6	Z'
7	U
8	U'*
9	V
10	V'*
11	W
12	W'*
13	Vcc
14	GND
15	NC

\* U', V' and W' are "no connect" for Output option B (open collector UVW)

## ELECTRICAL OUTPUT CIRCUITS

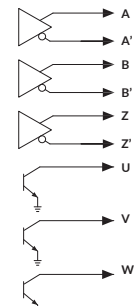
### Output Option A:

ABZ = 26C31 line driver (RS-422)  
UVW = 26C31 line driver (RS-422)



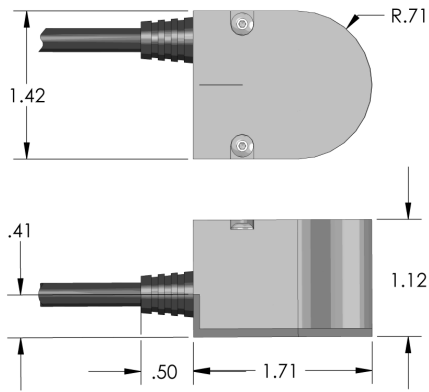
### Output Option B:

ABZ = 26C31 line driver (RS-422)  
UVW = open collector



- 26C31 line driver is TTL compatible (can be wired single-ended)
- 26C31 sink/source 20 mA max (meets RS-422 at 5 VDC supply)
- Open collector sink 30 mA max, pull up voltage 30 VDC max
- U, V and W are "no connect" for Commutation option 0

## DIMENSIONS



## Motor Mounting Considerations

3 SCREW MOUNTING 0-80  
3 PLCS-EQUALLY SPACED  
ON .823 DIAMETER CIRCLE

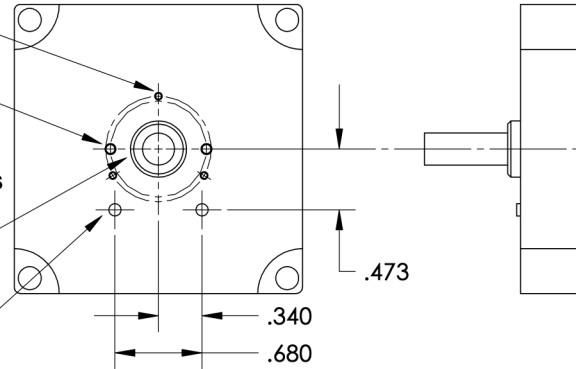
2 SCREW MOUNTING 2-56  
2 PLCS-EQUALLY SPACED  
ON .750 DIAMETER CIRCLE

$\pm \phi .010$ " Motor Shaft Center

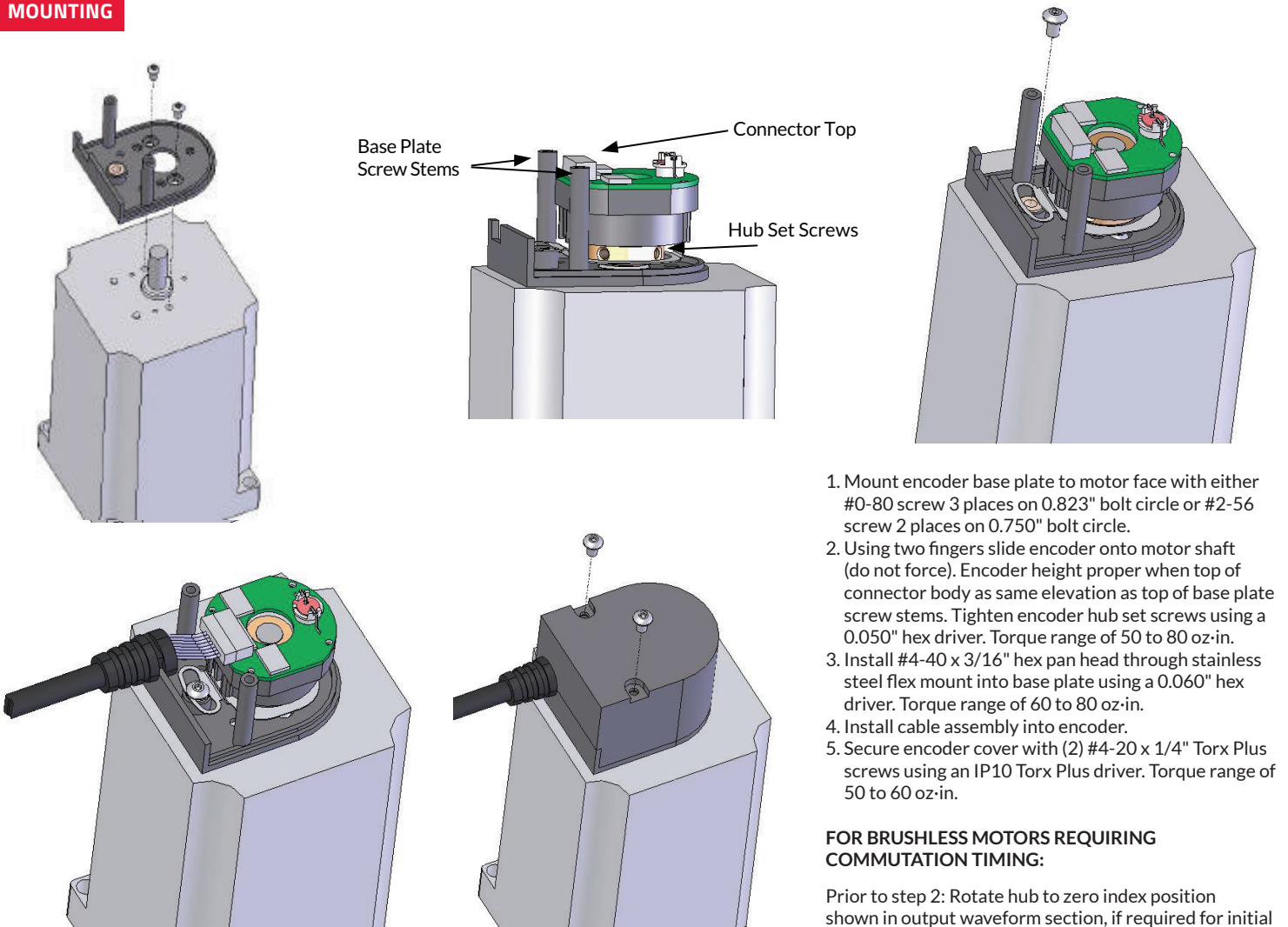
### OPTIONAL MOUNTING AIDS

MOTOR BOSS:  
DIAMETER = 0.431" - 0.438"  
HEIGHT = 0.10"  
CHAMFER = 0.03" X 45°

ALIGNING PINS:  
DIAMETER = 0.092" - 0.096"  
HEIGHT = 0.30"  
CHAMFER = 0.01" X 45°



## MOUNTING



1. Mount encoder base plate to motor face with either #0-80 screw 3 places on 0.823" bolt circle or #2-56 screw 2 places on 0.750" bolt circle.
2. Using two fingers slide encoder onto motor shaft (do not force). Encoder height proper when top of connector body as same elevation as top of base plate screw stems. Tighten encoder hub set screws using a 0.050" hex driver. Torque range of 50 to 80 oz-in.
3. Install #4-40 x 3/16" hex pan head through stainless steel flex mount into base plate using a 0.060" hex driver. Torque range of 60 to 80 oz-in.
4. Install cable assembly into encoder.
5. Secure encoder cover with (2) #4-20 x 1/4" Torx Plus screws using an IP10 Torx Plus driver. Torque range of 50 to 60 oz-in.

### FOR BRUSHLESS MOTORS REQUIRING COMMUTATION TIMING:

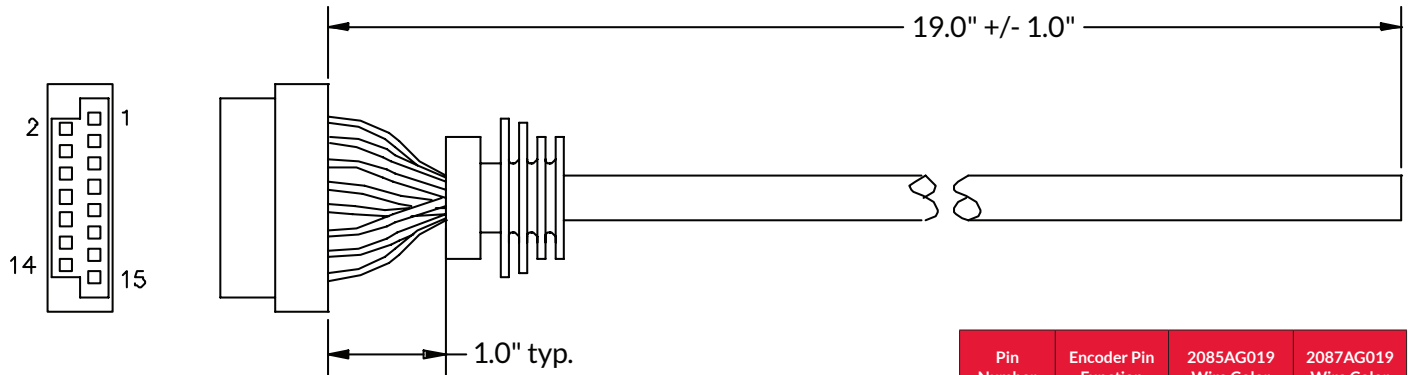
Prior to step 2: Rotate hub to zero index position shown in output waveform section, if required for initial commutation positioning. Power appropriate motor windings to lock motor shaft location to matching U transition.

Prior to step 5: Flex mount screw can be loosened to allow final commutation timing adjustment. Rotate encoder to match commutation signals to back driven EMF motor windings. Re-tighten flex mount screw.

## CABLE OPTIONS

(2085AG019, 2087AG019)

Consult Factory for Custom Lengths



Half Meter Cable One End Terminated:

2085AG019 = 14 conductor 28 AWG for UVW commutation

2087AG019 = 8 conductor 28 AWG for non-commutation

Connector = JAE FI-W15S

Pin Number	Encoder Pin Function	2085AG019 Wire Color	2087AG019 Wire Color
1	A	Brown	Brown
2	A'	White	White
3	B	Blue	Blue
4	B'	Green	Green
5	Z	Orange	Orange
6	Z'	Yellow	Yellow
7	U	Violet	-
8	U'	Gray	-
9	V	White/Brown	-
10	V'	White/Red	-
11	W	White/Orange	-
12	W'	White/Yellow	-
13	Vcc	Red	Red
14	GND	Black	Black
15	No Connect	-	-

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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