Dynapar™ brand

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DYNAPAR™
1675 Delany Road
Gurnee, IL 60031-1282
Phone: 800.234.8731
Fax: 847.662.4150
www.dynapar.com
Application Assistance 1.800.234.8731
dynapar.techsupport@dynapar.com

Technical Bulletin

SPECIFICATIONS

STANDARD OPERATING CHARACTERISTICS

Code: Incremental with commutation option, Optical
Resolution: 500, 512, 1000, 1024, 2000, 2048, 2500, 4096, 5000PPR incremental with 4, 6, 8 or 12 pole commutation channels.

Accuracy: Incremental: ±2.5 arc-mins. max.

edge to any edge; Commutation: ±6 arc-mins. max.

Phasing for CCW rotation of motor shaft (viewing encoder cover): A leads B by 90° and U leads V leads W by 120 °.

Minimum edge separation A to B is 45°.

Index to U channel: +/- 1 °mech. index pulse center to U channel edge.

Index Pulse Width: 90° gated A and B high; (180° gated B high gating options available - consult factory)

ELECTRICAL

Input Power Requirements:
5±10% VDC at 150 mA max (incremental only); 175 mA max. (incremental and commutation), excluding output load

Output Signals:
Line Driver: sink / source 40 mA max.,
Open Collector Incremental (≤ 2048 PPR): 16 mA sink max.
Open Collector Commutation: 30 mA sink max. (2.0 kΩ pull-ups in encoder)

Frequency Response:

PPR ≤ 2048: 250 kHz;
PPR > 2048: 500 kHz

Termination: 16 pin, fully shielded, 2mm pitch, double row header. Accessory mating cable assembly available: 26 AWG twisted pair, jacketed and shielded with copper drain wire

MECHANICAL

Weight: 4 oz. (110 gm) typ.

Dimensions: Outside Diameter with cover: 1.96" (49.8mm), without cover 1.85" (47.0mm); Outside collar height 1.71" (43.4mm), inside collar height 1.50" (38.1mm)

Material: Bearing housing: aluminum;
Cover: high temperature, glass filled polymer;

Hub: Brass; Disk: 0.030" thick glass

Finish: Cover: RAL 7010 (dark grey)

Moment of Inertia: $5.3X10^{-4}$ in-oz $sec.^2$ (37.3 gm-cm^2)

Hub Diameters: 1/4", 3/8", 7/16", 1/2", 6mm, 8mm,10mm ,12mm standard

Bore Dia. Tolerance: +0.001"/-0.000" (+0.025 mm/-0.000 mm)

Mating Shaft Length: 1.62" (41 mm) minimum for outside shaft collar. 0.50 inch minimum for inside shaft collar

Mating Shaft Runout: 0.002" (0.05 mm) max. (Includes shaft perpendicularity to mounting surface)

Mating Shaft Axial movement: ±0.060" (±1.52 mm)

Mounting: Four standard configurations are available for tethers. A choice of U.S. and Metric screws are included.

Mounting holes should be 0.01" (0.254 mm) true position to shaft for best encoder operation.

Shaft clamp: 2 #6-32 set screws in collar around hub shaft (will not mar shaft)

Electrical/Mechanical Alignment Range: ±15° mechanical typical (see tether options)

Acceleration: 100,000 rad/$sec.^2$ max.

Max. Velocity: RPM= (Frequency / PPR)x 60; or 12,000 RPM, whichever is less;

Bearing Life:[(3.6×10^9) / RPM] Hours ; e.g. 605,000 hours @6,000 RPM

(*Based on bearing manufacturer's suggested calculation for 6803ZZ with 37N equivalent dynamic load - including preload and tether reaction loads - at 6000 RPM continuous with adequate lubrication*)

ENVIRONMENTAL

Operating Temperature: 0° to +120°C

Storage Temperature: -40° to +120°C

Shock: 100 Gs for 6 msec duration

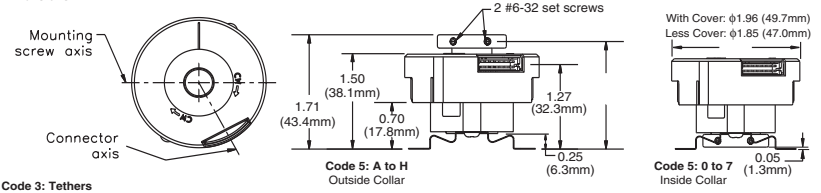
Vibration: 2.5 Gs at 5 to 2000 Hz

Relative Humidity: 90% non-condensing

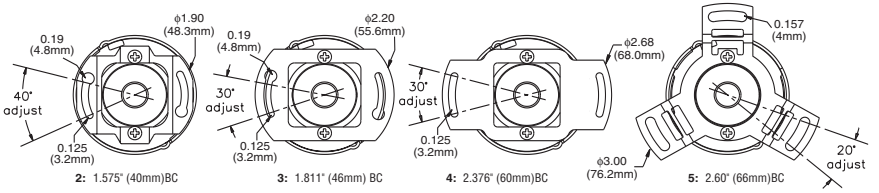
Enclosure Rating: NEMA 1 / IP40 (for models with cover)

DIMENSIONS & ORDERING

Dimensions



Code 3: Tethers



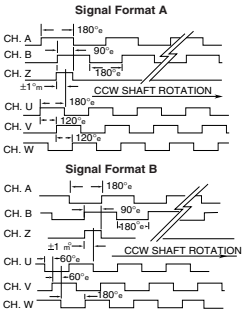
Electrical Connections

Pin	Function*	Cable Wire Color
1	VCC	RED
2	U	Brown
3	GND	BLACK
4	V	GRAY
5	A	BLUE
6	W	WHITE
7	$\bar{A}$	BLUE/BLACK
8	NONE	NONE
9	B	GREEN
10	$\bar{U}$	BROWN/BLACK
11	$\bar{B}$	GREEN/BLACK
12	$\bar{V}$	GRAY/BLACK
13	Z	VIOLET
14	$\bar{W}$	WHITE/BLACK
15	$\bar{Z}$	VIOLET/BLACK
16	NONE	NONE

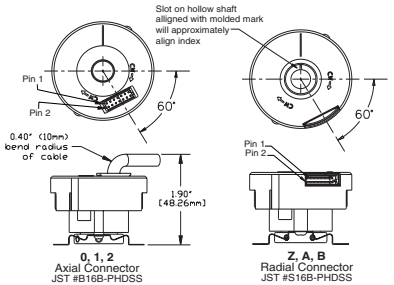
* Function availability dependant on Model

Mating Cable Assembly:
Incremental only, 111752-000x
Incremental + Comm., 111753-000x
x= length in feet

Output Waveforms



Code 6: Termination



Ordering Information

To order, complete the model number with code numbers from the table below:

Code 1: Model	Code 2: PPR, Poles	Code3:Tether	Code 4: Electrical	Code5:Shaft/Bore	Code6:Termination
F18	□□□□/□	□	□	□	□

Ordering Information

F18 Size 18 Commutating Encoder

Incremental channels only

0500/0	**2048/0**
0512/0	**2500/0**
1000/0	**4096/0**
1024/0	**5000/0**
2000/0	

Incremental plus Commutation channels

0500/†	**2500/†**
0512/8	**4096/†**
1000/†	**5000/†**
1024/†	
2000/†	
2048/†	

† Available with 4, 6, 8 or 12 pole. *(12 pole is designated by character "C")*

Examples: 1024/8 is 1024PPR, 8 pole; 2000/C is 2000PPR, 12 pole

0 No Tether
2 2 #2 on 1.575" Diameter
3 2 #4 on 1.811" Diameter
4 2 #4 on 2.376" Diameter
5 3 #4 on 2.60" Diameter
7 2 M2.5 on 40 mm Diameter
8 2 M3 on 46 mm Diameter
9 2 M3 on 60 mm Diameter
A 3 M3 on 66 mm Diameter

Available when Code 2 is ≤ 2048/0
0 5V in, open collector out incremental only
C 5V in, open collector out incremental only - reverse phase

Available when Code 2 is XXXX/0
3 5V in, line driver out incremental only
D 5V in, line driver out incremental only - reverse phase

Available when Code 2 is XXXX/4, XXXX/6, XXXX/8 or XXXX/C
6 5V in, line driver out for incremental; 5V in, open collector out for commutation
E 5V in, line driver out for incremental; 5V in, open collector out for commutation - reverse phase
9 5V in, line driver out for incremental; 5V in, line driver out for commutation
F 5V in, line driver out for incremental; 5V in, line driver out for commutation - reverse phase

Inside Collar:
0 1/4 in.
1 3/8 in.
2 7/16 in.
3 1/2 in.
4 6 mm
5 8 mm
6 10 mm
7 12 mm

Outside Collar:
A 1/4 in.
B 3/8 in.
C 7/16 in.
D 1/2 in.
E 6 mm
F 8 mm
G 10 mm
H 12 mm

Code: Connector/Cable Axial	Code: Connector/Cable Radial	Code: Wire Pigtail	Length
0	**Z**	*N/A*	*None*
1	**A**	**J**	1 Ft.
2	**B**	**K**	2 Ft.
3	**C**	**L**	3 Ft.
4	**D**	**M**	4 Ft.
5	**E**	**N**	5 Ft.
6	**F**	**P**	6 Ft.
7	**G**	**Q**	7 Ft.
8	**H**	**R**	8 Ft.

CONNECTION OPTIONS

You may choose an integral connector mounted in axial or radial position. Available with or without mating connector/cable.

Alternativly, a direct-solder pigtail cable is offered.

Installation

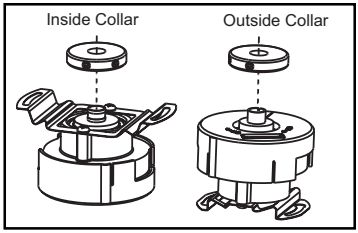
PREPARATION:

A. Unpack encoder and mating cable assembly. Locate the plastic bag with mounting hardware and shaft collar.

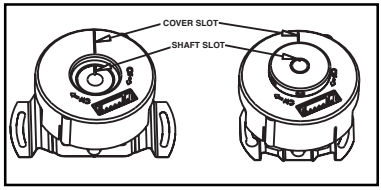
B. Hand tools required are 1/16 hex driver for collar set screws and phillips screwdriver.

C. Optional motorized fixture may need to be provided to align the commutation signals.

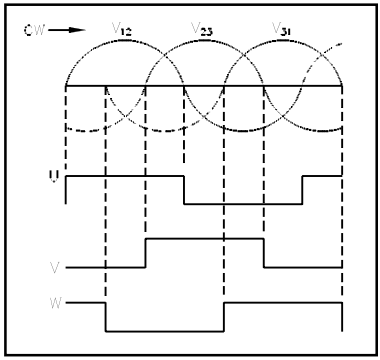
PROCEDURE:



Step 1. Install shaft collar onto small diameter of hollow shaft. To hold collar on shaft during encoder installation, tighten set screws to lightly contact the shaft . *Do not over tighten or bore could be distorted and interfere with insertion of driving shaft.*

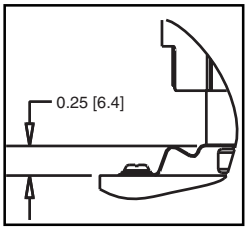


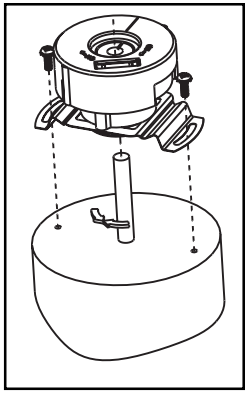
Step 2. Locate the small slot on the cover end of the hollow shaft. Rotate the shaft to align the slot with the molded slot on the plastic cover. This will facilitate a coarse index (Z)pulse alignment. It also corresponds to a transition edge of the U commutation channel. Maintain or re-establish this alignment when you install the encoder onto the driving shaft.



Step 3. If you install the encoder onto a brushless DC motor, you may need to align the encoder shaft with the motor shaft for proper commutation. To do this, determine which rotor poles need to be aligned with which commutation signals (U,V and W)from the encoder. For example, apply enough voltage to the windings that correspond to the U commutation signal to lock the rotor.

Step 4. While maintaining the coarse mechanical alignment per Step 2, slide the encoder onto the rotor shaft until the tether contacts the mounting surface. Install the tether screws loosely and rotate the encoder housing (and hollow shaft) so the mounting screws are roughly centered in the tether slots. While keeping the clearance noted for proper tether performance, firmly tighten the shaft collar set screws to 5.0-5.5 in lbs (56-62 N-cm).

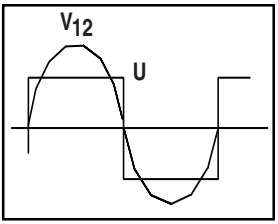




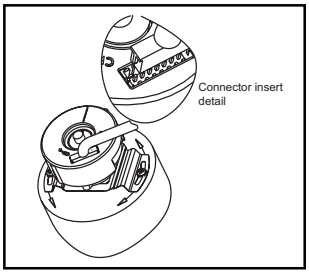
Step 5. When the encoder shaft and rotor are securely connected, the rotor locking voltage may now be removed (if previously applied per Step 3).

Step 6. Install the mating cable to the encoder pin header while noting the proper alignment of the keying features. Apply 5 VDC to the encoder and connect one commutation signal (U,V or W) to an oscilloscope. *Use proper ESD precautions. Secure unconnected wires from contacting each other or any metal surface to avoid potential motor or encoder damage.*

Step 7. Use a motorized fixture to back-drive the motor/encoder assembly while using an oscilloscope to observe the EMF sine wave from the winding related to the monitored commutation channel. Look at both signals and fine tune the alignment by rotating the encoder housing as needed.



Step 8. When the correct signal alignment is achieved, tighten the tether mounting screws. The diagram to right is for example only, each motor and drive combination may require different alignment for optimum performance.



Step 9. Disconnect power and oscilloscope connections to the encoder and motor. Install any external covers or connectors at this time. *Take caution when routing the encoder cable or other wires to avoid interference with the motion of the encoder or tether. This could cause damage to the encoder bearings or the cable jacket or wires*.