

# Series F14 Commutating

- Premium servo motor feedback in a compact, reliable, and easy-to-install package
- Outside diameter 1.55" (40 mm)
- Resolution to 5,000 PPR for low speed smoothness
- Frequency response to 500 kHz
- Operation to 120° C doesn't limit machine performance



MOTOR MOUNT

## APPLICATION/INDUSTRY

The Dynapar brand Series F14 encoder provides high performance, cost effective feedback for stepper and servo motor controls

## DESCRIPTION

The F14 offers compact package dimensions and a pluggable pin header. A compliant tether allows easy mounting with high tolerance to motor shaft movement and 30 degrees of adjustment to align the signal outputs to the shaft position.

A superior optical configuration allows for generous internal component clearance eliminating potential damage at high ambient operating temperatures. High temperature rated grease is standard for extended bearing life. No special tools are required for installation.

The use of optically-generated signals for Brushless DC (BLDC) servo control provides higher accuracy and reliability by eliminating the hysteresis found in competitive units with hall effect sensors, ensuring maximum performance and reliability of the servo system.

## FEATURES AND BENEFITS

- The F14 design operates up to 120°C. The high temperature materials, phased array sensor, and low current requirements stabilize the output signals over a wide range of input voltage, ambient temperature, or output frequencies.
- The F14 features a clamping system, available in top or bottom locations, which does not mar the shaft, will not loosen over time and provides superior clamping force.
- For fast, easy installation a slot is provided on the encoder hollow shaft, which when aligned to molded mark on cover, sets the index. The housing may be rotated to allow further adjustment of the index, or fine alignment of the commutation channels to the BLDC motor windings.
- The F14 outputs are protected from short circuits and operate on 5 VDC power.

## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

Code: Incremental with commutation option, Optical  
 Resolution: 200, 400, 500, 1000, 1024, 2000, 2048, 2500, 4096, 5000 PPR incremental with 4, 6 and 8 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: 1024 PPR: 16 mA sink max.  
 Open Collector Commutation: 30 mA sink max. (2.0 kΩ pull-ups in encoder)  
 Frequency Response:  
 PPR ≤ 1024: 250 kHz; PPR > 1024: 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

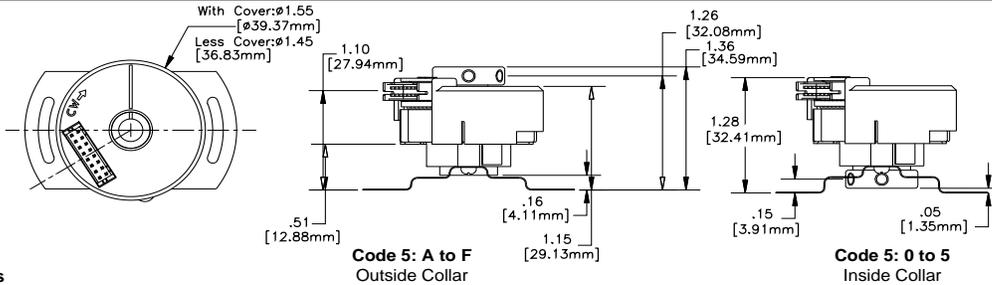
Weight: 1.6 oz. (45gm) typ.  
 Dimensions: Outside Diameter with cover: 1.55" (39.8mm), without cover 1.45" (36.8mm); Outside collar height 1.36" (34.6mm), inside collar height 1.28" (32.4mm)  
 Material: Bearing housing: aluminum; Cover: high temperature, glass filled polymer; Hub: Brass; Disk: 0.030" thick glass  
 Finish: Cover: RAL 7010 (dark grey)  
 Moment of Inertia: 8.2X10<sup>-5</sup> in-oz sec.<sup>2</sup> (5.8 gm-cm<sup>2</sup>)  
 Hub Diameters: 1/4", 6mm, 8mm standard  
 Bore Dia. Tolerance: +0.001"/-0.000" (+0.025 mm/-0.000 mm)  
 Mating Shaft Length: 1.35" (34.3 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: Two standard configurations are available for tethers. A choice of U.S. or 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.<sup>2</sup> max.  
 Max. Velocity: RPM = (Frequency / PPR) x 60; or 12,000 RPM, whichever is less;  
 Bearing Life: [(1.4 X 10<sup>9</sup>) / RPM] Hours; e.g. 230,000 hours @ 6,000 RPM  
*(Based on bearing manufacturer's suggested calculation for 6801ZZ with 44N equivalent dynamic load - including preload and tether reaction loads - at 6000 RPM continuous with adequate lubrication)*

### ENVIRONMENTAL

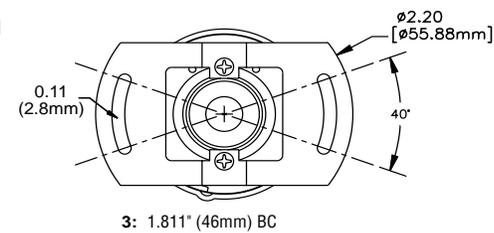
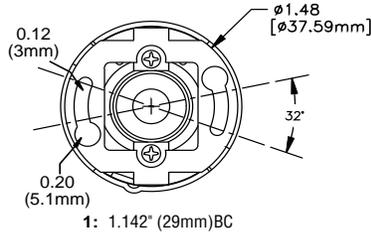
Operating Temperature: 0° to +120°C  
 Storage Temperature: -40° to +120°C  
 Shock: 100 Gs for 6 msec duration  
 Vibration: 2.5 Gs at 5 to 2000 Hz  
 Relative Humidity: 90% non-condensing  
 Enclosure Rating: NEMA 1 / IP40 (for models with cover)

# Series F14 Commutating

Dimensions



Code 3: Tethers



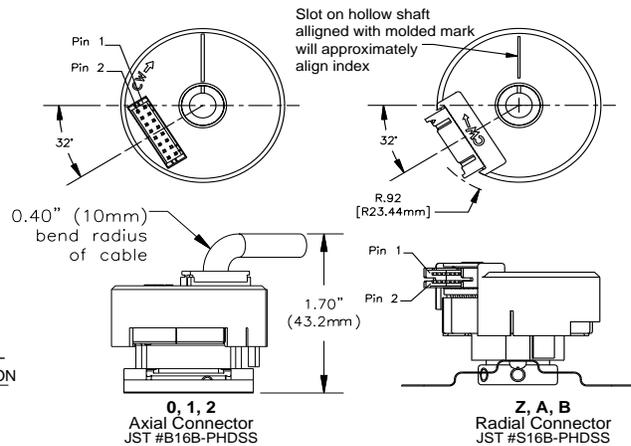
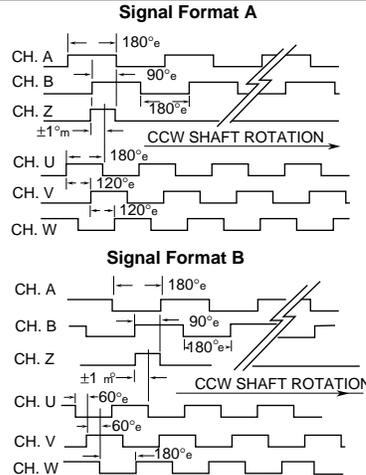
Electrical Connections

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

\* Function availability dependent on Model

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

Output Waveforms



Ordering Information

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

Code 1: Model	Code 2: PPR, Poles	Code 3: Tether	Code 4: Electrical	Code 5: Shaft/Bore	Code 6: Termination																																									
<b>F14</b>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>																																									
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F14	Size 14 Commutating Encoder	Incremental channels only	0 No Tether	Available when Code 2 is ≤ 1024/0	Inside Collar: 0 1/4 in. 4 6 mm 5 8 mm  Outside Collar: A 1/4 in. E 6 mm F 8 mm																																									
		0200/0    2000/0 0400/0    2048/0 0500/0    2500/0 1000/0    4096/0 1024/0    5000/0	1 2 #2 on 1.181" Diameter  3 2 #4 on 1.811" Diameter  6 2 M2.5 on 30 mm Diameter  8 2 M3 on 46 mm Diameter	0 5V in, open collector out incremental only - Format A  C 5V in, open collector out incremental only - Format B  Available when Code 2 is XXXX/0 3 5V in, line driver out incremental only - Format A  D 5V in, line driver out incremental only - Format B  Available when Code 2 is XXXX/4, XXXX/6, or XXXX/8 6 5V in, line driver out incr.; 5V in, open collector out comm. Format A  E 5V in, line driver out incr.; 5V in, open collector out comm. - Format B  9 5V in, line driver out incr.; 5V in, line driver out comm. Format A  F 5V in, line driver out incr.; 5V in, line driver out comm. - Format B		<table border="1"> <thead> <tr> <th rowspan="2">Code</th> <th colspan="2">Connector/Cable/Wire</th> <th rowspan="2">Length</th> </tr> <tr> <th>Axial</th> <th>Radial</th> <th>Pigtail</th> </tr> </thead> <tbody> <tr><td>0</td><td>Z</td><td>N/A</td><td>None</td></tr> <tr><td>1</td><td>A</td><td>J</td><td>1 Ft.</td></tr> <tr><td>2</td><td>B</td><td>K</td><td>2 Ft.</td></tr> <tr><td>3</td><td>C</td><td>L</td><td>3 Ft.</td></tr> <tr><td>4</td><td>D</td><td>M</td><td>4 Ft.</td></tr> <tr><td>5</td><td>E</td><td>N</td><td>5 Ft.</td></tr> <tr><td>6</td><td>F</td><td>P</td><td>6 Ft.</td></tr> <tr><td>7</td><td>G</td><td>Q</td><td>7 Ft.</td></tr> <tr><td>8</td><td>H</td><td>R</td><td>8 Ft.</td></tr> </tbody> </table>	Code	Connector/Cable/Wire		Length	Axial	Radial	Pigtail	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
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† Available with 4, 6 or 8 pole.  
 e.g. 1000/6 is 1000PPR with 6 poles

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