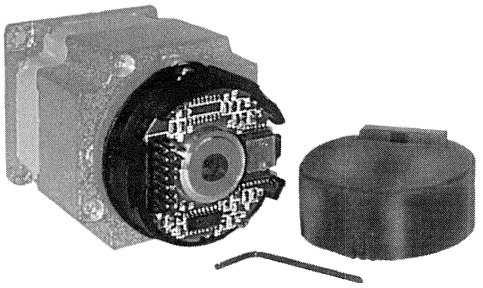
Dynapar brand Encoder **Series M21** CE



Shown installed on Size 23 (2.3") servo motor

Bulletin Number: 702074-0001
Revision Level: C
Date: 4/24/98

Manufactured by:
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Application Assistance 1.800.234.8731/

Technical Bulletin

The Dynapar brand M21 modular encoder provides high-performance, cost effective feedback for stepper and servo motor controls. Using industry standard package dimensions, the M21 is easily installed onto the motor without time-consuming adjustments or special tools. Its unique mechanical design automatically centers and gaps the disc during installation.

For Brushless DC (BLDC) servo control, optional 3 phase commutation tracks replace the traditional Hall Effect sensors. These optically-generated signals provide higher accuracy and reliability, improving the performance and reliability of the servo system.

Dynapar Exclusive: The M21 design operates up to 120°C. The high temperature plastics, phased array sensor, and low current requirements stabilize the output signals over a wide range of input voltage, ambient temperature, or output frequencies.

Dynapar Exclusive: The M21 provides 30 degrees of adjustment to align the signal outputs to the shaft position. Using an industry standard Size 21 modular mounting pattern, the index mark on the disc hub can be coarse aligned to the index sensor position on the housing. The housing rotates to allow further adjustment of the index or fine alignment of the commutation channels to the BLDC motor windings.

Dynapar Exclusive: The M21 enclosure is dirt-tight, rated NEMA 1 / IP50. The cover is gasketed to seal the disc and optics from contamination. Additionally, the base can be sealed to the motor for further environmental protection.

Dynapar Exclusive: The M21 outputs are protected from short circuits, operate on 5 or 12 VDC power, and meet the stringent IEC 801 noise immunity standards.

SPECIFICATIONS

Electrical

Code: Incremental, Optical
Resolution: 500, 1000, 1024, 2000, or 2048 PPR incremental channels; 2, 3, or 4 PPR commutation channels
Accuracy: Incremental: ±5 arc-mins. max. edge to any edge; Commutation: ±6 arc-mins. max.
Sense: (viewing encoder mounting surface) A leads B by 90° for CCW rotation of motor shaft; U leads V, V leads W by 120° for CW rotation of motor shaft
Phasing:
Incremental Channels: 90° ±18° electrical
Commutation Channels: 8 Pole: 30°; 6 Pole: 40°; 4 Pole: 60° mechanical
Index to U Channel: ±1° mechanical - Index center to U channel edge
Symmetry:
Incremental Channels: 180° ±18° electrical
Commutation Channels: 8 Pole: 45°; 6 Pole: 60°; 4 Pole: 90° mechanical
Index Pulse Width: 180° ±36° electrical (Gated with B low)
Input Power Requirements: Incremental: 5 or 12 VDC ±10% at 100 mA max. (excluding output load); Commutation: 5 or 12 VDC ±10% at 75 mA max. (excluding output load)
Output Signals: Line Driver: ET7272, sink/source 40 mA max., Open Collector: w/2.2 kΩ pull-ups, 16 mA sink max.
Frequency Response: 200 kHz min.
Termination: Connector: PCB mounted dual row head with 0.1" x 0.1" pin spacing, 10 pins (incremental only), 16 pins (w/commutation); Cable: conductors - 28 AWG, stranded (7/36), insulation - black, PVC; Shield: aluminum/polyester foil plus tinned, copper drain wire (28 AWG, 7/36)
Noise Immunity: Tested to IEC 801 standards for Heavy Industrial Electro-Static Discharge, Radio Frequency Interference, Electrical Fast Transients, Conducted Interference, and Magnetic Fields (for models or applications with shielded cable)

Mechanical

Weight: Connector: 1 oz. (28 gm) typ.
Connector w/cover: 1.5 oz. (43 gm) typ.
Cable: 2.5 oz (71 gm) typ.
Cable w/cover: 3 oz. (85 gm) typ.
Dimensions: Outside Diameter: 2.1" (53 mm) max. w/cover, 2.0" (51 mm) max. without cover; Height: 0.8" (20.3 mm) max. (w/cover, excluding connector); Emitter to Detector Gap: 0.070" (1.8 mm) min.
Material: Base, Housing, & Cover: high temperature, glass filled polymer; Hub: Aluminum; Disk: 0.030" thick glass
Finish: Base & Housing: black; Cover: RAL 7010 (dark grey)
Moment of Inertia: 6.64 x 10^{-5} in-oz sec.^{2} (4.7 gm-cm^2)
Hub Diameters: 1/4", 3/8", 7/16", 1/2", 6 mm, 8 mm, 10 mm, 12 mm nominal
Hub Dia. Tolerance: +0.001"/-0.000" (+0.026 mm/-0.000 mm)
Mating Shaft Length: 0.45" (12 mm) min. blind hub clamp screw, 0.65" (16.5 mm) exposed hub clamp screw; 0.75" (19 mm) max. inside cover
Mating Shaft Runout: 0.002" (0.05 mm) max. (Includes shaft perpendicularity to mounting surface)
Mating Shaft Endplay: +0.005"/-0.015" (+0.13 mm/-0.38 mm) nominal ("+" indicates away from mounting face)
Mounting: Base: (2) #4-40 (M2.5) #1 Phillips fillister head cap screw on 1.812" (46 mm) B.C., 0.01" (0.254 mm) true position to shaft; Shaft: split hub w/collar clamp, #2-56 hex socket cap screw (5/64" hex wrench included)
Electrical/Mechanical Alignment Range: ±15° mechanical
Acceleration: 100,000 rad/sec.^{2} max.
Velocity: 12,000 RPM max.

Environmental

Operating Temperature: -40° to 120°C
Storage Temperature: -40° to 85°C
Shock: 50 G's for 11 msec duration
Vibration: 2.5 G's at 5 to 2000 Hz
Relative Humidity: 90% non-condensing
Enclosure Rating: NEMA 1 / IP50 dirt-tight (for models with cover)

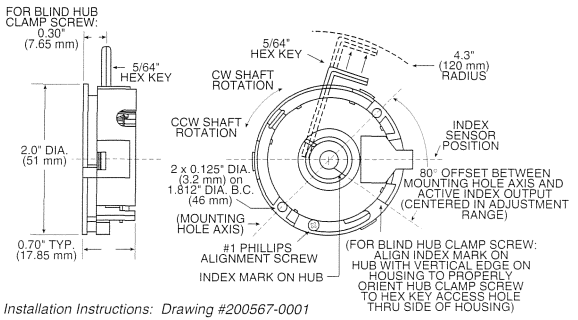
IMPORTANT ENCODER INSTALLATION INFORMATION

Important Wiring Instructions: Use of shielded cable is recommended for all encoder installations. The shield should be connected to signal-ground at the receiving device only. ***Connecting the shield at both ends can cause grounding problems that degrade system performance.*** If possible, run the encoder cable through a dedicated conduit (not shared with other wiring). Use of conduit will protect the cable from physical damage and provide a degree of electrical isolation. Do not run the cable in close proximity to other conductors that carry current to heavy loads such as motors, motor starters, contactors, solenoids, etc. This practice can induce electrical transients in the encoder cable, potentially interfering with reliable data transmission.

Refer to Electrical Connections table for wiring information. To avoid possible damage, do not connect or disconnect the encoder connector or wiring while power is applied to the system.

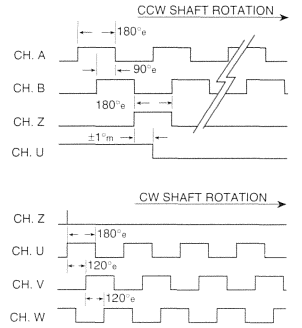
CAUTION: Unused encoder signal wires must be individually insulated and under no circumstances be in contact with ground, voltage sources, or other signal lines.

Dimensions/Installation



Installation Instructions: Drawing #200567-0001
Alignment Instructions: Drawing #200567-0002

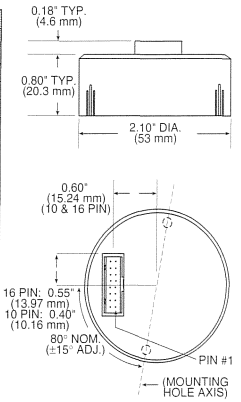
Output Waveforms (For clarity, compliments are not shown.)



Code 6: Terminations (Not all signals present on all models)

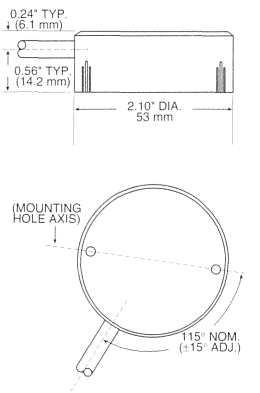
0: Pin Header **1-8:** Ribbon Cable

Pin	10 Pin O.C.	10 Pin L.D.	16 Pin
1	A	—	Vcc com
2	Vcc	Vcc	Vcc Inc
3	GND	GND	GND Inc
4	—	—	GND com
5	—	A'	A'
6	—	A	A
7	—	B'	B'
8	B	B	B
9	—	Z'	Z'
10	Z	Z	Z
11	—	—	U'
12	—	—	U
13	—	—	V'
14	—	—	V
15	—	—	W'
16	—	—	W



A-H: Shielded Cable

Function	Wire Color Incr. Only	Wire Color Incr. & Comm.
Vcc com	—	RED/WHT
Vcc Inc	RED	RED
GND Inc	BLK	BLK
GND com	—	BLK/WHT
A'	RED/BLK	BLU/BLK
A	GRN	BLU
B'	WHT/BLK	GRN/BLK
B	ORN	GRN
Z'	BLU	VIO/BLK
Z	WHT	VIO
U'	—	BRN/BLK
U	—	BRN
V'	—	GRY/BLK
V	—	GRY
W'	—	WHT/BLK
W	—	WHT



Ordering Information

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

Code 1: Model	Code 2: PPR, Poles	Code 3: Cover	Code 4: Electrical	Code 5: Hub	Code 6: Termination
M21	□□□□/□	□	□	□	□

Ordering Information

M21 Size 20 Commutating Modular

Incremental channels only
0500/0 **2000/0**
1000/0 **2048/0**
1024/0

Incremental plus Commutation channels
0500/4 **2000/4**
0500/6 **2000/6**
0500/8 **2000/8**
1000/4 **2048/4**
1000/6 **2048/6**
1000/8 **2048/8**
1024/4
1024/6
1024/8

0 No cover
1 Enclosed, end-of-shaft mount
2 Through shaft

0 5V in, open collector out incremental only
1 12V in, open collector out incremental only
3 5V in, line driver out incremental only

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.
7 5V in, line driver out incr.; 12V in, open collector out comm.
9 5V in, line driver out incr.; 5V in, line driver out comm.

Blind hub clamp screw:
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

Exposed hub clamp screw:
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

0 Pin Header
1-8 Mating ribbon cable included; 1=1 ft., 2=2 ft., etc.

Available when Code 4 is 3 or higher:
A-H Shielded cable; A=1 ft., B=2 ft., etc.