

INCREMENTAL ENCODERS

SERIES M15

Dynapar™ brand

For Stepper & Small Servo Motors

Key Features

- **Modular Encoder with Easy Installation Requiring No Special Gapping Tools or Parts**
- **Phased Array Sensor Technology Allowing .030" Axial Shaft Play**
- **Wide -20 to 120C Operating Temperature Range**

SSM
Servo Small Motor

SPECIFICATIONS

STANDARD OPERATING CHARACTERISTICS

Code: Incremental**Resolution:** (pulses/revolution)

Incremental: 200 to 1024 PPR;

Commutation: 4, 6, or 8 pole

Accuracy:Incremental: ± 5 arc-mins. max. edge to edge;Commutation: ± 6 arc-mins. max.**Sense:** (viewing encoder mounting surface)Incremental: A leads B by 90° for CCW rotation of

motor shaft;

Commutation: U leads V, V leads W by 120° for CW

rotation of motor shaft

Phasing:Incremental: $90^\circ \pm 18^\circ$ electricalCommutation: 8 Pole: 30° ; 6 Pole: 40° ; 4 Pole: 60°

mechanical

Index to U Channel: $\pm 1^\circ$ mechanical - Index center to

U channel edge

Symmetry:Incremental: $180^\circ \pm 18^\circ$ electricalCommutation: 8 Pole: 45° ; 6 Pole: 60° ; 4 Pole: 90°

mechanical

Index Pulse Width: $180^\circ \pm 36^\circ$ electrical (Gated with

B low) standard

ELECTRICAL

Input Power Requirements:Incremental: 5 or 12 VDC $\pm 10\%$ at 100 mA max.

(excluding output load);

Incremental w/Commutation: 5 or 12 VDC $\pm 10\%$ at

120 mA max. (excluding output load)

Output Signals:

7272 Line Driver: 40 mA sink/source max.;

Open Collector w/2.0 k Ω 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), 14

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: Conforms to EN50082-1 Light

Industrial for Electro-Static Discharge, Radio

Frequency Interference, Electrical Fast Transients,

and Magnetic Fields (for models or applications

with shielded cable)

MECHANICAL

Weight:

Connector: 0.8 oz. (23 gm) typ.

Connector w/cover: 1.0 oz. (28 gm) typ.

Cable: 1.3 oz (37 gm) typ.

Cable w/cover: 1.5 oz. (43 gm) typ.

Dimensions:

Outside Diameter: 1.60" (40.7 mm) max. w/cover,

1.50" (38.2 mm) max. without cover;

Height: 1.27" (32.3 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: 3.40×10^{-5} in-oz sec.² (2.4 gm-cm²)**Hub Diameters:** 1/8", 1/4", 3/8", 3/16", 6 mm,

8 mm, 10 mm nominal

Hub Dia. Tolerance: $+0.001/-0.000$ " ($+0.026$ mm/ $-$

0.000 mm)

Mating Shaft Length: 0.45" (12 mm) min.; 0.85"

(22 mm) max. inside cover

Mating Shaft Runout: 0.002" (0.05 mm) max. (In-

cludes shaft perpendicularity to mounting surface)

Mating Shaft Endplay: $+0.015/-0.015$ " ($+0.38$ 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., or (2) #2-56 (M2.0)

hex socket cap screw on 1.28" (32.5 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: $\pm 15^\circ$

mechanical

Acceleration: 100,000 rad/sec.² max.**Velocity:** 12,000 RPM max.

ENVIRONMENTAL

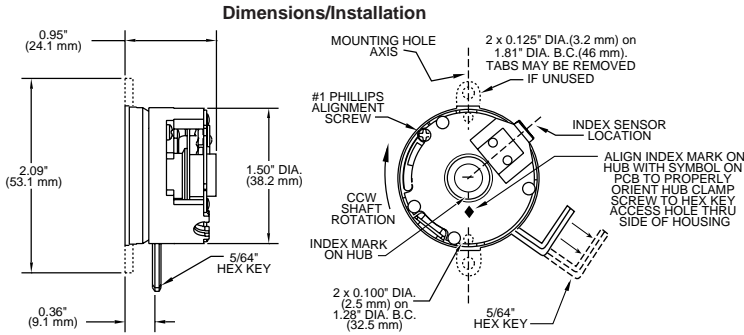
Operating Temperature: 0° to 120° C**Storage Temperature:** -40° to 85° C**Shock:** 50 G's for 11 msec duration**Vibration:** 2.5 G's at 5 to 2000 Hz**Relative Humidity:** 90% non-condensing**Enclosure Rating:** NEMA 1 / IP40 dirt-tight (for

models with cover)



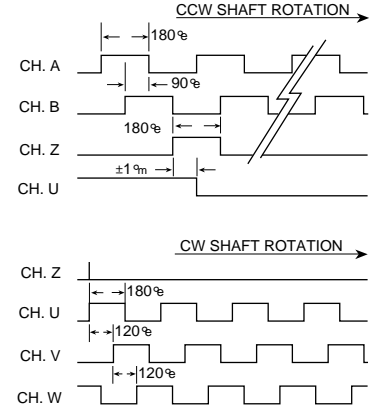
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Installation Instructions:
 Incremental only models: Drawing #200638-0001
 Commutation models: Drawing #200638-0002

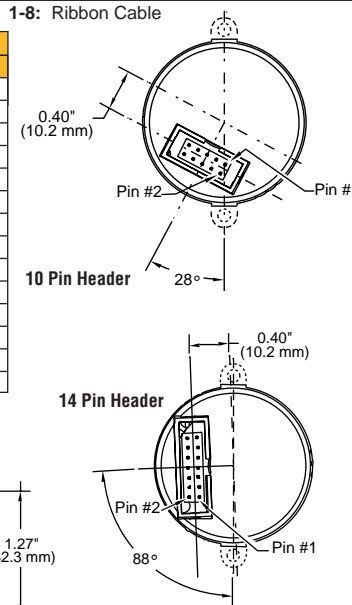
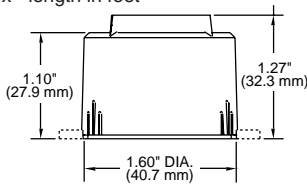
Output Waveforms (For clarity, compliments are not shown.)



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

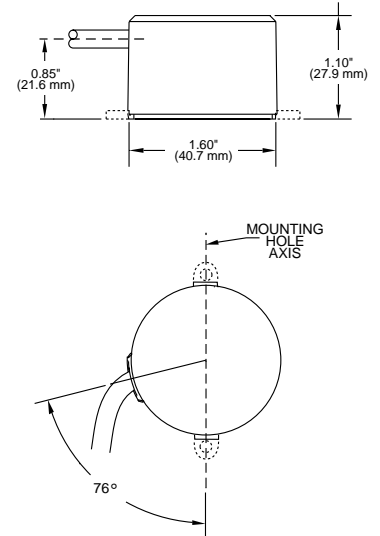
Pin	10 Pin Header		14 Pin Header	
	O.C.	L.D.	O.C.	L.D.
1	A	—	Vcc	—
2	Vcc	Vcc	U	—
3	GND	GND	U'	—
4	—	—	V	—
5	—	A'	V'	—
6	—	A	W	—
7	—	B'	W'	—
8	B	B	A'	—
9	—	Z'	A	—
10	Z	Z	B	—
11	—	—	B'	—
12	—	—	Z	—
13	—	—	GND	—
14	—	—	Z'	—

Mating Cable Assembly:
 10 pin, 109524-000x
 14 pin, 110527-000x
 x= length in feet



Function	Wire Color	
	Incr. Only	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

A-H: Shielded Cable



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
M15	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> / <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Ordering Information						
M15	Size 15 Commutating Modular	Incremental channels only	0 No cover	0 5V in, open collector out incremental only	0 1/4 in. 1 3/8 in. 4 6 mm 5 8 mm 6 10 mm 8 3/16 in. 9 1/8 in.	Available when Code 4= 0,1,3,6 or 9 0 Pin Header 1-8 Mating ribbon cable included; 1=1 ft., 2=2 ft., etc.
		Incremental plus Commutation channels	1 Enclosed, end-of-shaft mount 2 Through shaft	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		Available when Code 4= 0 – 9
		0500/6 1024/4 1000/4 1024/6 1000/6 1024/8 1000/8		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.		A-H Shielded cable; A=1 ft., B=2 ft., etc.

INCREMENTAL ENCODERS

SERIES M53

Dynapar™ brand

For Stepper & Small Servo Motors

Key Features

- 2.0" Diameter Modular Encoder with Easy Installation Requiring No Special Gapping Tools or Parts
- Phased Array Sensor Technology Allowing .020" Axial Shaft Play
- Up to 2048 PPR with Commutation Tracks

SSM
Servo Small Motor

SPECIFICATIONS

STANDARD OPERATING CHARACTERISTICS

Code: Incremental, Optical
Resolution: (pulses/revolution)
 Incremental: 500 to 2048 PPR
 Commutation: 4, 6 or 8 pole
Accuracy:
 Incremental: ± 5 arc-mins. max. edge to edge;
Sense: (viewing encoder mounting surface)
 Incremental: A leads B by 90° for CCW rotation of motor shaft;
 Commutation: U leads V, V leads W by 120° for CW rotation of motor shaft
Phasing:
 Incremental: $90^\circ \pm 18^\circ$ electrical
 Commutation: 8 Pole: 30° ; 6 Pole: 40° ; 4 Pole: 60° mechanical
 Index to U Channel: $\pm 1^\circ$ mechanical - Index center to U channel edge
Symmetry:
 Incremental: $180^\circ \pm 18^\circ$ electrical
 Commutation: 8 Pole: 45° ;
 6 Pole: 60° ; 4 Pole: 90° mechanical
Index Pulse Width: $90^\circ \pm 36^\circ$ electrical (Gated with A high and B low)

ELECTRICAL

Input Power Requirements:
 Incremental: 5 VDC or 12 VDC $\pm 10\%$ at 100 mA max. (excluding output load);
 Commutation: 5 VDC or 12 VDC $\pm 10\%$ at 75 mA max. (excluding output load)

ELECTRICAL (CONT.)

Output Signals:
 7272 Push-Pull: 40mA, sink or source
 7272 Differential Line Driver: 40 mA, sink or source
Frequency Response: 200 kHz min.
Termination:
Connector: PCB mounted dual row head with $0.1" \times 0.1"$ 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)

MECHANICAL

Dimensions:
 Outside Diameter: 2.1" (53 mm) max. w/cover, 2.0" (51 mm) max. without cover; Height: 0.8" (20.3 mm) (w/cover, excluding connector);
 Emitter to Detector Gap: 0.070" (1.8 mm) min.
Hub Diameters: 1/4", 3/8", 7/16", 1/2", 6 mm, 8 mm, 10 mm, 12 mm nominal
Mounting Configuration:
 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)
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: $+0.011"/-0.008"$ ($+0.30$ mm/ -0.21 mm) nominal ("+" indicates away from mounting face)
Electrical/Mechanical Alignment Range: $\pm 15^\circ$ mechanical
Acceleration: 100,000 rad/sec.² max.
Velocity: 12,000 RPM max.
Moment of Inertia: 6.64×10^{-6} in-oz sec.² (4.7 gm-cm²)
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)
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.

ENVIRONMENTAL

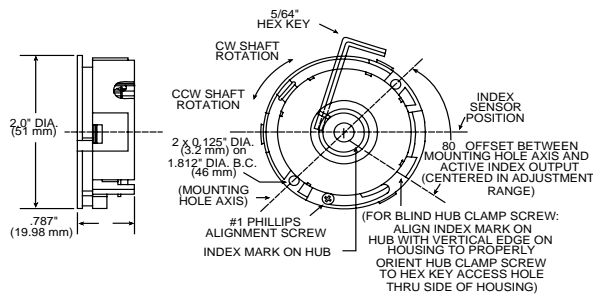
Operating Temperature: 0° to 120°C
Storage Temperature: -40° to 85°C
Shock: 50 G's for 11 msec duration
Vibration: 2.5 G's at 5 to 2000 Hz
Relative Humidity: Up to 90% (non-condensing)
Enclosure Rating: NEMA 1 / IP50 dirt-tight (for models with cover)



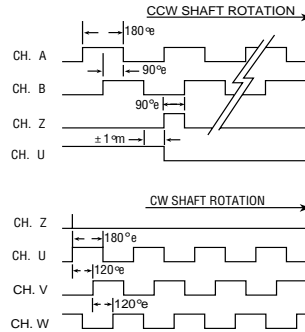
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Dimensions/Installation



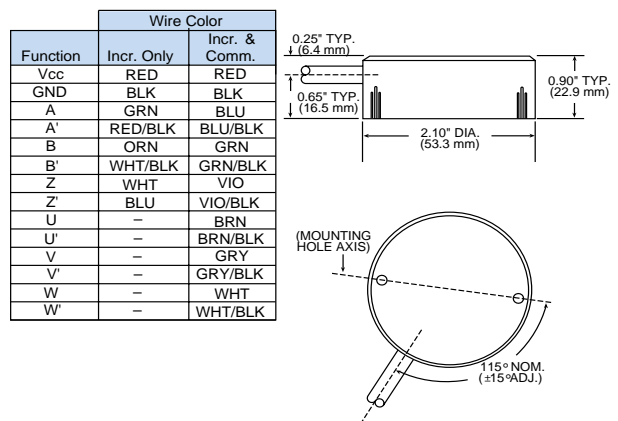
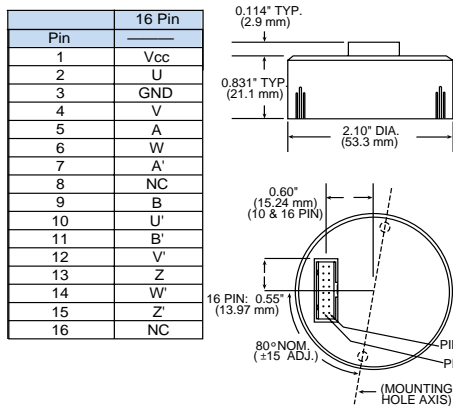
Output Waveforms (For clarity, compliments are not shown.)



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

0: 16 Pin JST connector 1-8: Shielded Cable with JST connector

A-H: Shielded Cable



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 Bore	Code 6: Termination
M53	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Ordering Information

M53 Size 20 Commutating Modular	Incremental channels only	0 No Cover 1 Radial Exit Cover (for Shielded Cable) 2 Axial Exit (for Shielded Cable with JST Connector)	0 5V in, open collector out incremental only 1 12V in, open collector out incremental only 3 5V in, line driver out incremental only A 12V in, 5V line driver out incremental only B 12V in, 12V line driver out incremental only Available when Code 2 is XXXX/4, XXXX/6, or XXXX/8 6 5V in, line driver out incremental open collector out Comm 9 5V in, line driver out incremental line driver out Comm C 12V in, 5V line driver out incremental, open collector D 12V in, 12V line driver out incremental, open collector E 12V in, 5V line driver out incremental, 5V line driver out Comm out Comm out Comm F 12V in, 12V line driver out incremental, 12V line driver out Comm	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	Available when Code 3 is 0 or 2: 0 JST connector 1-8 Shielded cable with connector; 1=1 ft., 2=2 ft., etc. Available when Code 3 is 0 or 1: A-H Shielded cable; A=1 ft., B=2 ft., etc.
	Incremental plus Commutation channels	0500/4 1024/4 0500/6 1024/6 0500/8 1024/8 1000/4 2000/4 1000/6 2000/6 1000/8 2000/8 2048/4 2048/6 2048/8			