

## Features

- 3.3 and 5 VDC voltage supply option
- Quadrature output
- Bushing or servo mount
- Non-contacting magnetic technology
- Small size
- CMOS and TTL compatible
- Resolution from 32-256 PPR
- Long life
- High operating speed
- Highly repeatable
- Sealed option
- Magnetic technology

## EMS22Q - Non-Contacting Incremental Encoder

### Electrical Characteristics

Resolution .....	32 to 256 PPR
Insulation Resistance (500 VDC) .....	1,000 megohms
Electrical Travel .....	Continuous
Supply Voltage .....	5.0 VDC $\pm 10\%$ , 3.3 VDC $\pm 10\%$
Supply Current .....	20 mA maximum
Output Voltage	
Low Output Level .....	V <sub>ss</sub> +0.4 V maximum
High Output Level .....	V <sub>dd</sub> -0.5 V minimum
Output Current	
With 4.5 VDC Supply Voltage .....	4 mA maximum
With 3.0 VDC Supply Voltage .....	2 mA maximum
Rise/Fall Time (Incremental Output) .....	500 ns maximum
Shaft RPM (Ball Bearing) .....	10,000 rpm maximum
Hysteresis .....	0.7 °
Accuracy	
Nominal .....	$\pm 0.7^\circ$ or better
Worst Case .....	$\pm 1.4^\circ$
Output Transition Noise .....	0.12 ° RMS max.

### Environmental Characteristics

Operating Temperature Range .....	-40 °C to +125 °C (-40 °F to +257 °F)
Storage Temperature Range .....	-55 °C to +125 °C (-67 °F to +257 °F)
Humidity .....	MIL-STD-202, Method 103B, Condition B
Vibration .....	15 G
Shock .....	50 G
Rotational Life	
S Bushing (@1,000 rpm) .....	100,000,000 revolutions
T & W Bushings (@1,000 rpm with 250 g side load) .....	50,000,000 revolutions
IP Rating .....	IP 65

### Mechanical Characteristics

Mechanical Angle .....	360 ° Continuous
Torque	
Starting .....	43 $\pm 21$ g-cm (0.6 $\pm 0.3$ oz-in.)
Running .....	29 $\pm 14$ g-cm (0.4 $\pm 0.2$ oz-in.)
Mounting Torque .....	203 N-cm (18 lb.-in.)
Shaft End Play .....	0.30 mm (0.012 ") T.I.R. maximum
Shaft Radial Play .....	0.12 mm (0.005 ") T.I.R. maximum
Weight .....	11 gms. (0.4 oz.)
Terminals .....	Axial, radial or ribbon cable
Soldering Condition	
Manual Soldering .....	96.5Sn/3.0Ag/0.5Cu solid wire or no-clean rosin cored wire 370 °C (700 °F) max. for 3 seconds
Wave Soldering .....	96.5Sn/3.0Ag/0.5Cu solder with no-clean flux 260 °C (500 °F) max. for 10 seconds
Wash processes .....	Not recommended
Marking .....	Manufacturer's trademark, name, part number, and date code.
Hardware .....	One lockwasher and one mounting nut supplied with each encoder, except on servo mount versions.

### Pin Configuration

Output Type	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6
A/B Quadrature	A	B	GND	Index	VCC*	CS**

\* Can be 5 or 3.3 VDC depending on the version.

\*\* Active low chip select pin; if not used connect pin 6 to GND.



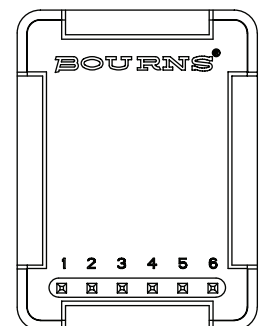
**WARNING Cancer and Reproductive Harm - [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)**

\*RoHS Directive 2015/863, Mar 31, 2015 and Annex.

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Users should verify actual device performance in their specific applications.

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## Applications

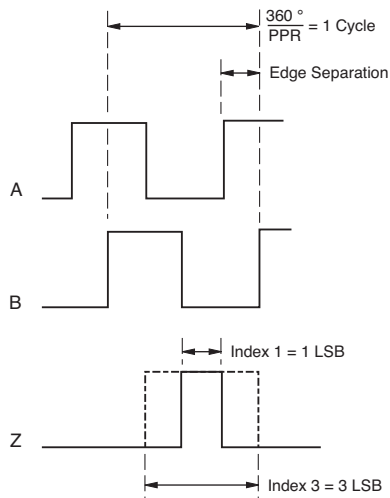
- Material handling equipment
- Brushless DC motor commutation
- Robotics
- Automotive
- Industrial automation
- Petroleum refinery
- Medical (low/medium risk)\*
- Office equipment
- Audio and broadcast equipment

# EMS22Q - Non-Contacting Incremental Encoder

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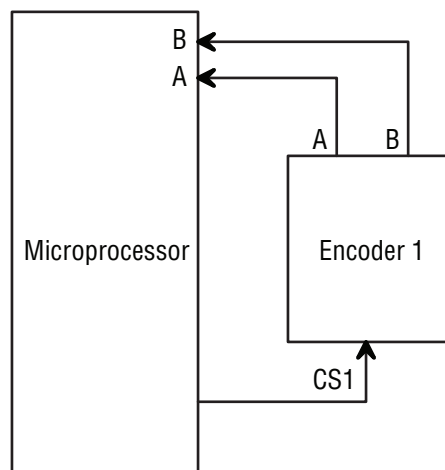
## Output Type Waveform and Variant Table

### Quadrature Output



PPR	3.3 Vcc	5.0 Vcc	Index 1	Index 3
256	X		X	
256	X			X
256		X	X	
256		X		X
128	X		X	
128	X			X
128		X	X	
128		X		X
64	X		X	
64	X			X
64		X	X	
64		X		X
32	X		X	
32	X			X
32		X	X	
32		X		X

Minimum edge separation =  $20 \times 256 / \text{PPR}$  (no missing pulses)



Chip Select Hardware Sample

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Consult factory for options not shown, including:

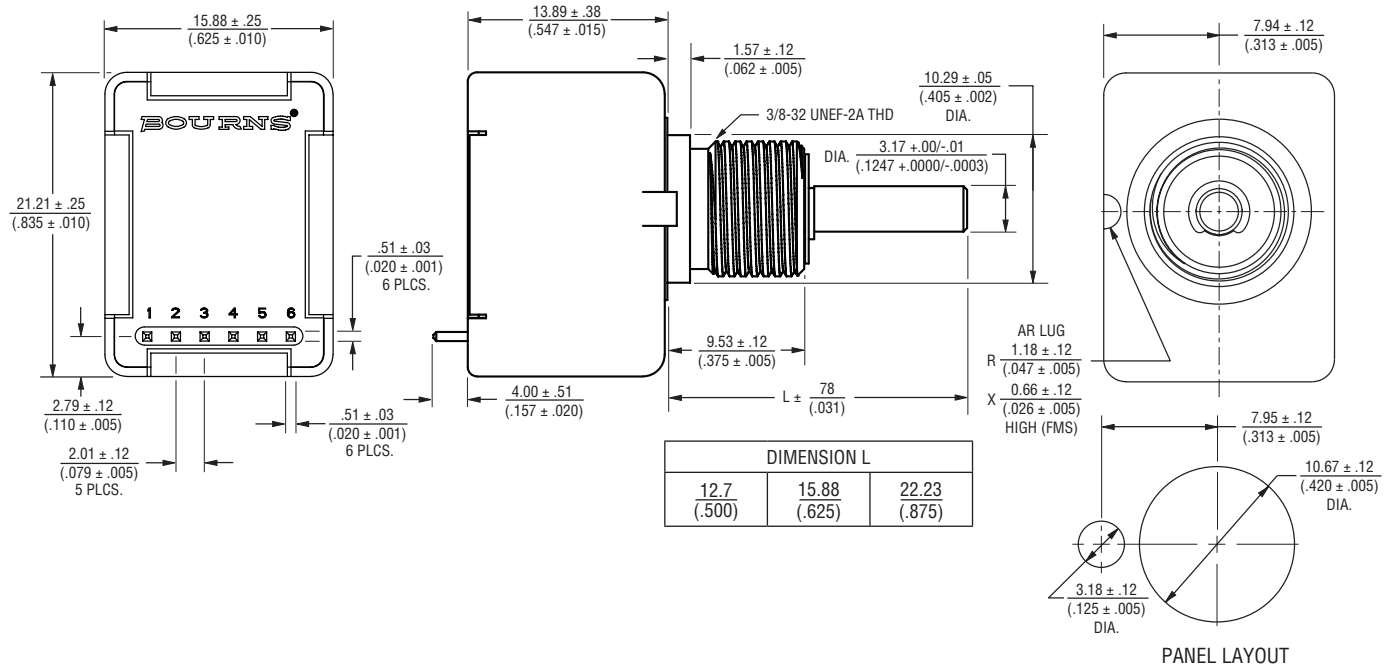
- Wire lead or cable options
- Special shaft/bushing sizes and features
- Connectors
- Special performance characteristics
- Non-standard resolutions
- PCB mounting bracket

# EMS22Q - Non-Contacting Incremental Encoder

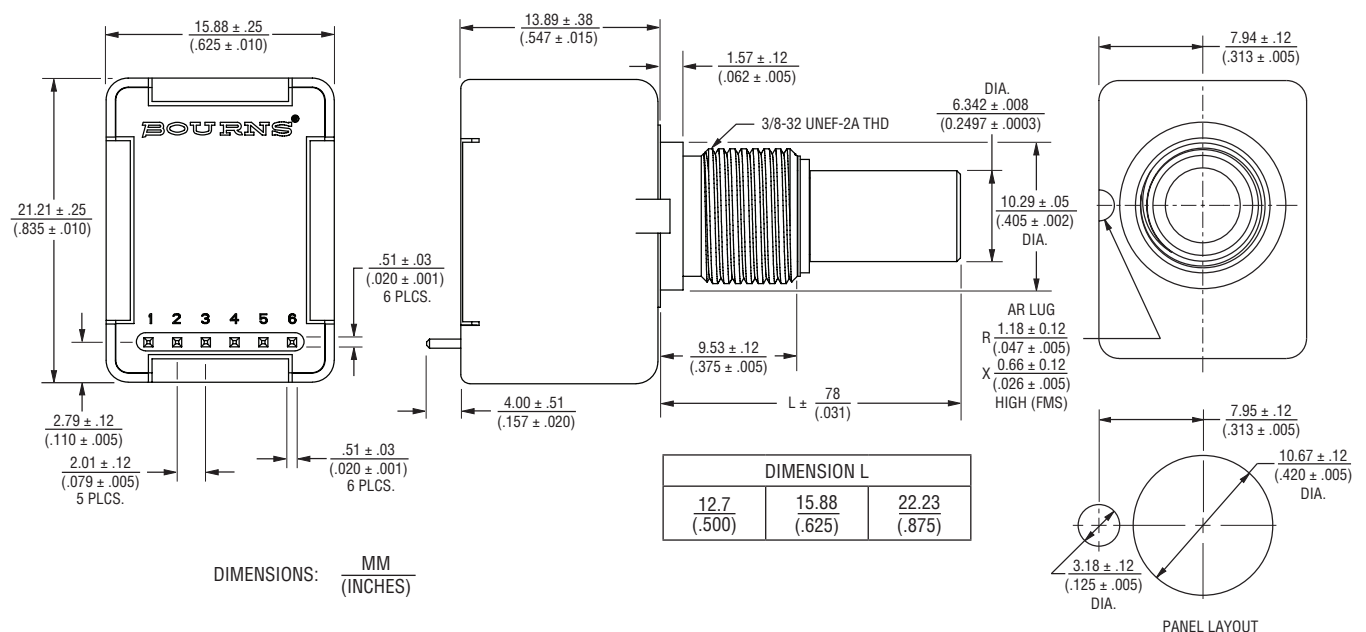


## Dimensional Drawings

### Shaft Style D (Bushing T)



### Shaft Style B (Bushing S)



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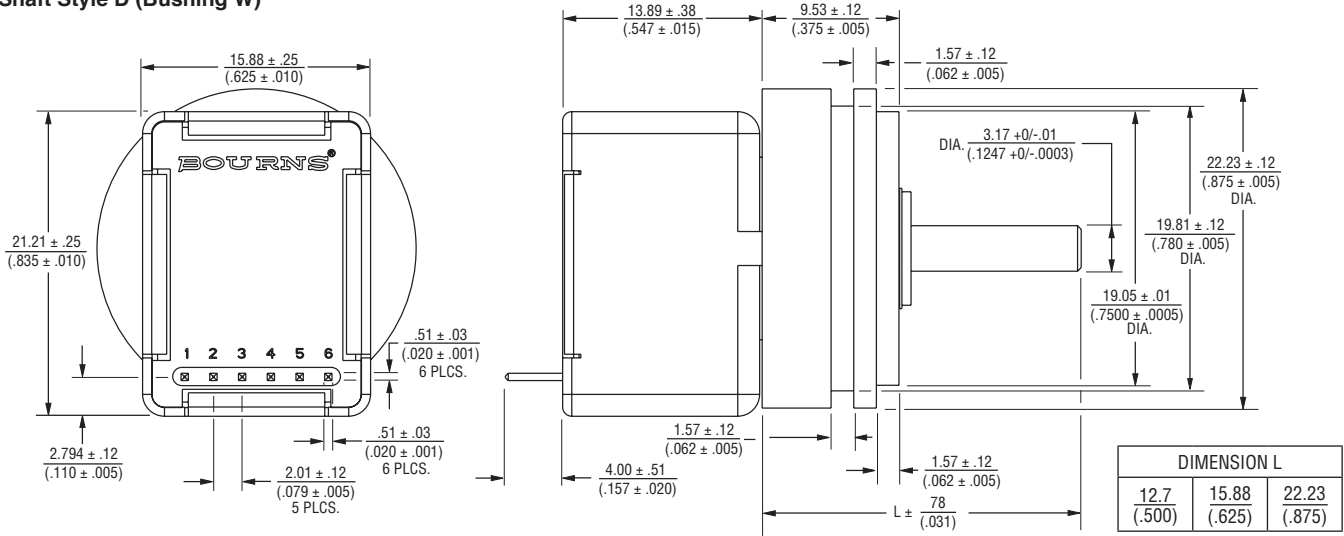
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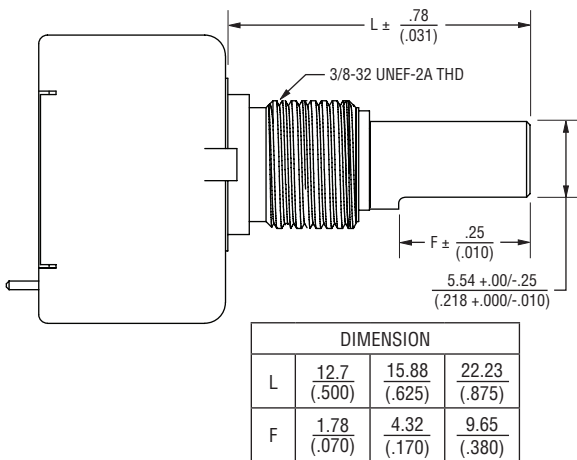
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## Product Dimensions (Continued)

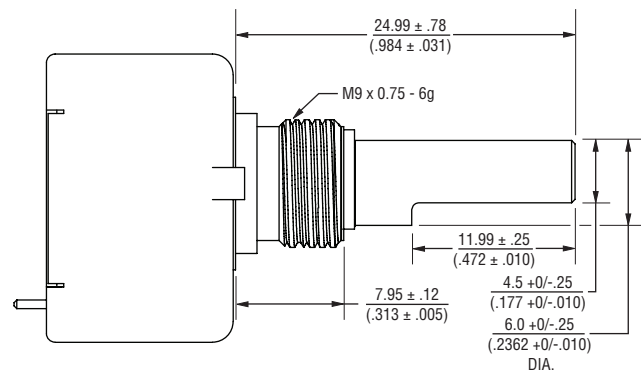
### Shaft Style D (Bushing W)



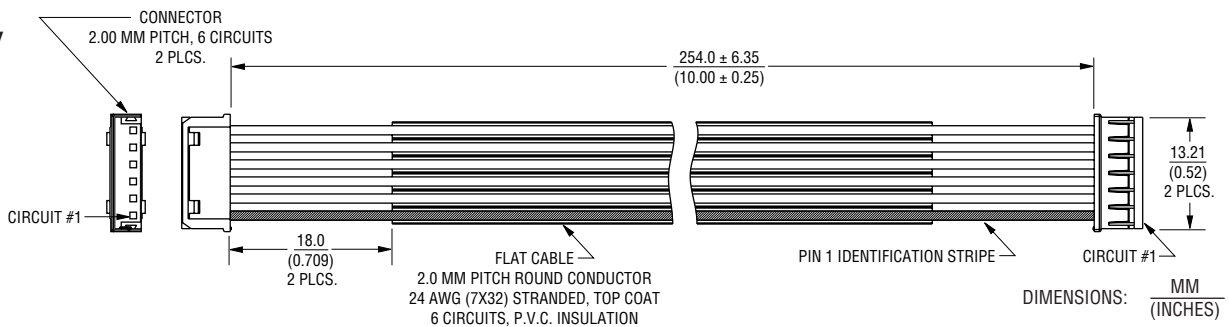
### Shaft Style C (Bushing S)



### Shaft Style M (Bushing D)



### Cable Assembly



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# EMS22Q - Non-Contacting Incremental Encoder

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## How To Order

### BOURNS EMS22 22 MM NON-CONTACTING INCREMENTAL ENCODER

**E M S 2 2 Q 5 1 - B 2 8 - L S 4**

INDEX CHANNEL	
Code	Description
1	1 LSB
3	3 LSB

SHAFT LENGTH DESIGNATOR*	
Code	Description
16	1/2 " Long
20	5/8 " Long
28	7/8 " Long
25	25 mm Long (Available with D Bushing Only)

RESOLUTION	
Code	PPR
1	32
2	64
3	128
4	256

VOLTAGE SUPPLY	
Code	Description
3	3.3 VDC
5	5 VDC

SHAFT STYLE		
Code	Description	Available With Bushings (Code)
B	1/4 " Dia., Plain End	S
C	1/4 " Dia., Flatted End	S
D	1/8 " Dia., Plain End	T, W
M	6 mm Dia., Flatted End	D

TERMINAL CONFIGURATION**	
Code	Description
L	Axial, Multi-Purpose Pin
M	Rear Ribbons Cable with Connector
W	Rear Ribbons Cable - No Connector

BUSHING DESIGNATOR	
Code	Description
S	3/8 " D X 3/8 " L Threaded (Single Ball Bearing)
T	3/8 " D X 3/8 " L Threaded (Dual Ball Bearing)
W	Servo Mount 7/8 " D (Dual Ball Bearing)
D	9 mm D X 7.94 mm L Threaded (Single Ball Bearing)

OUTPUT TYPE	
Code	Description
Q	Quadrature

\* Shaft length measured from mounting surface.

\*\* Standard ribbon cable is 10 inches long. Consult factory for other lengths.

REV. 06/20

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