



## Features

- Two channel quadrature output
- Bushing or servo mount
- Square wave signal
- Index channel available
- Small size
- Resolution to 256 PPR
- CMOS and TTL compatible
- Long life
- High operating speed

## EN - Rotary Optical Encoder

### Electrical Characteristics

|                                                                           |                                                                                         |
|---------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| Output .....                                                              | 2-bit gray code, Channel A leads Channel B by 90 ° (electrical) with clockwise rotation |
| Resolution .....                                                          | 25 to 256 cycles per revolution                                                         |
| Insulation Resistance (500 VDC) .....                                     | 1,000 megohms                                                                           |
| Electrical Travel .....                                                   | Continuous                                                                              |
| Supply Voltage .....                                                      | 5.0 VDC $\pm 0.25$ VDC*                                                                 |
| Supply Current .....                                                      | 26 mA maximum                                                                           |
| Output Voltage .....                                                      |                                                                                         |
| Low Output .....                                                          | 0.8 V maximum                                                                           |
| High Output .....                                                         | 4 V minimum                                                                             |
| Output Current .....                                                      |                                                                                         |
| Low Output .....                                                          | 25 mA minimum                                                                           |
| Rise/Fall Time .....                                                      | 200 ns (typical)                                                                        |
| Shaft RPM (Ball Bearing) .....                                            | 3,000 rpm maximum                                                                       |
| Power Consumption .....                                                   | 136 mW maximum                                                                          |
| Pulse Width (Electrical Degrees, Each Channel) .....                      | 180 ° $\pm 45$ ° TYP.                                                                   |
| Pulse Width (Index Channel) .....                                         | 360 ° $\pm 90$ °                                                                        |
| Phase (Electrical Degrees, Channel A to Channel B) .....                  | 90 ° $\pm 45$ ° TYP.                                                                    |
| Index Channel Centered on 1-1 State Combination of A and B Channels ..... | 0 ° $\pm 45$ °                                                                          |

\*Consult factory for other voltages up to 5 VDC.

### Environmental Characteristics

|                                               |                                       |
|-----------------------------------------------|---------------------------------------|
| Operating Temperature Range .....             | -40 °C to +75 °C (-40 °F to +167 °F)  |
| Storage Temperature Range .....               | -40 °C to +85 °C (-40 °F to +185 °F)  |
| Humidity .....                                | MIL-STD-202, Method 103B, Condition B |
| Vibration .....                               | 5 G                                   |
| Shock .....                                   | 50 G                                  |
| Rotational Life .....                         |                                       |
| A & C Bushings (300 rpm maximum)** .....      | 10,000,000 revolutions                |
| W, S & T Bushings (3,000 rpm maximum)** ..... | 200,000,000 revolutions               |
| IP Rating .....                               | IP 40                                 |

### Mechanical Characteristics

|                                                       |                                                                                                   |
|-------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| Mechanical Angle .....                                | 360 ° Continuous                                                                                  |
| Torque (Starting and Running) .....                   |                                                                                                   |
| A & C Bushings (Spring Loaded for Optimum Feel) ..... | 1 N-cm (1.5 oz-in.) maximum                                                                       |
| W, S & T Bushings (Ball Bearing Shaft Support) .....  | 0.07 N-cm (0.1 oz-in.) maximum                                                                    |
| Mounting Torque .....                                 | 1.7 to 2.0 N-cm (15 to 18 lb.-in.) maximum                                                        |
| 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 or radial pc pins or ribbon cable                                                           |
| Soldering Condition .....                             | Recommended hand soldering using Sn95/Ag5 no clean solder, 0.025 " wire diameter.                 |
|                                                       | Maximum temperature 399 °C (750 °F) for 3 seconds. No wash process to be used with no clean flux. |
|                                                       | Part can be wave soldered at 260 °C (500 °F) for 5 seconds, no wash process with no clean flux.   |
| 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.   |

\*\*For resolutions  $\leq 128$  quadrature cycles per shaft revolution.

Specifications are subject to change without notice.

# EN - Rotary Optical Encoder

**BOURNS®**

## General Information

### ROTARY OPTICAL

The Bourns® EN model is a self-contained rotary optical encoder. It produces a 2-bit quadrature signal which is suitable for digital systems where both magnitude and direction of adjustment must be provided. The EN encoder is ideal for use as a digital panel control or as a position sensing device in applications where long life, reliability, high resolution and precise linearity are critical.

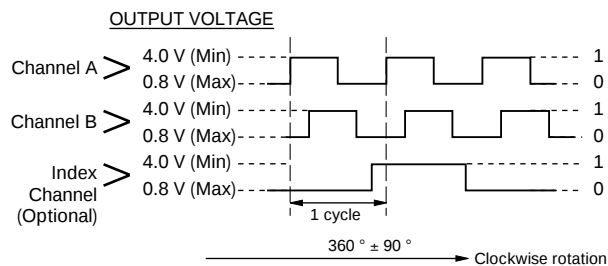
The EN series encoder converts rotary input into electrical signals which can be used by microprocessors without A/D conversion.

Bourns encoder output signals are square wave digital pulses which do not require debounce circuitry. Both features make it possible to significantly reduce the memory overhead, wiring and wiring interconnects required by other types of control devices.

EN optical encoders offer a useful rotational life of from 10 million to 200 million shaft revolutions, making them ideal for extended service applications. The Bourns encoder is also compact and well suited for situations where the available space is limited.

## Quadrature Output Table

### OUTPUT TABLE



### STANDARD RESOLUTIONS AVAILABLE

(Full quadrature output cycles per shaft revolution)

|     |     |
|-----|-----|
| 25* | 125 |
| 50* | 128 |
| 64  | 200 |
| 100 | 256 |

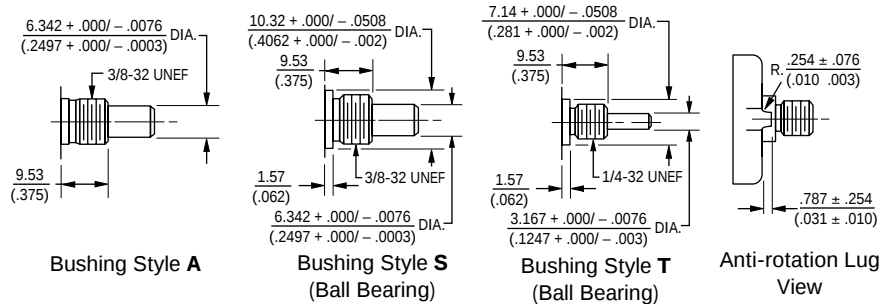
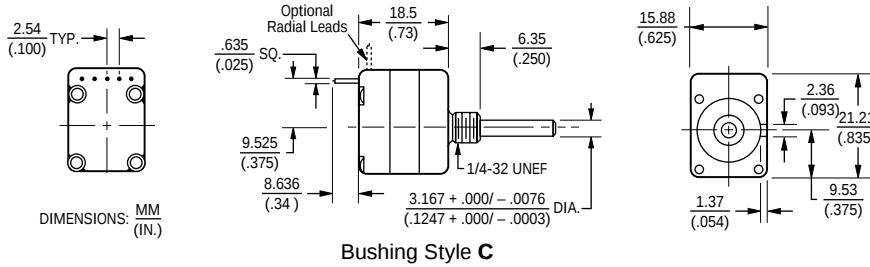
For Non-Standard Resolutions—  
Consult Factory

\* Channel B leads Channel A

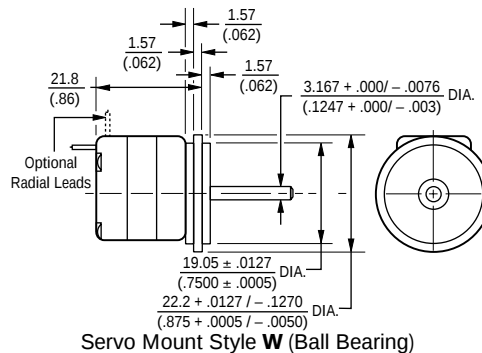
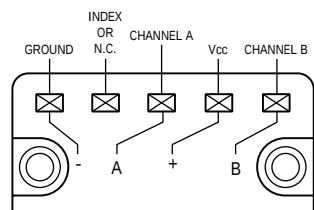
# EN - Rotary Optical Encoder

**BOURNS®**

## Dimensional Drawings



## TERMINATION DIAGRAM



## How To Order

**BOURNS EN SERIES OPTICAL ENCODER**

**E N C 1 J - B 2 8 - L 0 0 1 2 8**

| ANTI-ROTATION LUG POSITION |                       |
|----------------------------|-----------------------|
| Code                       | Description           |
| D                          | None                  |
| J                          | 9:00 Position         |
| P                          | Rear Mounting Bracket |

| SHAFT LENGTH* |             |
|---------------|-------------|
| Code          | Description |
| 16            | 1/2 " Long  |
| 20            | 5/8 " Long  |
| 28            | 7/8 " Long  |

| SWITCHING CONFIGURATION |                                                                |
|-------------------------|----------------------------------------------------------------|
| Code                    | Description                                                    |
| 1                       | Channel A Leads<br>Channel B By 90 °<br>(Clockwise Rotation)** |
| 2                       | Code 1 Switching<br>With Index Channel                         |

| TERMINAL*** CONFIGURATION |                                  |
|---------------------------|----------------------------------|
| Code                      | Description                      |
| L                         | Axial, Multi-Purpose Pin         |
| R                         | Radial, Multi-Purpose Pin        |
| M                         | Rear Ribbon Cable with Connector |
| N                         | Side Ribbon Cable with Connector |
| W                         | Rear Ribbon Cable - No Connector |
| Y                         | Side Ribbon Cable - No Connector |

| RESOLUTION |                       |
|------------|-----------------------|
| Code       | Cycles Per Revolution |
| 00025      | 25                    |
| 00050      | 50                    |
| 00064      | 64                    |
| 00100      | 100                   |
| 00125      | 125                   |
| 00128      | 128                   |
| 00200      | 200                   |
| 00256      | 256                   |

| SHAFT STYLE |                            |                          |
|-------------|----------------------------|--------------------------|
| Code        | Description                | Use With Bushings (Code) |
| B           | 1/4 " Dia., Plain End      | A, S                     |
| D           | 1/8 " Dia., Plain End      | C, T, W                  |
| C           | 1/4 " Dia., Single Flatted | A, S                     |

| BUSHING CONFIGURATION |                                         |
|-----------------------|-----------------------------------------|
| Code                  | Description                             |
| A                     | 3/8 "D X 3/8 "L Threaded                |
| C                     | 1/4 "D X 1/4 "L Threaded                |
| S                     | 3/8 "D X 3/8 "L Threaded (Ball Bearing) |
| T                     | 1/4 "D X 3/8 "L Threaded (Ball Bearing) |
| W                     | Servo Mount 7/8 "D (Ball Bearing)       |

\* Shaft length measured from mounting surface.

\*\* 25 and 50 ppr is reversed (Channel B leads Channel A)

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

Consult factory for options not shown, including:

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