Features

■ Two channel quadrature output
■ Bushing or servo mount
■ Square wave signal
■ Index channel available
■ Small size
■ Resolution to 256 PPR

BOURNS® PRO AUDIO™

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EN - Rotary Optical Encoder

Electrical Characteristics

Output ....2-bit quadrature 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 ±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 ° ±45 ° TYP.
Pulse Width (Index Channel) ....360 ° ±90 °
Phase (Electrical Degrees, Channel A to Channel B) ....90 ° ±45 ° TYP.
Index Channel Centered on 1-1 State Combination of A and B Channels ....0 ° ±45 °

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
  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 5 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.
**For resolutions ≤ 128 quadrature cycles per shaft revolution.

Quadrature Output Table

OUTPUT VOLTAGE

Channel A
4.0 V (Min)
0.8 V (Max)

Channel B
4.0 V (Min)
0.8 V (Max)

Index Channel (Optional)
4.0 V (Min)
0.8 V (Max)

1 cycle

360 ° ± 90 ° → Clockwise rotation
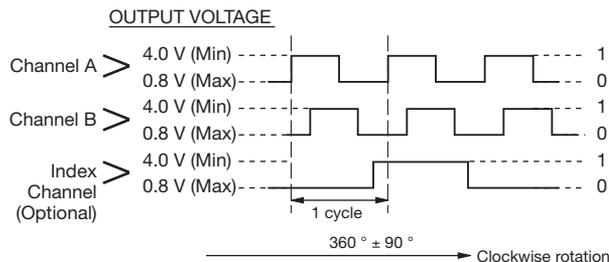
STANDARD RESOLUTIONS AVAILABLE

(Full quadrature output cycles per shaft revolution)

25*	125
50*	128
64	200
100	256

For Non-Standard Resolutions—Consult Factory

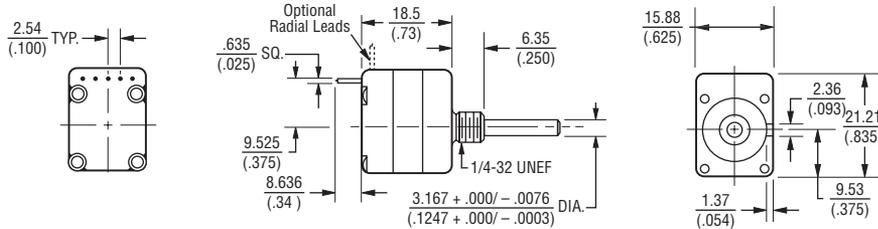* Channel B leads Channel A

Additional Features

■ CMOS and TTL compatible

■ Long life

■ Ball bearing option for high operating speed up to 3000 rpm

EN - Rotary Optical Encoder

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Dimensional Drawings

Bushing Style **C**

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

Bushing Style **A**

Bushing Style **S** (Ball Bearing)

Bushing Style **T** (Ball Bearing)

Anti-rotation Lug View
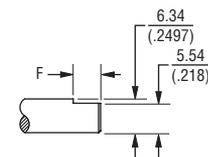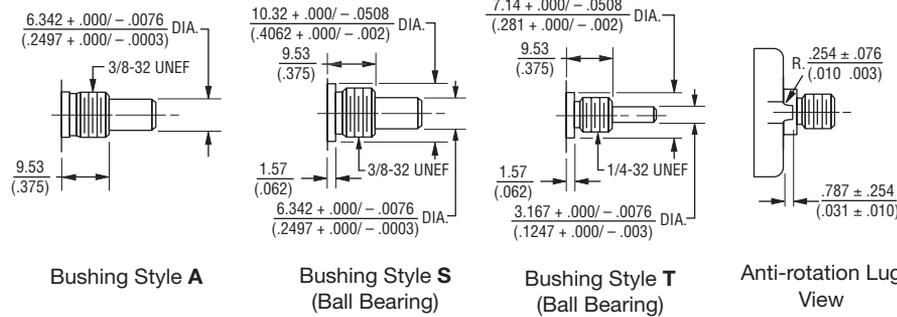
Shaft End Style **C**

SHAFT LENGTH	SHAFT FLAT LENGTH (DIM. F)
12.7 (.050)	2.54 (.100)
15.9 (.625)	5.08 (.200)
19.1 (.750)	8.25 (.325)
22.2 (.875)	9.65 (.380)

TERMINATION DIAGRAM
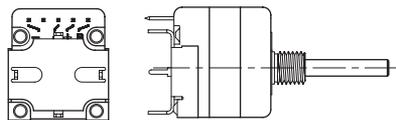

GROUND | INDEX OR N.C. | CHANNEL A | Vcc | CHANNEL B
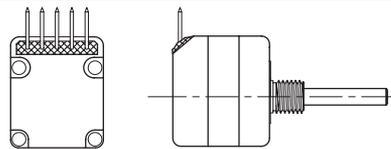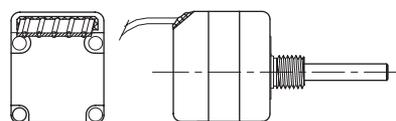
A | + | B
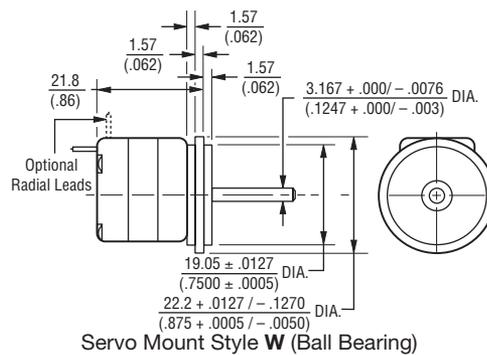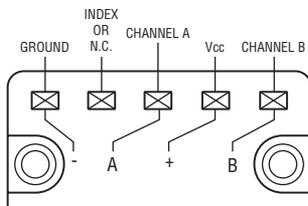
Servo Mount Style **W** (Ball Bearing)
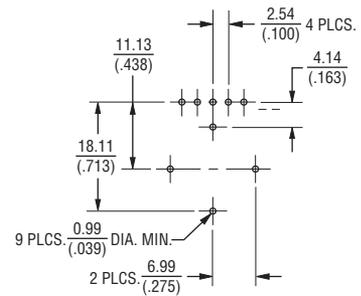
Recommended Board Layout with Bracket

Bushing with Bracket

Radial Leads

Axial Ribbon Cable Option

Radial Ribbon Cable Option

Ribbon Cable Option Detail

Connector Pinout

Connector Pinout

DIMENSIONS: $\dfrac{\text{MM}}{\text{(INCHES)}}$
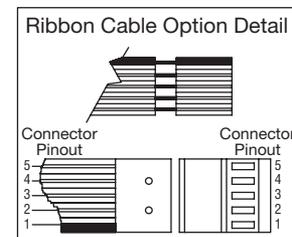
Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

GENERAL INFORMATION

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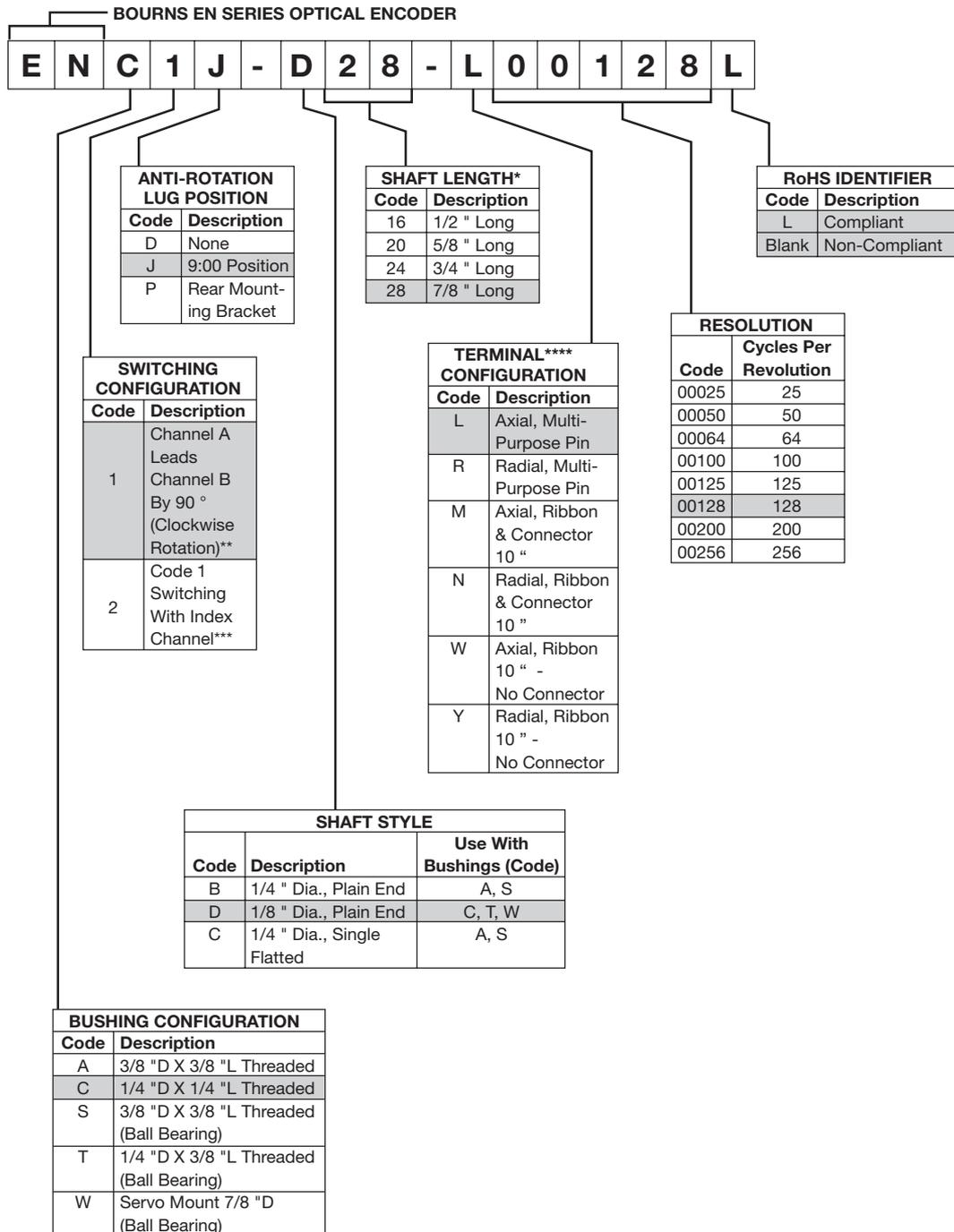
Bourns encoder output signals are square wave digital pulses which do not require debounce circuitry. Both features make it possible to significantly reduce the memory overhead, wiring and wiring interconnects required by other types of control devices.

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.

EN - Rotary Optical Encoder

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How To Order

BOURNS EN SERIES OPTICAL ENCODER

E N C 1 J - D 2 8 - L 0 0 1 2 8 L

ANTI-ROTATION LUG POSITION

Code	Description
D	None
J	9:00 Position
P	Rear Mounting Bracket

SWITCHING CONFIGURATION

Code	Description
1	Channel A Leads Channel B By 90 ° (Clockwise Rotation)**
2	Code 1 Switching With Index Channel***

SHAFT LENGTH*

Code	Description
16	1/2 " Long
20	5/8 " Long
24	3/4 " Long
28	7/8 " Long

TERMINAL**** CONFIGURATION

Code	Description
L	Axial, Multi-Purpose Pin
R	Radial, Multi-Purpose Pin
M	Axial, Ribbon & Connector 10 "
N	Radial, Ribbon & Connector 10 "
W	Axial, Ribbon 10 " - No Connector
Y	Radial, Ribbon 10 " - No Connector

RESOLUTION

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

RoHS IDENTIFIER

Code	Description
L	Compliant
Blank	Non-Compliant

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).
*** Only available with 50, 64, 100 and 128 PPR.
*** Standard ribbon cable is 10 " long. Consult factory for other lengths.

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