

# Installation Instructions

## 847A and 847B Hollow Shaft Incremental Encoders

**IMPORTANT: SAVE THESE INSTRUCTIONS FOR FUTURE USE.**

### Selection Guide

**847**  $\frac{A}{a}$   $\frac{Q}{b}$   $\frac{3}{c}$   $\frac{1}{d}$   $\frac{4}{e}$   $\frac{R}{f}$   $\frac{B}{g}$   $\frac{65536}{h}$

**a**

| Code | Encoder Diameter/Type                |
|------|--------------------------------------|
| A    | 2 in. diameter, blind hollow shaft   |
| B    | 2 in. diameter, through hollow shaft |

**b**

| Code | Mounting Configuration |
|------|------------------------|
| Q    | 3-point mounting       |
| R    | 2-point mounting       |

**c**

| Code | Shaft Size                          |
|------|-------------------------------------|
| 3    | 3/8 in. diameter metal hollow shaft |
| 4    | 1/2 in. diameter metal hollow shaft |

**d**

| Code | Power Supply  |
|------|---------------|
| 1    | 4.5...5.5V DC |
| 2    | 8...30V DC    |

**e**

| Code   | Output Configuration                 |
|--|--------------------------------------|
| <b>Signal Phasing A-leads-B<br/>clockwise rotation viewed from shaft end, Z gated A</b>  |                                      |
| 4  | 4.5...5.5V line driver outputs (TTL) |
| 5  | 4.5...5.5V open collector outputs ❶  |
| 6  | 8...30V line driver outputs (HTL) ❷  |
| 7  | 8...30V open collector outputs ❷     |
| <b>Signal Phasing B-leads-A<br/>clockwise rotation viewed from shaft end, Z gated BN</b> |                                      |
| A  | 4.5...5.5V line driver outputs (TTL) |
| B  | 4.5...5.5V open collector outputs ❶  |
| C  | 8...30V line driver outputs (HTL) ❷  |
| D  | 8...30V open collector outputs ❷     |

❶ Options 5 and B cannot be ordered with option 2 from Table d.

❷ Options 6, 7, C, and D cannot be ordered with option 1 from Table d.

**f**

| Code | Connector/Cable Exit |
|------|----------------------|
| R    | Radial exit          |

**g**

| Code | Connector/Cable Type                       |
|------|--|
| A    | M12 connector, 8-pin with mating connector |
| B    | M12 connector, 8-pin                       |
| P    | 1.5 m (4.9 ft) cable                       |
| Q    | 5 m (16.4 ft) cable                        |
| R    | 10 m (32.8 ft) cable                       |

**h**

| Code              | Resolution                      |
|-------------------|---------------------------------|
| 00001...<br>65536 | 00001...65536 pulses/revolution |

### Accessories

| Description                       | Part Number |
|-----------------------------------|-------------|
| Differential encoder buffer board | 845-BB*     |
| M12 cable                         | 889D-F8FB-* |

\* See <http://ab.rockwellautomation.com/Motion-Control/High-Resolution-Incremental-Optical-Encoder> for selection.

## Specifications

| Electrical   |  |
|--|--|
| Code format  | Incremental<br>Two channels with zero index  |
| Signal options, clockwise rotation viewed from shaft end | A-leads-B, 180° marker gated with A or<br>B-leads-A, 180° marker gated with BN   |
| Signal phase relation                                    | 90° ± 22° channels   |
| Symmetry   | 40...60%   |
| Supply current   | 50 mA  |
| Frequency response                                       | 4.5...5.5V line driver output: 820 kHz<br>8...30V line driver output: 820 kHz<br>Open collector: 150 kHz                                       |
| Resolution   | 1...65536 pulses/revolution  |
| Load current   | 30 mA for all output types   |
| Output drivers   | 4.5...5.5V line driver - IC HD2<br>8...30V line driver - IC HD2<br>Open collector - 7406   |
| Electrical protection                                    | Reverse polarity and short circuit for all output types  |
| Cable outer diameter                                     | 0.25 in. (6.2 mm)  |
| Cable type   | 300V, 105 °C, 26 AWG, 9-conductor with overall braided shield, UL AWM type 20327 for use in fixed (non-flexing) installations; RoHS compliant. |
| Cable bend radius  | Minimum 5x outer diameter  |

| Mechanical                            |   |
|---------------------------------------|---|
| Maximum operating speed               | 6000 RPM  |
| Angular acceleration                  | 500,000 radians/s <sup>2</sup>  |
| Moment of inertia                     | 40 g·cm <sup>2</sup>  |
| Startup torque at 20 °C (68 °F)       | 0.8 N·cm  |
| Operating torque at 20 °C (68 °F)     | 0.6 N·cm  |
| Permissible shaft movement [mm (in.)] | Radial<br>Static: ± 0.3 (0.012)<br>Dynamic: ± 0.05 (0.002)<br>Axial<br>Static: ± 0.5 (0.02)<br>Dynamic: ± 0.1 (0.004) |
| Hollow shaft diameter                 | 3/8 in. (9.5 mm) or 1/2 in. (12.7 mm)   |
| Approximate weight [kg (lb)]          | 0.16 (0.35) with M12 connector  |
| MTTFd (EN ISO 13849-1)                | 330 years   |

| Environmental                  |   |
|--------------------------------|---|
| Enclosure rating per IEC 60529 | Shaft: IP65<br>Housing, connector version with mating connector installed:<br>with blind hollow shaft: IP67<br>with through hollow shaft: IP65<br>Housing, cable version:<br>with blind hollow shaft: IP67<br>with through hollow shaft: IP65 |
| Temperature                    | -30...+80 °C (-22...+176 °F) operating<br>-40...+100 °C (-40...+212 °F) storage   |
| Relative humidity              | 90% noncondensing   |
| Shock                          | 100 G/11 ms duration  |
| Vibration                      | 30 G/10...2000 Hz   |
| EMC                            | EN 61000-6-2 and EN 61000-6-3 (M12 connector)   |
| Housing material               | EN AC-47100 die-cast aluminum   |
| Housing finish                 | Powder coat paint, color RAL 9005, Pantone black C (jet black)  |
| Flange material                | 6061-T6 aluminum  |
| Shaft material                 | SAE 303 stainless steel   |
| Certifications                 | UL Listed, RoHS compliant<br>CE Marked for all applicable directives<br>For use in NFPA 79 applications only  |

## Mounting Instructions

|                  |   |
|------------------|---|
| <b>IMPORTANT</b> | Make sure that mating shaft is chamfered and grease-free. |
|------------------|---|

- Using a 5/64-in. Allen wrench, loosen the screw on the clamping ring.
- Slide the encoder onto the mating shaft until the flex mount rests on the machine surface.  
The encoder must slide freely onto the shaft; if not, do not force. Check the shaft for interferences such as gouges, burrs, rust, or size.  
If mounting holes exist, proceed to step 6.
- Hold encoder firmly and mark the mounting holes.
- Mount the encoder with #4-40 (or equivalent) screws.
- Slide the encoder back onto the shaft until the flex mount rests on the machine surface.
- Attach the encoder with #4-40 (or equivalent) screws.

|                  |   |
|------------------|---|
| <b>IMPORTANT</b> | Do not stress the flex mount while tightening the screws. |
|------------------|---|

- Tighten the clamping ring screw to 8 in·lb.

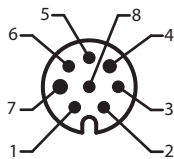
8. Make the electrical connections according to the Connector Pins and Signal Availability table.

**IMPORTANT**

Wiring must be in accordance with the National Electric Code and applicable local codes and regulations.

**Connector Pins and Signal Availability**

| Signal Name              | Wire color attached cable | Pin number M12 8-pin connector |
|--------------------------|---------------------------|--------------------------------|
| V DC                     | Red                       | 8                              |
| Common                   | Black with red band       | 7                              |
| A output                 | White                     | 2                              |
| AN output                | Black with white band     | 1                              |
| B output                 | Blue                      | 4                              |
| BN output                | Black with blue band      | 3                              |
| Z output                 | Green                     | 6                              |
| ZN output                | Black with green band     | 5                              |
| Zero set input           | Yellow                    | -                              |
| Case                     | Black                     | -                              |
| Recommended mating cable | (Attached to encoder)     | 889D-F8FB-*                    |

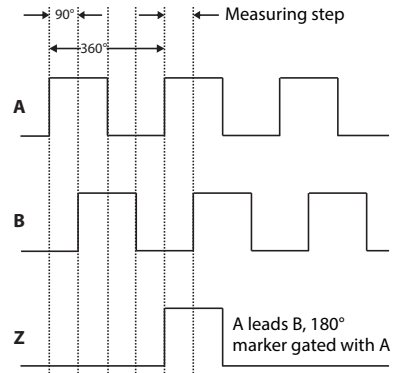


**M12 pins on encoder connector**

**Output Waveforms**

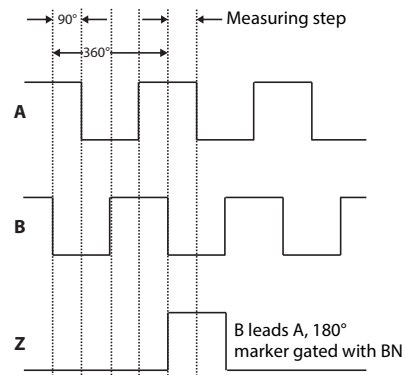
Complementary signals AN, BN, and ZN are supplied only on units with line driver outputs.

**Signals and marker option - A leads B (CW rotation)**



Clockwise rotation when facing encoder shaft

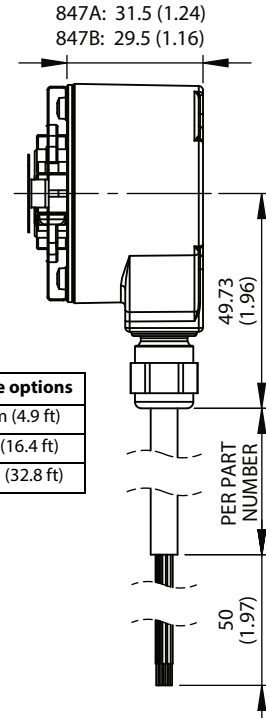
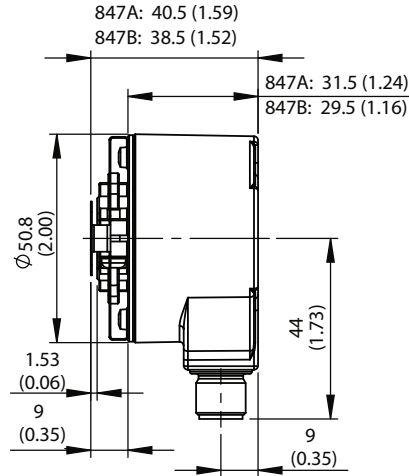
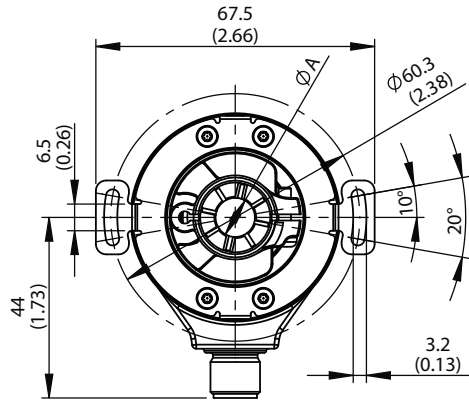
**Signals and marker option - B leads A (CW rotation)**



Clockwise rotation when facing encoder shaft

# Approximate Dimensions [mm (in.)]

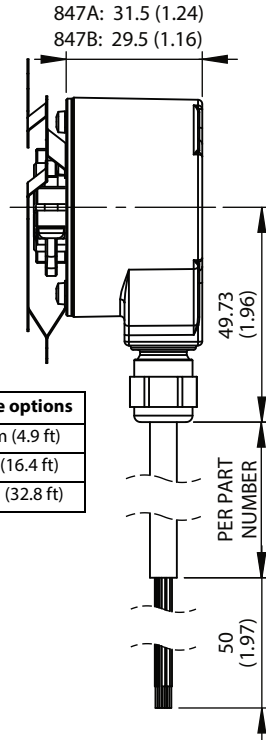
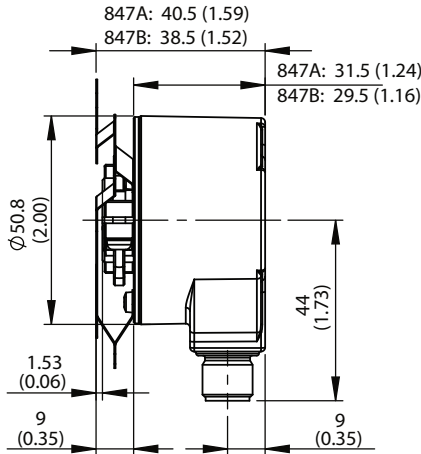
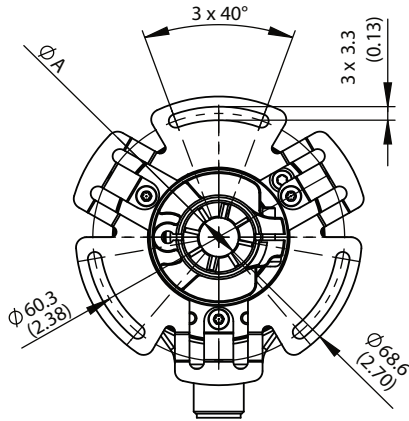
## 2-Point Mounting



| Cable options  |  |
|----------------|--|
| 1.5 m (4.9 ft) |  |
| 5 m (16.4 ft)  |  |
| 10 m (32.8 ft) |  |

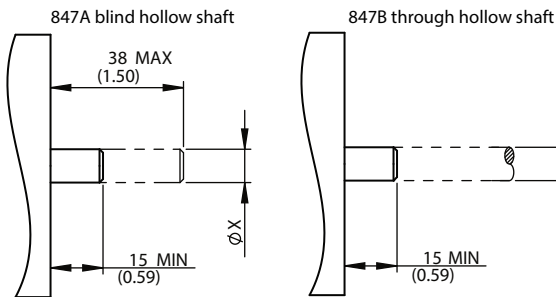
| 847A and 847B bore diameter options |                                   |
|-------------------------------------|-----------------------------------|
| Nominal, in.                        | Bore $\phi$ A                     |
| 3/8                                 | 9.543...9.558 (0.3757...0.3763)   |
| 1/2                                 | 12.716...12.734 (0.5006...0.5013) |

## 3-Point Mounting



| Cable options  |  |
|----------------|--|
| 1.5 m (4.9 ft) |  |
| 5 m (16.4 ft)  |  |
| 10 m (32.8 ft) |  |

## Customer Shafts



| 847A and 847B customer shaft diameter |                                   |
|---------------------------------------|-----------------------------------|
| Nominal, in.                          | Shaft $\phi$ X                    |
| 3/8                                   | 9.535...9.520 (0.3754...0.3748)   |
| 1/2                                   | 12.712...12.694 (0.5005...0.4998) |

Rockwell Automation maintains current product environmental information on its website at <http://www.rockwellautomation.com/rockwellautomation/about-us/sustainability-ethics/product-environmental-compliance.page>.

[www.rockwellautomation.com](http://www.rockwellautomation.com)

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