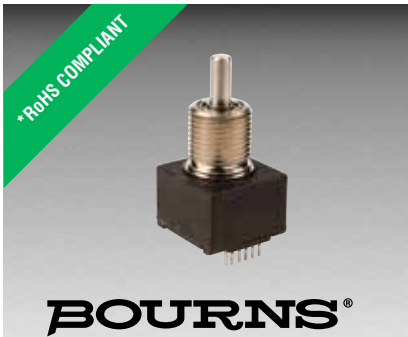




## Features

- RoHS compliant\*
- HCMOS, CMOS and TTL compatible
- Compact package size
- High rotational cycle life
- Ball bearing shaft support
- Recommended for machine/machine interface applications (MMI)

## ES14 - 14 mm Rotary Optical Encoder

### Electrical Characteristics

|                                                                   |                                       |
|-------------------------------------------------------------------|---------------------------------------|
| Electrical Output .....                                           | 2-bit quadrature code                 |
| Resolution .....                                                  | 8 to 64 pulses per revolution (PPR)   |
| Supply Voltage (VCC) .....                                        | 5.0 VDC $\pm$ 0.25 VDC                |
| Supply Current (ICC) .....                                        | 26 mA maximum                         |
| Output Voltage                                                    |                                       |
| Low (VCE(sat)), per Channel .....                                 | 800 mV maximum at I(SINK) = 25 mA     |
| High (VO(HI)), per Channel .....                                  | 4.0 VDC minimum @ VCC = 4.75 VDC      |
| Output Current I(SINK), per Channel .....                         | 25 mA minimum                         |
| Rise/Fall Time .....                                              | 200 ns typical                        |
| Power Dissipation .....                                           | 167 mW maximum                        |
| Pulse Width (per Channel) .....                                   | 180 $^{\circ}$ e typical              |
| Phase Angle (Channel A Leads Channel B, Clockwise Rotation) ..... | 90 $^{\circ}$ e $\pm$ 72 $^{\circ}$ e |
| Insulation Resistance @ 500 VDC .....                             | 1,000 megohms minimum                 |
| Operating RPM .....                                               | 1000 maximum                          |

### Environmental Characteristics

|                                             |                                                                               |
|---------------------------------------------|-------------------------------------------------------------------------------|
| Operating Temperature Range @ 5.0 VDC ..... | -40 $^{\circ}$ C to +70 $^{\circ}$ C (-40 $^{\circ}$ F to +158 $^{\circ}$ F)  |
| Storage Temperature Range .....             | -55 $^{\circ}$ C to +125 $^{\circ}$ C (-67 $^{\circ}$ F to +257 $^{\circ}$ F) |
| Vibration .....                             | 15 G                                                                          |
| Shock .....                                 | 50 G                                                                          |
| Humidity .....                              | MIL-STD-202, Method 103, Condition B                                          |
| Flammability .....                          | Conforms to UL 94HB                                                           |
| IP Rating .....                             | IP 54**                                                                       |

### Mechanical Characteristics

|                                       |                                             |
|---------------------------------------|---------------------------------------------|
| Mechanical Angle .....                | 360 $^{\circ}$ Continuous                   |
| Torque                                |                                             |
| Starting/Running .....                | 1.05 N-mm (0.15 oz.-in.) maximum            |
| Rotational Life .....                 | 50,000,000 cycles (100,000,000 revolutions) |
| Shaft Radial Play .....               | 0.003 in. maximum                           |
| Shaft Axial Structural Strength ..... | 35 lbs. minimum                             |
| Mounting Torque .....                 | 2.0 N-m (18 lb.-in.) maximum                |

### Materials and Finishes

|                          |                                                                                                                      |
|--------------------------|----------------------------------------------------------------------------------------------------------------------|
| Terminals .....          | Sn plated PC pins                                                                                                    |
| Soldering Condition      |                                                                                                                      |
| Manual Soldering .....   | 96.5Sn/3.0Ag/0.5Cu solid wire or no-clean rosin cored wire<br>370 $^{\circ}$ C (700 $^{\circ}$ F) max. for 3 seconds |
| Wave Soldering .....     | 96.5Sn/3.0Ag/0.5Cu solder with no-clean flux<br>260 $^{\circ}$ C (500 $^{\circ}$ F) max. for 5 seconds               |
| Wash processes .....     | Not recommended                                                                                                      |
| Mounting Hardware        |                                                                                                                      |
| Nut .....                | Brass, hex (metric)/Nickel-plated brass, hex (SAE)                                                                   |
| Lockwasher .....         | Nickel-plated spring steel, internal tooth                                                                           |
| Marking .....            | Manufacturer's symbol, model number, product code, terminal style and date code                                      |
| Standard Packaging ..... | Anti-static plastic tube (25 pcs./tube)                                                                              |

\*\*When device is mounted by normal mounting means.

## Additional Features

- Cable/connector option
- Optional bracket

# ES14 - 14 mm Rotary Optical Encoder

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## Part Numbering System

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E | S | 1 | 4 | A | 0 | D | - | E | 2 | 8 | - | L | 0 | 3 | 2 | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| MODEL NO. DESIGNATOR |                              |
|----------------------|------------------------------|
| ES14                 | 14 mm Rotary Optical Encoder |

| BUSHING DESIGNATOR |                            |
|--------------------|----------------------------|
| Code               | Description                |
| A                  | 3/8 " D x 3/8 " L Threaded |

| DETENT OPTION |             |
|---------------|-------------|
| Code          | Description |
| 0             | No Detent   |

| ANTI-ROTATION LUG/BACKET OPTION |                                             |
|---------------------------------|---------------------------------------------|
| Code                            | Description                                 |
| A                               | A/R Lug                                     |
| B                               | Bracket (No hardware/no cable or connector) |
| D                               | None                                        |

| SHAFT STYLE (See Outline Drawing for Details) |                        |                      |
|-----------------------------------------------|------------------------|----------------------|
| Code                                          | Description            | Available w/ Bushing |
| E                                             | 1/8 " Dia. Slotted End | A                    |

| SHAFT LENGTH DESIGNATOR |              |                     |
|-------------------------|--------------|---------------------|
| Code                    | Length (FMS) | Available w/Bushing |
| 28                      | 7/8 "        | A                   |

| SWITCH OPTION |             |
|---------------|-------------|
| Code          | Description |
| N             | No Switch   |

| RESOLUTION (Pulses Per Revolution) |             |
|------------------------------------|-------------|
| Code                               | Description |
| 08                                 | 8 PPR       |
| 16                                 | 16 PPR      |
| 32                                 | 32 PPR      |
| 64                                 | 64 PPR      |

| CABLE/CONNECTOR OPTION |                                                                                                    |
|------------------------|----------------------------------------------------------------------------------------------------|
| Code                   | Description                                                                                        |
| 0                      | No Cable/Connector                                                                                 |
| 1                      | 6 " Cable with Female Connector (0.049 "/1.25 mm pitch centers in-line) and stripped/tinned leads  |
| 2                      | 6 " Cable with Female Connector (0.049 "/1.25 mm pitch centers in-line) on both ends               |
| 3                      | 12 " Cable with Female Connector (0.049 "/1.25 mm pitch centers in-line) and stripped/tinned leads |
| 4                      | 12 " Cable with Female Connector (0.049 "/1.25 mm pitch centers in-line) on both ends              |

| TERMINAL CONFIGURATION |                          |
|------------------------|--------------------------|
| Code                   | Description              |
| L                      | Axial Multi-Purpose Pin  |
| R                      | Radial Multi-Purpose Pin |

### Cable and Connector Options:

H-290-4 = 6 " Cable with Female Connector (0.049 "/1.25 mm pitch centers in-line) and stripped/tinned leads  
H-290-1 = 6 " Cable with Female Connector (0.049 "/1.25 mm pitch centers in-line) on both ends  
H-290-2 = 12 " Cable with Female Connector (0.049 "/1.25 mm pitch centers in-line) and stripped/tinned leads  
H-290-3 = 12 " Cable with Female Connector (0.049 "/1.25 mm pitch centers in-line) on both ends

For other cable and connector options, please contact the factory.

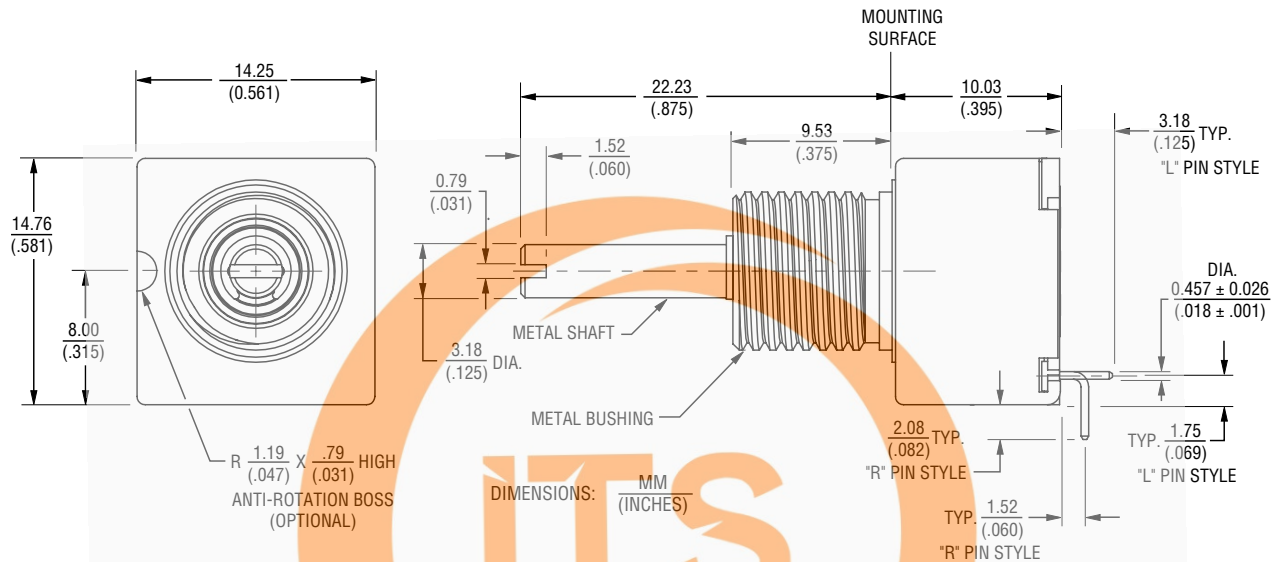
Specifications are subject to change without notice.

The device characteristics and parameters in this data sheet can and do vary in different applications and actual device performance may vary over time. Users should verify actual device performance in their specific applications.

# ES14 - 14 mm Rotary Optical Encoder

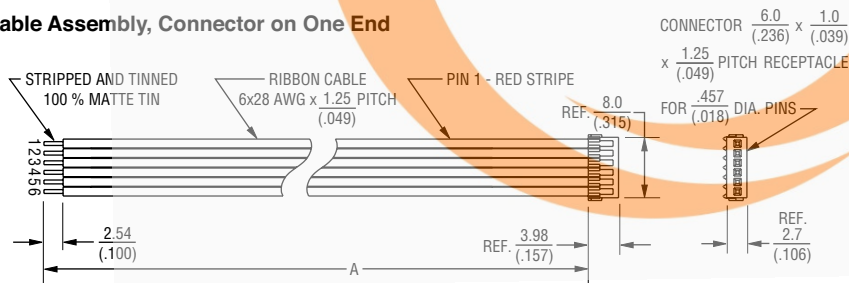
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## Product Dimensions



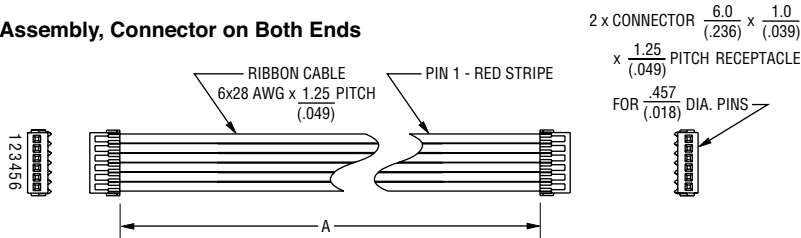
## Cable/Connector Options

### Cable Assembly, Connector on One End



| HARDWARE NUMBER | DESCRIPTION                            | "A" DIM.                  |
|-----------------|----------------------------------------|---------------------------|
| H-290-4         | CABLE ASSEMBLY, CONNECTOR ON ONE END   | 152.4 ± 5.0 (6.0 ± .197)  |
| H-290-2         | CABLE ASSEMBLY, CONNECTOR ON ONE END   | 304.8 ± 5.0 (12.0 ± .197) |
| H-290-1         | CABLE ASSEMBLY, CONNECTOR ON BOTH ENDS | 152.4 ± 5.0 (6.0 ± .197)  |
| H-290-3         | CABLE ASSEMBLY, CONNECTOR ON BOTH ENDS | 304.8 ± 5.0 (12.0 ± .197) |

### Cable Assembly, Connector on Both Ends



DIMENSIONS: MM / INCHES

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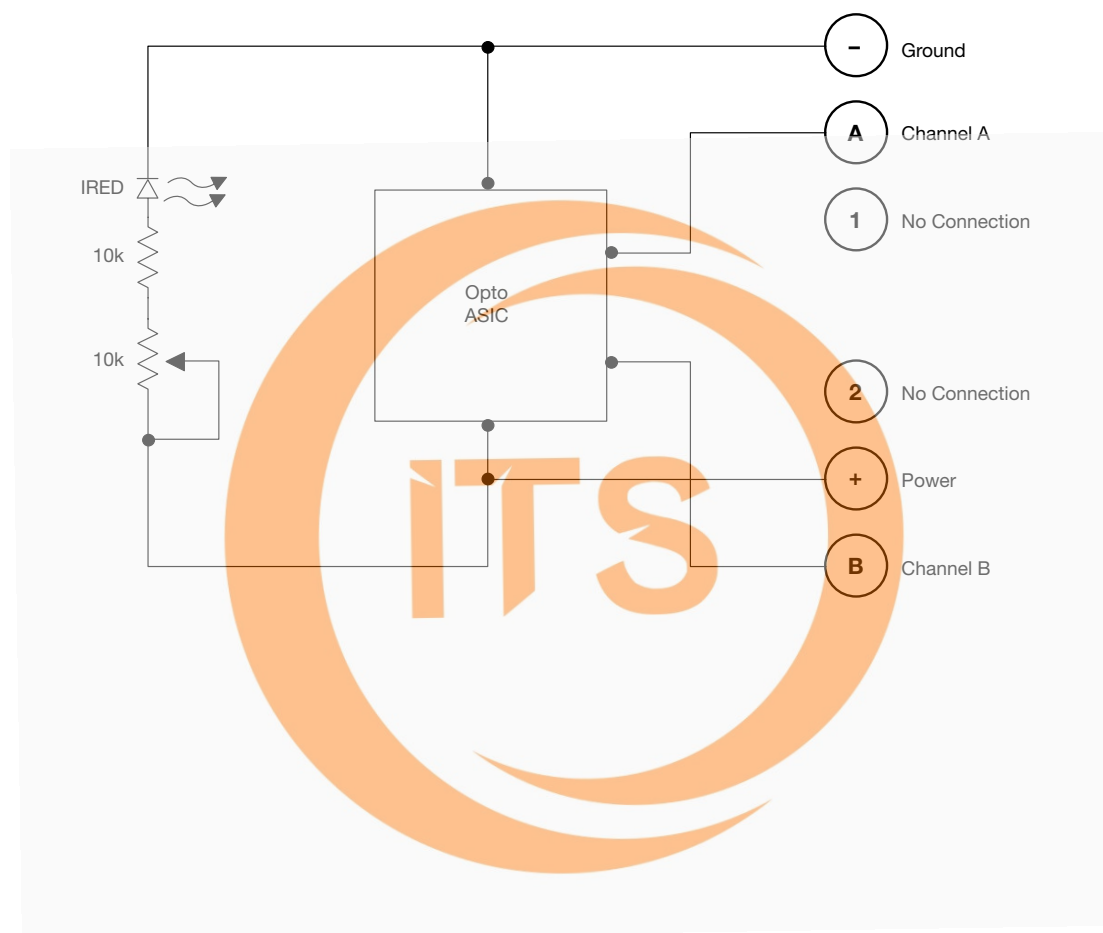
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## ES14 - 14 mm Rotary Optical Encoder

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### Electrical Block Diagram



01/16

Specifications are subject to change without r

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