The MIL-Series incremental encoders represents BEI’s response to today’s high reliability optical encoder demands. By utilizing state-of-the-art design techniques and offering the most common resolutions, the MIL-157 presents a highly accurate and reliable off-the-shelf solution to high-rel needs in a compact package size.

The electronics were designed to meet the stringent requirements of MIL-STD-454 to insure the highest level of quality and reliability. Seals at the connector and housing provide reliable protection for the electronics and optics assemblies against water spray and oil mist. An optional (at no extra cost) shaft seal provides additional protection from fluid contamination.

**OPTIONS:**
- Zero reference signal
- Shaft seal
- Special shaft configurations
- Other disk resolutions
- Mil-Temp (Non 883 Screened) parts
- Connector pin-outs or wire colors to customer requirements
- Screened LED and photodetectors

**FEATURES:**
- Single solid state LED light source
- Single substrate photocell array
- Printed wiring boards designed to MIL-STD-275 and procured per MIL-P-55110
- Integrated circuits screened per MIL-STD-833, Level B
- Complementary digital outputs from DS7830 line drivers
- Resolution to 2048 cycles per turn
- Incremental output code of two signals phased 90 elec. deg. apart
- All units 100% inspected for electrical and mechanical features
- Meets or exceeds applicable portions of MIL-STD-810 Methods 514.3 and 516.3

**MIL-157 SERIES OPTICAL INCREMENTAL ENCODERS**

**STANDARD DISK RESOLUTIONS**

<table>
<thead>
<tr>
<th>Description</th>
<th>Counts/Turn</th>
</tr>
</thead>
<tbody>
<tr>
<td>0060</td>
<td>60</td>
</tr>
<tr>
<td>0120</td>
<td>120</td>
</tr>
<tr>
<td>0128</td>
<td>128</td>
</tr>
<tr>
<td>0240</td>
<td>240</td>
</tr>
<tr>
<td>0256</td>
<td>256</td>
</tr>
<tr>
<td>0360</td>
<td>360</td>
</tr>
<tr>
<td>0512</td>
<td>512</td>
</tr>
<tr>
<td>0720</td>
<td>720</td>
</tr>
<tr>
<td>1024</td>
<td>1024</td>
</tr>
<tr>
<td>1440</td>
<td>1440</td>
</tr>
<tr>
<td>2048</td>
<td>2048</td>
</tr>
</tbody>
</table>

**NOTE:** Any disk resolution less than 512 is available with any of standard options.

**INTERNAL ELECTRONICS OPTION:**
"A" - Schmitt-trigger outputs in quadrature

**ZERO REFERENCE OPTION:**
Place a "Z" here if reference required

**SHAFT SEAL OPTION:**
Place an "S" here if seal required

**CONNECTOR OPTION:**
No designator for end mtg connector
"/EC" - End exit cable with DA-15P connector
"/SC" - Side exit cable with DA-15P connector
"/E" - End exit cable with flying leads
"/S" - Side exit cable with flying leads

Approved for general release.
CONNECTION PIN FUNCTIONS

<table>
<thead>
<tr>
<th>PIN NO.</th>
<th>WIRE COLOR</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Orange</td>
<td>A count-signal (Lead)</td>
</tr>
<tr>
<td>2</td>
<td>Yellow</td>
<td>A count-signal</td>
</tr>
<tr>
<td>4</td>
<td>Blue</td>
<td>B count-signal (Lag)</td>
</tr>
<tr>
<td>5</td>
<td>Violet</td>
<td>B count-signal</td>
</tr>
<tr>
<td>7</td>
<td>White</td>
<td>C zero-reference</td>
</tr>
<tr>
<td>8</td>
<td>Gray</td>
<td>C zero-reference</td>
</tr>
<tr>
<td>10</td>
<td>Red</td>
<td>+ 5 VDC input</td>
</tr>
<tr>
<td>12</td>
<td>Black</td>
<td>Circuit Ground</td>
</tr>
<tr>
<td>15</td>
<td>Brown</td>
<td>Case Ground</td>
</tr>
</tbody>
</table>

Lead/Lag relationship shown above assumes counter clockwise shaft rotation as viewed from shaft end.

SPECIFICATIONS

**ELECTRICAL**

- **Power Required:** +5.0 ± 0.25 Vdc at 150 mA max
- **Output Logic Level:**
  - Binary "1": 1.8 Vdc min at -40mA source
  - Binary "0": 0.5 Vdc max at +40mA sink
- **Risetime and Falltime:** 200 nsec. max (measured from 10% to 90% level)
- **Output Frequency Range:** 0 to 50 KHz or 5000 rpm
- **Code:** Incremental – Two count tracks phased 90 ± 30 electrical degrees apart - 2048 cpt max
- **Accuracy:**
  - Bit-to-Bit: 5 arcsec rms typical
  - Absolute: 32 arcsec rms typical

**MECHANICAL**

- **Weight:** 6.0 oz. max
- **Torque:**
  - Starting: 0.15 oz-in max. without seal
  - Running: 0.10 oz-in max. without seal
- **Shaft Load:**
  - Radial: 5.0 lbs max ¼” from bearing flange
  - Axial: 3.0 lbs max
- **Moment of Inertia:** 0.000040 oz-in-sec²
- **Slew Speed:** 5,000 rpm max
- **Acceleration:** 750,000 rad/sec² max

**ENVIRONMENTAL**

- **Temperature:**
  - Operating: -55° C to +85° C
  - Storage: -65° C to +95° C
  - Altitude: 70,000 ft max
- **Vibration:** Meets or exceeds MIL-STD-810, Method 514.3, Category 7B; 7.3 grms
- **Shock:** 50 g's at 11 msec; per MIL-STD-810, Method 516.3, Procedure 1(b)
- **Humidity:** 99% RH max

**RELIABILITY**

- **Bearing Fatigue Life:** 1 x 10⁹ rev at max rated load

Specifications subject to change without notice.