Features:

- All Electronics Contained in Read Station
- High Resolution (up to 24 bits)
- Accuracy < 2 Arcseconds
- Sample rate to 8KHz
- Wide Temperature Range
- In-Situ Auto Calibration
- Cancellation of Repeatable Errors
- Large Air Gap and Depth of Focus
- Absolute Serial Output
- High Reliability
- Monolithic Photodiode Array
- Long life space heritage LED light source
- Low Profile, Light Weight and Low Power
- +6.0 to +36 VDC input power
- Built-In-Test and Diagnostics
- Piloted Hub to Ease Installation

General Description

BEI Precision Systems & Space Company is now offering an Absolute Intuitive Modular Encoder (AIME) configuration in the nanoSeries®. This is a high resolution, single read station, absolute optical encoder with insitu calibration and wide angle error correction. The modular absolute encoder model shown is available for installation on a user base/bearing/shaft assembly to a resolution of 24-bits and accuracy 2 arc-seconds RMS. Higher resolutions are available as special models.

Single read station configuration with wide angle error correction standard provides accuracy less than 2 arcseconds RMS over 360 degrees. Additional read heads for optical redundancy or additional wide angle bearing error cancellation are available. The optical system permits large air gaps (0.015" or greater) and gap variations. The built-in auto-calibration feature and face mount makes the read station and code disk assembly very easy to align on a user base/bearing/shaft assembly.

The absolute encoder data is derived from several tiers of multi-speed sinusoidal data tracks which are digitized and merged into a continuous data word. The resultant absolute position word is not sensitive to power interruptions. This technique minimizes the number of data tracks (minimizes size and parts count). All data is derived from ratiometric tracks on the code disk, resulting in excellent tolerance to ageing, temperature, etc.

There are a number of BEI PSSC proprietary techniques used in these encoders that allow most repeatable errors to be removed from the output data. These encoders incorporate algorithms that can cancel disk centering and bearing eccentricities, even with a single readhead. The ultimate limitation of how accurate and repeatable the nanoSeries® AIME can be is determined by the thermal and mechanical stability of the axis of rotation of the spindle. The encoder accuracy is limited only by the mechanical and thermal stability of the spindle — all other errors are cancelled or minimized.
Connector Pinout:

The standard nanoSeries® AIME output connector is a 9-pin D-Sub Micro-D Connector (M83513/04-A11N) type with the following pinout:

<table>
<thead>
<tr>
<th>PIN</th>
<th>MNEMONIC</th>
<th>I/O</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+POS</td>
<td>Output</td>
<td>Position data output</td>
</tr>
<tr>
<td>6</td>
<td>-POS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>+CMD</td>
<td>Input*</td>
<td>Command word input*</td>
</tr>
<tr>
<td>7</td>
<td>-CMD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>+CLK</td>
<td>Input</td>
<td>Synchronous clock input</td>
</tr>
<tr>
<td>8</td>
<td>-CLK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>+VDC</td>
<td>—</td>
<td>Supply voltage</td>
</tr>
<tr>
<td>9</td>
<td>GND</td>
<td>—</td>
<td>Supply voltage return</td>
</tr>
<tr>
<td>5</td>
<td>CHAS</td>
<td>—</td>
<td>Chassis (case) ground</td>
</tr>
</tbody>
</table>

* ISS only; N/C for optional SSI.
** End-user interface to the encoder’s microcontroller JTAG port can be provided as a special feature.

Output Protocol:

Standard ISS*:

Optional SSI:

## General Specifications:

<table>
<thead>
<tr>
<th>Quanta/Resolution</th>
<th>Resolution (Arc Seconds)</th>
<th>Accuracy(^{(1)}) (Arc Seconds)</th>
<th>Speed (bps for full accuracy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>nS24/30</td>
<td>16,777,216</td>
<td>0.08</td>
<td>2.0</td>
</tr>
</tbody>
</table>

| Interrogation Rate/Acquisition Time | 8 kHz max/Data Acquisition Time 70 µsec typ |
| Slew Speed (nonoperating)          | 3600 rpm max. |
| Operating Temperature Range - Standard | -40°C to +71°C |

| Storage Temperature Range          | -65°C to +95°C   |
| Weight                               | 5 oz max readhead; 5.8 oz max disk/hub |
| Input Power                          | Standard 6.0 to 36 VDC at 1.5 watts, Switching Regulator |
|                                      | Optional +5VDC ± 5% at 240 ma nominal |
| Altitude                             | to 70,000 feet (21,335 meters) |
| Vibration                            | 16.34 g from 99 to 2000 Hz |
| Shock                                | 20 g at 11 msec |
| Relative Humidity                    | to 98% (avoid condensation) |
| Rated Life, LED                      | 100,000 hours min. |
| MTBF                                  | 300,000 hours typical (calculated per MIL-HDBK-217 Ground Fixed) |

\(^{(1)}\) RMS transition error of transducer and electronics. Excludes quantizing error of ½ LSB. These numbers exclude the effects of customer spindle eccentricities and disk centering errors after in-situ calibration.

## Special Models:

Many other sizes, configurations, and resolutions are possible at additional cost and lead time. Possible options include vacuum rating, radiation resistance, special materials, cable or connector variations, etc. Contact the factory for price and delivery.

Linear or arcate (limited angle) versions of these devices are also available for special applications. Contact the factory for quotation.

## Ordering Information:

```
  nanoSeries® AIME  nS 24/30 P1 K1 S2 - XX
  Resolution Bits/ Turn
  3.0 inch Outside Disk Diameter (x10)
  Input Voltage
  P1: 6 to 36 VDC
  P2: 5 VDC
  Special features (TBD)
  Serial Output Data Driver
  S1 - RS485
  S2 - LVDS
  Package Style
  K1 - Kit Face Mount
  K2 - Kit Flanged Mount
```