Specification
924 - 02017 - 001

General Specifications
Type H29
Incremental Optical Encoder
Special Features:  1.062 Pilot Dia.
                 2.81 Face Dia.
                 1.187 Long Shaft with Flat

Notice: The design and specifications of the instruments and accessories illustrated and described in this publication are subject to improvement without notice.

<table>
<thead>
<tr>
<th>REV</th>
<th>DESCRIPTION</th>
<th>DATE</th>
<th>PREP BY</th>
<th>CHK</th>
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<td>C</td>
<td>Updated</td>
<td>4-20-81</td>
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<td>10-23-79</td>
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<td>Rev. Table II Page 7 Per ECN 1093</td>
<td>10-11-78</td>
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1.0 Scope: This specification describes the BEI Industrial Encoder Division Heavy Duty Type H29 Incremental Optical Encoder.

2.0 Mechanical Specifications

2.1 Dimensions

2.2 Shaft Diameter

2.3 Shaft Loading

2.4 Shaft Runout

2.5 Starting Torque at 25°C (Standard without sealed bearings)

2.6 Starting Torque at 25°C (With optional sealed bearings)

2.7 Bearings

2.8 Shaft

2.9 Housing and Cover

2.10 Bearing Life (Mfr's Specifications)

2.11 Moment of Inertia

2.12 Slew Speed

2.13 Weight

See Figure 2

Standard: .3747/.3745 Dia.
Options: Available with stepped shaft .2497/.2495 Dia.

Up to 40 lbs Axial and 35 lbs Radial

.0005 T.I.R.

1.0 Oz. In. Max.

1.5 Oz. In. Max.

Class ABEC 7

416 Stainless Steel

Die Cast Aluminum

$2 \times 10^8$ Revs at rated shaft loading. $5 \times 10^{10}$ Revs at 10% of rated shaft loading.

$4.1 \times 10^{-4}$ Oz. In. Sec.$^2$

5000 RPM Max.

20 Oz. Max.
3.0 Electrical Specifications

3.1 Code Incremental

3.2 Cycles Per Shaft Turn 1 to 2540

3.3 Supply Voltage See Table I

3.4 Current Requirements
   TTL 200 Ma Max., 150 Ma Typ.
   CMOS 150 Ma Max., 125 Ma Typ.

3.5 Output Format
   2 Channels (A and B) in quadrature ± 27° electrical at 10 KHZ. See Figure 1.

3.6 Output Format Options
   Index and Complementary outputs are available

3.7 Output Options See Table I

**TABLE I**

<table>
<thead>
<tr>
<th>I.C. Number</th>
<th>Type</th>
<th>Feature</th>
<th>Optional Pull-up Resistor</th>
<th>Output</th>
<th>Supply Voltage ± 5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>SN7404</td>
<td>$T^2_L$</td>
<td>Totem Pole</td>
<td></td>
<td>16 MA/5V</td>
<td>+5 VDC</td>
</tr>
<tr>
<td>SN7406</td>
<td>$T^2_L$</td>
<td>Open Collector</td>
<td>470 Ohms</td>
<td>40 MA/30V</td>
<td>+5 VDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hi-Voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SN74C04</td>
<td>CMOS</td>
<td></td>
<td></td>
<td></td>
<td>+5 to 15 VDC *</td>
</tr>
<tr>
<td>MC680</td>
<td>HTL</td>
<td>Totem Pole</td>
<td></td>
<td></td>
<td>+15 VDC</td>
</tr>
<tr>
<td>MC681</td>
<td>HTL</td>
<td>Open Collector</td>
<td>15K Ohms</td>
<td></td>
<td>+15 VDC</td>
</tr>
<tr>
<td>MC689</td>
<td>HTL</td>
<td>Open Collector</td>
<td>15K Ohms</td>
<td>20V</td>
<td>+15 VDC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hi-Voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DM8830</td>
<td>$T^2_L$</td>
<td>Line Driver</td>
<td></td>
<td></td>
<td>+5 VDC</td>
</tr>
<tr>
<td>MM88C30</td>
<td>CMOS</td>
<td>Line Driver</td>
<td></td>
<td></td>
<td>+5 to 15 VDC *</td>
</tr>
</tbody>
</table>

*Specify Actual Voltage
3.8 Illumination
   Incandescent Lamp
   (40,000 hours life)
   or LED, Optional

3.9 Frequency Response
   (Channels A and B)
   50 KHZ

3.10 Frequency Response
    (Index)
    20 KHZ

4.0 Environmental Specifications

4.1 Temperature
   Operating
   0 to 70°C Standard
   Storage
   -25 to 90°C

4.2 Shock
   50 G's for 11 MSEC duration

4.3 Vibration
   5 to 2000 HZ @ 20 G's

4.4 Humidity
   98% RH without condensation

5.0 Options (For the following option capability, consult factory for complete specification)

5.1 Direction Sensing
   Pulse Output X1, X2, or X4

5.2 Interpolation
   Multiplied Square Wave Output
   X5

5.3 Dual Resolution
   Selectable Output

5.4 Sinewave
   Differential Amplified Outputs
CCW ROTATION
VIEWING SHAFT

FIGURE 1
OUTPUT WAVE FORMS
Alternate End-Mounted Connector (EM)

Optional 2.671 Dia. Synchro Groove

.3747 Dia.  .3745 Dia.

.62

.015 Deep Flat

1.061 Dia.

1.060 Dia.

MS Connector Side-Mounted (SM)

6-32UNC-2B x .28 deep 4 holes equally spaced on 2.562 Dia. B.C. (Omitted when Synchro Groove is ordered)

2.35 Max.

2.81 Dia.

FIGURE 2
H29 DIMENSIONS
TABLE II
OUTPUT TERMINATIONS

MS3102E18-1P

<table>
<thead>
<tr>
<th>PIN</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Channel A</td>
</tr>
<tr>
<td>B</td>
<td>Channel ( \overline{A} )</td>
</tr>
<tr>
<td>C</td>
<td>Channel B</td>
</tr>
<tr>
<td>D</td>
<td>Channel ( \overline{B} )</td>
</tr>
<tr>
<td>E</td>
<td>Channel Z</td>
</tr>
<tr>
<td>F</td>
<td>Channel ( \overline{Z} )</td>
</tr>
<tr>
<td>G</td>
<td>Case Ground</td>
</tr>
<tr>
<td>H</td>
<td>N/C</td>
</tr>
<tr>
<td>I</td>
<td>+V</td>
</tr>
<tr>
<td>J</td>
<td>Ground</td>
</tr>
</tbody>
</table>

Channels \( \overline{A} \), \( \overline{B} \) and \( \overline{Z} \) are optional
6.0 Ordering Information: Encoder may be specified using the following model numbering system:

<table>
<thead>
<tr>
<th>TYPE:</th>
<th>H = Heavy Duty</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASIC SIZE:</td>
<td>29 = 2.81 Dia.</td>
</tr>
<tr>
<td>HOUSING CONFIGURATION LETTER:</td>
<td>E = Synchro Mount, F = Face Mount</td>
</tr>
<tr>
<td>SHAFT SEAL CONFIGURATION:</td>
<td>SB = Seal, Integral with Bearing, Blank = Shielded Bearing</td>
</tr>
<tr>
<td>CYCLES PER TURN:</td>
<td>Enter Cycles, 500 = 500 Cycles, 2500 = 2500 Cycles, Etc.</td>
</tr>
<tr>
<td>NO. OF CHANNELS:</td>
<td>A = Single Channel, AB = Dual Quadrature Channels, ABZ = Dual with Index, AZ = Single with Index</td>
</tr>
<tr>
<td>COMPLEMENTS:</td>
<td>C = Complementary Outputs, Blank = None</td>
</tr>
<tr>
<td>OUTPUT I.C.:</td>
<td>7406, 8830, 7404, etc. (See Table I), Followed by &quot;R&quot; = Pull-up Resistor</td>
</tr>
<tr>
<td>ILLUMINATION:</td>
<td>Blank = Incandescent (Standard), LED = Light Emitting Diode (Optional)</td>
</tr>
<tr>
<td>OUTPUT TERMINATION LOCATION:</td>
<td>E = End, S = Side</td>
</tr>
<tr>
<td>OUTPUT TERMINATION:</td>
<td>M18 = MS3102E18-1P Connector</td>
</tr>
</tbody>
</table>

S = Special Non-Standard Features specified on purchase order or customer's spec.