H40 Shock Proof Optical Encoder

BEI SENSORS



The H40 is an ultra heavy duty encoder whose internal structure is totally isolated from severe shock and shaft loading conditions. The optics and electronics are supported in shock absorbing material within the heavy cast outer housing. The encoder shaft is flexibly coupled to the high load capacity bearings and shaft assembly, which is carried in the outer housing. The entire bearing assembly is field-removable to permit proper shaft support while pressing pulleys, gears, etc. onto the shaft. An Underwriters Laboratories listed version of this model is available.

The H40 Shock Proof Encoder is available with the following certifications:

CE EN 55011 and EN 61000-6-2

UL U.S. Standards Class I, Group D, Division 1

cUL Canadian Standards Class I, Group D, Division 1

Mechanical Specifications

Shaft Diameter: 5/8" nominal

Flats On Shaft: Two flats, 0.75" long X 0.30" deep at 90°

Shaft Loading/Bearing Life: Refer to figure 1, back page

Shaft Runout: 0.001" T.I.R. at mid-point of shaft

Starting Torque at 25° C: 10.0 in-oz (max)

Bearings: Class 52100 SAE high carbon steel, stainless steel option

Shaft Material: 1070 carbon steel, 303 and 316 stainless steel optional

Enclosure: Die cast aluminum, hard anodized with dichromate sealed finish (optional). Shaft seals and sealed bearings are standard to achieve environmental ratings.

Maximum RPM: 10,000 RPM (see frequency response, below)

Coupling Windup: The H40 uses an internal coupling. Windup error (degrees) = a X 7.5 X 10^{-4} rad/sec^2 where a = angular acceleration in rad/sec^2

Weight: Approx 9 lbs

Electrical Specifications

Output Format: 2 channels in quadrature, 1/2 cycle index gated with negative B channel

Cycles per Shaft Turn: 1 to 72,000 (see Table 3). For resolutions above 3,600 see interpolation options in the BEI 2008 Spec Guide on pages 36 and 37.

Supply Voltage: 5 to 28 VDC available

Current Requirements: 100 mA typical + output load, 250 mA (max)

Voltage/Output: (see note 5)
15V/V: Line Driver, 5–15 VDC in, Vout = Vin
28V/V: Line Driver, 5–28 VDC in, Vout = Vin
28V/5: Line Driver, 5–28 VDC in, Vout = 5 VDC
28V/OC: Open Collector, 5 – 28 VDC in, OC_{out}

Protection Level: Reverse, overvoltage and output short circuit (see note 5)

Frequency Response: 100 KHz, up to 1 MHz with interpolation option (see note 5)

Output Terminations: see Table 2, back page

Termination Type: Compression type, UL recognized. Accepts AWG 14 to 22, stranded wire, strip 1/4"

Note: Consult factory for other electrical options

Environmental Specifications

Enclosure Rating: NEMA 4 X & 6 (IP66), outdoor Non-Hazardous locations, NEMA 4 X & 13 (IP66), indoor Non-Hazardous locations

Hazardous Area Rating: The optional Underwriters Laboratories listed version is for use in hazardous locations; NEMA Enclosure 7. Class 1, Group D, Division 1, NEC Class 2 circuits only

Temperature: Operating, 0° to 70° C; extended temperature testing available (see note 6); 80° C max for UL and CEN approved units; storage; -25° to 90° C

Shock: 200 g's at 11msec

Vibration: 5 to 2000 Hz @ 20 g's

Humidity: 100% RH

NOTES & TABLES:
All notes and tables referred to in the text can be found on the back page.

H40 Shock Proof Ordering Options for assistance call 800-350-2727

Use this diagram, working from left to right to construct your model number (example: **H40A-2000-ABZC-28V/V-SC-UL**).
All notes and tables referred to can be found on the back of this page.

H40	A	–	1024	–			–		–	SC	–	UL	–	S

TYPE:
H = Heavy Duty, 40 = 4.00" Square

HOUSING CONFIGURATION:
A = Base Mounted Feet
B = No Mounting Feet

CYCLES PER TURN:
Enter Cycles
See Table 3

NO. OF CHANNELS:
A = Single Channel
AB = Dual Quad. Ch.
ABZ = Dual with Index
AZ = Single with Index
See note 1

COMPLEMENTS:
C = Complementary Outputs,
Blank = None
See note 2

VOLTAGE/OUTPUT:
15V/V = 5–15 $V_{in/out}$
28V/V = 5–28$V_{in/out}$
28V/5 = 5–28V_{in}/5V_{out}
28V/OC = 5–28V_{in}/OC_{out}
See note 3

OUTPUT TERMINATION:
SC = Side Conduit
EC = End Conduit; Conduit uses 1/2–14 NPSF (dryseal) straight pipe threads;
EM16 = MS3102R16S-1P
EM18 = MS3102R18-1P,
See Table 1, back page

CERTIFICATION:
UL = UL Explosion Proof rating, only available with SC termination

SPECIAL FEATURES:
S= Special features specified on purchase order (consult factory)
See note 4

BEI SENSORS Tel: 805-968-0782 /800-350-2727 | Fax: 805-968-3154 / 800-960-2726 | 7230 Hollister Ave., Goleta, CA 93117-2807 | www.beisensors.com

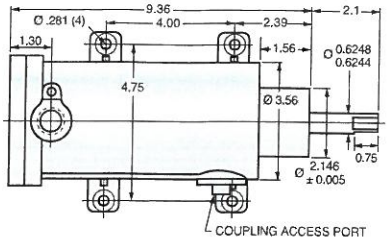
Specification No. 02045-001 Rev.08-11

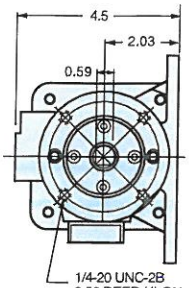
H40 Shock Proof Optical Encoder

BEI SENSORS

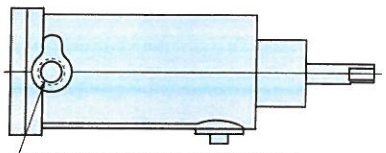
Dimensions

H40A

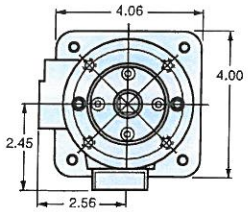




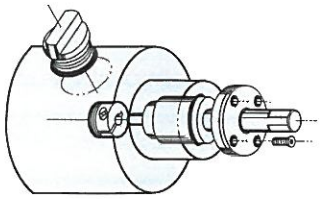
H40B



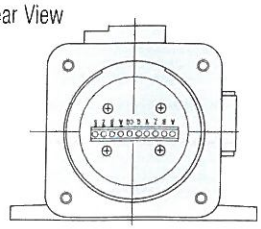
1/2 - NPSF (DRYSEAL) STRAIGHT PIPE THREADS
NOTE: THIS WIRING PORT WILL BE SEALED WITH A PIPE PLUG IF THE EM OR EC OPTION IS SPECIFIED



Field Replaceable Coupling & Bearing Assembly



Rear View



Tables

Table 1 Output Functions

Incremental	
TERMINAL	FUNCTION
A	CHANNEL A
B	B
Z	Z
V	+VDC
G	GROUND (0V)
CG	CASE GROUND
$\overline{A}$	$\overline{A}$
$\overline{B}$	$\overline{B}$
$\overline{Z}$	$\overline{Z}$
S	SPARE*

*or SELECT on Dual Count encoders

8-Bit Absolute*		
GRAY CODE	NATURAL BINARY	TERMINAL NUMBER
G0	2^0	1
G1	2^1	2
G2	2^2	3
G3	2^3	4
G4	2^4	5
G5	2^5	6
G6	2^6	7
G7	2^7	8
SPARE		9
SPARE		10
LATCH		11
INTERROGATE		12
SPARE		13
+VDC		14
0V (COMMON)		15
CASE GROUND		16

Latch and Interrogate are optional

Table 2 Incremental Output Terminations

M16 CONNECTOR	CHANNELS DESIGNATED IN MODEL NUMBER	
PIN	ABZ	ABC
A	A	A
B	B	$\overline{B}$
C	Z	$\overline{A}$
D	+V(SUPPLY VOLTAGE)	
E	—	$\overline{B}$
F	0V (CIRCUIT COMMON)	
G	CASE GROUND (CG)	

M18 CONNECTOR	
PIN	CHANNEL
A	CHANNEL A
B	B
C	Z
D	+VDC
F	GROUND (0V)
G	CASE GROUND
H	$\overline{A}$
J	$\overline{B}$
J	$\overline{Z}$

Table 3

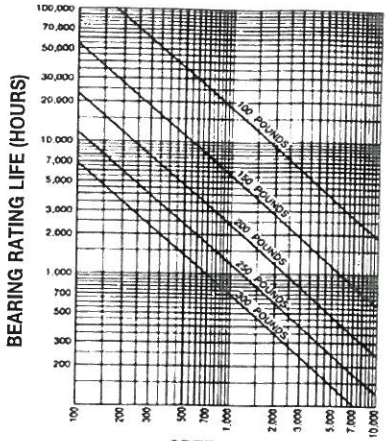
Disc Resolutions for Incremental Encoder Model H40

1, 2, 3, 5, 6, 7, 8, 10, 13, 16, 20, 24, 25, 26, 30, 32, 33, 34, 36, 37, 40, 45, 48, 50, 51, 56*, 60, 64, 66, 72, 75, 80, 86, 88, 90, 100, 102, 120, 122,125, 127, 128, 132, 144, 148, 150, 158, 160, 175, 176, 180, 187, 192, 200, 202, 204*, 217, 220, 240, 250, 254, 255, 256, 264*, 274, 280, 283, 288, 292, 300, 312, 320, 321, 325, 360, 366, 372, 375, 377, 380, 381, 384, 385, 393, 400, 430, 432, 450, 462, 480, 490, 500, 502, 508, 512, 522, 530, 550, 560*, 576, 598, 600, 604, 625, 628, 635, 638, 640, 660, 672, 676, 680, 687, 690, 700, 720, 725, 735, 740, 744, 748, 750, 762, 768, 780, 785, 800, 812, 825, 850, 864, 878, 888, 900, 912, 914, 938, 942, 955, 960, 1000, 1016, 1024, 1030, 1035, 1036, 1040, 1054, 1056, 1074, 1076, 1080,1088, 1100, 1101, 1125, 1136, 1200, 1237, 1250, 1257, 1270, 1280, 1300, 1314, 1332, 1333, 1390, 1400, 1414, 1427, 1440, 1484, 1500, 1562, 1570, 1596, 1600, 1650, 1666, 1718, 1745, 1774, 1800, 1840*, 1850, 1855, 1875, 1894, 1920, 1952, 1968, 1979, 1995, 2000, 2048, 2080, 2094, 2100, 2160, 2164, 2199, 2200, 2250, 2356, 2400, 2485, 2500, 2514, 2519, 2540, 3000, 3125, 3600, 4000, 4096, 5000

*AB or ABC output only. NOTE: Resolutions up to 72,000 are available.

Figure 1

Bearing Life vs. Speed at Various Radial Loads



Notes

1. Mounting is usually done either using the D-style square flange mount, E- or G-style servo mounts, or one of the standard face mounts, F1 for example. Consult factory for additional face mount options.

2. The shaft seal is recommended in virtually all installations. The most common exceptions are applications requiring a very low starting torque or those requiring operation at both high temperature and high speed.

3. Non-standard index widths and multiple indices are available by special order. Consult factory.

4. Complementary outputs are recommended for use with line driver type (source/sink) outputs. When used with differential receivers, this combination provides a high degree of noise immunity.

5. Output IC's: Output IC's are available as either Line Driver (LD) or NPN Open Collector (OC) types. Open Collectors require pull-up resistors, resulting in higher output source impedance (sink impedance is similar to that of line drivers). In general, use of a Line Driver style output is recommended. Line Drivers source or sink current and their lower impedance mean better noise immunity and faster switching times. **Warning:** Do not connect any line driver outputs directly to circuit common/0V, which may damage the driver. Unused outputs should be isolated and left floating. Our applications specialists would be pleased to discuss your system requirements and the compatibility of your receiving electronics with Line Driver type outputs.

28V/V: Multi-voltage Line Driver (7272*): 100 mA source/sink. Input voltage 5 to 28 VDC +/- 5% standard (Note: $V_{out} = V_{in}$). This driver is TTL compatible when used with 5 volt supply. Supply lines are protected against overvoltage to 60 volts and reverse voltage. Outputs are short circuit protected for one minute. Supply current is 120 mA typical (plus load current). This is the recommended replacement for 3904R and 7406R open collector outputs with internal pullup resistors. It is also a direct replacement for any 4469, 88C30, 8830 or 26LS31 line driver

28V/5: Multi-voltage Line Driver (7272*): 100 mA source/sink. Input voltage 5 to 28 VDC +/- 5% standard, internally regulated with 5V (TTL compatible) logic out. Supply lines are protected against overvoltage to 60 volts and reverse voltage. Outputs are short circuit protected for one minute. Supply current is 90 mA typical (plus load current).

15V/V: Multi-voltage Line Driver (4469*): 100 mA source/sink. Input voltage 5 to 15 VDC +/- 5% standard (Note: $V_{out} = V_{in}$). TTL compatible when used with 5 volt supply. Supply lines are protected against overvoltage to 60 volts and reverse voltage. Outputs are short circuit protected for one minute. Supply current is 90 mA typical (plus load current). This is a direct replacement for the 4469 Line Driver.

28V/OC: NPN Open Collector (3904*, 7273*). Current sink of 80 mA max. Current sourced by external pull- up resistor. Output can be pulled up to voltage other than supply voltage (30 V max). Input voltage 5 to 28 VDC +/- 5% standard. Supply current is 120 mA typical. This replaces prior IC's with designations of 3904, 7406, 3302, 681 and 689.

5V/OCR, 15V/OCR, 24V/OCR: Open Collector (3904R*, 7406R*, 7273R*): Current sink of 70 mA max. Includes internal pull-ups sized at approximately 100 ohms/volt. Max current source is 10 mA. Supply current is 100 mA typical, 120 mA with internal pull-ups. The 5V/OCR, 15V/OCR and 24V/OCR are often replaced by the 28V/V in system upgrades.

3904, 3904R, 4469, 5V/V, 5V/OC, 5V/OCR, 9V/OC: Intrinsically safe line driver and open collector outputs. These drivers are specific to intrinsically safe encoders, and are installed per the appropriate control drawings listed in Table 2.1 on page 48 of the 2008 BEI Specifying Guide.

6. Special –S at the end of the model number is used to define a variety of non-standard features such as special shaft lengths, voltage options, or special testing. Please consult the factory to discuss your special requirements.

7. Higher frequency response may be available. Please consult with the factory.

8. Extended temperature ratings are available in the following ranges: -40 to 70°C, -40 to 85°C, –20 to 105°C and –40 to 105°C depending on the particular model. Some models can operate down to -55°C. Extended temperature ranges can affect other performance factors. Consult with factory for more specific information.

9. Mating straight plug receptacles may be ordered from the factory:
For M12 use MS3116F12-10S, For M14 use MS3106F14S-6S
For M14/19 use MS3116J14-19S, For M16 use MS3106F16S-1S
For M18 use MS3106F18-1S, For M20 use MS3106F20-29S

*Products manufactured prior to April 2007 used the line driver IC name and 5V voltage in the model number.