H25 Incremental Optical Encoder

BEI SENSORS

The H25 is the flagship of the BEI Sensors product line. It was designed from the ground up for the industrial marketplace. The H25 offers features such as EMI shielding, 40 lb. ABEC 7 bearings, matched thermal coefficients on critical components, and custom high-efficiency optics. The encoder meets NEMA 4 and 13 requirements when ordered with the shaft seal. Typical applications include machine control, process control, the wood processing industry, oil well logging, industrial weighing, agricultural machinery, textile equipment, web process control, robotics, and food processing.

Special Models of the H25 Incremental Encoder are available with one or more of the following certifications. Consult factory for details.

CE EN 61000-6-4 and EN 61000-6-2

UL Class I, Group A,B,C & D; Class II Group E, F & G

UL Class I, Zone 0, Group IIC

IEC IECEx UL 12.0035X UL 13.0071X

Ex CENELEC II 1 G Ex ia IIB/IIC T4 II 3 G Ex nA IIB T4 Gc

c UL us Class I, Div 2, Group A,B,C & D; Class II, Div 2, Group F & G

Mechanical Specifications

Shaft Diameter: 3/8" (1/2"as special feature)
Flat On Shaft: 3/8" Shaft: 0.80 long X 0.03" deep; 1/2" Shaft: 0.80 long X 0.04" deep (1/2'' shaft w/flat must be ordered as special feature)
Shaft Loading: 3/8" shaft: Up to 40 pounds axial and 35 pounds radial; 1/2" shaft: Up to 90 pounds axial and 80 pounds radial
Shaft Runout: 0.0005 T.I.R. at midpoint regardless of shaft diameter
Starting Torque at 25°C: Without shaft seal 1.0 in-oz (max); With shaft seal 2.5 in-oz (max); 1/2" shaft with shaft seal: 3.5 in-oz (max)
Bearings: Class ABEC 7 standard, ABEC 5 for 1/2" shaft
Shaft Material: 416 stainless steel
Bearing Housing: Die cast aluminum with protective finish; stainless steel (special feature)
Cover: Die cast aluminum; stainless steel (special feature)
Bearing Life: 2 X 10⁹ revs (1300 hrs at 2500 RPM) at rated load 1 X 10¹⁰ revs (67,000 hrs at 2500 RPM) at 10% of rated load

Maximum RPM: 12,000 RPM nominal, 8000 RPM with 1/2" shaft (see Frequency Response, below) 30,000 RPM available on units with 3/8" shaft—consult with factory
Moment of Inertia: 4.1×10^{-4} oz-in-sec^2; 5.2×10^{-4} oz-in-sec^2 with 1/2" shaft
Weight: 13 oz typical, 14.5 oz typical with 1/2" shaft

Electrical Specifications

Code: Incremental
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 2) For resolutions above 3,600 see BEI for interpolation options
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, $V_{out} = V_{in}$
28V/V: Line Driver, 5–28 VDC in, $V_{out} = V_{in}$
28V/5: Line Driver, 5–28 VDC in, $V_{out} = 5$ 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 1MHz with interpolation option (see note 7)
Output Terminations: (See table 1, back)
Note: Consult factory for other electrical options
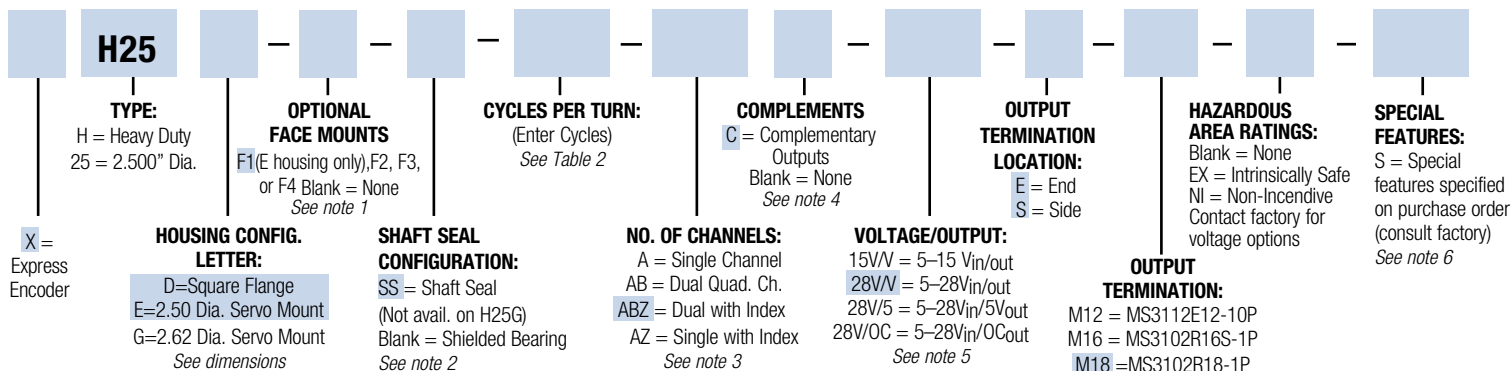
Environmental Specifications

Enclosure Rating: NEMA 4 & 13 (IP 66) when ordered with shaft seal (on units with an MS connector) or a cable gland (on units with cable termination).
Temperature: Operating, 0º to 70º C; extended temperature testing up to 105°C available; Storage, -25º to 90º C unless extended temperature option called out.
Shock: 50 g's for 11 msec duration
Vibration: 5 to 2000 Hz @ 20 g's
Humidity: 98% RH without condensation

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

H25 Incremental Ordering Options for assistance call 800-350-2727

Use this diagram, working from left to right to construct your model number (example: **H25D-SS-2000-ABZC-28V/V-SM18**).

All notes and tables referred to can be found on pages the back of this page.

H25 — — — — — — — — —

TYPE:
H = Heavy Duty
25 = 2.500" Dia.

OPTIONAL FACE MOUNTS
F1(E housing only),F2, F3, or F4 Blank = None
See note 1

CYCLES PER TURN:
(Enter Cycles)
See Table 2

COMPLEMENTS
C = Complementary Outputs
Blank = None
See note 4

OUTPUT TERMINATION LOCATION:
E = End
S = Side

HAZARDOUS AREA RATINGS:
Blank = None
EX = Intrinsically Safe
NI = Non-Incendive
Contact factory for voltage options

SPECIAL FEATURES:
S = Special features specified on purchase order (consult factory)
See note 6

X = Express Encoder

HOUSING CONFIG. LETTER:
D=Square Flange
E=2.50 Dia. Servo Mount
G=2.62 Dia. Servo Mount
See dimensions

SHAFT SEAL CONFIGURATION:
SS = Shaft Seal
(Not avail. on H25G)
Blank = Shielded Bearing
See note 2

NO. OF CHANNELS:
A = Single Channel
AB = Dual Quad. Ch.
ABZ = Dual with Index
AZ = Single with Index
See note 3

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

OUTPUT TERMINATION:
M12 = MS3112E12-10P
M16 = MS3102R16S-1P
M18 = MS3102R18-1P
C = Pigtail Cable
CS = Cable with seal
Cable length specified in inches
(i.e. C18 = Pigtail 18" long)
See table 1 & note 9

EXPRESS ENCODERS: Items highlighted with ▢ are standard Express Encoders and ship in one to three days.
T2 and **T5** options are available as standard H25 Express Encoder model options.
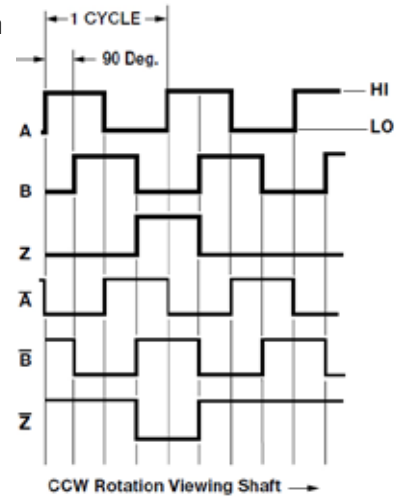
BEI SENSORS
Tel: 805-716-0322 / 800-350-2727
www.beisensors.com

Specification No. 02002-001 Rev C 08-17

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Figure 1
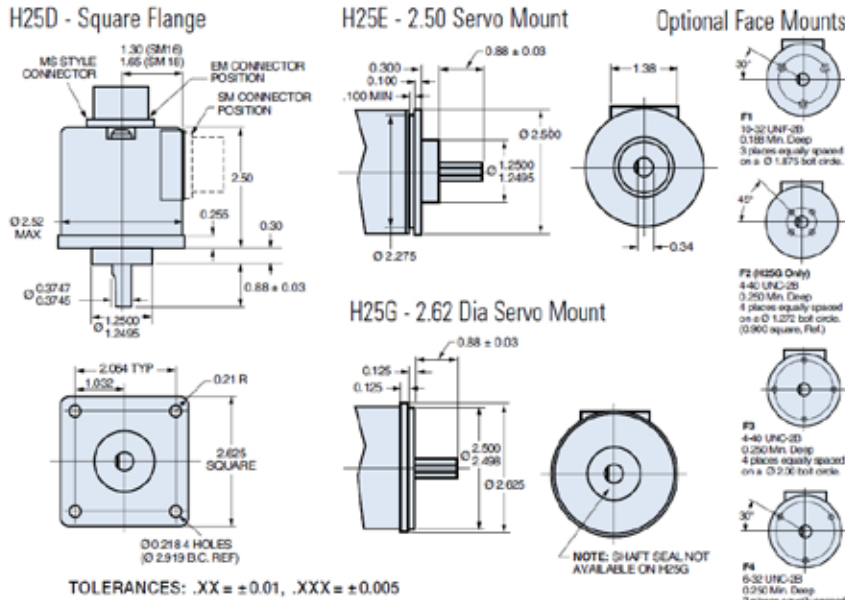
Output Waveform

CCW Rotation Viewing Shaft →

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. 5V/V. 5V/OC, 5V/OCR and 9V/OC can be intrinsically safe line driver and open collector outputs available on certain model variations. They are intrinsically safe only when installed per the controldrawing noted on the certification label affixed to the encoder body.

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.

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. 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 number instead of voltage output in model number.

Tables

Table 1: Incremental Output Terminations

The connector style will determine pinouts. For example, an encoder with ABC channels and an M18 connector uses the table to the right.

M14 CONNECTOR	M16 CONNECTOR	CHANNELS DESIGNATED IN MODEL NO.	
PIN	PIN	ABZ	ABC
E	A	A	A
D	B	B	B
C	C	Z	A̅
B	D	+V (SUPPLY VOLTAGE)	
F	E	—	B̅
A	F	0V (CIRCUIT COMMON)	
	G	CASE GROUND (CG) (except H20)	

M 18 CONNECTOR	
PIN	CHANNEL
A	A
B	B
C	Z
D	+V
E	—
F	0V
G	CG
H	A̅
I	B̅
J	Z̅

WIRE COLOR (22AWG)	DA 15P CONNECTOR	CHANNELS DESIGNATED IN MODEL NO.		
		ABZ	ABC	ABZC
YEL	13	A	A	A
BLUE	14	B	B	B
ORN	15	Z	—	Z
W-Yel	10	—	A̅	A̅
W-Blu	11	—	B̅	B̅
W-Orn	12	—	—	Z̅
RED	6	+V (SUPPLY VOLTAGE)		
BLK	1	0V (CIRCUIT COMMON)		
GRN	9	CASE GROUND (CG) (except H20)		
WHITE		SHIELD DRAIN (Shielded Cable Only)		

M 12 CONNECTOR	
PIN	CHANNEL
A	A
B	B
C	Z
D	+V
E	—
F	0V
G	CG
H	A̅
J	B̅
K	Z̅

Table 2: Disc Resolutions for Incremental Encoder Models H25, H38, H40, L25, E25

Resolutions highlighted with [   ] are available as standard Model 25 EXPRESS ENCODERS© that ship in one to three days.

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, 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, 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, 2821, 2827, 2833, 3000, 3125, 3600, 4000, 4096, 5000

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

These commodities, technology or software if exported from the United States must be in accordance with the Bureau of Industry, and Security, Export Administration regulations. Diversion contrary to U.S. Law is prohibited.

BEI SENSORS

Mouser Electronics

Authorized Distributor

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BEI Sensors:

H25G-F3-SB-1000-ABZ-28V/V-SM16   H25G-F3-SB-1000-ABZ-28V/V-EM16   H25E-F45-SS-100-ABC-28v/v-EM16
01002-6987   01002-8292   01002-2299   01002-7726   01002-510   01002-9293   01002-7762   01002-7491   01002-7573
01002-9418   01002-9753   01005-1066   01002-5171   01002-7319   01002-7252   01005-1091   01005-1422   01002-5260
01002-7680   01005-1005   01002-7173   01002-2021   01002-289   01002-9191   01002-9631   01002-7027

Sensata:

01002-8500   01002-7954   01002-8153   01002-8124   01002-7563   01002-7811   01005-1185   01002-8757   01002-7481
01002-8489   01002-8720   01005-1053   01005-1311   01002-8491   01002-8624   01002-7157   01002-8366
01002-7009   01002-8683   01005-1398   01002-9694   01002-8291   01005-1393   01002-8544   01002-8460   01002-9255
01124-001   H25D/SS-300-AB-5V/OC-SM16-EX   01002-7696   01002-8093   01005-1284   01002-9227   01005-1392
01002-7475   01002-7567   01002-9499   01005-1234   01005-1661   01005-886   01002-9978   01002-8577   01124-013
01005-1663   01002-9872   01002-10189   01002-7557   01002-7783   01005-1478   01002-9467   01002-9498   01005-1508
01002-9076   01002-7905   01002-9207   01005-1332   01002-9119   01002-9561   01002-8245   01124-007   01002-8207
01002-9381   01002-9939   01002-9254   01002-8774   01002-10597   01002-8139   01002-9208   01002-10188   01002-10520
01002-8551   01002-8856   01005-1403   01002-8403   01002-8569   01002-9893   01002-9349   01005-1200
01002-8779   01005-1256   01002-8335   01002-8710   01002-7379   01002-9221   01005-1218   01002-9417   01002-8859
01002-9206   01002-9337   01002-4698   01002-9947   01002-7712   01002-8644   01002-7531   01002-10580   01002-7758
01002-7768   01002-9434   01002-7390   01002-8568   01002-7421