

H25 SERIES

INCREMENTAL ENCODER

Introduction

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, high precision ball bearings and matched thermal coefficients on critical components. The encoder meets up to IP66 sealing requirements when ordered with the shaft seal.

GEN²

For **Generation 1** datasheet [click here](#).



Features

- Wide operating temperature range
- Ruggedized, well-sealed unit for long life operation
- Industry standard interfaces make it easy to install
- Extensive electrical protection reduces damage due to miswiring
- High noise immunity especially useful in electrically noisy automation environments
- Selected configurations available in 1 to 3 days shipment ("Express Encoder" option)

Applications

- Machine control – speed and position
- From wood harvesting all the way to processed lumber
- Oil well logging – wireline and coil tubing
- Agricultural equipment - center point irrigation, planting, harvesting
- Web process control - dancers, slitters, flying knives
- Food processing – inspection stations, conveyor control.

SPECIFICATIONS

Mechanical

| | |
|--------------------------------|--|
| Shaft Diameter | 3/8" standard (1/4" as special feature) |
| Flat On Shaft | 3/8" Shaft: 0.75 long X 0.03" deep, 1/4" shaft 0.75 X .02 deep |
| Shaft Loading | 3/8" shaft: Up to 40 pounds axial and 35 pounds radial |
| Shaft Runout | 0.0005 T.I.R. at midpoint regardless of shaft diameter |
| Starting Torque at 25°C | 1.0 in-oz max without shaft seal; 2.5 in-oz max with shaft seal. |
| Bearings | High precision ball bearings, Material: Chrome steel; shielded bearings standard, sealed bearings optional |
| Shaft Material | Stainless Steel |
| Bearing Housing | Die cast aluminum with protective finish |
| Cover | Die cast aluminum with protective finish |
| Bearing Life | 2 X 10 ⁸ revs (1300 hrs at 2500 RPM) at rated load, 1 X 10 ¹⁰ revs (67,000 hrs at 2500 RPM) at 10% of rated load |
| Maximum RPM | 10,000 RPM nominal, 8000 RPM with 1/2" shaft (see Frequency Response, below) |
| Moment of Inertia | 4.1 X 10 ⁻⁴ oz-in-sec ² |
| Weight | 13 oz typical |

Electrical

| | |
|------------------------------|---|
| Code | Incremental |
| Output Format | 2 outputs in quadrature, A leads B CCW, 1/2 cycle index , Z, gated with negative B Consult factory for other output formats. |
| Cycles per Shaft Turn | 2 to 80,000 (see table 2) |
| Supply Voltage | 5 to 28 VDC +/- 5% |
| Current Requirements | 100 mA typical +output load, 250 mA (max) |
| Voltage/Output | (See notes) 15/V: Line Driver, 5–15 VDC in, Vout = Vin 28/V: Line Driver, 5–28 VDC in, Vout = Vin 28/5: Line Driver, 5–28 VDC in, Vout = 5 VDC 28/O: Open Collector, 5–28 VDC in, OCout |
| Protection Level | Reverse, overvoltage and line driver output protection diodes |
| Frequency Response | 300 kHz |
| Output Terminations | See Table 1 |

Environmental

| | |
|-------------------------|---|
| Enclosure Rating | IP66 when ordered with shaft seal (on units with an MS connector) or a cable gland (on units with cable termination). |
| Temperature | Standard operating temperature -40° C to +85° C; options available at -40° C to +100° C (Consult factory). Storage temperature -40° C to +100° C. |
| Shock | 100 g's for 5 msec duration |
| Vibration | 50 to 2000 Hz @ 30grms |
| Humidity | 98% RH without condensation |

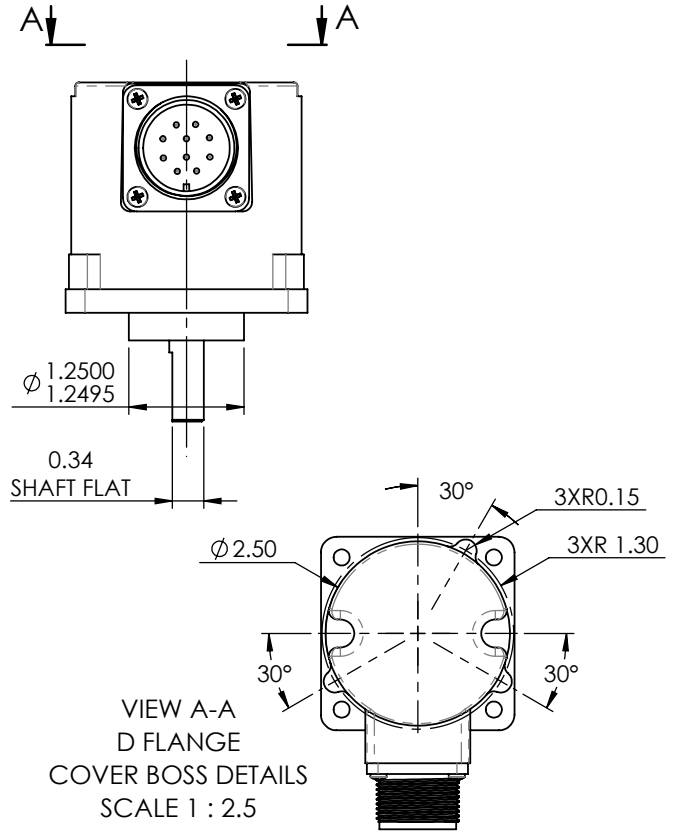
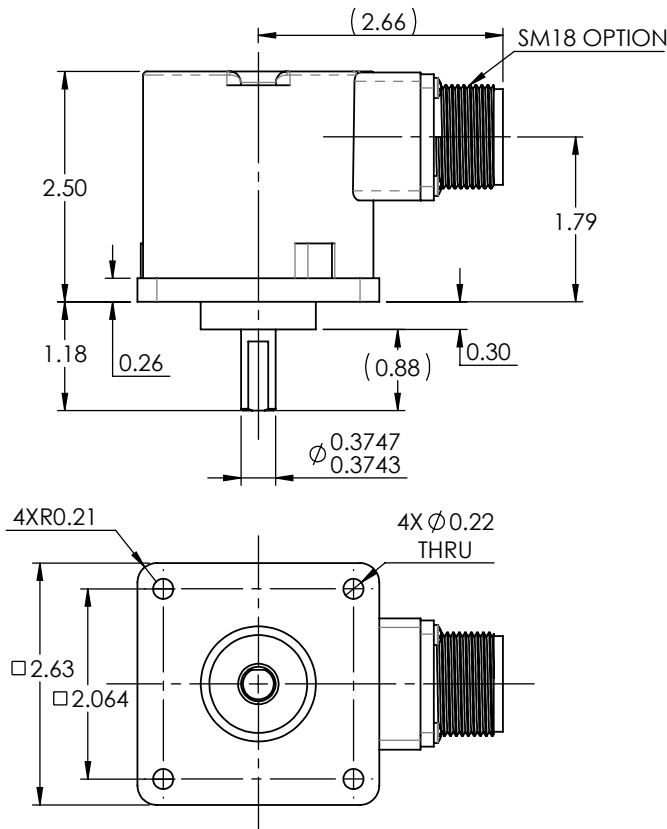


DIMENSIONS

Dimensions in inches

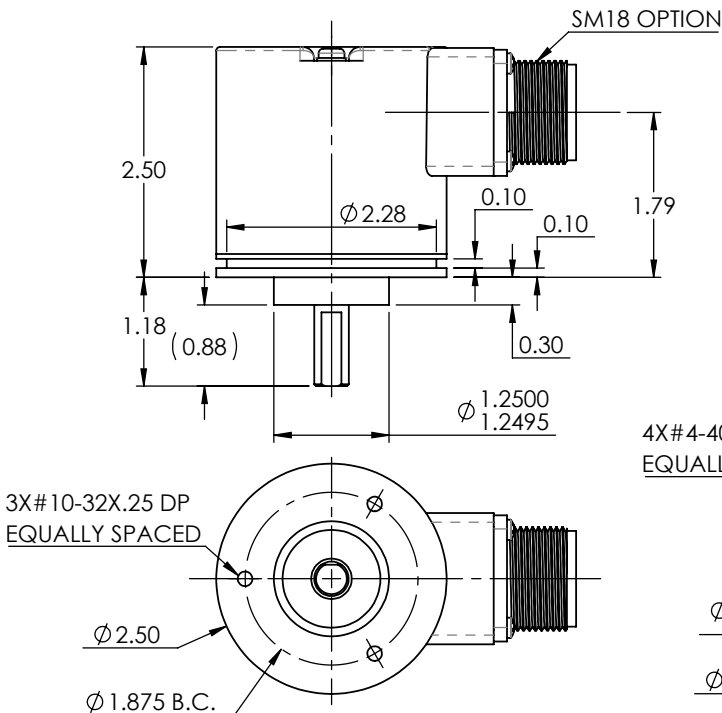
H25D SQUARE FLANGE

(WITH STANDARD 3/8" SHAFT AND SM18 CONN.)



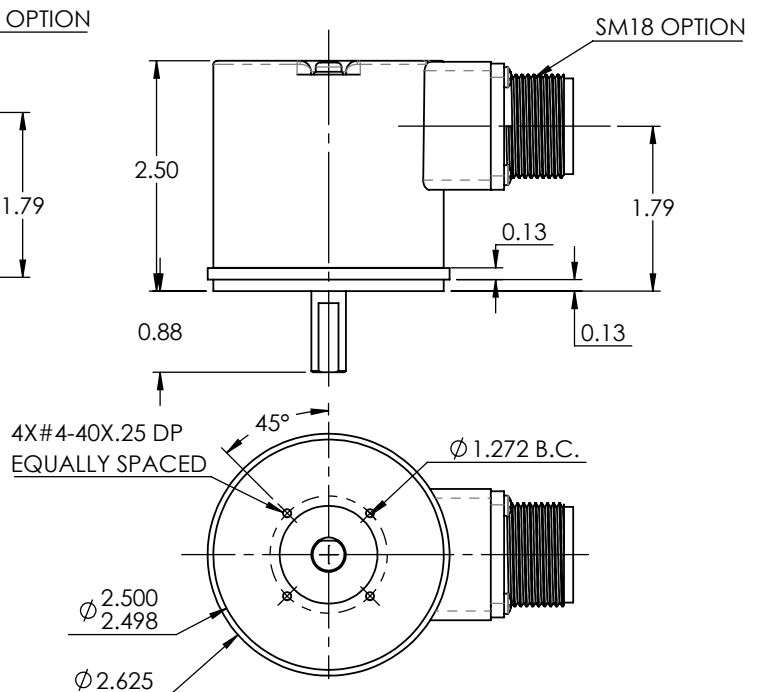
H25E SERVO MOUNT

(WITH OPTIONAL F1 FACEMOUNT)



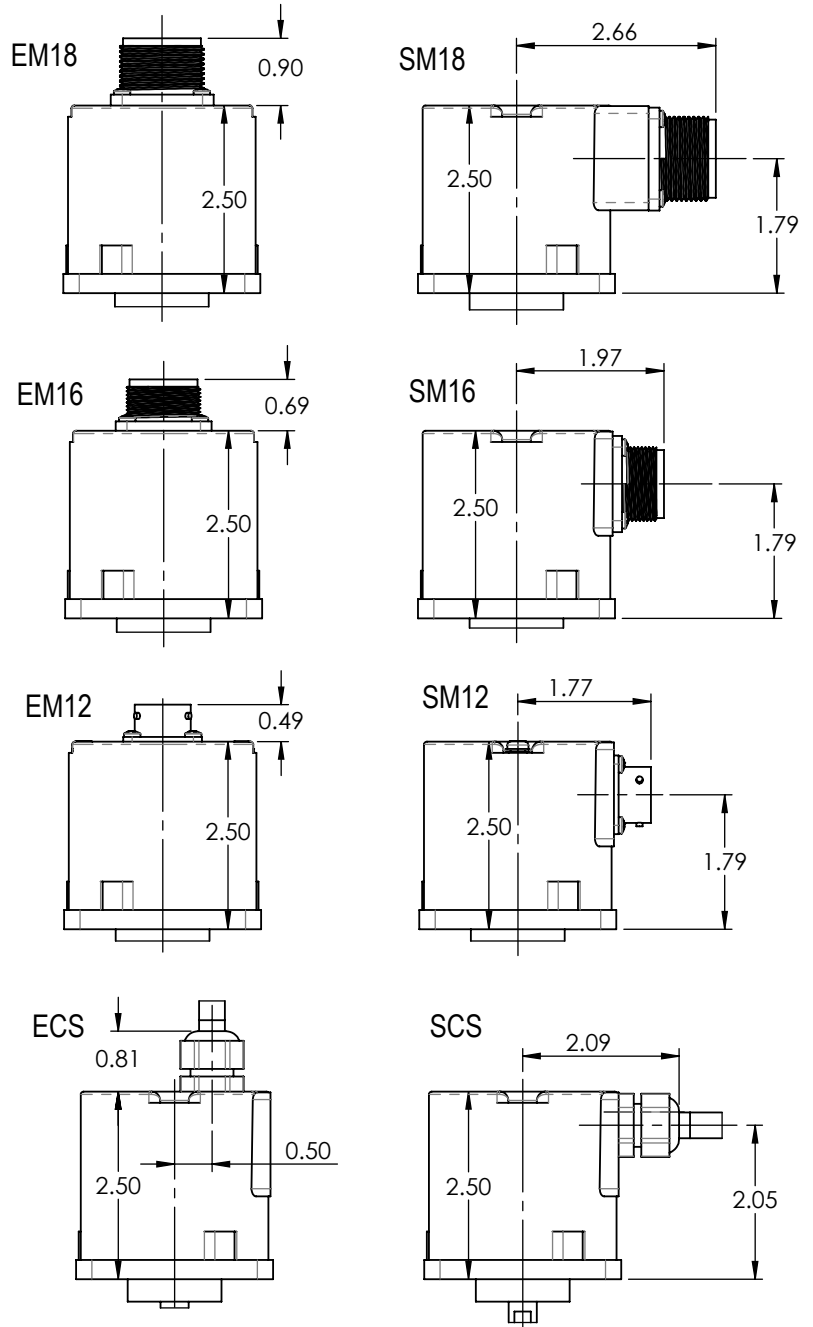
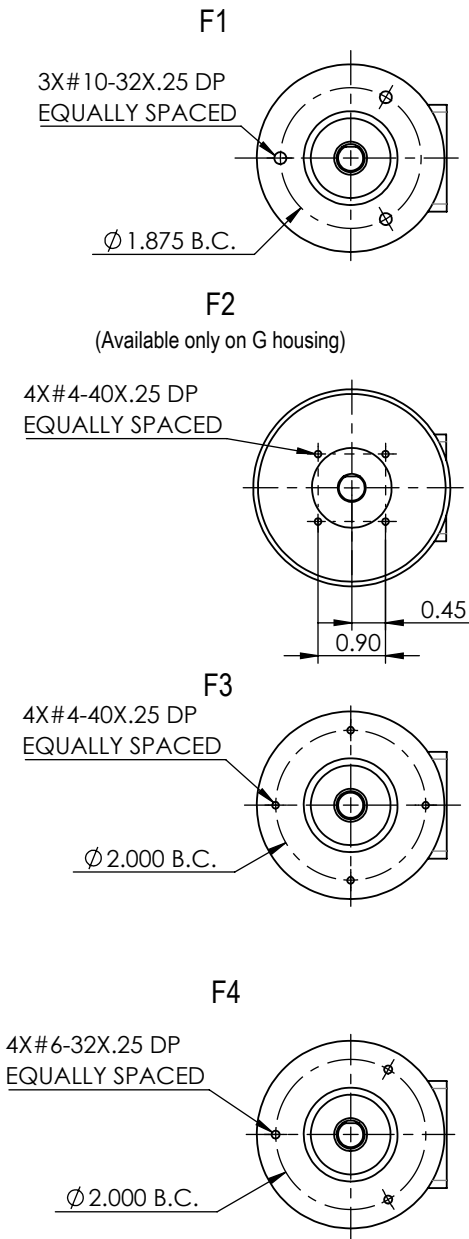
H25G SERVO MOUNT

(WITH OPTIONAL F2 FACEMOUNT)



FACEMOUNT OPTIONS
(NOTE RESTRICTIONS)

CONNECTOR OPTIONS



ALLOW FOR APPROX. 2 IN. CABLE BEND
RADIUS BEYOND END OF CABLE GLAND

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 Pin | M16 Connector Pin | Channels Designated in Model Number | |
|----------------------|----------------------|-------------------------------------|-----------|
| | | ABZ | ABC |
| E | A | A | A |
| D | B | B | B |
| C | C | Z | \bar{A} |
| B | D | +V (Supply Voltage) | |
| F | E | — | \bar{B} |
| A | F | 0V (Circuit Common) | |
| | G | Case Ground (CG) | |

| Wire Color (22AWG) | DA 15P Connector | Channels Designated in Model Number | | |
|-----------------------|------------------|-------------------------------------|-----------|-----------|
| | | ABZ | ABC | ABZC |
| YEL | 13 | A | A | A |
| BLUE | 14 | B | B | B |
| ORN | 15 | Z | — | Z |
| W-Yel | 10 | — | \bar{A} | \bar{A} |
| W-Blu | 11 | — | \bar{B} | \bar{B} |
| W-Orn | 12 | — | — | \bar{Z} |
| RED | 6 | +V (Supply Voltage) | | |
| BLK | 1 | 0V (Circuit Common) | | |
| GRN | 9 | Case Ground (CG) | | |
| WHITE | | Shield Drain (Shielded Cable Only) | | |

| M18 Connector | |
|---------------|-----------|
| Pin | Channel |
| A | A |
| B | B |
| C | Z |
| D | +V |
| E | — |
| F | 0V |
| G | CG |
| H | \bar{A} |
| I | \bar{B} |
| J | \bar{Z} |

| M12 Connector | |
|---------------|-----------|
| Pin | Channel |
| A | A |
| B | B |
| C | Z |
| D | +V |
| E | — |
| F | 0V |
| G | CG |
| H | \bar{A} |
| J | \bar{B} |
| K | \bar{Z} |

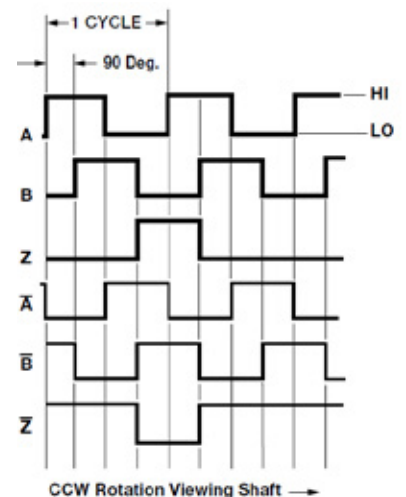
Table 2: Resolutions for Incremental Encoder Models H25

| PPR: 1, 2, 3... THROUGH ...10000 INCLUDING TABLE BELOW | | | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 10160 | 15000 | 19456 | 24500 | 28800 | 33792 | 38912 | 44450 | 51200 | 58000 | 64800 | 71680 |
| 10200 | 15240 | 19500 | 24576 | 29000 | 34000 | 39000 | 45000 | 52000 | 58368 | 65000 | 72000 |
| 10240 | 15360 | 19800 | 24600 | 29210 | 34200 | 39370 | 45056 | 52070 | 58420 | 65536 | 72390 |
| 10800 | 15500 | 20000 | 25000 | 29400 | 34290 | 39600 | 45720 | 52200 | 59000 | 66000 | 72500 |
| 11000 | 15600 | 20320 | 25200 | 29500 | 34500 | 39936 | 46000 | 52224 | 59392 | 66040 | 72704 |
| 11264 | 16000 | 20400 | 25400 | 29696 | 34800 | 40000 | 46080 | 52500 | 59400 | 66560 | 73660 |
| 11400 | 16200 | 20480 | 25500 | 30000 | 34816 | 40200 | 46800 | 53000 | 59690 | 66600 | 73728 |
| 11430 | 16384 | 21000 | 25600 | 30480 | 35000 | 40640 | 46990 | 53248 | 60000 | 67000 | 73800 |
| 12000 | 16500 | 21504 | 25800 | 30600 | 35400 | 40800 | 47000 | 53340 | 60416 | 67310 | 74930 |
| 12288 | 16510 | 21590 | 26000 | 30720 | 35500 | 40960 | 47104 | 54000 | 60960 | 67500 | 75000 |
| 12500 | 16800 | 21600 | 26400 | 31000 | 35560 | 41000 | 47500 | 54272 | 61000 | 67584 | 75600 |
| 12600 | 17000 | 22000 | 26500 | 31200 | 35840 | 41400 | 48000 | 54610 | 61200 | 68000 | 76200 |
| 12700 | 17400 | 22200 | 26624 | 31744 | 36000 | 41910 | 48128 | 55000 | 61440 | 68400 | 77400 |
| 13000 | 17408 | 22500 | 26670 | 31750 | 36830 | 41984 | 48260 | 55296 | 62000 | 68580 | 77470 |
| 13200 | 17500 | 22528 | 27000 | 31800 | 36864 | 42000 | 48600 | 55800 | 62230 | 68608 | 77500 |
| 13312 | 17780 | 22800 | 27500 | 32000 | 37000 | 42500 | 49000 | 55880 | 62464 | 69000 | 78740 |
| 13500 | 18000 | 22860 | 27600 | 32400 | 37200 | 42600 | 49152 | 56000 | 62500 | 69632 | 79200 |
| 13800 | 18432 | 23000 | 27648 | 32500 | 37500 | 43000 | 49530 | 56320 | 63000 | 69850 | 80000 |
| 13970 | 18500 | 23400 | 27940 | 32768 | 37800 | 43008 | 50000 | 57000 | 63488 | 70000 | |
| 14000 | 18600 | 23500 | 28000 | 33000 | 37888 | 43180 | 50176 | 57150 | 63500 | 70200 | |
| 14336 | 19000 | 23552 | 28200 | 33020 | 38000 | 43200 | 50400 | 57344 | 64000 | 70656 | |
| 14400 | 19050 | 24000 | 28500 | 33500 | 38100 | 44000 | 50800 | 57500 | 64512 | 71000 | |
| 14500 | 19200 | 24130 | 28672 | 33600 | 38400 | 44032 | 51000 | 57600 | 64770 | 71120 | |

NOTES

1. 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.
2. 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.
3. Output IC's are available as either Line Driver (LD) or NPN Open Collector (OC) types.
4. 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.
5. 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/OV, which may damage the driver.
6. Outputs protection diodes on std. product, diodes will redirect current away from output node if shorted to +V or OV, excessive voltage will damage diodes.
7. Reverse voltage protection: indefinite reverse polarity at 30VDC.
8. Transient voltage protection: 10/100 us waveform. 600W peak pulse power on 10/100 us waveform.
9. 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.

Standard Output Waveform



EXPRESS ENCODERS: Items highlighted with this are standard Express Encoders and ship in few days.



ORDERING OPTIONS








Example : H25D-SS-2000-ABZC-28/V-S M18

| | H25 | D | SS | 2000 | ABZ | C | 28/V | S | M18 |
|--|-----|---|----|------|-----|---|------|---|-----|
| Type | | | | | | | | | |
| X = Express Encoder Blank = Standard Leadtime | | | | | | | | | |
| Family | | | | | | | | | |
| H25 = Heavy Duty; 2.5" diameter | | | | | | | | | |
| Housing Configuration | | | | | | | | | |
| D = Square Flange E = 2.50 Diameter Servo Mount G = 2.62 Diameter Servo Mount See dimensions | | | | | | | | | |
| Optional Face Mounts | | | | | | | | | |
| F1 (Included with Express Encoder H25E housing) F2 (Available with H25G housing only) F3 or F4 Blank = None | | | | | | | | | |
| Shaft Seal Configuration | | | | | | | | | |
| SS = Shaft Seal (Not available on H25G) Blank = Shielded Bearing | | | | | | | | | |
| Cycles Per Turn | | | | | | | | | |
| (Enter Cycles) See Table 2 | | | | | | | | | |
| Number of Channels | | | | | | | | | |
| A = Single Channel AB = Dual Quad. Channel ABZ = Dual with Index AZ = Single with Index | | | | | | | | | |
| Complements | | | | | | | | | |
| C = Complementary Outputs Blanks = None | | | | | | | | | |
| Voltage/Output | | | | | | | | | |
| 15/V = 5-15 Vin/out 28/V = 5-28Vin/out 28/5 = 5-28Vin/5Vout 28/O = 5-28Vin/OCout | | | | | | | | | |
| Output Termination Location | | | | | | | | | |
| E = End S = Side | | | | | | | | | |
| 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 | | | | | | | | | |
| 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 9 | | | | | | | | | |

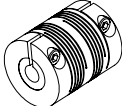
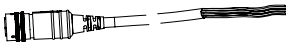
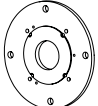
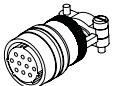
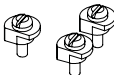
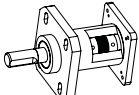
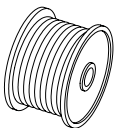
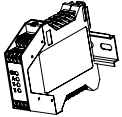
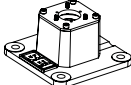
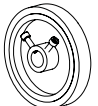

*Available in **Generation 1**. For Datasheet [click here](#).

AGENCY APPROVALS & CERTIFICATIONS

Special Models of the H25 Incremental Encoder are available with one or more of the following certifications. Consult with factory in order to ensure how to correctly specify the agency approval(s) that you require.

| Model H25 Hazardous Area Ratings | Agency | | Ratings and Markings (for all standard product configurations) | File Number |
|----------------------------------|---|-----------|--|------------------------|
| Blank |  | CE | EN 55011: Electromagnetic Disturbance (EMI) EN 61000-6-2: Electromagnetic Compatibility (EMC) | |
| *EX Intrinsic Safety |  | UL | Class I, Groups A, B, C, D Class II, Groups E, F, G | 20180302-E78446 |
| |  | DEMKO | II 1 G Ex ia IIC T4 Ga (9V/OC is II 1 G Ex ia IIB T4 Ga) | DEMKO 06 ATEX 0614247X |
| |  | IEC/IECEx | Ex ia IIC T4 Ga (9V/OC is Ex ia IIB T4 Ga) -40°C ≤ Ta ≤ +85°C | IECEx UL 12.0035X |
| *NI Non-Incendive |  | UL | Class I, Div. 2, Groups A, B, C, D Class II, Div. 2, Groups F, G | 20170321-E78446 |
| |  | DEMKO | II 3 G Ex nA IIB T4 Gc | DEMKO 13 ATEX 1209038X |
| |  | IEC/IECEx | Ex nA IIB T4 Gc -40°C ≤ Ta ≤ +80°C | IECEx UL 13.0071X |

*Available in **Generation 1**. For Datasheet [click here](#).

| Description | Part Number |
|---|--|
| Flexible shaft couplings  | 39074-12-12 = 3/8 to 3/8 39074-12-8 = 3/8 to 1/4 39074-8-8 = 1/4 to 1/4 |
| Connector cable assemblies  | 31186-1810 = M18, 10pin, 10 ft length 31186-1820 = M18, 10pin, 20 ft length 31186-1850 = M18, 10pin, 50 ft length 31186-1610 = M16, 7pin, 10 ft length 31186-1620 = M16, 7pin, 20 ft length 31186-1650 = M16, 7pin, 50 ft length 31186-1410 = M14, 6pin, 10 ft length 31186-1420 = M14, 6pin, 20 ft length 31186-1450 = M14, 6pin, 50 ft length 31186-1210 = M12, 10pin, 10 ft length 31186-1220 = M12, 10pin, 20 ft length 31186-1250 = M12, 10pin, 50 ft length |
| Adapter plates  | 38228-001 = Aluminum 38228-002 = Delrin |
| Connector mates  | MS3106F18-1S = Mates to standard M18 style, 10pin conn. MS3106F16S-1S = Mates to standard M16 style, 7pin conn. MS3106F14S-6S = Mates to standard M14 style, 6pin conn. MS3116F12-10S = Mates to standard M12 style, 10pin conn. |
| Servo clamps  | 31165-001 = 0.093 grip 31165-002 = 0.125 grip |
| High load bearing assemblies  | 11008-000 = H20 and H25 flange mount 11009-001 = H25 foot mount 11009-002 = H20 foot mount |
| Bulk encoder cable  | 37048-003-100 = 100 ft spool 37048-003-500 = 500 ft spool 37048-003-1000 = 1K ft spool |
| Electronic Modules  | 60001-010 = Opto isolator 60011-001 = Broadcaster 60002-000 = Encoder tester *There are many options for Electronic modules, consult factory for help selecting the best one for your application |
| Mounting adapters  | 11012-002 = H25 56C |
| 12 in. OD Measuring wheels  | 31196-001 = 3/8in. Bore 31196-002 = 1/2in. Bore 31196-003 = 5/8in. Bore |
| SwiftComm  | 60032-001 = Wireless Interface 5V In, 10FT, M18 60032-003 = Wireless Interface 15V In, 10FT, M18 60032-005 = Wireless Interface 24V In, 10FT, M18 |