Model H20® Incremental Encoder

BEI SENSORS

The H20 is an extremely rugged encoder designed to economically fill the resolution range up to 4096 cycles per turn. This compact unit features a shock resistant disc, heavy duty bearings, and EMI shielding. The H20 conforms to NEMA 4 and 13 requirements. The H20 is also available in a hub shaft style with a flexmount (inset) for easy mounting directly to small motors. Typical applications of the H20 include machine control, process control, agricultural machinery, textile equipment, robotics, food processing, and metering.

Special Models of the H20 Incremental Encoder are available with one or more of the following certifications. Consult factory for details.

- EN 55011 and EN 61000-6-2
- U.S. Standards Class I, Group A,B,C & D; Class II Group E,F & G
- UL 12.0035X, UL 12.0082X
- Canadian Standards Class I, Zone 0, Group IIC
- CENELEC II 1 G Ex ia IIB/IIC T4, II 3 G Ex nA IIB T3 Gc, II 3 G Ex nA IIB T4 Gc
- Class I, Div 2, Group A,B,C & D; Class II, Div 2, Group F & G

Mechanical Specifications

Shaft Diameter: 1/4" thru 3/8" and metric versions. Hollow shaft, hub shaft or thru-shaft versions available.

Flat On Shaft: 0.75 x 0.03 deep

Shaft Loading: up to 40 lbs. axial and 40 lbs. radial

Shaft Runout: .001 T.I.R. maximum

Starting Torque at 25°C: 1.0 in-oz maximum without shaft seal; 2.5 in-oz maximum with shaft seal; 4.0 in-oz thru-shaft

Bearings: 52100 bearing steel

Shaft material: 303 stainless steel

Bearing Housing: Die cast aluminum with iridite finish; stainless steel (special feature)

Cover: Die cast aluminum with protective finish (For MS or CS terminations), otherwise drawn aluminum with protective finish; stainless steel (special feature)

Bearing Life: 1.5 X 10^9 revs at rated load (10,000 hrs at 2500 RPM)

Maximum RPM: 8,000 (see Frequency Response)

Moment of Inertia: 2.0 x 10^{-4} oz-in-sec^2

Weight: 9 oz. typical

Electrical Specifications

Code: Incremental

Output Format: 2 channels in quadrature, 1/2 cycle index gated with negative B channel as standard. Ungated index when 3904 is specified as the output device

Cycles per Shaft Turn: 1 to 4096 (see table A) For resolutions above 1024 contact 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)
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 1024 cpt; 400 KHz with interpolation option (see note 7)

Output Terminations: see Table 1

Note: Consult factory for other electrical options

Environmental Specifications

Enclosure Rating: NEMA 4 & 13 (IP66) when ordered with shaft seal (on units with an MS connector) and a cable gland (on units with cable termination)

Temperature: Operating, 0° to 70°C; extended temperature testing available (see note 8); Storage, -25° to 90°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.

H20 Incremental Ordering Options

for assistance call 800-350-2727

Use this diagram, working from left to right to construct your model number (example: **H20DB-37-SS-500-ABZC-28V/V-SM18**).

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

[ ] **H20** [ ] [ ] – [ ] – [ ] – [ ] – [ ] – [ ] – [ ] [ ] – [ ] – [ ] [ ] – [ ] – [ ]

- X = Express Encoder
- **TYPE:** H = Heavy Duty; 20 = 2.00" DIA.
- **HOUSING CONFIG:** D = Square Flange; E = 2.00 Dia. *See Dimensions*
- **SHAFT DIA:** 25 = 0.2497 / 0.2495; 37 = 0.3747 / 0.3745; 39 = 0.3935 / 0.3932
- **PILOT CONFIG:** A=1.181 (30mm) Female (No shaft seal available); B =1.25
- **FACE MOUNT:** F5, F12, F28; Blank = None *See Dimensions*
- **SHAFT TYPE:** TS=Thru Shaft; HS=Hollow Shaft; HBS=Hub Shaft; Blank = single ended shaft (standard)
- **SHAFT SEAL:** SS = Shaft Seal (must use pilot B, except HBS units can take SS with pilot A) *See note 2*
- **CYCLES PER TURN:** (Enter Cycles) *See table A*
- **NO. OF CHANNELS:** A = Single Channel; AB = Dual Quad. Ch.; ABZ = Dual with Index; AZ = Single with Index *See note 3*
- **COMPLEMENTS:** C = Complementary Outputs; Blank = None *See note 4*
- **VOLTAGE/OUTPUT:** 28V/V = 5–28$V_{in/out}$; 28V/5 = 5–28V_{in}/5V_{out}; 28V/OC = 5–28V_{in}/OC_{out}
- **OUTPUT TERMINATION LOCATION:** E = End; S = Side
- **OUTPUT TERMINATION:** M14 = MS3102R14S-6P; M16 = MS3102R16S-1P; M18 = MS3102R18-1P; C= Pigtail Cable; CS =Cable with Seal (Side or End Term); Add cable length (i.e., C18=18" cable) *See table 1 & note 9*
- **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*

EXPRESS ENCODERS® Items highlighted with [ ] are standard Express Encoders and ship in one to three days.

T2 option is available as a standard H20 Express Encoder.

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Specification No. 02055-001 Rev.08-13

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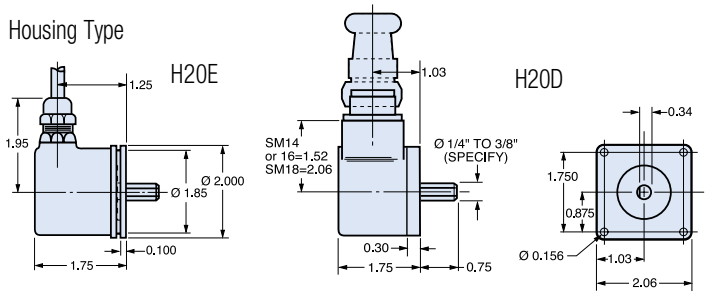
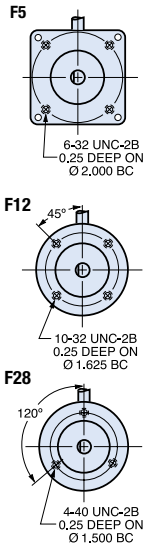
Dimensions

Housing Type

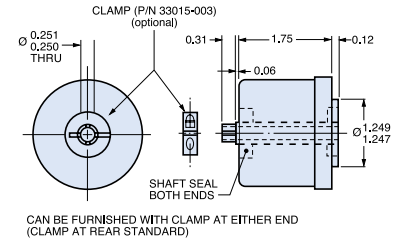


Optional Face Mounts

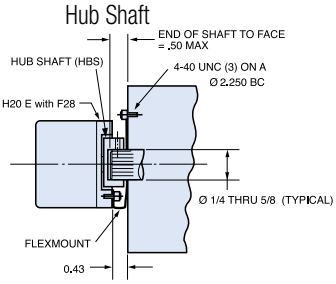


Special Shaft Options

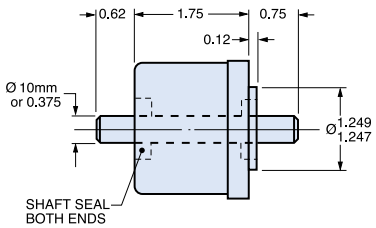
Hollow Shaft



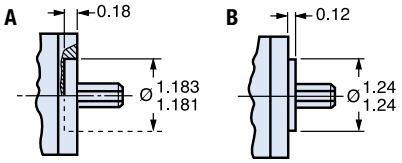
Hub Shaft



Thru-Shaft



Pilot Options



(H20DA or H20EA) (H20DB or H20EB)

Table1

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	$\overline{A}$
B	D	+V (SUPPLY VOLTAGE)	
F	E	—	$\overline{B}$
A	F	0 V (CIRCUIT COMMON)	
	G	CASE GROUND (CG) (Except H20)	

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	—	$\overline{A}$	$\overline{A}$
W-BLU	11	—	$\overline{B}$	$\overline{B}$
W-OM	12	—	—	$\overline{Z}$
RED	6	+V (SUPPLY VOLTAGE)		
BLK	1	0 V (CIRCUIT COMMON)		
GRN	9	CASE GROUND (CG) (Except H20)		
WHITE		SHIELD DRAIN (Shielded cable only)		

M18 CONNECTOR	
PIN	CHANNEL
A	A
B	B
C	Z
D	+V
E	—
F	OV
G	—
H	A
I	B
J	Z

Figure 1

Output Waveform

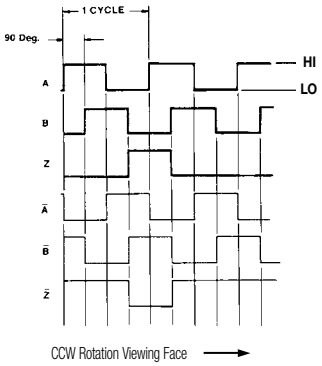


Table A

H20 Disc Resolutions

1* 2 3 5 **6** 8 10
11 12 24 25 30
32 40 50 60 64
75 80 95 100 105 115
120 125 150 192 200
240 250 256 300 336
360 400 500 510 512
600 625 635 720 785
1000 1024 1200**

Resolutions Shown in **RED** are not available as Express Encoders

*No index. For interpolation please specify the multiplied output (up to 4,096 for H20) in the model number, i.e. 4,096-T4.

**Consult factory for this resolution

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/OV, 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. 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.

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 number instead of voltage output in model number.

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