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.

- **ENC** 55011 and EN 61000-6-2
- **UL** 12.0035X
- **IEC** EN 55011
- **CENELEC** Class II Group E, F & G
- **UL** 12.0035X
- **Canada Standards** Class I, Zone O, Group IIC
- **BEI** Specification No. 02055-001 Rev.05-13

### 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:** 0.001 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
- **Bearings 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)
- **Shaft Life:** 1.5 x 10^6 revs at rated load (10,000 hrs at 2500 RPM)
- **Maximum RPM:** 8,000 (see Frequency Response)
- **Moment of Inertia:** 2.0 x 10^-6 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/5: Line Driver, 5–28 VDC in, Vout = Vin 28/5: Line Driver, 5–28 VDC in, Vout = 5 VDC 28/0C: Open Collector, 5–28 VDC in, OCout
- **Protection Level:** reverse, overvoltage and output short circuit (see note 5)
- **Frequency Response:** 100 KHz (up to 1024 cpr, 400 KHz with interpolation option (see note 7)

### H20 Incremental Ordering Options

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

### Notes & Tables
- All notes and tables referred to in the text can be found on the back of this page.

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**H20 Models**

- **H20 Express Encoder**
- **H20D = 1.181 (30mm) Female**
- **B = 1.25**
- **C = Pigtail Cable**
- **CS = Cable with Seal (Side or End Term)**
- **T2 = 2.00” DIA.**
- **EX = Intrinsically Safe**
- **NI = Non-Incendive**
- **S = Special features specified on purchase order (Consult factory) See note 6**
- **E = End**
- **S = Side**
- **MD14 = MS3102R14S-6P**
- **M16 = MS3102R16S-1P**
- **M18 = MS3102R18S-1P**
- **C = Pigtail Cable**
- **CS = Cable with Seal (Side or End Term)**
- **Add cable length (i.e., C18=18” cable)**

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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.
**Incremental Output Terminations**

The connector style will determine pinouts. For example, an encoder with ABC channels and an M16 connector uses the table to the right.

**Table 1**

<table>
<thead>
<tr>
<th>PIN</th>
<th>PIN</th>
<th>CHANNELS DESIGNATED IN MODEL NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>A</td>
<td>ABZ ABC</td>
</tr>
<tr>
<td>D</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>C</td>
<td>C</td>
<td>Z</td>
</tr>
<tr>
<td>B</td>
<td>D</td>
<td>+V (SUPPLY VOLTAGE)</td>
</tr>
<tr>
<td>A</td>
<td>F</td>
<td>0 V (CIRCUIT COMMON)</td>
</tr>
<tr>
<td>G</td>
<td></td>
<td>CASE GROUND (CG) (Except H20)</td>
</tr>
</tbody>
</table>

**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 therefore mean better noise immunity and faster switching times. **Warning:** Do not connect any line driver outputs directly to a circuit common/0 V, which may damage the encoder. 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.

6. Output IC’s: 28V/V: Multi-voltage Line Driver (7272*): 100 mA source/sink. Input voltage 5 to 26 VDC +/- 5% standard (Note: V_{IN} = V_{OUT}). This driver is TTL compatible when used with 5V 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 pull-up resistors. It is also a direct replacement for any 4469, 88C30, 88C33, 93L00 or 26L351 line driver. 28V/OC: Multi-voltage Line Driver (7277*): 100 mA source/sink. Input voltage 5 to 26 VDC +/- 5% standard, internally regulated with 5V (TTL compatible) logic. 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 a direct replacement for the 4469 Line Driver. 28V/OCC: NPN Open Collector (7274*, 7275*). Current sink of 80 mA max. Current sourced by external pull-up resistor. Output can be pulled up to voltage other than supply voltage (0 V max). Input voltage 5 to 26 VDC +/- 5% standard. Supply current is 120 mA typical. The datasheets for designations 3904, 7406, 3302, 681 and 689, 5V/OCR, 15V/OCR, 24V/OCR: Open Collector (3904R*, 7406R*, 7272R*). Current sink of 80 mA at 25°C. Current sourced by external pull-up resistor. Output can be pulled up to voltage other than supply voltage (0 V max). Input voltage 5 to 26 VDC +/- 5% standard. Supply current is 120 mA typical (plus load current). This is a direct replacement for the 4469 Line Driver. 28V/OCC: NPN Open Collector (7274*, 7275*). Current sink of 80 mA max. Current sourced by external pull-up resistor. Output can be pulled to voltage other than supply voltage (0 V max). Input voltage 5 to 26 VDC +/- 5% standard. Supply current is 120 mA typical. This combination provides a high degree of noise immunity and faster switching times.

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

8. Extended temperature ratings are available in the following ranges:

-40 to 70°C, -40 to 85°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 factory for more specific information.

9. Higher voltage outputs are available.

-40 to 70°C, -40 to 85°C, –20 to 105°C and –40 to 105°C depending on the particu-

10. When used with differential receivers, this combination provides a high degree of noise immunity and faster switching times. **Warning:** Do not connect any line driver outputs directly to a circuit common/0 V, which may damage the encoder. 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.

11. Output IC’s: 28V/V: Multi-voltage Line Driver (7272*): 100 mA source/sink. Input voltage 5 to 26 VDC +/- 5% standard (Note: V_{IN} = V_{OUT}). This driver is TTL compatible when used with 5V 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 pull-up resistors. It is also a direct replacement for any 4469, 88C30, 88C33, 93L00 or 26L351 line driver. 28V/OC: Multi-voltage Line Driver (7277*): 100 mA source/sink. Input voltage 5 to 26 VDC +/- 5% standard, internally regulated with 5V (TTL compatible) logic. 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 a direct replacement for the 4469 Line Driver. 28V/OCC: NPN Open Collector (7274*, 7275*). Current sink of 80 mA max. Current sourced by external pull-up resistor. Output can be pulled to voltage other than supply voltage (0 V max). Input voltage 5 to 26 VDC +/- 5% standard. Supply current is 120 mA typical. This combination provides a high degree of noise immunity and faster switching times. **Warning:** Do not connect any line driver outputs directly to a circuit common/0 V, which may damage the encoder. 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.

12. Output IC’s: 28V/V: Multi-voltage Line Driver (7272*): 100 mA source/sink. Input voltage 5 to 26 VDC +/- 5% standard (Note: V_{IN} = V_{OUT}). This driver is TTL compatible when used with 5V 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 a direct replacement for the 4469 Line Driver. 28V/OCC: NPN Open Collector (7274*, 7275*). Current sink of 80 mA max. Current sourced by external pull-up resistor. Output can be pulled to voltage other than supply voltage (0 V max). Input voltage 5 to 26 VDC +/- 5% standard. Supply current is 120 mA typical. This combination provides a high degree of noise immunity and faster switching times. **Warning:** Do not connect any line driver outputs directly to a circuit common/0 V, which may damage the encoder. 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.

13. Output IC’s: 28V/V: Multi-voltage Line Driver (7272*): 100 mA source/sink. Input voltage 5 to 26 VDC +/- 5% standard (Note: V_{IN} = V_{OUT}). This driver is TTL compatible when used with 5V 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 a direct replacement for the 4469 Line Driver. 28V/OCC: NPN Open Collector (7274*, 7275*). Current sink of 80 mA max. Current sourced by external pull-up resistor. Output can be pulled to voltage other than supply voltage (0 V max). Input voltage 5 to 26 VDC +/- 5% standard. Supply current is 120 mA typical. This combination provides a high degree of noise immunity and faster switching times. **Warning:** Do not connect any line driver outputs directly to a circuit common/0 V, which may damage the encoder. 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.

14. Output IC’s: 28V/V: Multi-voltage Line Driver (7272*): 100 mA source/sink. Input voltage 5 to 26 VDC +/- 5% standard (Note: V_{IN} = V_{OUT}). This driver is TTL compatible when used with 5V 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 a direct replacement for the 4469 Line Driver. 28V/OCC: NPN Open Collector (7274*, 7275*). Current sink of 80 mA max. Current sourced by external pull-up resistor. Output can be pulled to voltage other than supply voltage (0 V max). Input voltage 5 to 26 VDC +/- 5% standard. Supply current is 120 mA typical. This combination provides a high degree of noise immunity and faster switching times. **Warning:** Do not connect any line driver outputs directly to a circuit common/0 V, which may damage the encoder. 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.