Model HS20 is a compact, rugged hollow-shaft encoder designed with harsh environments in mind. This optical encoder can be used where lighter duty encoders are not suitable or cost effective. The compact design makes it easy to incorporate into tight installations and is well-sealed to stand up to dust, dirt, and splashing liquids.

Other features include dual preloaded bearings for longevity and stability, differential line driver outputs for noise immunity and a standard, Euro-style 8-pin (M12 x 1) sealed connector for easy connectivity. A specially designed, non-marring shaft clamp allows for easy installation and eliminates shaft damage should you need to reinstall or reposition the encoder on the shaft. Model HS20 is ideal for small motor applications and a number of harsh applications including off-highway agriculture and construction equipment.

Special Models of the HS20 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
Canadian Standards Class I, Zone 0, Group IIC
Class I, Div 2, Group A,B,C & D; Class II, Div 2, Group F & G

Mechanical Specifications
- Shaft Bore: 5/8", 1/2", 1/4", metric available
- Allowable Misalignment: 0.005 TIR, 0.010
- Axial using R2 Tether
- Bore Runout: 0.001 TIR
- Starting Torque at 25°C: 3.5 in-oz (max)
- Bearings: 52100 dual preloaded bearings
- Shaft Material: Aluminum
- Bearing Housing: Aluminum with protective finish
- Cover: Aluminum with protective finish
- Bearing Life: 7.5 X 10^6 revs
- Maximum RPM: 6000 (see frequency response)
- Moment of Inertia: 3.4 X 10^-4 oz-in-sec^2
- Weight: 8 ounces, maximum

Electrical Specifications
- Code: Incremental output format; 2 channels in quadrature, with complements; 1/2 cycle index gated with negative B channel
- Cycles Per Shaft Turn: 2 through 1024
- Supply Voltage: 5–28 VDC ± 5%
- Current Requirements: 100mA typical + output load, 250mA (max)
- Voltage/Output: (see note 5)
  - 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, OCout
- (Higher frequency response may be available. Please consult with the factory.)
- Protection Level: Overvoltage, reverse voltage, Outputs short-circuit protected (1 minute max) (see note 5)
- Frequency Response: 100kHz
- Output Termination Pinouts: see Table 1, back page

Environmental Specifications
- Enclosure Rating: IP64
- Temperature: 0–70° Standard
- Shock: 50 g’s for 11 msec duration
- Vibration: 5–2000 Hz @ 20 g’s
- Humidity: 98% RH non-condensing

NOTEs AND TABLEs: All notes and tables referred to in the text can be found on the back page.

Special Models of the HS20 Incremental Encoder are available with one or more of the following certifications. Consult factory for details.

Canadian Standards
Class I, Div 2, Group A,B,C & D; Class II, Div 2, Group F & G

HS20 Incremental Ordering Options
FOR ASSISTANCE CALL 800-350-2727

Use this diagram, working from left to right to construct your model number (example: HS20-50-R2-SS-1024-ABZC-28V/V-K8).

TYPE: Hollow Shaft, 2.0” Diameter
BORE SIZE
- 62 = .625”
- 37 = .375”
- 50 = .500”
- 25 = .250”

TETHER: R2 = Tetherarm
R3 = Flexmount

SHAFT SEAL:
- SS = Through Shaft Rubber Seals
- BS = Blind Shaft Rubber Seal
- FS = Through Shaft Felt Seals
- BFS = Blind Shaft Felt Seal

CYCLES PER TURN:
- 2 to 1024, See table 2, back page

VOLTAGE/OUTPUT:
- 28V/V: 5–28V/5V
- 28V/OC: 5–28V/OC

CHANNELS:
- ABZC

CONNECTOR:
- K8 = M12 X 1, 8 Pin (Euro style)
- CS18 = 18” pigtail with cable gland

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.

Specification No. 02082-001 Rev. 08-13
**HS20 Incremental Optical Encoder**

### Dimensions

**R2 Tether Arm**

![HS20 Diagram](image)

### Tables and Figures

#### Table 1—Output Termination Pinouts

<table>
<thead>
<tr>
<th>Pin (KB)</th>
<th>Wire</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>YEL</td>
<td>A</td>
</tr>
<tr>
<td>4</td>
<td>BLU</td>
<td>B</td>
</tr>
<tr>
<td>6</td>
<td>ORN</td>
<td>Z</td>
</tr>
<tr>
<td>2</td>
<td>RED</td>
<td>+V (SUPPLY)</td>
</tr>
<tr>
<td>7</td>
<td>BLK</td>
<td>OV (CIRCUIT COMMON)</td>
</tr>
<tr>
<td>N/C</td>
<td>GRN</td>
<td>CASE GROUND</td>
</tr>
<tr>
<td>3</td>
<td>W/YEL</td>
<td>A</td>
</tr>
<tr>
<td>5</td>
<td>W/BLU</td>
<td>B</td>
</tr>
<tr>
<td>8</td>
<td>W/ORN</td>
<td>Z</td>
</tr>
</tbody>
</table>

**Notes**

1. The typical hollow shaft product is supported by, and clamped to, the driving shaft. A flexible tether is used to keep the housing from rotating.
2. The rubber 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. For these exceptions, a felt shaft seal is recommended. Felt seals require very low starting torque and can virtually eliminate frictional heat. Encoders ordered with felt shaft seals will have an enclosure rating of IP50 and will have less than 1/10th the starting torque specified under Mechanical Configurations.
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 have lower impedance than 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 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, 88C03, 8830 or 26LS31 line driver.
6. Multivoltage Line Driver (7272*: 100 mA source/sink. Input voltage 5 to 28 VDC +/- 5% standard (Note: VLL = VHS). 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 90 mA typical (plus load current). 3904, 7406, 3302, 681 and 689.
7. 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 have lower impedance than 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 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, 88C03, 8830 or 26LS31 line driver.
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**Figure 1**

**Output Waveform**

**Table 2—HS20 Disc Resolutions**

<table>
<thead>
<tr>
<th>Resolutions Shown in RED are not available as Express Encoders</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>No index. For interpolation please specify the multiplied output (up to 4,096 for HS20) in the model number, i.e. 4,096-T4.</em>* Consult factory for this resolution</td>
</tr>
<tr>
<td>1° 2 3 5 6 8 10 11</td>
</tr>
<tr>
<td>12 24 25 30 32 40</td>
</tr>
<tr>
<td>50 60 64 75 80 95</td>
</tr>
<tr>
<td>100 105 115 120 125</td>
</tr>
<tr>
<td>150 192 200 240 250</td>
</tr>
<tr>
<td>256 300 336 360 400</td>
</tr>
<tr>
<td>500 510 512 600 625</td>
</tr>
<tr>
<td>635 720 785 1000 1024</td>
</tr>
<tr>
<td>1200**</td>
</tr>
</tbody>
</table>

**Extended temperature ratings are available in the following ranges:**

-40°C to 100°C, 0°C to 105°C, and -50°C 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.

**Mating plug receptacles and mating cable assemblies may be ordered from the factory.**

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