MODEL HS20® | OPTICAL INCREMENTAL ENCODER

Introduction

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 it 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 x1) 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.

SPECIFICATIONS

Mechanical

Shaft Bore	5/8", 1/2", 1/4", metric available
Allowable Misalignment	0.005 TIR, 0.010 Axial using R2 Tether
Bore Runout	.001 T.I.R.
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	7.5×10^9 revs
Maximum RPM	6,000 RPM (see frequency response, below)
Moment of Inertia	3.4×10^{-4} oz-in-sec^2
Weight	8 oz. maximum

Electrical

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, $V_{out} = V_{in}$ 28V/5: Line Driver, 5–28 VDC in, $V_{out} = 5$ VDC 28V/OC: Open Collector, 5 – 28 VDC in, OC_{out} (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 (Higher frequency response may be available. Please consult with the factory.)
Output Terminations	see Table 1, following pages

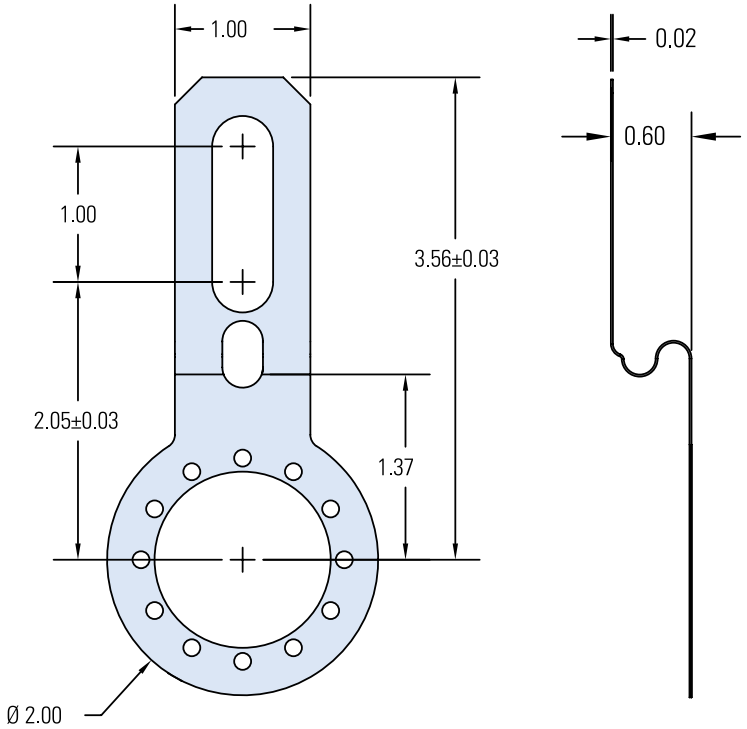
Environmental

Enclosure Rating	IP64
Temperature	0° to 70°C standard
Shock	50 g's at 11 msec duration
Vibration	5 to 2000 Hz @ 20 g's
Humidity	98% RH non-condensing

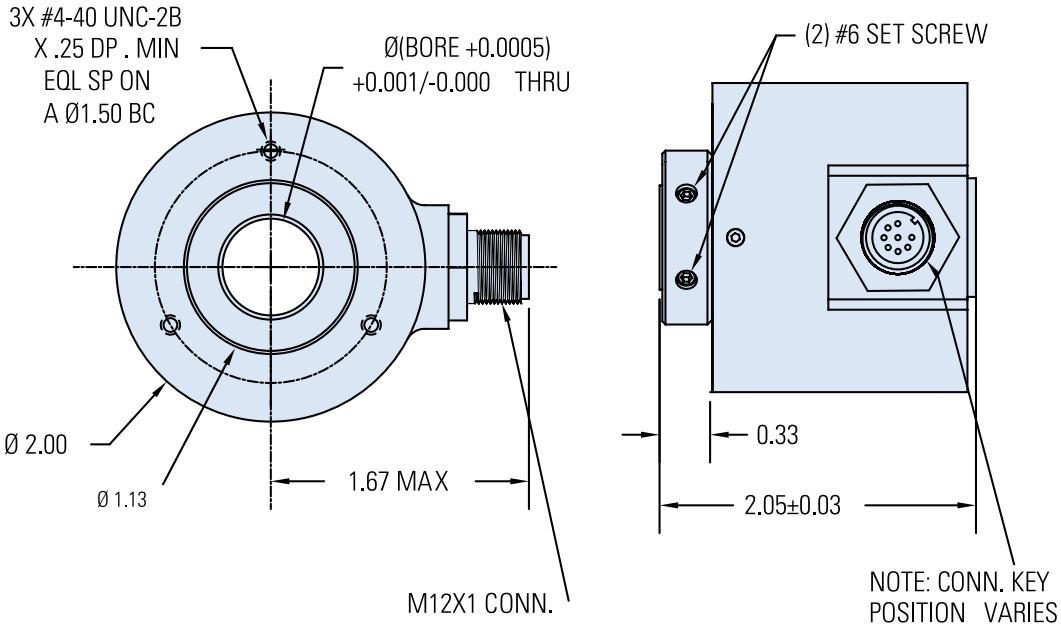
Notes and Tables: All notes and tables referred to in the text can be found in the pages that follow.

DIMENSIONS
Dimensions in inches

R2 Tether Arm



HS20 Diagram



TABLES

Table 1 —
Output Terminations Pinouts

PIN K8 (M12x1)	Wire	Function
1	YEL	A
4	BLU	B
6	ORN	Z
2	RED	+V (Supply)
7	BLK	0V (Circuit Common)
N/C	GRN	Case Ground
3	W/YEL	$\overline{A}$
5	W/BLU	$\overline{B}$
8	W/ORN	$\overline{Z}$

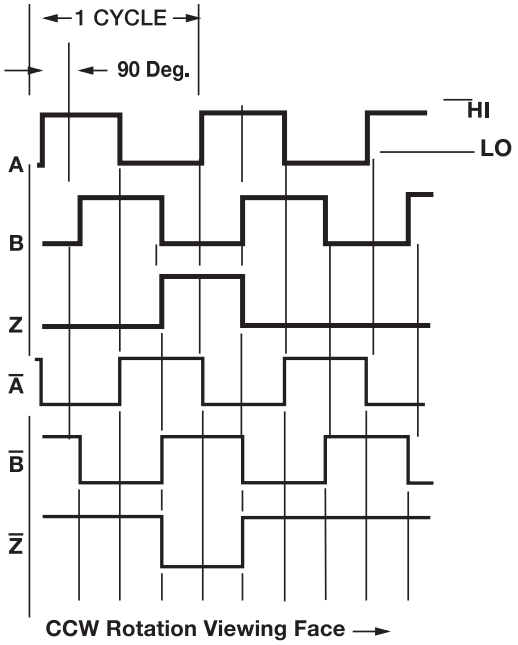
Table 2 —
HS20 Disc Resolutions

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**

***** No index. For interpolation please specify the multiplied output (up to 4,096 for HS20) in the model number, i.e. 4,096-T4.
****** Consult factory for this resolution

FIGURE 1

Output Waveform



ORDERING OPTIONS

HS20 – 62 – R2 – SS – 1024 – ABZC – 28V/V – K8 – EX – S

Type

H: Heavy Duty
20: 2.00" Diameter

Bore Size

62: .625" **50:** .500"
37: .375" **25:** .250"

Tether

R2: Tether arm
R3: Flexmount

Shaft Seal

SS: Through Shaft Rubber Seals **BFS:** Blind Shaft Felt Seal
BS: Blind Shaft Rubber Seal *See Note 2*
FS: Through Shaft Felt Seals

Cycles Per Turn

2 to 1024
See Table 2

Channels

ABZC

Voltage / Output

28V/V: 5-28V_{in}/$_{out}$ **28V/OC:** 5-28V_{in}/OC_{out}
28V/5: 5-28V_{in}/5V_{out}

Connector

K8: M12 X 1, 8 Pin (Euro Style)
CS18: 18" Pigtail with Cable Gland

Hazardous Area Ratings

Blank: None **NI:** Non-Incendive
EX: Intrinsically Scale *Contact Factory for Voltage Options*

Special Features

S: Special features specified on purchase order. (Consult factory)

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 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). **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. The 5V/OCR, 15V/OCR and 24V/OCR are often replaced by the 28V/V in system upgrades. **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 plug receptacles and mating cable assemblies may be ordered from the factory.

AGENCY APPROVALS & AVAILABLE CERTIFICATIONS

Agency	Area Certification
CE	EN 55011 and EN 61000-6-2
UL	U.S. Standards Class I, Group A,B,C & D; Class II Group E, F & G
cUL	Canadian Standards Class I, Zone 0, Group IIC
IEC	UL 12.0035X UL 12.0082X
ATEX	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
cRUus	Class I, Div 2, Group A,B,C & D; Class II, Div 2, Group F & G

Consult factory for more details.

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02082-001 Rev: 05/11/18

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