MODEL H20 | INCREMENTAL ENCODER

Product Description

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 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.





SPECIFICATIONS

Mechanical Specifications

Shaft Diameter	1/4" thru 3/8" and metric versions. Hollow shaft, hub shaft or thru-shaft versions available.
Flats On Shaft	0.75" long 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 RPM (see frequency response, below)
Moment of Inertia	2.0 X 10^{-4} oz-in-sec^2
Weight	9 oz. typical

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Electrical Specifications

Code	Incremental
Output Format	2 channels in quadrature, 1/2 cycle index gated with negative B channel as standard. Ungated index when OC 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; 400KHz with interpolation option (see note 7))
Output Terminations	see Table 1, following pages

Note: Contact 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 at 11msec duration
Vibration	5 to 2000 Hz @ 20 g's
Humidity	98% RH without consideration

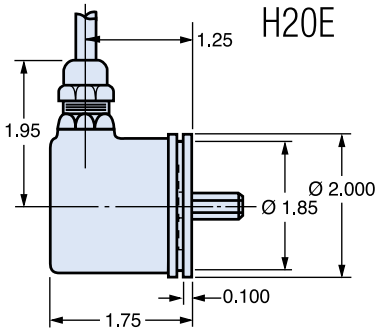
Notes and Tables: All notes and tables referred to in the text can be found in the pages that follow.

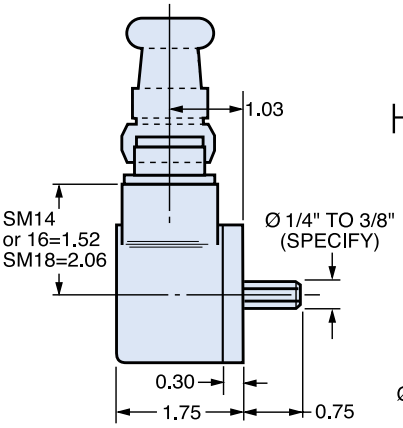
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DIMENSIONS
Dimensions in inches

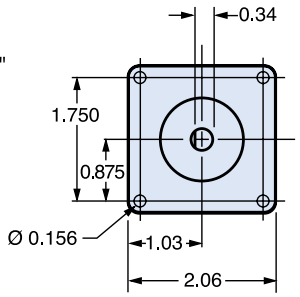
Housing Type

H20E



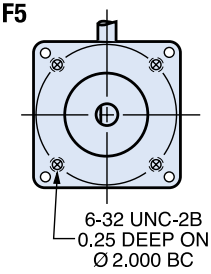


H20D

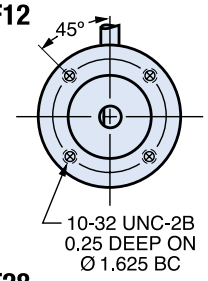


Optional Face Mounts

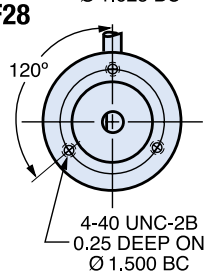
F5



F12

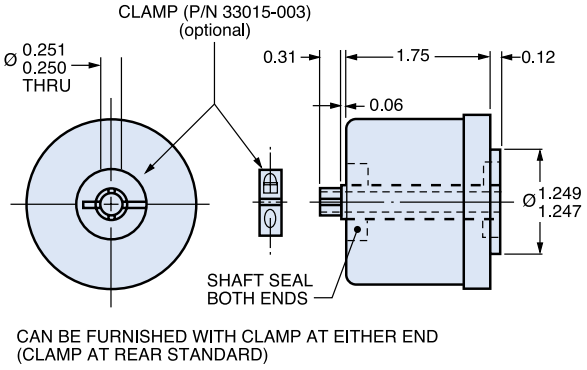


F28

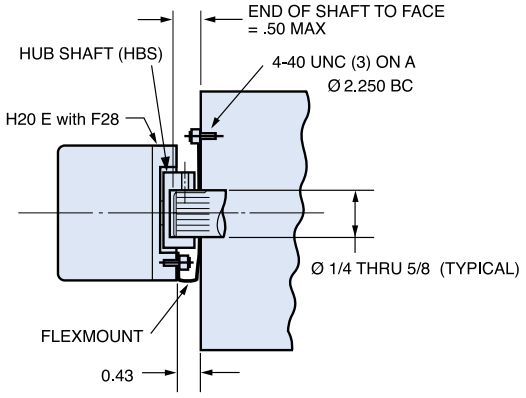


Special Shaft Options

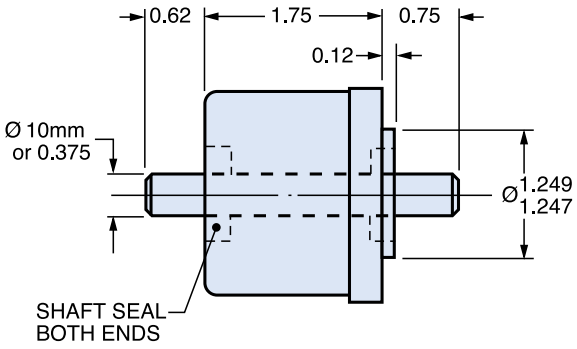
Hollow Shaft



Hub Shaft

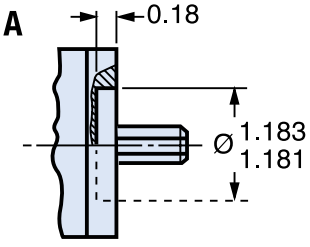


Thru-Shaft



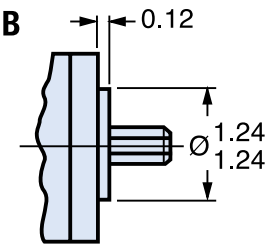
Pilot Options

A



(H20DA or H20EA)

B



(H20DB or H20EB)

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TABLES

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	M16 Connector	Channels Designed 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	0V (Circuit Common)	
	G	Case Ground (CG) (Except H20)	

M18 Connector	
PIN	Function
A	A
B	B
C	Z
D	+V
E	—
F	0V
G	—
H	$\overline{A}$
I	$\overline{B}$
J	$\overline{Z}$

Wire Color (22AWG)	DA 15P Connector	Channels Designed 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-ORN	12	—	—	$\overline{Z}$
RED	6	+V (Supply Voltage)		
BLK	1	0V (Circuit Common)		
GRN	9	Case Ground (CG) (Except H20)		
WHITE		Shield Drain (Shielded Cable Only)		

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**

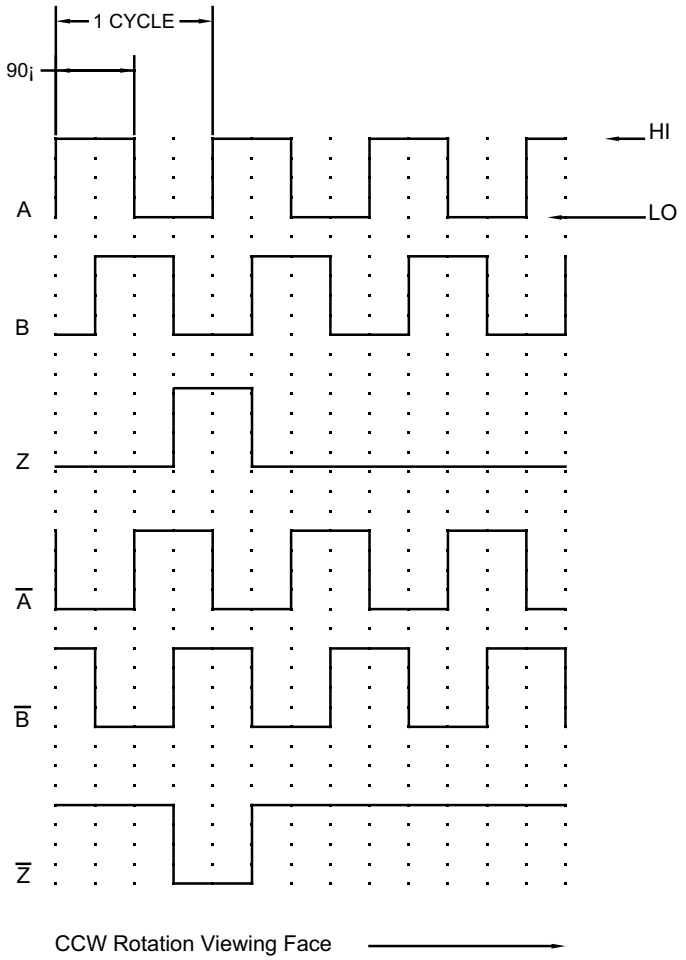
Resolutions shown **in blue** are not available as Express Encoders.

***** 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

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FIGURE 1

Output Waveform



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ORDERING OPTIONS

Items highlighted in blue are standard Express Encoders and ship in one to three days.

X	H20	D	B	–	37	–	TS	–	F5	–	SS	–	500	–	ABZ	C	–	28V/V	–	S	M18	–	EX	–	S

Encoder

X: Express Encoder

Type

H: Heavy Duty
20: 2.00" DIA.

Housing Configuration

D: Square Flange
E: 2.00 Dia.
See Dimensions

Pilot Configuration

A: 1.181 (30mm) Female (No shaft seal available)
B: 1.25

Shaft Diameter

25: 0.2497, 0.2495 **39:** 0.3935, 0.3932
37: 0.3747, 0.3745

Shaft Type

TS: Thru Shaft **HBS:** Hub Shaft
HS: Hollow Shaft **Blank:** Single Ended Shaft (Standard)

Face Mount

F5, F12, F28 *See Dimensions*
Blank: None

Shaft Seal

SS: Shaft Seal (Must use Pilot B, except HBS unites can take SS with Pilot A)
(See Note 2)

Cycles Per Turn

(Enter Cycles)
(See Table A)

No. of Channels

A: Single Channel **AZ:** Single with Index
AB: Dual Quad. Ch. *(See Note 3)*
ABZ: Dual with Index

Compliments

C: Complimentary Outputs *(See note 4)*
Blank: None

Voltage / Output

28V/V: 5-28V_{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 **M18:** MS3102R18S-1P **CS:** Cable with Seal (Side or End Term) *(See Table 1 & Note 9)*
M16: MS3102R16S-1P **C:** Pigtail Cable Add cable length (i.e., C18=18" cable)

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)
(See Note 6)

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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/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). **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 control drawing 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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AGENCY APPROVALS & AVAILABLE CERTIFICATIONS

Model H20 Hazardous Area Ratings	Agency		Ratings and Markings (for all standard product configurations)	File Number
Blank	CE	CE	EN 55011: Electromagnetic Disturbance (EMI) EN 61000-6-2: Electromagnetic Compatibility (EMC)	
EX Intrinsic Safety	c UL us LISTED	UL	Class I, Groups A, B, C, D Class II, Groups E, F, G	20180302-E78446
	Ex	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	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	c UL us	UL	Class I, Div. 2, Groups A, B, C, D Class II, Div. 2, Groups F, G	20170321-E78446
	Ex	DEMKO	II 3 G Ex nA IIB T3 Gc T3B: -40°C ≤ Ta ≤ +85°C T4: -40°C ≤ Ta ≤ +55°C	DEMKO 13 ATEX 1209038X
	IEC IECEx	IEC/IECEx	Ex nA IIB T3 Gc T3B: -40°C ≤ Ta ≤ +85°C T4: -40°C ≤ Ta ≤ +55°C	IECEx UL 13.0071X

Consult factory for more details.

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