NorthStar brand Encoder
Series HD20 Harsh-Duty Optical Encoder

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Technical Bulletin

DESCRIPTION

The HD20 Harsh-Duty Optical Encoder is a compact heavy-duty encoder designed to exceed IP66/IP67 and NEMA 6 requirements. It is also available in stainless steel that exceeds NEMA 4X and NEMA 6P requirements for stringent wash down environments, including high pressure steam or caustic chemicals. It features 100 lb Axial and Radial Bearings, –40° to +100°C temperature range, double-sealed housing, and optional dual outputs. Covered by a two-year warranty (one year for bearings), NorthStar's traditional quality, reliability and value are built-in to every HD20 encoder.

It is also available as an Intrinsically Safe version certified to ATEX EEx ia IIB T4 when used with the appropriate accessory IS Barrier.

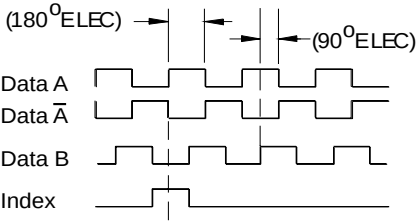
STANDARD OPERATING CHARACTERISTICS

Code: Incremental
Resolution: 1 to 3600 PPR (pulses/revolution)
Format: Two channel quadrature (AB) with optional Index (Z), and complementary outputs
Phase Sense: A leads B for CCW shaft rotation viewing the shaft clamp end of the encoder
Quadrature Phasing: 90° ± 15° electrical
Symmetry: 180° ± 18° electrical
Waveforms: Squarewave with rise and fall times less than 1 microsecond into a load capacitance of 1000 pf

ELECTRICAL

Input Power: 5-26VDC; 50 mA max., not including output loads. ATEX: 5VDC, 7-26VDC
Outputs: 2N2222, ET7272, ET7273
Frequency Response: 125 kHz (data & index)
Termination: 6, 7, or 10 pin MS Connector; 18" cable exit w/seal
Mating Connector:
6 pin, style MS3106A-14S-6S (MCN-N4);
7 pin, style MS3106A-16S-1S (MCN-N5);
10 pin, style MS3106A-18-1S (MCN-N6)

DATA AND INDEX
Not all complements shown.
$\overline{A}$ shown for reference



A Leads B CCW

MECHANICAL

Shaft Material: 303 stainless steel (passivated)
Shaft loading: Up to 100 lbs axial and radial
Shaft runout: 0.0005 TIR at midpoint
Starting torque: 2.5 in-oz. maximum (at 25°C)
Bearings: 5200 ZZ double row
Bearing life: 5 x 10^8 revs at rated shaft Loading, 5 x 10^{11} revs at 10% of rated shaft loading.(manufacturers' specs)
Housing and cover: Hard Anodized Aluminum. Also available in Electroless Nickel finish and Stainless Steel.
Disc material: Metal or mylar
Weight: 14 ounces, typical

ENVIRONMENTAL

Operating Temperature: -40 to 100°C
Operating Temperature ATEX: -40 to 80°C
Storage temperature: -40 to 100°C
Shock: 50G's for 11msec duration
Vibration: 5 to 2000Hz @ 20 G's
Humidity: 100%
Enclosure Rating: NEMA 4 and 13 When ordered with shaft seal

IMPORTANT ENCODER INSTALLATION INFORMATION

Mounting the Encoder: The encoder should be mounted such that its shaft is in close as possible alignment with the axis of the driving machine or motor shaft.

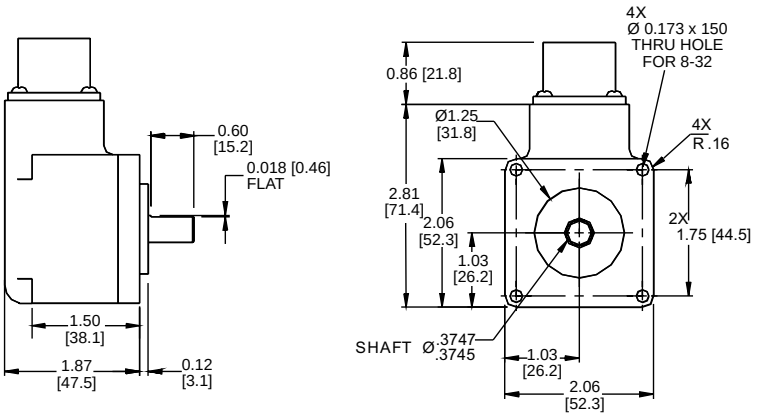
> ***CAUTION: The loads applied to the encoder shaft must be in accordance with the specificatios of this device.***

Important Wiring Instructions: Use of shielded cable is recommended for all encoder installations. The shield should be connected to signal-ground at the receiving device only. ***Connecting the shield at both ends can cause grounding problems that degrade system performance.***
If possible, run the encoder cable through a dedicated conduit (not shared with other wiring). Use of conduit will protect the cable from physical damage and provide a degree of electrical isolation. Do not run the cable in close proximity to other conductors that carry current to heavy loads such as motors, motor starters, contactors, solenoids, etc. This practice can induce electrical transients in the encoder cable, potentially interfering with reliable data transmission.

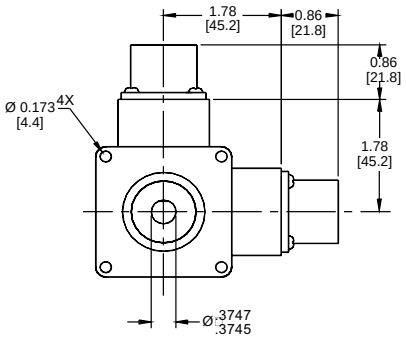
Refer to Electrical Connections table for wiring information. To avoid possible damage, do not connect or disconnect the encoder connector or wiring while power is applied to the system.

> ***CAUTION: Unused encoder signal wires must be individually insulated and under no circumstances be in contact with ground, voltage sources, or other signal lines.***

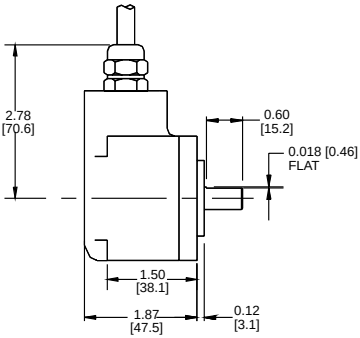
Dimensions
inches [mm]



Standard Housing



Dual Redundant Outputs



Cable Exit

Models Information

Code 1: Model	Code 2: PPR	Code 3: Shaft	Code4:Electrical	Code 5: Termination	Code 6: Options
HD20□	□□□□	□	□	□	□
Ordering Information					
Size 20 Harsh-Duty Optical Encoder **1** Unidirectional **2** Bidirectional **3** Bidirectional with Index **With ATEX Type 1* Option** **4** Unidirectional **5** Bidirectional **6** Bidirectional with Index available when: Code 4 is 0 - 3, F or G **With ATEX Type 2* Option** **7** Unidirectional **8** Bidirectional **9** Bidirectional with Index available when: Code 4 is 4 **With ATEX Type 3* Option** **A** Unidirectional **B** Bidirectional **C** Bidirectional with Index	**0001 0500** **0024 0512** **0025 0600** **0035 0625** **0040 0720** **0060 1000** **0100 1024** **0120 1200** **0192 1250** **0200 1440** **0240 2000** **0250 2048** **0256 2500** **0300 2540** **0360 3600**	**0** 3/8" Dia. Shaft with flat **4** 10mm Dia. Shaft, with flat	**0** 5-26V in, 5-26V Open Collector out (7273) **1** 5-26V in, 5-26V Open Collector out with 2.2 kΩ Pullups (7273) **2** 5-26V in, 5-26V Push-Pull out **F** 5-26V in, 5-26V Open Collector out (2222) **G** 5-26V in, 5-26V Open Collector out with 2.2 kΩ Pullups (2222) available when: Code 1 is 1,2,4,5,7,8,A or B and Code 5 is 3 through D, or Code 1 is 3,6,9 or C and Code 5 is 5 or D: **3** 5-26V in, 5-26V Differential Line Driver out (7272) **4** 5-26V in, 5V Differential Line Driver out (7272)	**1** 6 Pin Connector **3** 7 Pin Connector **5** 10 Pin Connector **D** 18" Sealed Cable	**0** No Options **1** Nickel Finish Housing **2** Stainless Steel Housing **3** Redundant Outputs (Dual Connector Housing) **4** Nickel Finish Housing with Redundant Outputs **5** Stainless Steel Housing with Redundant Outputs

*Note: Available ATEX Certified Options

ATEX Type 1: ATEX Certified; 5V in, 5V out only

ATEX Type 2: ATEX Certified; 7-26V in, 7-26V out

ATEX Type 3: ATEX Certified; 7-26V in, 5V out

NOTE: When selecting ATEX models, ATEX voltages replace those shown in Code 4.

Wiring Information

6, 7 & 10 Pin MS Connectors and Cables

Connector & mate/accessory cable assembly pin numbers and wire color information is provided here for reference. Models with direct cable exit carry the color coding as shown in the right hand column.

Encoder Function	Cable # 108594- 6 Pin Single Ended		Cable # 108595- 7 Pin Single Ended		Cable # 108596- 7 Pin Dif Line Drv w/o Idx		Cable # 1400635- 10 Pin Dif Line Drv w/ Idx		Cable Exit with Seal
	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Wire Color
Sig. A	E	BRN	A	BRN	A	BRN	A	BRN	GREEN
Sig. B	D	ORG	B	ORG	B	ORG	B	ORG	BLUE
Sig. Z	C	YEL	C	YEL	—	—	C	YEL	ORANGE
Power +V	B	RED	D	RED	D	RED	D	RED	RED
Com	A	BLK	F	BLK	F	BLK	F	BLK	BLACK
Case	—	—	G	GRN	G	GRN	G	GRN	WHITE
N/C	F	—	E	—	—	—	E	—	—
Sig$\overline{A}$	—	—	—	—	C	BRN/WHT	H	BRN/WHT	VIOLET
Sig$\overline{B}$	—	—	—	—	E	ORG/WHT	I	ORG/WHT	BROWN
Sig$\overline{Z}$	—	—	—	—	—	—	J	YEL/WHT	YELLOW

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