

# SERIES HD20

**NorthStar™ brand**

## Harsh Duty Optical Encoder

### Key Features

- Size 20 Heavy-Duty Encoder with Single or Dual Isolated Outputs
- Unbreakable Code Disc up to 3600 PPR
- Special Housing and Seals for IP67 Rating
- Anodized Aluminum, Stainless Steel, or Nickel Plated Housing

HD  
Heavy Duty



CE  
EN 61326-1



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental, Optical  
**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:** For resolutions to 625 PPR:  $90^\circ \pm 15^\circ$  electrical; For resolutions over 625 PPR:  $90^\circ \pm 30^\circ$  electrical  
**Symmetry:**  
 For resolutions to 1024 PPR:  $180^\circ \pm 18^\circ$  electrical  
 For resolutions over 1024 PPR:  $180^\circ \pm 25^\circ$  electrical  
**Index:** 150° to 330° A leads B, CCW (From Shaft End)  
**Waveforms:** Squarewave with rise and fall times less than 1 microsecond into a load capacitance of 1000 pF

### ELECTRICAL

**Input Power:** 5-26VDC; 80 mA max., not including output loads.  
**Outputs:**  
 2N2222 Open Collector: 250mA, sink max  
 7272 Push-Pull: 40mA, sink or source  
 7272 Differential Line Driver: 40 mA, sink or source  
 7273 Open Collector: 40mA, sink max  
**Frequency Response:** 125 kHz (data & index)  
**Noise Immunity:** Tested to EN61326-1  
**Electrical Immunity:** Reverse polarity and short circuit protected  
**Termination:** 6, 7, or 10 pin MS Connector; 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)  
 10 pin, NEMA4 style (MCN-N6N4)

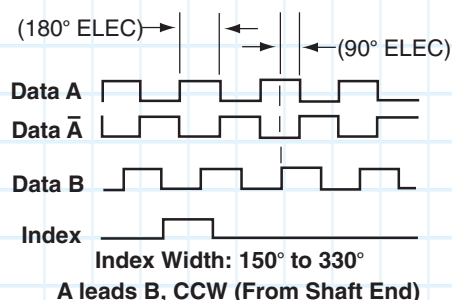
### MECHANICAL

**Shaft Size:** 10mm, 3/8"  
**Shaft Speed:** 6000 RPM, maximum  
**Shaft Loading:** Up to 100 lbs axial and radial  
**Starting Torque:** 2.5 in-oz. maximum (at 25°C)  
**Bearings:** 5200 ZZ double row  
**Bearing life:**  $5 \times 10^8$  revs at rated shaft Loading,  $5 \times 10^{11}$  revs at 10% of rated shaft loading. (manufacturers' specs)  
**Housing and Cover:** Hard Anodized Aluminum. Also available in Electroless Nickel finish and Stainless Steel.  
**Shaft Material:** 303 stainless steel (passivated)  
**Disc Material:** Plastic  
**Weight:** 14 ounces, typical

### ENVIRONMENTAL

**Operating Temperature:** -40 to 100°C  
**Storage Temperature:** -40 to 100°C  
**Shock:** 50G's for 11msec duration  
**Vibration:** 5 to 2000Hz @ 20 G's  
**Humidity:** Up to 98% (non-condensing)  
**Enclosure Rating:** IP67

### DATA AND INDEX Not all complements shown A shown for reference



## Ordering Information

To order, complete the model number with code numbers from the table below:

| Code 1: Model                        | Code 2: PPR                                                                                                                                                                                                                                                                                                                  | Code 3: Shaft                                                                           | Code 4: Electrical                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Code 5: Termination                                                                                                                                                                                                                                          | Code 6: Options                                                                                                                                                                                                                                                                                                              |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>HD20</b> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>                                                                                                                                                                                                                          | <input type="checkbox"/>                                                                | <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <input type="checkbox"/>                                                                                                                                                                                                                                     | <input type="checkbox"/>                                                                                                                                                                                                                                                                                                     |
| Ordering Information                 |                                                                                                                                                                                                                                                                                                                              |                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                              |
| Size 20<br>Heavy Duty<br>Encoder     | <b>0001 0500</b><br><b>0010 0512</b><br><b>0024 0600</b><br><b>0025 0625</b><br><b>0035 0720</b><br><b>0040 1000</b><br><b>0060 1024</b><br><b>0100 1200</b><br><b>0120 1250</b><br><b>0192 1440</b><br><b>0200 2000</b><br><b>0240 2048</b><br><b>0250 2500</b><br><b>0256 2540</b><br><b>0300 2600</b><br><b>0360 3600</b> | <b>0</b> 3/8" Dia.<br>Shaft with<br>flat<br><br><b>4</b> 10mm<br>Dia. Shaft,<br>no flat | <b>0</b> 5-26V in, 5-26V<br>Open Collector<br>out (7273)<br><br><b>2</b> 5-26V in, 5-26V<br>Push-Pull out<br>(7272)<br><br><b>F</b> 5-26V in, 5-26V<br>Open Collector<br>out (2222)<br><br><b>G</b> 5-26V in, 5-26V<br>Open Collector<br>out with 2.2 kΩ<br>Pullups (2222)<br><br>Available when:<br>Code 1 is 1,2<br>and Code 5 is 3<br>through H, or Code<br>1 is 3 and Code 5<br>is 5 through H:<br><br><b>3</b> 5-26V in, 5-26V<br>Differential Line<br>Driver out (7272)<br><br><b>4</b> 5-26V in, 5V<br>Differential Line<br>Driver out (7272) | <b>1</b> 6 Pin Connector<br><br><b>3</b> 7 Pin Connector<br><br><b>5</b> 10 Pin Connector<br><br><b>D</b> 18" Sealed Cable<br><br><b>E</b> 3' Sealed Cable<br><br><b>F</b> 6' Sealed Cable<br><br><b>G</b> 10' Sealed Cable<br><br><b>H</b> 15' Sealed Cable | <b>0</b> No Options<br><b>1</b> Nickel Finish Housing<br><b>2</b> Stainless Steel Housing<br><br>Available when: Code 4 is 0, 2<br><br><b>3</b> Redundant Outputs (Dual Connector<br>Housing).<br><b>4</b> Nickel Finish Housing with Redundant<br>Outputs.<br><b>5</b> Stainless Steel Housing with Redun-<br>dant Outputs. |

### Cable Assemblies with MS Connector

|                    |                                                                                       |
|--------------------|---------------------------------------------------------------------------------------|
| <b>108594-XXXX</b> | 6 Pin MS, Cable Assy. For Use with Single Ended Outputs                               |
| <b>108595-XXXX</b> | 7 Pin MS, Cable Assy. For Use with Single Ended Outputs                               |
| <b>108596-XXXX</b> | 7 Pin MS, Cable Assy. For Use with Differential Line Driver w/o Index Outputs         |
| <b>1400635XXXX</b> | 10 Pin MS, Cable Assy. For Use with Differential Line Driver with Index Outputs       |
| <b>109209-XXXX</b> | NEMA4 10 pin MS, Cable Assy. For use with Differential Line Driver with Index Outputs |

### Mating Connectors (no cable)

|                 |                             |
|-----------------|-----------------------------|
| <b>MCN-N4</b>   | 6 pin, style MS3106A-14S-6S |
| <b>MCN-N5</b>   | 7 pin, style MS3106A-16S-1S |
| <b>MCN-N6</b>   | 10 pin, style MS3106A-18-1S |
| <b>MCN-N6N4</b> | 10 pin, NEMA4 style         |

**\*Note:** Standard cable length is 10 feet but may be ordered in any length in 5 foot increments. For example, for a 20 foot cable, replace XXXX with -0020.

# SERIES HD20

## ELECTRICAL CONNECTIONS

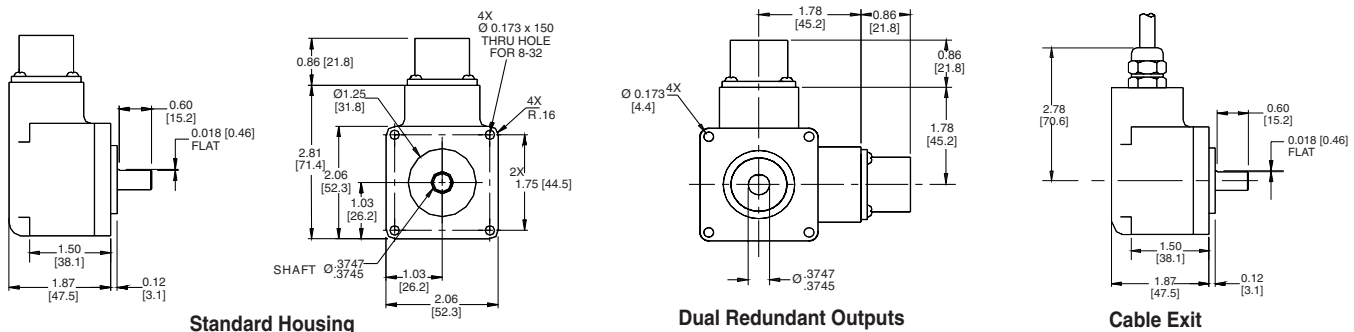
### 6, 7 & 10 Pin MS Connectors and Cables

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   | Table 1                                   |                 |                                           |                 |                                                               |                 |                                                                                          |                 |                         |
|--------------------|-------------------------------------------|-----------------|-------------------------------------------|-----------------|---------------------------------------------------------------|-----------------|------------------------------------------------------------------------------------------|-----------------|-------------------------|
|                    | Cable # 108594-XXXX<br>6 Pin Single Ended |                 | Cable # 108595-XXXX<br>7 Pin Single Ended |                 | Cable # 108596-XXXX<br>7 Pin Dif Line Driver<br>without Index |                 | ** Cable # 109209-XXXX<br>or Cable # 1400635XXXX<br>10 Pin Dif Line Driver<br>with Index |                 | Cable Exit<br>with Seal |
|                    | Pin                                       | Wire Color Code | Pin                                       | Wire Color Code | Pin                                                           | Wire Color Code | Pin                                                                                      | Wire Color Code | Wire Color Code         |
| Signal A           | E                                         | BRN             | A                                         | BRN             | A                                                             | BRN             | A                                                                                        | BRN             | GRN                     |
| Signal B           | D                                         | ORN             | B                                         | ORG             | B                                                             | ORG             | B                                                                                        | ORG             | BLU                     |
| Signal Z*          | C                                         | YEL             | C                                         | YEL             | —                                                             | —               | C                                                                                        | YEL             | ORG                     |
| Power +V           | B                                         | RED             | D                                         | RED             | D                                                             | RED             | D                                                                                        | RED             | RED                     |
| Com                | A                                         | BLK             | F                                         | BLK             | F                                                             | BLK             | F                                                                                        | BLK             | BLK                     |
| Case               | —                                         | —               | G                                         | GRN             | G                                                             | GRN             | G                                                                                        | GRN             | WHT                     |
| N/C                | F                                         | —               | E                                         | —               | —                                                             | —               | E                                                                                        | —               | —                       |
| Signal $\bar{A}$   | —                                         | —               | —                                         | —               | C                                                             | BRN/WHT         | H                                                                                        | BRN/WHT         | VIO                     |
| Signal $\bar{B}$   | —                                         | —               | —                                         | —               | E                                                             | ORG/WHT         | I                                                                                        | ORG/WHT         | BRN                     |
| Signal $\bar{Z}$ * | —                                         | —               | —                                         | —               | —                                                             | —               | J                                                                                        | YEL/WHT         | YEL                     |

- 1) Cable Configuration (**Table 1**): PVC jacket, 105 °C rated, overall foil shield; 3 twisted pairs 26 AWG (output signals), plus 2 twisted pairs 24 AWG (input power)
- 2) Standard cable length is 10 feet but may be ordered in any length in 5 foot increments. For example, for a 20 foot cable, replace -XXXX with -0020
- 3) \*Index not provided on all models. See ordering information.
- 4) \*\*For watertight applications, use NEMA4 10 pin cable & connector 109209-XXXX
- 5) "MS" Type mating connectors and pre-build cables are rated NEMA 12

## DIMENSIONS



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