

## SERIES HD25

**NorthStar™ brand**

### Harsh Duty Optical Encoder

#### Key Features

- Size 25 Heavy-Duty Encoder with Single or Dual Isolated Outputs
- Unbreakable Code Disc up to 20,000 PPR
- Special Housing and Seals for IP67 Rating
- Anodized Aluminum, Stainless Steel, or Nickel Plated Housing

**HD**  
Heavy Duty



#### SPECIFICATIONS

##### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental, Optical

**Resolution:** 1 to 20,000 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 end of the encoder

**Quadrature Phasing:**  $90^\circ \pm 30^\circ$  electrical

**Symmetry:**  $180^\circ \pm 25^\circ$  electrical

**Index:**  $180^\circ$  default gated to B low

**Waveforms:** Squawwave with rise and fall times less than 1 microsecond into a load capacitance of 1000 pf

##### ELECTRICAL

**Input Power:** 5-26VDC, 5-15VDC dependant on output type. 80 mA max., not including output loads.

##### Outputs:

7272 Push-Pull: 40mA, sink or source

7272 Differential Line Driver: 40 mA, sink or source

7273 Open Collector: 40mA, sink max

2N2222 Open Collector: 250mA, sink max

4469 Differential Line Driver: 100mA, sink or source

**Frequency Response:** 200 kHz (data and index)

**Noise Immunity:** Tested to EN61326-1

**Electrical Immunity:** Reverse polarity for all models and short circuit protected for 7272 and 7273 only

**Termination:** 6, 7, or 10 pin MS Connector, 5, 8 pin M12 Connector; Cable exit with 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)

Cable with 5 pin M12 Connector (112859-XXXX)

Cable with 8 pin M12 Connector (112860-XXXX)

##### MECHANICAL

**Shaft Sizes:** 10mm, 12mm, 3/8"

**Shaft Speed:** 6,000 RPM, maximum

**Shaft Loading:** Up to 100 lbs axial and radial

**Starting Torque:** 2.5 in-oz. maximum (at  $25^\circ\text{C}$ )

**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:** Aluminum

**Weight:** 14 ounces, typical

##### ENVIRONMENTAL

**Operating Temperature:**  $-40$  to  $100^\circ\text{C}$

**Storage Temperature:**  $-40$  to  $100^\circ\text{C}$

**Shock:** 50G's for 11msec duration

**Vibration:** 5 to 2000Hz @ 20 G's

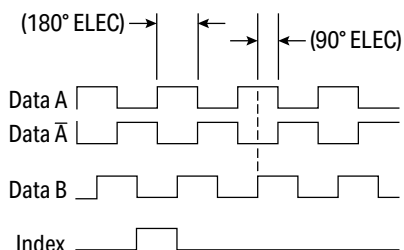
**Humidity:** Up to 98% (non-condensing)

**Enclosure Rating:** IP67

#### STANDARD DATA AND INDEX

Not all complements shown

$\bar{A}$  shown for reference



Index Width:  $180^\circ$  Default  
A leads B, CCW (from shaft end)

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### 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>HD25</b>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HD25 Heavy Duty Encoder <b>1</b> Unidirectional (A Channel) <b>2</b> Bidirectional (A & B Channels) <b>3</b> Bidirectional with Index (A, B, Z Channels)  <b>Note:</b> See code 4 column for addition of differential complementary channels	Enter Custom PPR from 1 to 20,000 Examples: <b>0001</b> = 1 PPR <b>0256</b> = 256 PPR <b>1000</b> = 1000 PPR <b>9999</b> = 9999 PPR <b>A000</b> = 10,000 PPR <b>B000</b> = 11,000 PPR <b>C999</b> = 12,999 PPR : : : <b>G000</b> = 16,000 PPR <b>G384</b> = 16,384 PPR <b>H000</b> = 17,000 PPR <b>J000</b> = 18,000 PPR <b>K000</b> = 19,000 PPR <b>L000</b> = 20,000 PPR  <b>Note:</b> Letter "I" is skipped and not used	<b>0</b> 3/8" Dia. Shaft with flat <b>4</b> 10mm Dia. Shaft, with flat <b>6</b> 12mm Dia. Shaft <b>7</b> 3/8" Dia Shaft with Flat, 4 Hole 2.00" BC	Available for all code options <b>0</b> 5-26V in, 5-26V Open Collector out (7273) <b>2</b> 5-26V in, 5-26V Push-Pull out (7272) <b>F</b> 5-26V in, 5-26V Open Collector out (2222) <b>G</b> 5-26V in, 5-26V Open Collector out with 2.2 kΩ Pullups (2222)  Available when: Code 1 is 1, 2 and Code 5 is 3, 5 or A through P, or Code 1 is 3 and code 5 is 5 or A through P: <b>3</b> 5-26V in, 5-26V Differential Line Driver out (7272) <b>4</b> 5-26V in, 5V Differential Line Driver out (7272) <b>6</b> 5-15V in, 5-15V Differential Line Driver out (4469)	<b>1</b> 6 Pin Connector <b>3</b> 7 Pin Connector <b>5</b> 10 Pin Connector <b>9</b> 5 Pin M12 Connector <b>A</b> 8 Pin M12 Connector <b>D</b> 18" Sealed Cable <b>E</b> 3' Sealed Cable <b>F</b> 6' Sealed Cable <b>G</b> 10' Sealed Cable <b>H</b> 15' Sealed Cable <b>P</b> 5m Sealed Cable	Available for all code options <b>0</b> Standard Housing <b>1</b> Nickel Finish Housing <b>2</b> Stainless Steel Housing  Available when: Code 4 is 0, 2, 3, 4 <b>3</b> Redundant Outputs (Dual Connector Housing) <b>4</b> Nickel Finish Housing with Redundant Outputs <b>5</b> Stainless Steel Housing with Redundant Outputs  <b>Note:</b> Simultaneous use of the dual outputs is not recommended.

### COMPATIBLE ACCESSORIES

#### CABLE ASSEMBLIES WITH MS CONNECTOR

- 108594-XXXX** 6 Pin MS, Cable Assy. For Use with Single Ended Outputs  
**108595-XXXX** 7 Pin MS, Cable Assy. For Use with Single Ended Outputs  
**108596-XXXX** 7 Pin MS, Cable Assy. For Use with Differential Line Driver without Index Outputs  
**1400635XXX** 10 Pin MS, Cable Assy. For Use with Differential Line Driver with Index Outputs  
**109209-XXXX** NEMA4 10 pin MS, Cable Assy. For Use with Differential Line Driver with Index Outputs

#### CABLE ASSEMBLIES WITH M12 CONNECTOR

- 112859-XXXX** 5 Pin M12, Cable Assy. For Use with Single Ended Outputs  
**112860-XXXX** 8 Pin M12, Cable Assy. For Use with Single Ended Outputs  
**112860-XXXX** 8 Pin M12, Cable Assy. For Use with Differential Line Driver Outputs

#### MATING CONNECTORS (NO CABLE)

- MCN-N4** 6 pin, style MS3106A-14S-6S  
**MCN-N5** 7 pin, style MS3106A-16S-1S  
**MCN-N6** 10 pin, style MS3106A-18-1S  
**MCN-N6N4** 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.

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### ELECTRICAL CONNECTIONS

#### 6, 7 AND 10 PIN MS CONNECTORS AND CABLES - WHEN CODE 5 = 1, 3, 5, OR D-P

Connector and 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.

Table 1									
Encoder Function	Cable # 108594-XXXX 6 Pin Single Ended		Cable # 108595-XXXX 7 Pin Single Ended		Cable # 108596-XXXX 7 Pin Diff Line Driver without Index		Cable # 109209-XXXX* or 1400635XXXX 10 Pin Diff Line Driver with Index		Cable Exit with Seal
	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Wire Color
Signal A	E	BRN	A	BRN	A	BRN	A	BRN	GRN
Signal B	D	ORG	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
Common	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

#### 5 AND 8 PIN M12 ACCESSORY CABLES WHEN - WHEN CODE 5 = 9 OR A

Connector pin numbers and cable assembly wire color information is provided here for reference.

Table 2						
Encoder Function	Cable # 112859-XXXX 5 Pin Single Ended		Cable # 112860-XXXX 8 Pin Single Ended		Cable # 112860-XXXX 8 Pin Differential	
	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color
Signal A	4	BLK	1	BRN	1	BRN
Signal B	2	WHT	4	ORG	4	ORG
Signal Z†	5	GRY	6	YEL	6	YEL
Power +V	1	BRN	2	RED	2	RED
Common	3	BLU	7	BLK	7	BLK
Signal $\bar{A}$	—	—	—	—	3	BRN/WHT
Signal $\bar{B}$	—	—	—	—	5	ORG/WHT
Signal $\bar{Z}$ †	—	—	—	—	8	YEL/WHT

#### Notes:

Cable Configuration (Table 1): PVC jacket, 105°C rated, overall foil shield; 3 twisted pairs 24 AWG (output signals), plus 2 twisted pairs 22 AWG (input power)

Cable Configuration (Table 2): PVC jacket, 105°C rated, overall foil shield; 24 AWG conductors, minimum

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

"MS" Type mating connectors and pre-build cables are rated NEMA 12

\*For watertight applications, use NEMA4 10 pin cable and connector 109209-XXXX

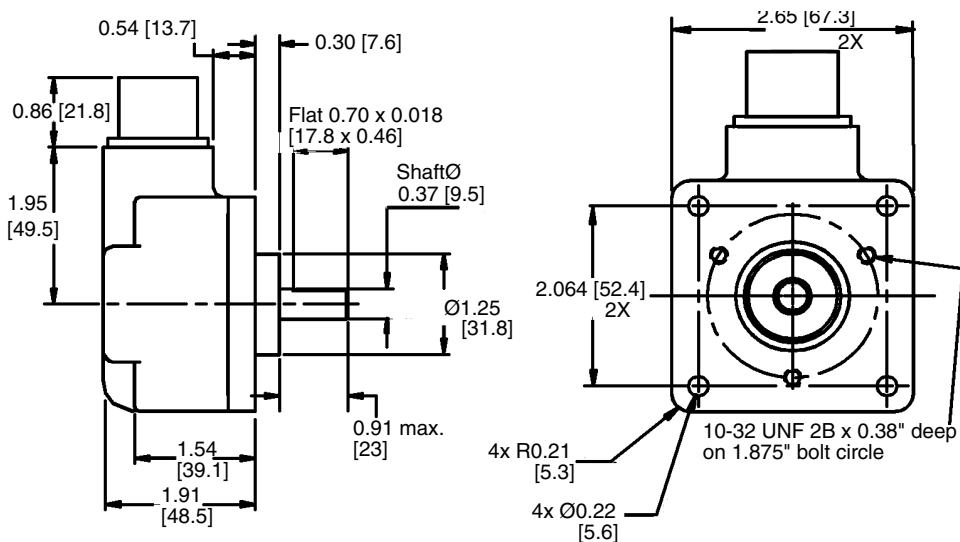
† Index not provided on all models. See ordering information

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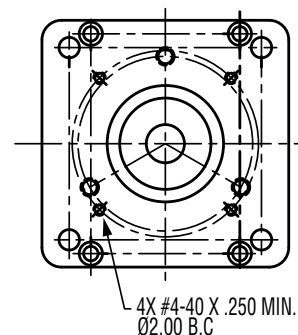
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Dimensions: inch [mm]

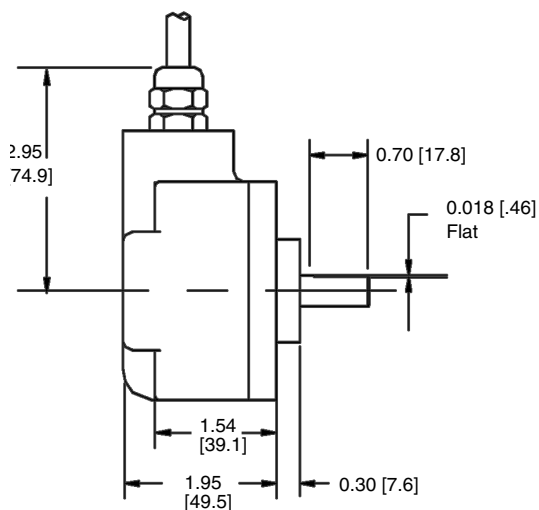
### STANDARD HOUSING



### WITH 4 HOLE 2.00" BC



### CABLE EXIT



### DUAL REDUNDANT OUTPUTS

