

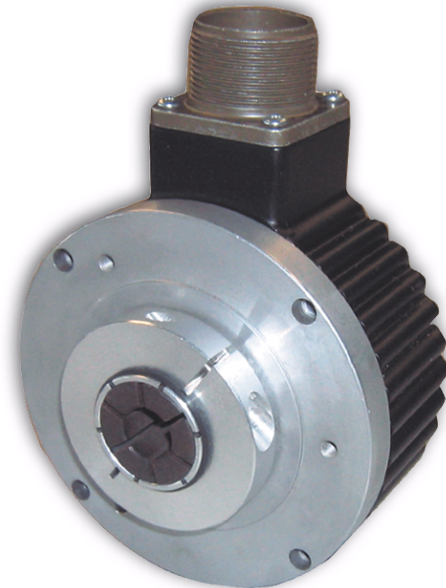
# SERIES HSD38

# NorthStar™ brand

## Harsh Duty Optical Encoder

### Key Features

- Premier Choice for Vector Motor OEMs
- Unbreakable Code Disc up to 5000PPR
- Dual-Sealed Housing
- Electrically & Thermally Isolated Hollow shaft



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental

**Resolution:** to 5000 PPR (pulses/revolution) See Ordering Information

**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 1200 PPR:  $90^\circ \pm 15^\circ$  electrical; For resolutions over 1250 PPR:  $90^\circ \pm 30^\circ$  electrical

**Symmetry:** For resolutions to 1024PPR:  $180^\circ \pm 18^\circ$  electrical

For resolutions over 1024PPR:  $180^\circ \pm 25^\circ$  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.

**Outputs:** ET7272, ET7273

**Frequency Response:** 125 kHz (data & index)

**Termination:** MS Connector; M12 Connector; cable exit w/seal. See Ordering Information

**Mating Connector:**

6 pin MS, style MS3106A-14S-6S (MCN-N4);

7 pin MS, style MS3106A-16S-1S (MCN-N5);

10 pin MS, style MS3106A-18-1S (MCN-N6);

10 pin Bayonet, MS3116-F12-10S (607545-0001)

Cable w/ 5 pin M12 connector, p/n 112859-xxx

Cable w/ 8 pin M12 connector, p/n 112860-xxx

### MECHANICAL

**Shaft Material:** 6061-T6 Aluminum

**Bore Diameter:** 1.00", 0.875", 0.750", 0.625", 0.500", 16mm, 15mm, 12mm. Insulated inserts provided for bores under 1 inch

**Bore Tolerance:**

1" bore:  $1.0005'' - 0.0000'' / +0.0010''$

< 1" bore: Nominal  $-0.0000'' / +0.002''$

**Mating Shaft Requirements:**

Configuration: Keyway allowed, Flat not allowed  
Runout:  $\pm 0.025''$  (0.635mm) radial, typical

Endplay:  $\pm 0.050''$  (1.27mm) axial, typical

Length: 1.25", Minimum, 1.60", Recommended

Maximum Length (w/ cover on): 2.50" (63.5mm)

**Starting torque:** 8 in-oz. maximum (at 25°C)

**Running torque:** 5 in-oz. maximum (at ambient)

**Bearings:** 61806-ZZ

**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.

**Disc material:** Metal or mylar (unbreakable)

**Weight:** 26 ounces, typical

### ENVIRONMENTAL

**Operating Temperature:** -40 to 100°C

**Storage temperature:** -40 to 100°C

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

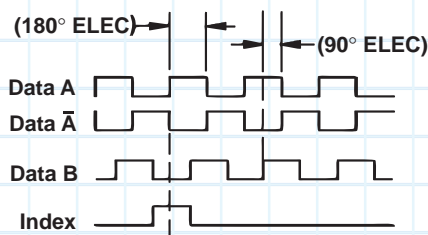
**Vibration:** 5 to 2000Hz @ 20 G's

**Humidity:** 100%

**Enclosure Rating:** IP67

### DATA AND INDEX

Not all complements shown  
A shown for reference



A leads B, CCW (From Clamp End)

(Reverse phasing, A leads B for CW also available:  
See Code 7 in Ordering Information)

Note: "MS" type mating connectors and prebuilt cables are rated NEMA 12. "M12" Cable assemblies are rated IP67

**Ordering Information**

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

Code 1: Model	Code 2: PPR	Code 3: Bore Size	Code 4: Format	Code 5: Output	Code 6: Termination	Code 7: Options	Code 8: Housing
<b>HSD38</b>	□□□□	□	□	□	□	□	□
<b>Ordering Information</b>							
<b>HSD38</b> Size 38 Heavy-duty, hollowshaft encoder	<b>0015</b> <b>0032</b> <b>0050</b> <b>0060</b> <b>0100</b> <b>0200</b> <b>0240</b> <b>0250</b> <b>0500</b> <b>0512</b> <b>0600</b> <b>1000</b> <b>1024</b> <b>1200</b> <b>2000</b> <b>2048</b> <b>3072</b> <b>4000</b> <b>4096</b> <b>5000</b>	<b>6</b> 12mm <b>9</b> 15 mm <b>7</b> 1/2" <b>8</b> 5/8" <b>A</b> 16mm <b>C</b> 3/4" <b>D</b> 20mm <b>E</b> 7/8"  not electrically isolated: <b>G</b> 1" <b>H</b> 1" Stainless Steel Collar	<b>0</b> single ended, unidirectional (A) <b>1</b> single ended, bidirectional (AB) <b>2</b> single ended, bidirectional with index (ABZ)  available when Code 5 is 3 or 4 and Code 6 is 1, 2, 4, 6, 7, 8, 9, A, G, J or K: <b>3</b> differential, bidirectional ( AĀ BĪ)	<b>0</b> 5-26V in, 5-26V Open Collector out (7273) <b>1</b> 5-30V in, 5-30V Push-Pull out <b>2</b> 5-26V in, 5-26V Push-Pull out  available when: Code 4 is 3 or 4 <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)  available when: Code 4 is 4 <b>X</b> Sin-Cos, 1Vp-p	<b>0</b> 6 pin connector <b>1</b> 7 pin connector <b>2</b> 10 pin connector <b>4</b> 10 pin Bayonet connector <b>5</b> 6 pin connector, plus mating connector <b>6</b> 7 pin connector, plus mating connector <b>7</b> 10 pin connector, plus mating connector <b>8</b> 10 pin Bayonet connector plus mating connector <b>9</b> 12 pin CW connector plus mating connector <b>A</b> 18" (.5m) cable <b>B</b> 36" (1m) cable <b>C</b> 72" (2m) cable <b>D</b> 144" (4m) cable <b>G</b> 13" (.3m) cable <b>J</b> 8 pin M12 connector <b>K</b> 18" (.5m) cable with 10 pin in-line connector  available when: Code 5 is 0, 1 or 2 <b>H</b> 5 pin M12 connector <b>L</b> 5 pin M12 connector w/special pinout	<b>0</b> No Option <b>1</b> Internally Isolated 1" bore <b>2</b> Reverse phasing, no bore isolation	<b>0</b> Cast Aluminum Housing, Slotted Tether Included <b>6</b> Cast Aluminum Housing, No Tether <b>C</b> Cast Aluminum Housing, Single-Point Tether Included (NEMA 4-1/2" C-face) <b>D</b> Same as "0" with Cover Kit <b>E</b> Same as "C" with Cover Kit <b>K</b> Cast Aluminum Housing, Single-Point Tether Included (NEMA 8-1/2" C-face) <b>M</b> Swivel-Rod tether with metric hardware <b>N</b> Same as "K" with Cover Kit

**Accessory Kits:**

- 114619-0001** Tether Kit, 4.5" C-face single point with 3/8" bolt
- 114620-0001** Tether Kit, Slotted with t-bolts for standard AC motor fan covers
- 114621-0001** Tether Kit, 8.5" C-face single point with 1/2" bolt
- 114591-0001** Cover Kit, 56C face
- 114592-0001** Cover Kit, fan cover
- 114593-0001** Dual Cover Kit, 56C face
- 114594-0001** Dual Cover Kit, fan cover

**10 foot Cable Assemblies with MS Connector**

- 108594-0010** 6 Pin MS, Cable Assy. For Use with Single Ended Outputs
- 108595-0010** 7 Pin MS, Cable Assy. For Use with Single Ended Outputs
- 108596-0010** 7 Pin MS, Cable Assy. For Use with Differential Line Driver w/o Index Outputs
- 112123-0010** 6 Pin MS, Cable Assy. For Use with Differential Line Driver w/o Index Outputs
- 1400635-0010** 10 Pin MS, Cable Assy. For Use with Differential Line Driver with Index Outputs
- 114448-0010** 10 Bayonet, Cable Assy. For Use with Differential Line Driver with Index Outputs
- 109209-0010** NEMA4 10 pin MS, Cable Assy. For use with differential line driver with index outputs

**10 foot Cable Assemblies with M23 Connector**

- 108615-0010** 12 Pin M23, Cable Assy. For Use with Differential Line Driver with Index Outputs, CCW

**15 foot Cable Assemblies with M12 Connector**

- 112859-0015** 5 Pin M12, Cable Assy. For Use with Single Ended Outputs
- 112860-0015** 8 Pin M12, Cable Assy. For Use with Single Ended Outputs
- 112860-0015** 8 Pin M12, Cable Assy. For Use with Differential Line Driver Outputs

**Mating Connectors (no cable)**

- 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 bayonet, style MS3116-F12-10S (607545-0001)

# SERIES HSD38



## 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. HSD37 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 Driver with Index		Cable # 1400635-; Cable # 109209-10 Pin Dif Line Driver with Index		Cable # 14448-10 Pin Bayonet		12 Pin (DW) (if used)	Cable Exit with Seal
	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color
Sig. A	E	BRN	A	BRN	A	BRN	A	BRN	A	BRN	5	GREEN
Sig. B	D	ORN	B	ORG	B	ORG	B	ORG	B	ORG	8	BLUE
Sig. Z	C	YEL	C	YEL	—	—	C	YEL	C	YEL	3	ORANGE
Power +V	B	RED	D	RED	D	RED	D	RED	D	RED	12	RED
Com	A	BLK	F	BLK	F	BLK	F	BLK	E	—	10	BLACK
Case	—	—	G	GRN	G	GRN	G	GRN	F	BLK	9	WHITE
N/C-Shield	F	—	E	—	—	—	E	—	G	GRN	7	—
SigA	—	—	—	—	C	BRN/WHT	H	BRN/WHT	H	BRN/WHT	6	VIOLET
SigB	—	—	—	—	E	ORG/WHT	I	ORG/WHT	J	ORG/WHT	1	BROWN
SigZ	—	—	—	—	—	—	J	YEL/WHT	K	YEL/WHT	4	YELLOW

### 5 & 8 Pin M12 Accessory Cables when Code 6= H or J

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

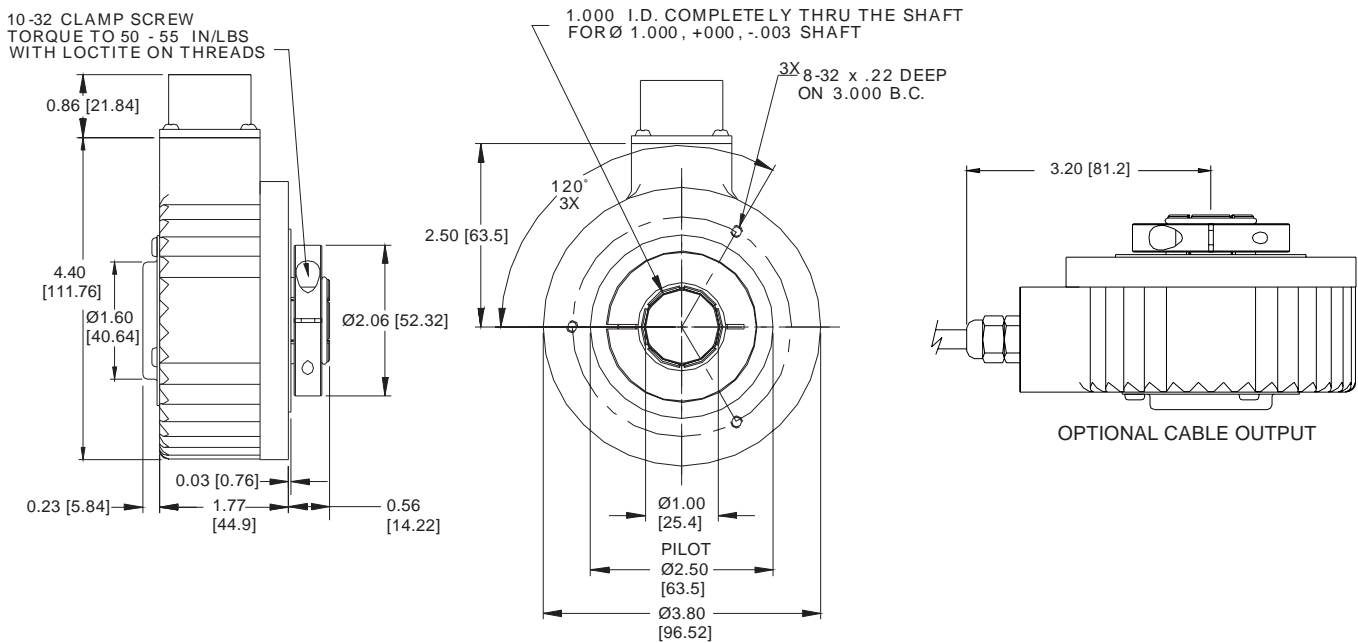
Encoder Function	Cable # 112859-5 Pin Single Ended		Cable # 112860-8 Pin Single Ended		Cable # 112860-8 Pin Differential	
	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color
Sig. A	4	BLK	1	BRN	1	BRN
Sig. B	2	WHT	4	ORG	4	ORG
*Sig. Z	5	GRY	6	YEL	6	YEL
Power +V	1	BRN	2	RED	2	RED
Com	3	BLU	7	BLK	7	BLK
Sig. A	—	—	—	—	3	BRN/WHT
Sig. B	—	—	—	—	5	ORG/WHT
*Sig. Z	—	—	—	—	8	YEL/WHT

\* Index not provided on all models. See ordering information  
Cable Configuration: PVC jacket, 105 °C rated, overall foil shield; 24 AWG conductors, minimum

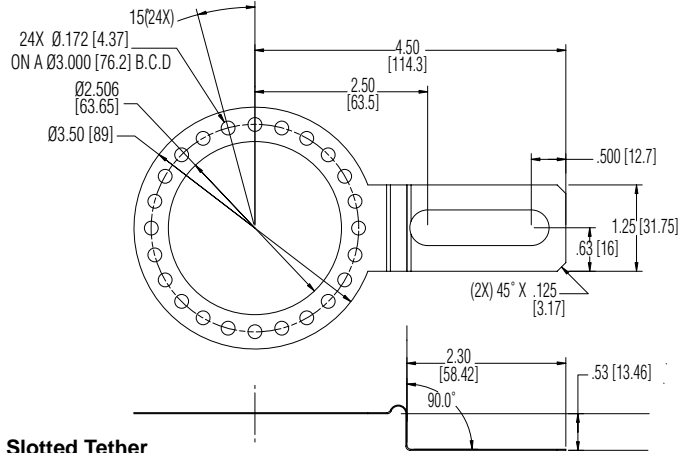
- \* Note: 1) Standard cable length is 10 feet but may be ordered in any length in 5 foot increment. For example, -0020 is a 20 foot cable.
- 2) "MS" type mating connectors and prebuilt cables are rated NEMA 12. "M12" Cable assemblies are rated IP67
- 3) For watertight applications, use NEMA4 10 pin cable & connector 109209-XXXX.

## DIMENSIONS inch [mm]

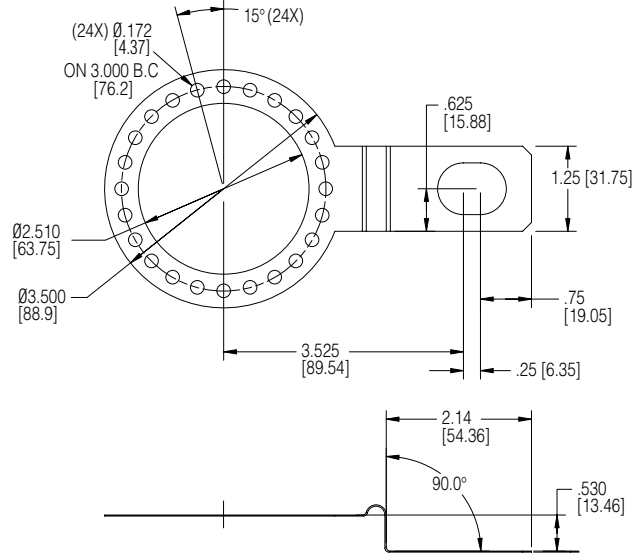
10-32 CLAMP SCREW  
TORQUE TO 50 - 55 IN/LBS  
WITH LOCTITE ON THREADS



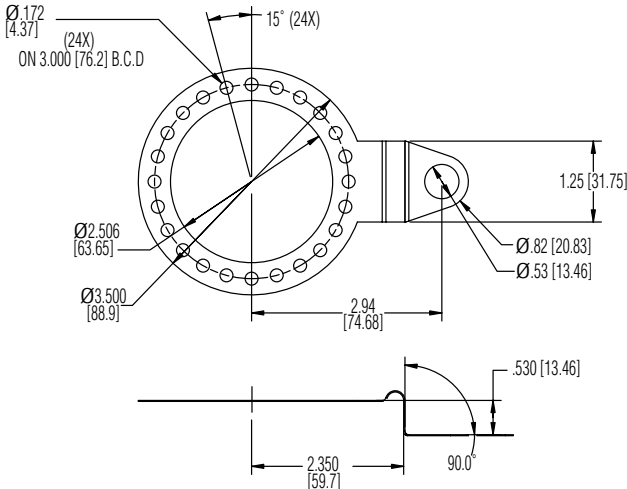
**DIMENSIONS** inch [mm]



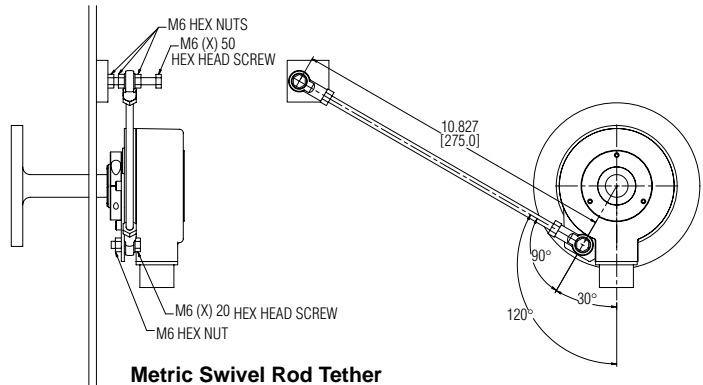
**Slotted Tether**



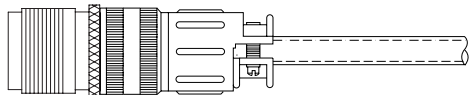
**Single Point Tether for 8-1/2" C-Face**



**Single Point Tether for 4-1/2" C-Face**



**Metric Swivel Rod Tether**



**Pigtail with MS Connector (K Option)**

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