

# SERIES HSD38

# NorthStar™ brand

## Harsh Duty Optical Encoder

### Key Features

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



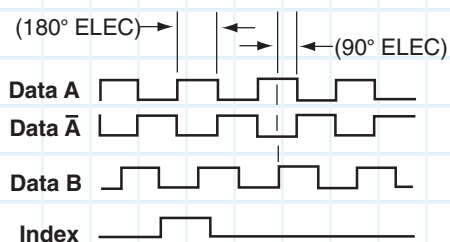
## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental, Optical  
**Resolution:** 15 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 1024 PPR:  $180^\circ \pm 18^\circ$  electrical  
 For resolutions over 1024 PPR:  $180^\circ \pm 25^\circ$  electrical  
**Index:**  $150^\circ$  to  $330^\circ$ , Reverse Phasing, A leads B for CW also available: See Code 7 in Ordering Information  
**Waveforms:** Squarewave with rise and fall times less than 1 microsecond into a load capacitance of 1000 pf

### 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)

### ELECTRICAL

**Input Power:** 5-26VDC. 50 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  
**Frequency Response:** 125 kHz (data & index)  
**Noise Immunity:** Tested to EN61326-1  
**Electrical Immunity:** Reverse polarity and short circuit protected  
**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 (MCN-B1)  
 12 Pin CW M23 Connector (MCN-C1)  
 Cable w/ 5 Pin M12 Connector, p/n 112859-xxxx  
 Cable w/ 8 Pin M12 Connector, p/n 112860-xxxx

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

### MECHANICAL

**Bore Diameter:** 12mm - 20mm, 1/2" - 1". Insulated inserts provided for bores under 1 inch  
**Mounting Configuration:** Hollow Bore, direct mount over shaft with multiple tether options  
**Bore Tolerance:**  
 1" bore:  $1.0005'' - 0.0000'' / +0.0010''$   
 < 1" bore: Nominal  $-0.000'' / +0.002''$   
**Shaft Speed:** 6000 RPM Maximum  
**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 25°C)  
**Bearings:** 61806-ZZ  
**Housing and Cover:** Aluminum  
**Shaft Material:** 6061-T6 Aluminum  
**Disc Material:** Mylar  
**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:** Up to 98% (non-condensing)  
**Enclosure Rating:** 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>	<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"/>	<input type="checkbox"/>

**Ordering Information**

<b>HSD38</b> Size 38 Heavy-duty, hollowshaft encoder	<b>0015</b>	Electrically isolated: <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" <b>T</b> 5/8" Stainless Steel Collar	<b>0</b> Single Ended, Unidirectional (A)	<b>0</b> 5-26V in, 5-26V Open Collector out (7273)	<b>0</b> 6 pin connector <b>1</b> 7 pin connector <b>2</b> 10 pin connector <b>3</b> 12 pin connector <b>4</b> 10 pin Bayonet con- nector <b>5</b> 6 pin + mating con- nector <b>6</b> 7 pin + mating con- nector <b>7</b> 10 pin + mating con- nector <b>8</b> 10 pin Bayonet + mating connector <b>9</b> 12 pin + mating connec- tor <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 <b>P</b> 1.5 ft (18") Cable with 10-pin Bulkhead Connector	<b>0</b> No Option <b>1</b> Internally Isolated 1" Bore <b>2</b> Reverse Phasing, No Bore Isola- tion <b>3</b> Internally Isolated 1" Bore, and Reverse Phasing	<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
	<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>		Available when Code 5 is 3 or 4 and Code 6 is 1, 2, 4, 6, 7, 8, 9, A, B, C, D, G, J, K, P, H, L: <b>3</b> Differential, Bidi- rectional ( AĀ BB̄ )	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)			
		Not electrically isolated: <b>G</b> 1" <b>H</b> 1" Stainless Steel Collar	Available when Code 5 is 3 or 4 and Code 6 is 2, 3, 4, 7, 8, 9, A, B, C, D, G, J, K, P, H, L: <b>4</b> Differential, Bidi- rectional with Index ( AĀ BB̄ Z̄Z̄ )				

**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 w/o Index Outputs
- 112123-XXXX** 6 Pin MS, Cable Assy. For Use with Differential Line Driver w/o Index Outputs
- 1400635XXXX** 10 Pin MS, Cable Assy. For Use with Differential Line Driver with Index Outputs
- 114448-XXXX** 10 Bayonet, 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 M23 Connector\***

- 115901-XXXX** 12 pin M23, Cable Assy. For Use with Differential Line Driver with Index Outputs, CW

**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** 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 (MCN-B1)
- 12 Pin CW M23 Connector (MCN-C1)

**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, 56 C-Face
- 114592-0001** Cover Kit, Fan Cover
- 114593-0001** Dual Cover Kit, 56 C-Face
- 114594-0001** Dual Cover Kit, Fan Cover

\*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 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. Models with direct cable exit carry the color coding as shown in the right hand column.

Encoder Function	Cable # 108594-XXXX 6 Pin Single Ended		Cable # 108595-XXXX 7 Pin Single Ended		Cable # 108596-XXXX 7 Pin Dif Line Driver With Out Index		**Cable # 1400635XXXX **Cable # 109209-XXXX 10 Pin Dif Line Driver with Index		Cable # 114448-XXXX 10 Pin Bayonet		Cable #115901-XXXX 12 Pin (CW)		Cable Exit with Seal
	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Wire Color
Sig. A	E	BRN	A	BRN	A	BRN	A	BRN	A	BRN	5	BRN	GRN
Sig. B	D	ORG	B	ORG	B	ORG	B	ORG	B	ORG	8	ORN	BLU
Sig. Z*	C	YEL	C	YEL	—	—	C	YEL	C	YEL	3	YEL	ORG
Power +V	B	RED	D	RED	D	RED	D	RED	D	RED	12	RED	RED
Com	A	BLK	F	BLK	F	BLK	F	BLK	F	BLK	10	BLK	BLK
Case	—	—	G	GRN	G	GRN	G	GRN	G	GRN	9	—	WHT
N/C-SLD	F	—	E	—	—	—	E	—	E	—	7	—	—
Sig. A	—	—	—	—	C	BRN/WHT	H	BRN/WHT	H	BRN/WHT	6	BRN/WHT	VIO
Sig. B	—	—	—	—	E	ORG/WHT	I	ORG/WHT	I	ORG/WHT	1	ORN/WHT	BRN
Sig. Z*	—	—	—	—	—	—	J	YEL/WHT	J	YEL/WHT	4	YEL/WHT	YEL

### 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.

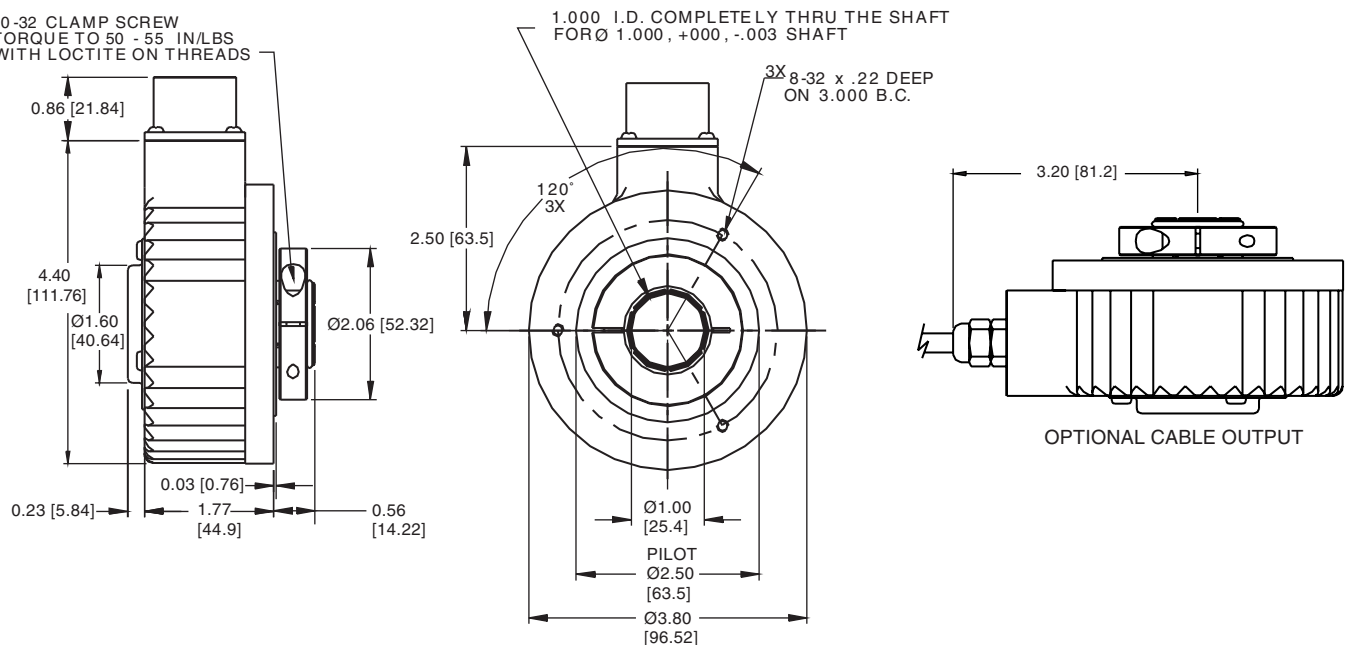
Encoder Function	Cable # 112859-XXXX 5 Pin Single Ended		Cable # 112860-XXXX 8 Pin Single Ended		Cable # 112860-XXXX 8 Pin Differential	
	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color
Sig. A	4	BLK	1	BRN	1	BRN
Sig. B	2	WHT	4	ORG	4	ORG
Sig. Z*	5	GRY	6	YEL	6	YEL
Power +V	1	BRN	2	RED	2	RED
Com	3	BLU	7	BLK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

### NOTES:

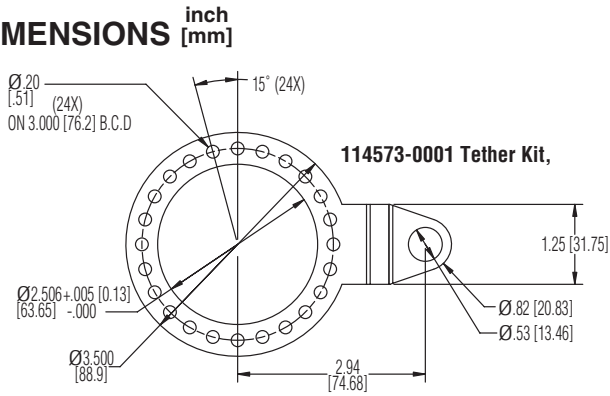
- 1) Cable Configuration (**Table 1**): PVC jacket, 105 °C rated, overall foil shield; 3 twisted pairs 24 AWG (output signals), plus 2 twisted pairs 22 AWG (input power)
- 2) Cable Configuration (**Table 2**): PVC jacket, 105°C rated, overall foil shield; 24 AWG conductors, minimum
- 3) Standard cable 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
- 4) \*Index not provided on all models. See ordering information.
- 5) \*\*For watertight applications, use NEMA4 10 pin cable & connector 1400635XXXX or 109209-XXXX.
- 6) "MS" Type mating connectors and pre-build cables are rated NEMA 12
- 7) "M12" Cable assemblies are rated IP67

## DIMENSIONS inch [mm]

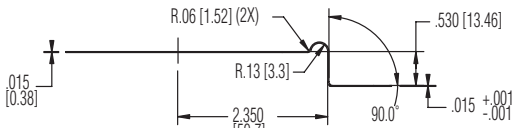
10-32 CLAMP SCREW  
TORQUE TO 50 - 55 IN/LBS  
WITH LOCTITE ON THREADS



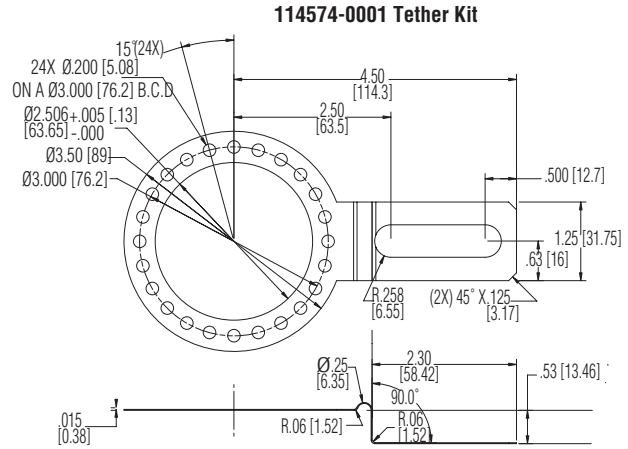
**DIMENSIONS** inch [mm]



**114573-0001 Tether Kit,**

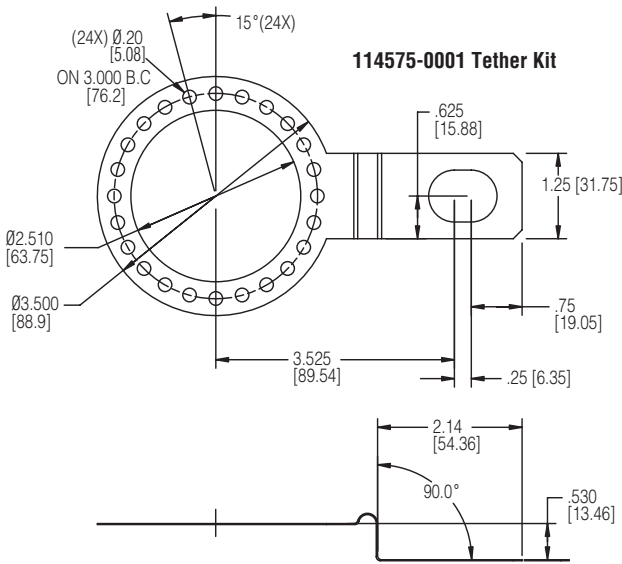


SINGLE POINT TETHERS  
SUPPLIED WITH ADAPTOR BUSHINGS  
FROM 0.25 TO 0.375

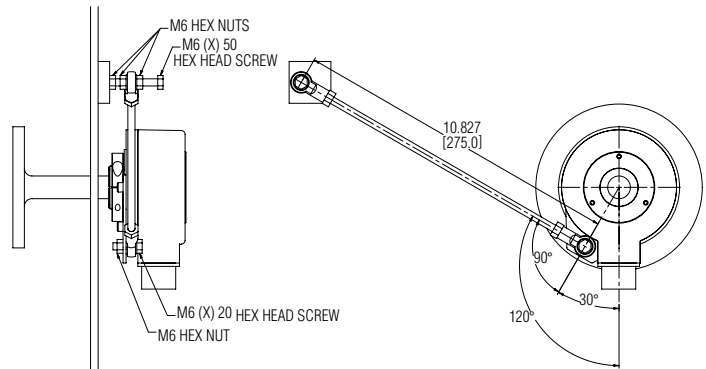


**114574-0001 Tether Kit**

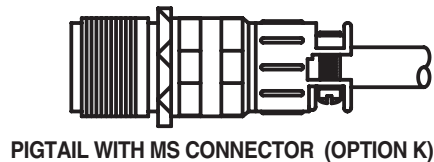
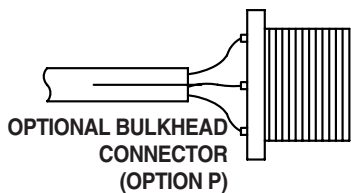
SLOTTED TETHER  
SUPPLIED WITH ADAPTOR BUSHINGS  
FROM 0.25 TO 0.375



**114575-0001 Tether Kit**



**Metric Swivel Rod Tether**



Worldwide Brands: NorthStar™ • Dynapar™ • Hengstler™ • Harowe™

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