

# 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

**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:** Aluminum

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

**Weight:** 26 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

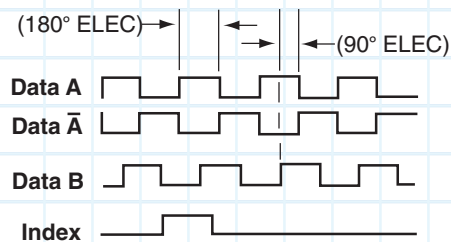
**Vibration:** 5 to 2000Hz @ 20 G's

**Humidity:** 100%

**Enclosure Rating:** IP67

### DATA AND INDEX

Not all complements shown  
A̅ shown for reference



Index Width: 150° to 330°

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:** 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 -0.000" / +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  $25^\circ\text{C}$ )

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

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>	<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"/>
<b>Ordering Information</b>							
<b>HSD38</b> Size 38 Heavy-duty, hollowshaft encoder	<b>0015</b>	<b>6</b> 12mm	<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>0</b> No Option	<b>0</b> Cast Aluminum Housing, Slotted Tether Included
	<b>0032</b>	<b>9</b> 15 mm	<b>1</b> single ended, bidirectional (AB)	<b>1</b> 5-30V in, 5-30V Push-Pull out	<b>1</b> 7 pin connector	<b>1</b> Internally Isolated 1" bore	<b>6</b> Cast Aluminum Housing, No Tether
	<b>0050</b>	<b>7</b> 1/2"	<b>2</b> single ended, bidirectional with index (ABZ)	<b>2</b> 5-26V in, 5-26V Push-Pull out	<b>2</b> 10 pin connector	<b>2</b> Reverse phasing, no bore isolation	<b>C</b> Cast Aluminum Housing, Single- Point Tether Included (NEMA 4-1/2" C-face)
	<b>0060</b>	<b>8</b> 5/8"	available when Code 5 is 3 or 4 and Code 6 is 1, 2, 4, 6, 7, 8, 9, A, G, J or K:	available when: Code 4 is 3 or 4	<b>3</b> 12 pin CW connector	<b>3</b> Internally Isolated 1" bore, and Reverse Phasing	<b>K</b> Cast Aluminum Housing, Single- Point Tether Included (NEMA 8-1/2" C-face)
	<b>0100</b>	<b>A</b> 16mm			<b>3</b> differential, bidirec- tional ( AA BB )		
	<b>0200</b>	<b>C</b> 3/4"	available when Code 5 is 3 or 4 and Code 6 is 2, 4, 7, 8, 9, A, G, J or K	<b>3</b> 5-26V in, 5-26V Differential Line Driver out (7272)	<b>4</b> 10 pin Bayonet con- nector plus mating connector	<b>E</b> Same as "C" with Cover Kit	<b>M</b> Swivel-Rod tether with metric hardware
	<b>0240</b>	<b>D</b> 20mm			<b>4</b> differential, bidirec- tional with index ( AA BB ZZ )		
	<b>0250</b>	<b>E</b> 7/8"	not electrically isolated:	<b>4</b> 5-26V in, 5V Differential Line Driver out (7272)	<b>6</b> 7 pin connector, plus mating connector	<b>H</b> 5 pin M12 connector	
	<b>0500</b>	<b>T</b> 5/8"			<b>G</b> 1"		
	<b>0512</b>	Stainless Steel Collar			<b>8</b> 10 pin CW connector, plus mating connector		
	<b>0600</b>				<b>9</b> 12 pin CW connector, plus mating connector		
	<b>1000</b>				<b>A</b> 18" (.5m) cable		
	<b>1024</b>				<b>B</b> 36" (1m) cable		
	<b>1200</b>				<b>C</b> 72" (2m) cable		
	<b>2000</b>				<b>D</b> 144" (4m) cable		
	<b>2048</b>				<b>G</b> 13" (.3m) cable		
	<b>3072</b>				<b>J</b> 8 pin M12 connector		
	<b>5000</b>				<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		
					available when: Code 5 is 0, 1 or 2		

**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** 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.

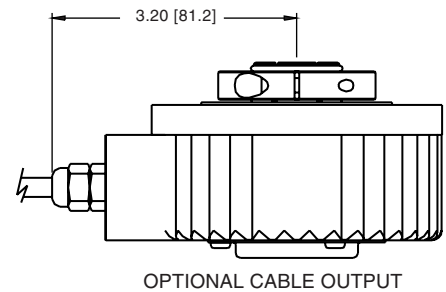
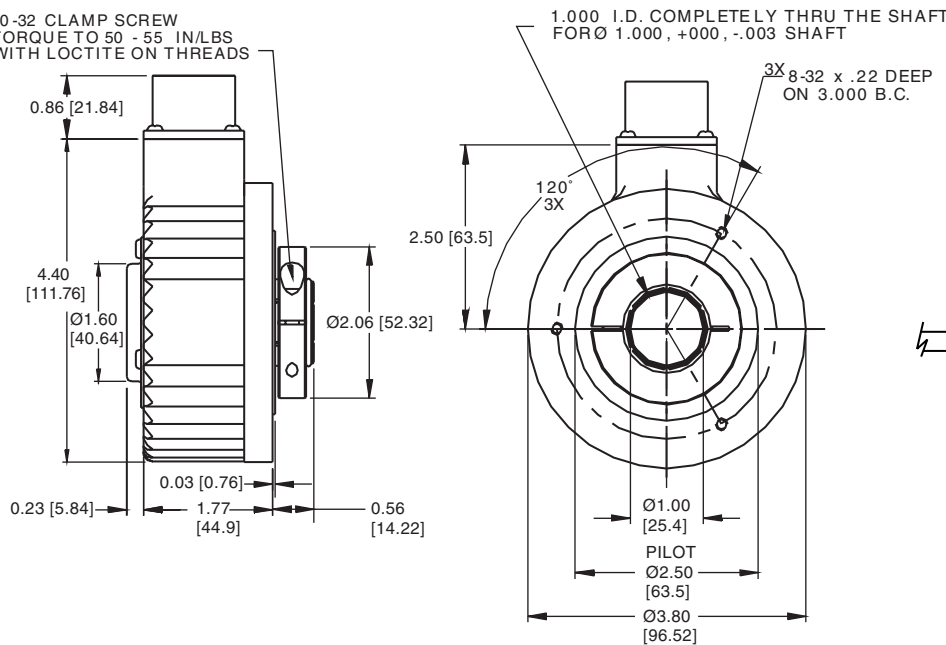
Encoder Function	Cable # 112859-5 Pin Single Ended		Cable # 112860-8 Pin Single Ended		Cable # 112860-8 Pin Differential	
	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color
Sig. A	4	BLK	1	BRN	1	BRN
Sig. B	2	WHT	4	ORG	4	ORG
*Sig. Z	5	GRY	6	YEL	6	YEL
Power +V	1	BRN	2	RED	2	RED
Com	3	BLU	7	BLK	7	BLK
Sig. A	—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

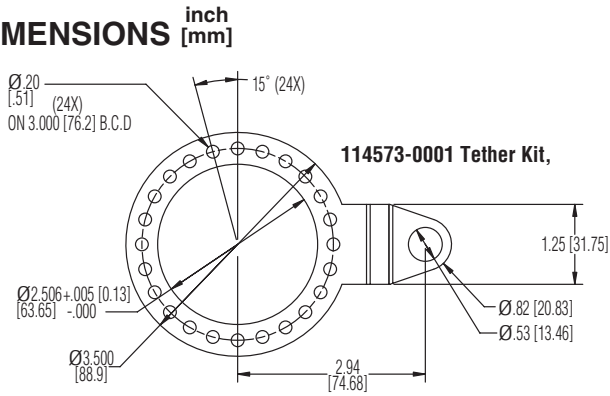
- \* Note: 1) Standard cable length is 10 feet but may be ordered in any length in 5 foot increment. For example, -0020 is a 20 foot cable.
- 2) "MS" type mating connectors and prebuilt cables are rated NEMA 12. "M12" Cable assemblies are rated IP67
- 3) For watertight applications, use NEMA4 10 pin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

## DIMENSIONS inch [mm]

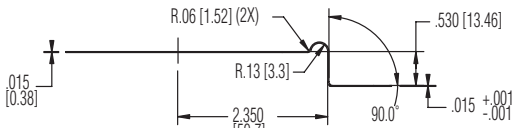
10-32 CLAMP SCREW  
TORQUE TO 50 - 55 IN/LBS  
WITH LOCTITE ON THREADS



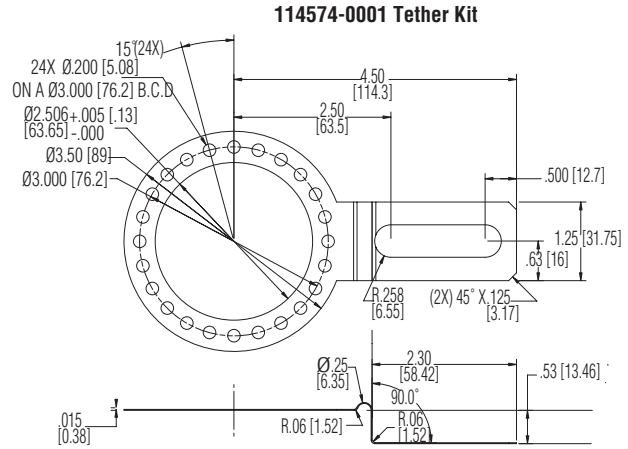
**DIMENSIONS** inch [mm]



**114573-0001 Tether Kit,**

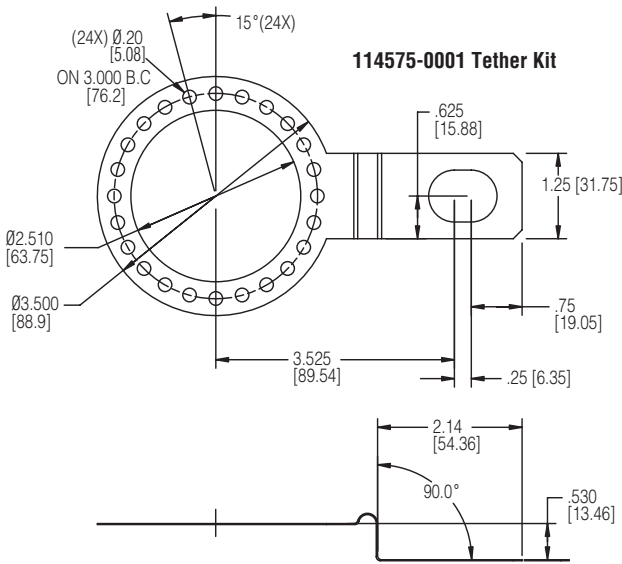


**SINGLE POINT TETHERS  
SUPPLIED WITH ADAPTOR BUSHINGS  
FROM 0.25 TO 0.375**

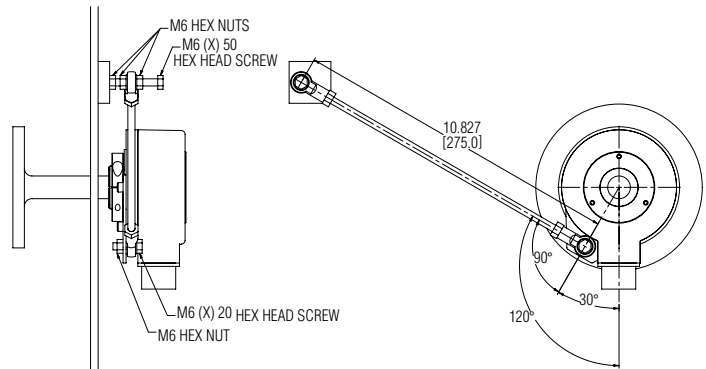


**114574-0001 Tether Kit**

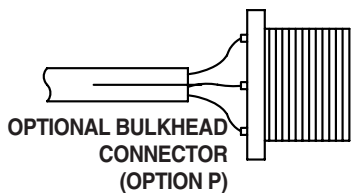
**SLOTTED TETHER  
SUPPLIED WITH ADAPTOR BUSHINGS  
FROM 0.25 TO 0.375**



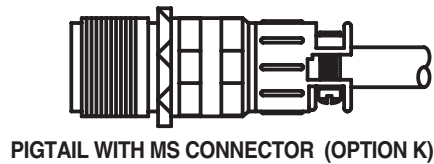
**114575-0001 Tether Kit**



**Metric Swivel Rod Tether**



**OPTIONAL BULKHEAD  
CONNECTOR  
(OPTION P)**



**PIGTAIL WITH MS CONNECTOR (OPTION K)**



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[WWW.DYNAPAR.COM](http://WWW.DYNAPAR.COM)

Headquarters: 1675 Delany Road • Gurnee, IL 60031-1282 • USA

**Customer Service:**  
Tel.: +1.800.873.8731  
Fax: +1.847.662.4150  
custserv@dynapar.com

**Technical Support**  
Tel.: +1.800.234.8731  
Fax: +1.847.662.4150  
northstar.techsupport@dynapar.com

**European Sales Representative**  
Hengstler GmbH  
Uhlandstrasse 49, 78554 Aldingen  
Germany  
[www.hengstler.com](http://www.hengstler.com)