NorthStar brand Encoder
Series HSD25 Harsh-Duty Optical Hub Shaft Encoder

Bulletin Number: 702636-0001
Revision Level: D
Date: August 29, 2007

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Technical Bulletin

DESCRIPTION

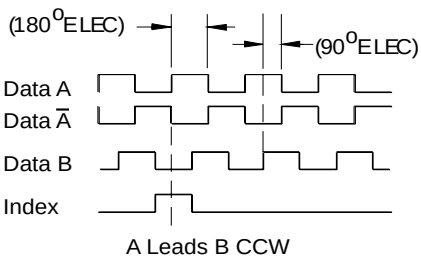
The HSD25 Harsh-Duty Optical Hub Shaft Encoder accepts up to 0.75" diameter shafts and operates reliably from –40 to +100°C. The Hard Anodized finish encoder exceeds IP66/IP67 and NEMA 6 enclosure requirements. It is available in Stainless Steel to meet NEMA 4x and 6P requirements and its sealed housing allows operation when washdown and high pressure steam or caustic chemicals are required. Innovative packaging techniques enable it to operate in high shock and vibration environments.

The HSD25 is available in an Intrinsically Safe version certified to ATEX EEx ia IIB T4 when used with the appropriate IS barrier.

STANDARD OPERATING CHARACTERISTICS

Code: Incremental
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: 90° ± 15° electrical
Symmetry: 180° ± 18° electrical
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.
$\overline{A}$ shown for reference



ELECTRICAL

Input Power: 5-26VDC. 50 mA max., not including output loads. ATEX: 5VDC, 7-26VDC
Outputs: 2N2222. ET7272, ET7273
Frequency Response: 125 kHz (data & index)
Termination: 6, 7, or 10 pin MS Connector; 18" (0.46m) 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)

MECHANICAL

Shaft Material: 303 stainless steel (passivated)
Bore Diameter: 3/8", 10mm, 1/2", 5/8", 3/4". Insulated inserts provided
Bore runout: 0.0005 TIR at midpoint
Starting torque: 2.5 in-oz. maximum (at 25°C)
Bearings: 61805-2RZ
Bearing life: 5 x 10^8 revs at rated shaft Loading, 5 x 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. Tether Available
Disc material: Metal or mylar
Weight: 20 ounces, typical

ENVIRONMENTAL

Operating Temperature: -40 to 100°C
Operating Temperature ATEX: -40 to 80°C
Storage temperature: -40 to 100°C
Shock: 50G's for 11msec duration
Vibration: 5 to 2000Hz @ 20 G's
Humidity: 100%
Enclosure Rating: NEMA 4X, NEMA 6, IP66, IP67 (NEMA 6P upon request)

IMPORTANT ENCODER INSTALLATION INFORMATION

Mounting the Encoder: The encoder should be mounted such that its shaft is in close as possible alignment with the axis of the driving machine or motor shaft.

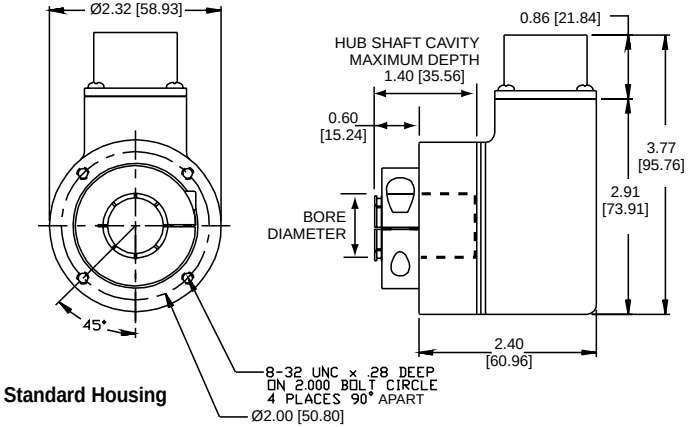
> ***CAUTION: The loads applied to the encoder shaft must be in accordance with the specificatios of this device.***

Important Wiring Instructions: Use of shielded cable is recommended for all encoder installations. The shield should be connected to signal-ground at the receiving device only. ***Connecting the shield at both ends can cause grounding problems that degrade system performance.***
If possible, run the encoder cable through a dedicated conduit (not shared with other wiring). Use of conduit will protect the cable from physical damage and provide a degree of electrical isolation. Do not run the cable in close proximity to other conductors that carry current to heavy loads such as motors, motor starters, contactors, solenoids, etc. This practice can induce electrical transients in the encoder cable, potentially interfering with reliable data transmission.

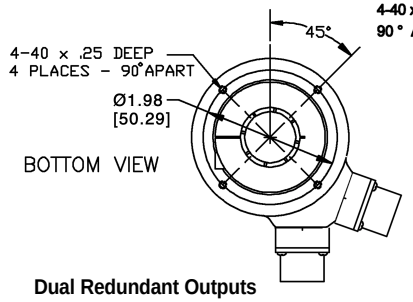
Refer to Electrical Connections table for wiring information. To avoid possible damage, do not connect or disconnect the encoder connector or wiring while power is applied to the system.

> ***CAUTION: Unused encoder signal wires must be individually insulated and under no circumstances be in contact with ground, voltage sources, or other signal lines.***

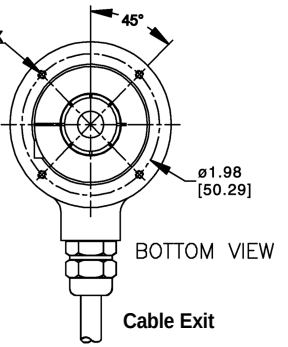
Dimensions
inches [mm]



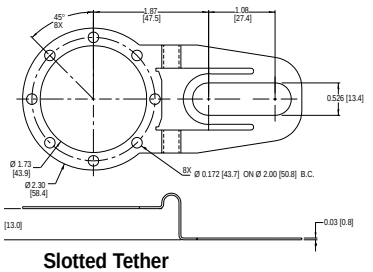
Standard Housing



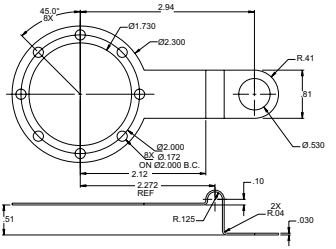
Dual Redundant Outputs



Cable Exit



Slotted Tether



Single Point Tether

Models Information

Code 1: Model	Code 2: PPR	Code3:Bore Size	Code 4: Format	Code5:Output	Code 6:Termination	Code 7: Safety	Code 8: Housing/Tether
HSD25 □□□□	□	□	□	□	□	□	□

Ordering Information

HSD23 Size 23 Harsh-Duty, Optical Hub Shaft Encoder	**0001** **0500** **0024** **0512** **0035** **0600** **0040** **0625** **0050** **0720** **0060** **1000** **0100** **1024** **0120** **1200** **0192** **1250** **0200** **1440** **0240** **2000** **0250** **2048** **0256** **2500** **0300** **2540** **0360** **3000** **3600**	**4** 3/8" **5** 10 mm **7** 1/2" **8** 5/8" **C** 3/4"	**0** single ended, undirectional (A) **1** single ended, bidirectional (AB) **2** single ended, bidirectional with index (ABZ) available when Code 5 is 3 or 4 and Code 8 is 0 to 3, or 6 to 8: **3** differential, bidirectional ($A\overline{A}$ $B\overline{B}$) available when Code 5 is 3 or 4 and Code 6 is 2, 3, 7, 8, A to G, J, and Code 8 is 0 to 3, or 6 to 8: **4** differential, bidirectional with index ($A\overline{A}$ $B\overline{B}$ $Z\overline{Z}$) **5** Dual isolated differential, bi-directional w/index ($A\overline{A}B\overline{B}Z\overline{Z}$)	**0** 5-26V in, 5-26V Open Collector out (7273) **2** 5-26V in, 5-26V Push-Pull out **F** 5-26V in, 5-26V Open Collector out (2222) **G** 5-26V in, 5-26V Open Collector out with 2.2 kΩ Pullups (2222) available when: Code 4 is 3, 4 or 5 **3** 5-26V in, 5-26V Differential Line Driver out (7272) **4** 5-26V in, 5V Differential Line Driver out (7272)	**0** 6 pin connector **1** 7 pin connector **2** 10 pin connector **3** 12 pin connector **5** 6 pin connector, plus mating connector **6** 7 pin connector, plus mating connector **7** 10 pin connector, plus mating connector **8** 12 pin connector, plus mating connector **A** 18"(.5m) cable **B** 36"(1m) cable **C** 72"(2m) cable **D** 10'(3m) cable **F** 13' (.3m) cable with 10 pin connector plus mating connector **G** 13'(.3m) cable **J** 8 Pin M12 Connector available when Code 5 is 0, 2 or F **H** 5 Pin M12 Connector	**0** No ATEX **1** ATEX Type 1* Option available when: Code 5 is 0, 2, 3, F or G **2** ATEX Type 2* Option available when: Code 5 is 4 **3** ATEX Type 3* Option	**0** Cast Alum Housing; slotted tether **1** Nickel Housing; slotted tether **2** Stainless Housing; slotted tether **3** Redundant Outputs (Dual Connector Housing); slotted tether **4** Nickel Housing; Redundant Outputs;slotted tether **5** Stainless Housing, Redundant Outputs; slotted-tether **C** Cast Alum Housing; single-point tether **D** Nickel Housing; single-point tether **E** Stainless Housing; single-point tether **F** Redundant Outputs (Dual Connector Housing); single-point tether **G** Nickel Housing; Redundant Outputs ; single-point tether **H** Stainless Housing, Redundant Outputs; single-point tether **6** Same as "0" but no tether** **7** Same as "1" but no tether** **8** Same as "2" but no tether** **9** Same as "3" but no tether** **A** Same as "4" but no tether** **B** Same as "5" but no tether**

**Note: Tether may be required for proper encoder operation and may be supplied by the customer or ogdered as the following accessories:

113317-0001 Single Point Tether Kit

113318-0001 Slotted Tether Kit

*Note: Available ATEX Certified Options

ATEX Type 1: ATEX Certified; 5V in, 5V out only

ATEX Type 2: ATEX Certified; 7-26V in, 7-26V out

ATEX Type 3: ATEX Certified; 7-26V in, 5V out

NOTE: When selecting ATEX models, ATEX voltages replace those shown in Code 5.

Wiring Information

6, 7 & 10 Pin MS Connectors and Cables

Connector & mate/accessory cable assembly pin numbers and wire color information is provided here for reference. HSD25 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 Drv wlo Idx		Cable # 1400635-10 Pin Dif Line Drv w/ Idx		Cable #108615-* 12 Pin CCW		Cable Exit with Seal
	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	5	BRN	GREEN
Sig. B	D	ORG	B	ORG	B	ORG	B	ORG	8	ORN	BLUE
Sig. Z	C	YEL	C	YEL	—	—	C	YEL	3	YEL	ORANGE
Power +V	B	RED	D	RED	D	RED	D	RED	12	RED	RED
Com	A	BLK	F	BLK	F	BLK	F	BLK	10	BLK	BLACK
Case	—	—	G	GRN	G	GRN	G	GRN	9	—	WHITE
N/C	F	—	E	—	—	—	E	—	7	—	—
Sig$\overline{A}$	—	—	—	—	C	BRN/WHT	H	BRN/WHT	6	BRN/WHT	VIOLET
Sig$\overline{B}$	—	—	—	—	E	ORG/WHT	I	ORG/WHT	1	ORN/WHT	BROWN
Sig$\overline{Z}$	—	—	—	—	—	—	J	YEL/WHT	4	YEL/WHT	YELLOW
0 Volt Sense	—	—	—	—	—	—	—	—	2	GRN	—
5 Volt Sense	—	—	—	—	—	—	—	—	11	BLK/WHT	—

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 # 112659-5 Pin Single Ended		Cable # 112660-8 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.$\overline{A}$	-	-	-	-	3	BRN/WHT
Sig.$\overline{B}$	-	-	-	-	5	ORG/WHT
*Sig.$\overline{Z}$	-	-	-	-	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

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