



**DYNAPAR**™  
INNOVATION - CUSTOMIZATION - DELIVERY

# ENCODERS & RESOLVERS



NorthStar™

ACURO®

Dynapar™

HENGSTLER®

Harowe™



**Innovation, Customization, Fast Delivery, and the most comprehensive encoder selection in the industry...Dynapar delivers the rotary feedback solutions customers are demanding.**

Dynapar is an ISO 9000 certified facility and has been manufacturing encoders in Gurnee Illinois since 1955. Today Dynapar offers the widest selection of the industry's most trusted brands in motion feedback control, including NorthStar heavy duty optical and harsh duty magneto resistive encoders, Acuro absolute encoders, Dynapar incremental encoders, Hengstler Euro-spec models, and Harowe resolvers. These brands serve the spectrum of heavy, industrial, servo, and light-duty applications.

Innovation is engrained into the fabric of our company. At Dynapar, we pride ourselves on being at the forefront of feedback technology, making advances to our products through a detailed understanding of the voice of our customers. Dynapar pioneered the first true vector-duty hollow-shaft encoder building on our strong presence in a number of industries including steel, paper, medical, material handling and industrial motor manufacturing.

Customization capability allows customers to meet the varied specifications of feedback application. Shafts, tethers, cables, connectors, and housings can be modified by local engineering teams, and quickly put into production to give our customers the right-fit product.

Fast Delivery is a customer requirement, and at Dynapar we take pride in operational excellence. All Dynapar and NorthStar encoders are built to order utilizing a Just-In-Time (JIT) manufacturing process, allowing for fast Delivery and 3 day lead times on most models.

**Depend on Dynapar.....Innovation—Customization—Delivery**



# NEW PRODUCTS

DYNAPAR 2010

M53

PAGE 3.26



**KEY FEATURES:**

- Redesigned circuitry for higher reliability
- Compact size for small motors
- Modular design w/integral gapping

HS35R

PAGE 2.44



**KEY FEATURES:**

- New Phased Array Technology
- High Resolution with unbreakable discs
- Wide sensor gap for high shock loading

HC20

PAGE 3.38



**KEY FEATURES:**

- Phased array technology
- Wide 0 to 120°C operating temperature
- Cost-effective high performance

HS60

PAGE 1.60



**KEY FEATURES:**

- Improved Seals
- Large 2-7/8" bore capability
- Anodized endbells for shaft isolation
- Stainless clamping shaft hub

AD34

PAGE 3.04



**KEY FEATURES:**

- Up to 17 bit absolute positioning
- 10,000 RPM capability for servo feedback
- Special shaft for easy one-step mounting
- Available with hubshaft (AD35)

AR62

PAGE 1.64



**KEY FEATURES:**

- Magnetic Technology
- 12 bit true absolute positioning
- Oversized bearings for high shaft loads
- Submersible

HSD44

PAGE 1.26



**KEY FEATURES:**

- O-ring housing with pilot seals against motor for the ultimate in protection
- Isolated coupling compensates for motor shaft runout and endplay
- Perfect for off-highway vehicle applications with high shock and vibration
- Unbreakable code disc

NORTHSTAR HD OPTICAL SECTION 1



**KEY FEATURES:**

- Unbreakable discs
- High temperature capability
- Phased Array Sensor Technology
- Intrinsic Safety on select models



Refer to page number A.12 for Selection Guide providing encoder choice by application and operating characteristics.

## Section A. Encoder Introduction

Dynapar & NorthStar	New Products	A.01
Catalog	Table of Contents	A.02
Reference	Encoder Technology Overview	A.04
Reference	Encoder Mounting Configurations	A.08
Reference	Encoder Duty Classification	A.10
Encoder	Selection Guide	A.12

## Section 1. Heavy Duty Encoders

Heavy Duty Encoder	Introduction	1.00
Heavy Duty Encoder	Selection Guide	1.02
HD20	NorthStar brand, Harsh Duty Optical Encoder	1.04
HD25	NorthStar brand, Harsh Duty Optical Encoder	1.06
HSD25	NorthStar brand, Harsh Duty Optical Encoder	1.08
HSD35	NorthStar brand, Heavy Duty Optical Encoder	1.12
HSD37	NorthStar brand, Harsh Duty Optical Encoder	1.16
HSD38	NorthStar brand, Harsh Duty Optical Encoder	1.20
DWD38	NorthStar brand, Harsh Duty Optical Encoder	1.24
HSD44	NorthStar brand, Extreme Heavy Duty Encoder	1.26
EN42	NorthStar brand, Zone 1 Heavy Duty Encoder	1.28
EN44	NorthStar brand, Extreme Heavy Duty Encoder	1.30
H56	Dynapar brand, Heavy Duty Encoder	1.32
X25	Dynapar brand, For Hazardous Location Application	1.34
60 Rotopulser®	Dynapar brand, Heavy Duty Rotopulser®	1.36
60P Rotopulser®	Dynapar brand, Heavy Duty Rotopulser®	1.38
R45 Rotopulser®	Dynapar brand, Bearingless Ring Kit	1.40
SLIM Tach® SL56	NorthStar brand, Bearingless Encoder	1.42
SLIM Tach® RL67	NorthStar brand, Bearingless Encoder	1.44
SLIM Tach® SL85	NorthStar brand, Bearingless Encoder	1.46
SLIM Tach® SL1250	NorthStar brand, Bearingless Encoder	1.50
RIM Tach® 8500	NorthStar brand, Bearingless Encoder	1.52
RIM Tach® 1250	NorthStar brand, Bearingless Encoder	1.54
RIM Tach® 6200	NorthStar brand, Severe Duty Encoder	1.56
SLIM Tach® HS56	NorthStar brand, Hollow Shaft Encoder	1.58
SLIM Tach® HS60	NorthStar brand, Hollow Shaft Encoder	1.60
RIM Tach® HS85	NorthStar brand, Hollow Shaft Encoder	1.62
AR62/AR63	ACURO brand, Magnetic Absolute Encoder	1.64
AX70/AX71	ACURO brand, Magnetic Absolute Encoder	1.66
R25	Harowe brand, Heavy Duty Resolver	1.70

## Section 2. Industrial Duty Encoders

Industrial Duty Encoder	Introduction	2.00
Industrial Duty Encoder	Selection Guide	2.02
22	Dynapar brand, "QUBE" Encoder	2.04
H20	Dynapar brand, Shafted Encoder	2.08
HA25	Dynapar brand, Shafted Encoder	2.12
HR25	Dynapar brand, Shafted Encoder	2.16
HC25	Dynapar brand, Shafted Encoder	2.20
H58	Dynapar brand, Shafted Encoder	2.24
H42	Dynapar brand, Shafted Encoder	2.28
HA725	Dynapar brand, Shafted Encoder	2.30
H20 Hubshaft	Dynapar brand, Shafted Encoder (Hubshaft)	2.32
HS20	Dynapar brand, Sealed Hollowshaft Encoder	2.36
HS35	Dynapar brand, Sealed Hollowshaft Encoder	2.40
HS35R	Dynapar brand, Sealed Hollowshaft Encoder	2.44
RI80E	Hengstler brand, Hollowshaft Encoder	2.48
HA26	Dynapar brand, Integral Coupling Encoder	2.50
HR26	Dynapar brand, Integral Coupling Encoder	2.54
HC26	Dynapar brand, Integral Coupling Encoder	2.58
AC36	ACURO brand, Absolute Encoder	2.62
AI25 DeviceNet	ACURO brand, Absolute Encoder	2.64
AI25 CAN Open	ACURO brand, Absolute Encoder	2.66
AI25 CAN Layer 2	ACURO brand, Absolute Encoder	2.68
AI25 Profibus	ACURO brand, Absolute Encoder	2.70
AI25 Interbus	ACURO brand, Absolute Encoder	2.72
AI25 BISS	ACURO brand, Absolute Encoder	2.74
AI25 SSI	ACURO brand, Absolute Encoder	2.76
AI25 Parallel	ACURO brand, Absolute Encoder	2.80
AC110	ACURO brand, Absolute Encoder	2.84



Refer to page number A.12 for Selection Guide providing encoder choice by application and operating characteristics.

**Section 3. Servo Duty Encoders**

Servo Duty Encoder	Introduction	3.00
Servo Duty Encoder	Selection Guide	3.02
AD34	ACURO brand, Single Turn Absolute Encoder	3.04
AD35	ACURO brand, Single Turn Absolute Encoder	3.06
AD36	ACURO brand, Single- / Multi- Turn Absolute Encoder	3.08
AD25	ACURO brand, Single- / Multi- Turn Absolute Encoder	3.10
M602 & M832	Dynapar brand, Kit Encoder	3.12
LM & LAM	Dynapar brand, Kit Encoder	3.15
E9	Dynapar brand, Miniature Encoder	3.18
M9	Dynapar brand, Miniature Encoder	3.20
M14	Dynapar brand, Miniature Encoder	3.22
M15	Dynapar brand, For Stepper & Small Servo Motors	3.24
M53	Dynapar brand, For Stepper & Small Servo Motors	3.26
F10	Dynapar brand, For Stepper & Small Servo Motors	3.28
F14	Dynapar brand, For Stepper & Small Servo Motors	3.30
F15	Dynapar brand, For Stepper & Small Servo Motors	3.32
F18	Dynapar brand, For Stepper & Small Servo Motors	3.34
F21	Dynapar brand, For Stepper & Small Servo Motors	3.36
HC20	Dynapar brand, For Stepper & Small Servo Motors	3.38
11 / R11	Harowe brand, Heavy Duty Brushless Resolvers	3.40
Frameless Resolvers	Harowe brand, Heavy Duty Brushless Resolvers	3.41
HaroMax Series 15	Harowe brand, Heavy Duty Brushless Resolvers	3.42
HaroMax Series 21	Harowe brand, Heavy Duty Brushless Resolvers	3.43

**Section 4. Light Duty Encoders**

Light Duty Encoder	Introduction	4.00
Light Duty Encoder	Selection Guide	4.01
E12	Dynapar brand, Miniature Encoder	4.02
E14	Dynapar brand, Miniature Encoder	4.04
E23	Dynapar brand, Miniature Encoder	4.06
EC23	Dynapar brand, Miniature Encoder	4.08
E14H	Dynapar brand, Hubshaft Miniature Encoder	4.10
E14IC	Dynapar brand, Integral Coupling Miniature Encoder	4.12

**Section 4. Encoder Accessories**

Replacement Wheels	NorthStar brand, Wheel Selection	5.00
Sensor Modules	NorthStar brand, Sensor Module Selection	5.01
Connectors & Cables	Cable Assemblies, Mating Connectors, Bulk Cable, Patch Cords	5.02
CPL	Dynapar brand, CPL Seies Couplings	5.03
FV2	Dynapar brand, Brushless Digital Feedback	5.05
FV3	Dynapar brand, Frequency to Voltage Converter	5.06
Mounting Brackets	Dynapar brand, "L" Mounting Bracket	5.07
Pivot Mount	Dynapar brand, Pivot Mounting Bracket	5.08
Universal Mount	Dynapar brand, Universal Mounting Bracket	5.09
Qube Pivot Mount	Dynapar brand, Pivot Mounting Bracket for Qube Encoder	5.10
C-Face Adapter	Dynapar brand, C-Face Adapter	5.11
5PY Adapter	Dynapar brand, 5PY Adapter for 2-1/2" Encoders	5.12
5PY Adapter	Dynapar brand, 5PY Adapter for X25 Encoders	5.13
RIM M100 Tester	NorthStar brand, RIM M100 Encoder Tester and Accessories	5.14
RIM SS2 Splitter	NorthStar brand, RIM SS2 Signal Splitter	5.15
RIM SSW Switcher	NorthStar brand, RIM SSW Signal Switcher	5.16



# TECHNOLOGY OVERVIEW

## DYNAPAR 2010

There are three main types of feedback devices: absolute, incremental, and resolver.

**Absolute encoders** are typically used in CNC, medical, and robot applications where high resolution is required and absolute feedback reduces power up sequences.

**Incremental encoders** can be used in positioning and motor speed feedback applications. These would specifically be cut-to-length, crane or hoist, and heavy vehicle applications.

**Resolvers** are used in applications that are environmentally demanding. This means extreme temperatures, shock, and vibration. These applications can be aerospace, military, heavy vehicle and radio active.

It is also important to note the distinction between resolution and accuracy. The illustration in Figure 1 shows that although there is the same number of transitions in a rotation, they can clearly be in the incorrect real position if the feedback device has poor accuracy. The application engineer must pay very close attention to the accuracy of high resolution devices; it can be misleading.

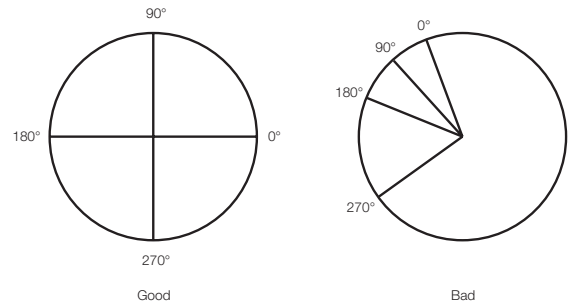


Figure 1: Accuracy

### ABSOLUTE ENCODER OVERVIEW



Absolute rotary encoders are devices that transmit a numerical representation of the angular position of a shaft. This number is coded in binary or Gray code. Each digit in binary or Gray code is referred to as a bit. Each digit also represents an exponent of two starting with zero from the left. Therefore, the third digit from the left would be 2<sup>2</sup>. The amount of bits an encoder has is equivalent to the resolution of the encoder. For example, a 22 bit encoder has a resolution of approximately four million counts per revolution or 2<sup>22</sup> counts. Transmission of high resolution values such as this can take place through several interfaces such as BiSS, SSI, Profibus, DeviceNet, etc.

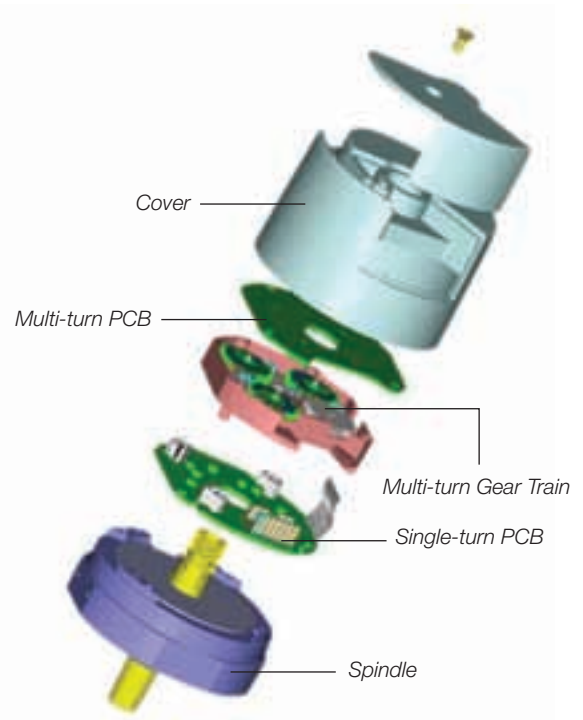


Figure 2: SSI/BiSS Encoder Assembly

Absolute encoders are made of these primary components.



The cover insures that the encoder is protected from the outside elements of the application. This could be washdown for the food industry, stainless for marine applications, or heavy duty for volatile environments.

The Multi turn PCB and gear train keeps an accurate count of the amount times the shaft has made a full rotation. On the PCB, there are three opto asics cascaded and transmitting position down the line using the BiSS protocol. Each opto asic is reading a transparent gear that is coded with an absolute position. The last ASIC transmits a complete 12 bit turn count to the single turn PCB. It is important to note that this is done without the use of a battery, so the count will be valid for the life of the encoder.

The single turn PCB has a single opto asic reading from a disk that is coded similar to the gears above it. The exception is that the disk has more tracks plus an incremental sinusoidal track that is used for a secondary output or for interpolating up to 22 bits.

The spindle primarily contains the bearing, flange, and shaft that meet the mechanical demands of the application. The spindle guarantees that the encoder will stand up to the specified shock and vibration, but proper assembly also insures that the encoder meets the specified accuracy.

Absolute encoders are typically used in CNC, medical, and robot applications where high resolution is required and absolute feedback reduces power up sequences.

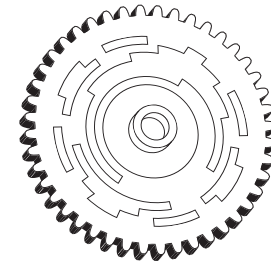


Figure 3: Coded Gear

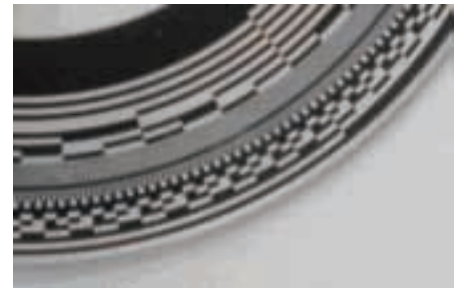


Figure 4: Absolute Disk Section

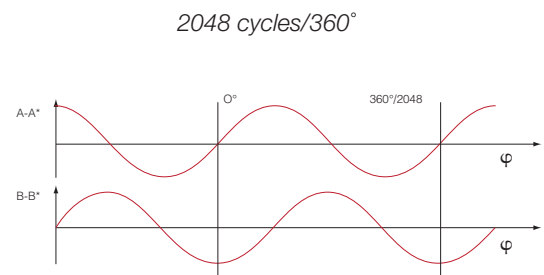


Figure 5: Incremental Sinusoidal Output



**INCREMENTAL ENCODER OVERVIEW**



Incremental encoders provide a specified amount of pulses in one rotation of the encoder. The output can be a single line of pulses (an “A” channel) or two lines of pulses (an “A” and “B” channel) that are offset in order to determine rotation. This phasing between the two signals is called quadrature.

The typical assembly of incremental encoders is reduced to a spindle assembly, PCB, and cover. Each component bears a similar purpose as the in the absolute encoders with the exception that the PCB contains a sensor array that creates just two primary signals for the purpose of position and speed.

Optionally, additional signals can be provided:

An index or ‘Z’ channel can be provided as one pulse per revolution signal for homing and pulse count verification on the A and/or B channels. This index can be gated to either A or B in their various states. It can also be un-gated and vary in width.

Commutation (U,V,W) channels can also be provided on some encoders. These signals are aligned to the commutation windings found on servo motors. They also ensure that the drive or amplifier for those motors apply current to each winding in the correct sequence and at the correct level.

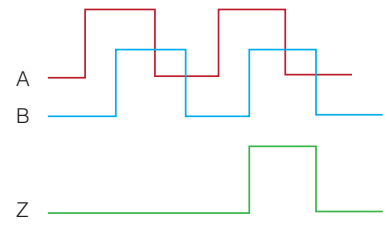


Figure 6: Incremental Encoder Signal

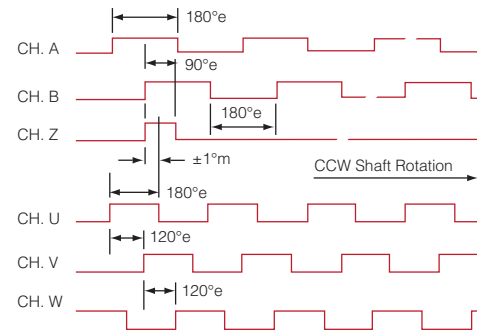


Figure 7: Commutation Channels

**RESOLVER OVERVIEW**



A resolver functions as an electro-mechanical position transducer which is essentially a variable-coupling or rotary transformer.

Like all transformers, the resolver requires an AC carrier or reference signal (input excitation) to be applied to the primary winding, contained in the rotor. The resulting changing magnetic field in the primary winding induces a voltage in the secondary stator windings.

The secondary of the resolver stator consists of two sets of windings that are at right angles to each other.

The magnitude of the magnetic coupling between the primary and the secondary varies according to the position of the rotating element (rotor) which then varies the amplitude of the output voltage. The amplitude of the reference or input signal is modulated by the sine and the cosine of the rotor angle to produce the sine and cosine output signals on the two secondary windings as shown in Figure 7.

Typically, there is one sine and one cosine wave per mechanical revolution which provides absolute position. A multi-speed resolver creates multiple sine and cosine waves throughout a revolution, which increases accuracy but at the expense of absolute position.



Figure 7: Resolver Signal





**ENCODER ENGINES**



The engine in encoders is the internal technology used to provide the signal required by the customer. Engine in its more familiar use would be gas, hybrid, or electric. Engines in encoder technology would typically be optical with a mask, optical phased array, and magnetic.

Traditional optical absolute and incremental encoders have four main components: LED, disk, mask, and sensor. The disk will have as many tracks as signals (A, B, Z, etc.), and the mask will have windows for each track. The windows on the mask will also have a size proportionate to the window size on the disk. In manufacturing, the mask is fastened directly to the sensor. This allows for one sensor to be used with several resolution options.

Phased array technology essentially averages several signals to increase signal stability. Users can easily install these modules without the need of precision fixtures and align disks without the use of microscopes. Figure 8 shows the cross sectional side view of the disk, and how the components are used to provide a proper signal.

This technology provides stable output during heavy shock and vibration, and opens up its use to oil rig, heavy vehicle, and military applications.

Magnetic encoders consist of a magnetized wheel, magneto resistive sensors, and a signal conditioning electrical circuit. The wheel is magnetized mainly with 480, 512, and 600 pole pairs. The amount of sensors and the signal conditioning circuit logic combine to multiply or divide the number of pole pairs to result in several different resolution options using only the three different wheels.

In absolute magnetic technology, there is a single pole pair rotating above a sensing element. The resolution is dependant upon the ability of the sensing element or ASIC (application specific integrated circuit)

In both absolute and incremental magnetic encoders, the engine allows for use in applications that are equal to or more demanding than the phased array engine capabilities.

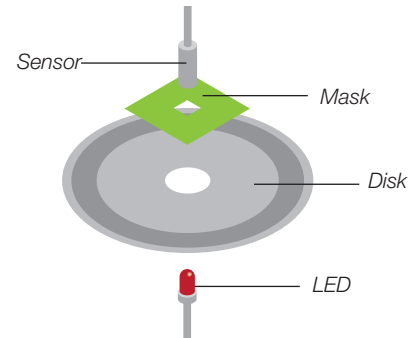


Figure 8: Traditional Optical Encoder Engine

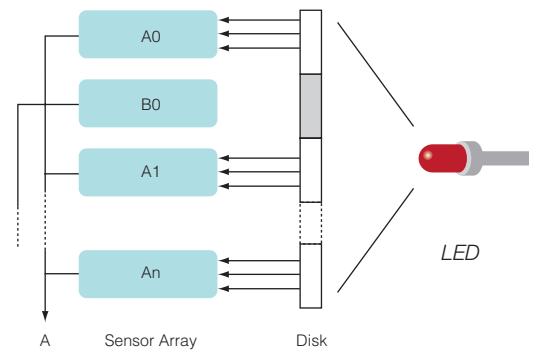


Figure 9: Phased Array Technology

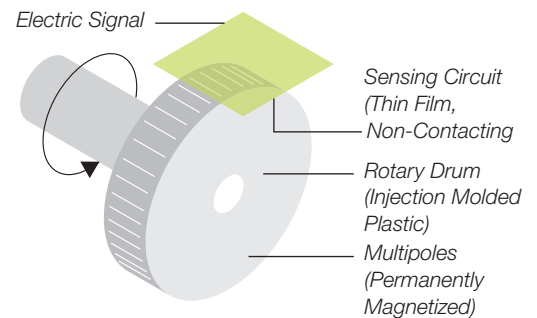


Figure 10: Incremental Magnetic Technology

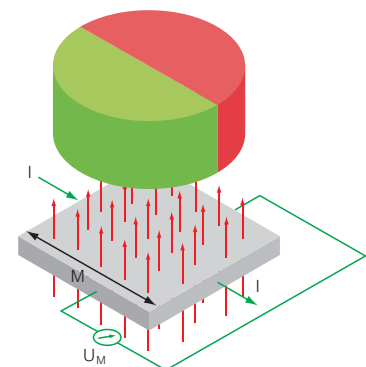


Figure 11: Absolute Magnetic Technology



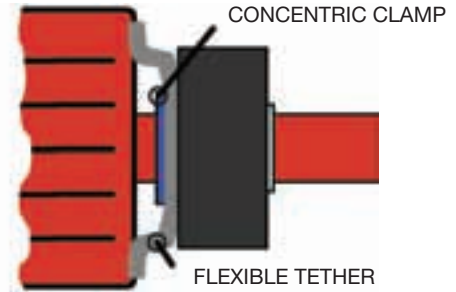
Encoders are applied to measure speed and position in a wide variety of applications and are therefore available with numerous mounting styles. The mounting style should be selected carefully to best fit the application at hand.

## HOLLOW-SHAFT

The motor or machine shaft extends through the hollow encoder shaft and is affixed by a concentric clamp. A flexible tether or torque arm attaches to the motor or machine surface to prevent the encoder body from rotating with the shaft.

**NOTE:** Eliminates the need for a coupling, and allows the encoder to be moved to the correct position for tethering without shaft modifications.

**Product Examples:** HS35 (page 2.40), HS20 (page 2.36), AC110 (2.84)

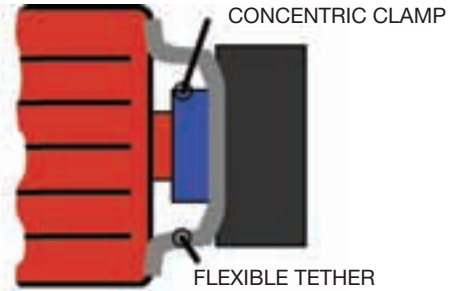


## HUB-SHAFT

A hub shaft encoder is similar to the hollow-shaft configuration, except the shaft does not extend through the encoder.

**NOTE:** Eliminates the need for a coupling, but may require a more precise shaft length to properly locate the encoder for tethering. This type provides improved sealing, as there is no opening on the back of the encoder.

**Product Examples:** AI25 (2.64 - 2.80), HSD25 (page 1.08), E14 (page 4.04)

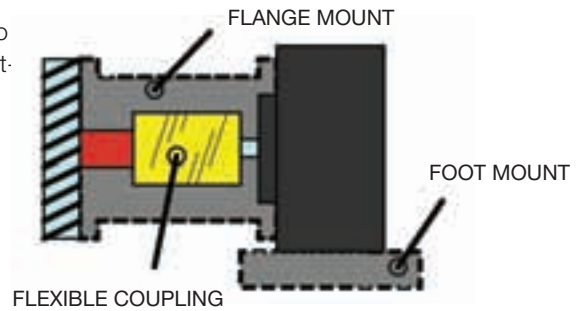


## SHAFTED WITH COUPLING

The original encoder configuration, a shafted encoder requires two special interfaces to properly mount the unit. The first is an encoder mount, which is typically either a mounting flange or a foot mount. The second is a flexible coupling, which compensates for shaft misalignment while providing little or no backlash.

**NOTE:** This solution is typically used when a hollow or hub-shafted solution cannot work. It requires care in aligning the encoder and driven shafts.

**Product Examples:** E14IC (page 4.12), HR26 (page 2.54)



## SHAFTED WITH BELT

A shafted encoder can be interfaced to a driven shaft by a belt. This is often done when the driven shaft is too large for coupling, or the application is space constrained and the encoder must be located to the side.

**NOTE:** The additional mechanical hardware adds cost and complexity to the system

**Product Examples:** H56 (page 1.32), RIM6200 (page 1.56)



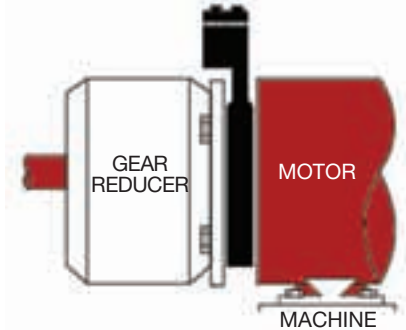


## C-FACE

NEMA motor come with standard interface dimensions on the face for mounting an aligning accessories. Common face mount dimensions are 4.5", 8.5", and 12.5". C-face encoders mount the housing to the motor face, and mount a wheel to the motor shaft separately. These are bearing-less.

**NOTE:** Bearing-less solution eliminates a wear component.

**Product Examples:** SL56 (page 1.42), SL85 (page 1.46)

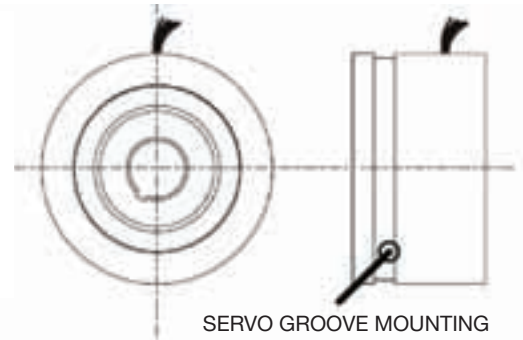


## FRAMELESS RESOLVER

Designed for standard resolver motor mounts, the resolver rotor mounts to the shaft, and the resolver housing mounts to the motor face. A clip secures the resolver housing via a groove, as shown.

**NOTE:** A frameless resolver mount is a bearing-less solution that makes a rugged resolver technology even more rugged.

**Product Examples:** HAROMAX 15 (page 3.42), HAROMAX 21 (page 3.43)

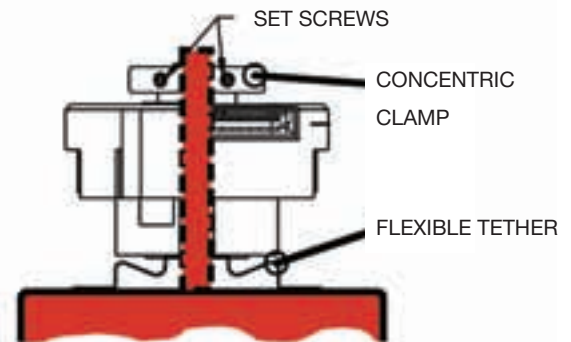


## SERVO FLEX-MOUNT

This style of encoder mount is designed as a drop-in replacement for frameless resolvers. The encoder quickly clips into place. Flex mount designs include the ability to make fine adjustments to align for motor commutation.

**NOTE:** The rigid encoder design incorporates bearings, which allows it to be used on motors that have higher shaft axial play and radial run-out.

**Product Examples:** F14 (page 3.30), F18 (page 3.34)

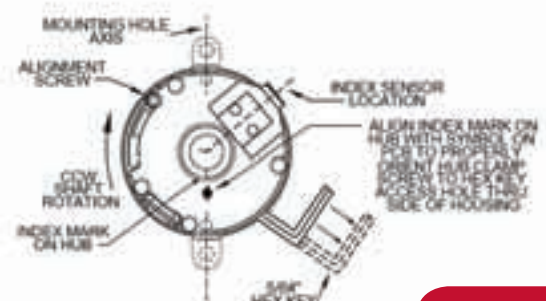


## SERVO KIT

The encoder is a modular assembly, eliminating the bearings, similar to the frameless resolver. The encoder housing affixes to the face of the motor, and the encoder disk is fastened to the motor shaft.

**NOTE:** Ideal for motors with tight tolerance on axial and radial shaft run-out. Bearing-less design eliminates a wear component.

**Product Examples:** M53 (page 3.26), M15 (page 3.24), ET Module (page 3.12)



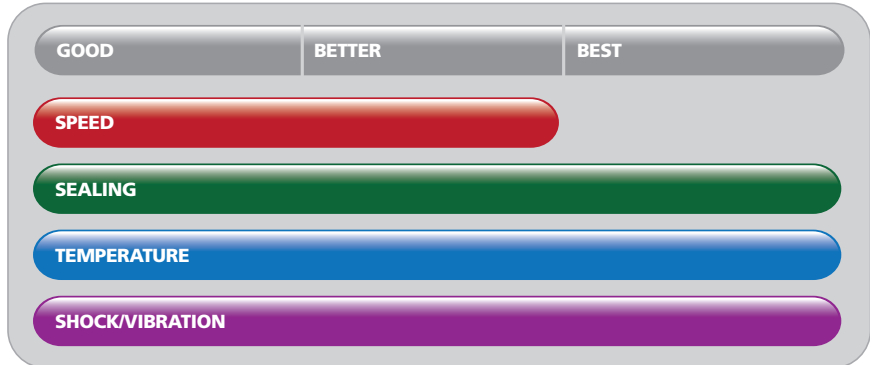


## ENCODER/RESOLVER DUTY CLASSIFICATION

### HEAVY DUTY

Heavy Duty encoders and resolvers are designed to survive some of the toughest environments. Paper and steel mills, aerospace applications, and food and beverage processing machinery are all areas that benefit from heavy duty encoders. Using magnetic, inductive, or specially designed optical technology, their tight sealing, heavy-duty bearings (where applicable), and high temperature range all suit them for use in harsh environments.

HEAVY DUTY GENERAL PERFORMANCE DATA

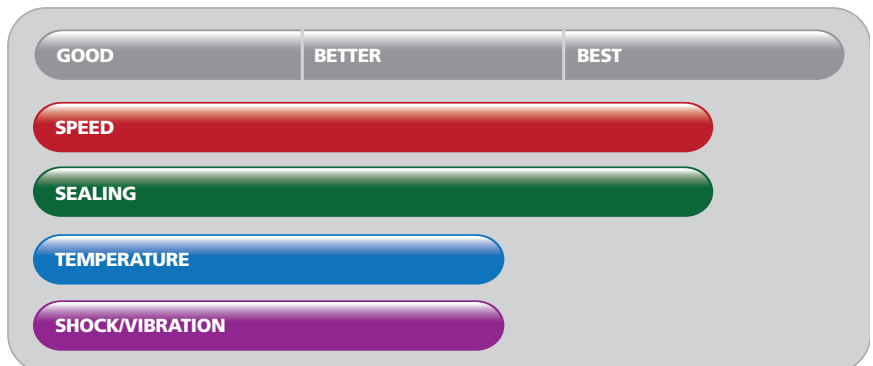


RIMTach 8500 Pictured.

### INDUSTRIAL DUTY

Often considered the “workhorse” of the encoder world, industrial duty encoders achieve a good compromise between ruggedness and performance. These encoders are typically used in factory environments where contaminants like dust and moisture are common. The hollow-shaft variety of industrial duty encoders is often the preferred choice of vector motor OEM’s for speed feedback.

INDUSTRIAL DUTY GENERAL PERFORMANCE DATA



HA25 Pictured.

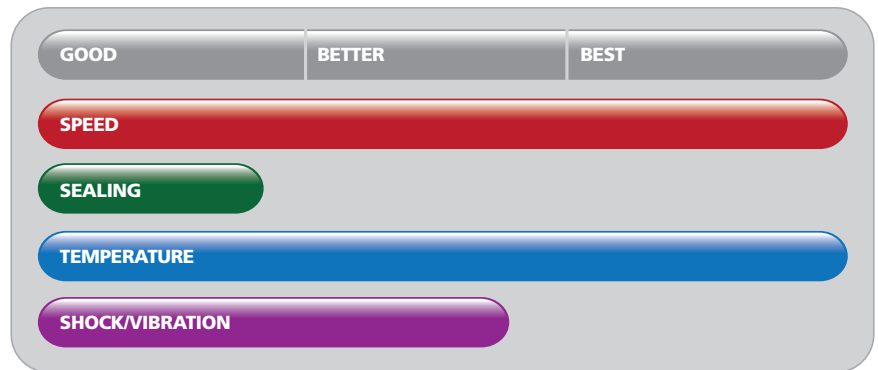


## SERVO DUTY

This class of encoders and resolvers is specifically suited to use on small-to mid-size stepper and servo motors. They typically have limited sealing due to their use inside motor housings, but are capable of very high speeds and high temperatures, a benefit due to being in such close proximity to motor windings. These encoders typically come from the factory ready to mount to common motor back shafts.



SERVO DUTY GENERAL PERFORMANCE DATA



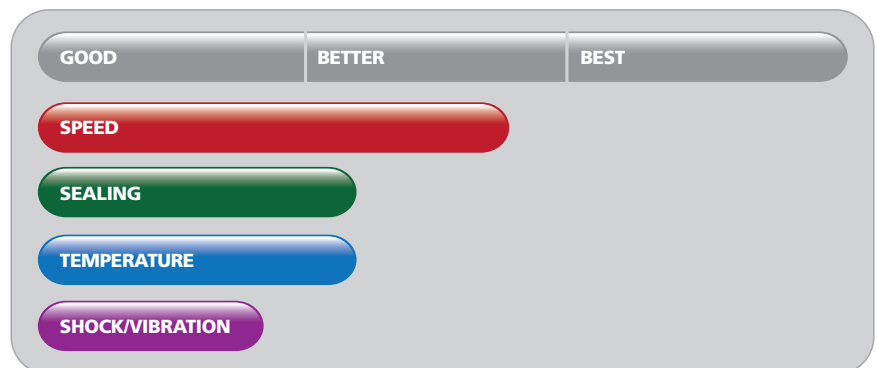
AD35 Pictured.

## LIGHT DUTY

Light duty encoders are commonly referred to as “commercial duty” due to their frequent use in commercial or office automation products. Copiers, fax machines, lab equipment, and medical equipment are common applications for light duty encoders. Typically these devices reside in fairly benign environments with little temperature variation, are fairly clean, and not generally subjected to high shock loading or moisture.



LIGHT DUTY GENERAL PERFORMANCE DATA



E14 Pictured.



# DYNAPAR™ SELECTION GUIDE

			Page			
<b>Incremental</b>	<b>Shafted</b>	<b>Light Duty</b>	E12	Ultra-compact 1.2" Diameter - 5, 12, or 15VDC - Metal housing	4.02	
			E14	1.44" Diameter - 5, 12, or 15VDC - Metal Housing - Line driver outputs.	4.04	
			E23	2.31" Diameter - 5-26VDC - Terminal Strip connections	4.06	
			EC23	2.31" Diameter - 5-26VDC - Up to 5000PPR	4.08	
		<b>Industrial Duty</b>	22 Qube Series	2.25" Anodized Qube - Dual shaft option - 5-26VDC	2.04	
			H20	Industry Standard 2.0" size - Multiple output options - Metal disc option	2.08	
			HA25	Industry Standard 2.5" size - Multiple housing options - Wide range of resolutions	2.12	
			HR25	Same as HA25 with metal disc	2.16	
			HC25	Same as HA25 up to 5000PPR	2.20	
			H58	Industry standard 58mm metric - 5-26VDC - Wide selection of options	2.24	
	H42		Economical 2.5" design - Unbreakable disc - 5-26VDC	2.28		
	<b>Heavy Duty</b>	HA725	Industry Standard 2.5" size - Up to 10,000PPR direct-read - 5V or 10-30VDC	2.30		
		HD 20	2.0" square flange mounting - IP67 seals - up to 3600 PPR - Phased Array sensor	1.04		
		HD25	2.5" square flange mounting - Dual output option - up to 5000 PPR - ATEX option	1.06		
		H56	Foot- or face-mount - 5/8" shaft - M/S or Field serviceable connectors	1.32		
	<b>Hubshaft</b>	<b>Light Duty</b>	RIMTach 6200	Foot or face mount - 5/8" single or dual shaft - Magneto-resistive technology - Removable sensor modules	1.56	
			X25	UL rating for Hazardous Locations - Conduit entry - up to 5000PPR	1.34	
		<b>Industrial Duty</b>	E14H	1.44" Diameter - Up to 5/8" hub bore including metric - 5, 12, or 15VDC	4.10	
			H20	Industry Standard 2.0" size - Up to 5/8" hub bore - Metal disc option	2.32	
		<b>Heavy Duty</b>	HSD25	2.3" diameter housing - IP67 sealing - Nickel, stainless, or anodized housing	1.08	
			HSD44	4.4" diameter housing - isolated hub compensates for motor endplay - metal disc	1.26	
		<b>Hollowshaft</b>	<b>Industrial Duty</b>	HS20	2.0" size - Up to 5/8" hollowshaft including metric - 5-26VDC	2.36
				HS35	3.5" diameter - up to 1.25" electrically isolated hollowshaft - 5-26VDC	2.40
				HS35R	NEW PRODUCT - Phased Array ASIC - Unbreakable discs - Up to 5000 PPR - Up to 1.25" hollowshaft	2.44
				Ri80E	100mm diameter - large 45mm hollowshaft capability - up to 4096 PPR - 5-30VDC	2.48
	<b>Heavy Duty</b>		HSD35	Up to 1.25" electrically isolated hollowshaft - Field-serviceable connectors - dual isolated output option	1.12	
			HSD37	3.75" housing - Phased Array Sensor - Up to 5000 PPR - Nickel, stainless & dual output housing option	1.16	
			HSD38	Finned 3.8" housing - Phased Array Sensor - Up to 5000 PPR - Ideal for vector motor duty	1.20	
			DWD38	3.75" housing - draw works threaded shaft - ATEX certification available - NAMUR output available	1.24	
			SLIMTach HS56	Magneto-resistive sensor - Up to 1-1/8" hollowshaft - Up to 2048 PPR - Field serviceable connector	1.58	
			SLIMTach HS60	NEW PRODUCT - Up to 2-7/8" stainless hollowshaft - Magneto-resistive sensor - Field serviceable connector	1.60	
			RIMTach HS85	Removeable Magneto-resistive sensors - Up to 4.5" hollowshaft - Dual isolated output option	1.62	
<b>Servo Duty</b>	F10		Compact 1.25" diameter - direct-fit for Size 10 resolver - 5VDC - Up to 2048 PPR & commutation channels	3.28		
	F14		1.55" Diameter - Flex tether mounting - 5VDC - Up to 5000 PPR & commutation channels	3.30		
	F15		1.45" Diameter - direct-fit for size 15 resolver - 5VDC - Up to 2048 PPR & commutation channels	3.32		
	F18		1.96" Diameter - Flex tether mounting - 5VDC - Up to 10,000 PPR & Commutation channels	3.34		
	F21		2.06" Diameter - direct-fit for size 21 resolver - 5VDC - Up to 2048 PPR & commutation channels	3.36		
	HC20		NEW PRODUCT - 1.97" diameter - multiple shaft mounting options - Up to 2500 PPR - 5VDC or 5-26VDC	3.38		
<b>Bearingless</b>	<b>Heavy Duty</b>		SLIMTach SL56	56C-face mounting. 5-15VDC or 5-26VDC. Magneto-resistive technology. Up to 2048 PPR.	1.42	
			SLIMTach RL67	56C-face mounting or Reliance RPM™ rabbit mounting. Magneto-resistive technology.	1.44	
			SLIMTach SL85	180C-face mounting. 5-15VDC or 5-26VDC. Magneto-resistive technology. Up to 2048 PPR.	1.46	
		SLIMTach SL1250	250C-face mounting. 5-15VDC or 5-26VDC. Magneto-resistive technology. Up to 2048 PPR.	1.50		
		RIMTach 8500	180C-face mounting. Removeable sensor modules. Magneto-resistive technology. Up to 1200 PPR.	1.52		
		RIMTach 1250	250C-face mounting. 5-15VDC or 5-26VDC. Magneto-resistive technology. Up to 2048 PPR.	1.54		
<b>Kit/Modular</b>	<b>Servo Duty</b>	M602 & M832	Component-level kit. 5VDC input. Unbreakable discs	3.12		
		LM & LAM	Component-Level Linear encoder kit. Digital or Analog output. 5VDC input.	3.15		
		M9 & E9	.9" diameter. Up to 512PPR. 5VDC input.	3.18		
		M14	1.496" diameter (38mm). Short mounting depth. Up to 1024PPR. 5VDC input.	3.22		
		M15	1.5" diameter. Up to 1024PPR with commutation channels. Phased-Array sensor technology.	3.24		
		M53	2.0" diameter. Up to 2500PPR with commutation channels. 5VDC or 12VDC input.	3.26		



Absolute			Page		
Shafted	Industrial Duty	AI25	2.5" size. Multiple fieldbus options. Up to 22 bit singleturn, 12 bit multiturn resolution.	2.64	
		Servo Duty	AD34	37.5mm diameter. Unique one-step shaft mounting. Up to 19 bit singleturn resolution.	3.04
	AD25		58mm diameter. Up to 22 bit singleturn resolution. Unique conical shaft for concentric mounting.	3.10	
	Heavy Duty	AR62/63	58mm size. Oversized bearings. Magnetic sensor. 12 bit singleturn resolution.	1.64	
		AX70/71	70mm diameter. ATEX certified explosion-proof. Aluminum or stainless steel housing.	1.66	
	Hubshaft	Industrial Duty	AI25	2.5" size. Multiple fieldbus options. IP64 protection rating.	2.64
			Servo Duty	AD35	37.5mm diameter. Up to 22 bit singleturn resolution. 5VDC or 7-30VDC.
AD36		37.5mm diameter. Up to 22 bit singleturn, 12 bit multiturn resolution. 5VDC or 7-30VDC.		3.08	
Hollowshaft	Industrial Duty	AC36	37.5mm diameter. Up to 22 bit singleturn, 12 bit multiturn resolution. 5VDC or 7-30VDC.	2.62	
		AC110	110mm diameter. Up to 50mm hollowshaft bore. Up to 22 bit singleturn resolution. 10-30VDC.	2.84	
	Servo Duty	AD36	37.5mm diameter. Up to 22 bit singleturn, 12 bit multiturn resolution. 5VDC or 7-30VDC.	3.08	
Resolver	Housed	Servo Duty	R11	Size 11 housing - unique shaft pinion for pulley mounting - Up to 155C temperature rating	3.40
			11	Size 11 housing - Up to 5X multi-speed available - High 3 arc-min accuracy	3.40
		Heavy Duty	R25	Industry standard 2.5" housing - Up to 125C temperature rating - Up to 200g shock rating	1.70
	Frameless	Servo Duty	10	Size 10 bearingless - Brushless construction - Up to 200C temperature rating	3.41
			15	Size 15 bearingless - Brushless construction - Multi-speed available	3.41
			21	Size 21 bearingless - Brushless construction - Multi-speed available	3.41
			31	Size 31 bearingless - Brushless construction - Up to 8X multi-speed available	3.41
			55	Size 55 bearingless - Up to 3.65" rotor I.D. bore - Up to 32X multi-speed available	3.41
			HaroMax 15	Size 15 bearingless - High-accuracy - Light weight aluminum housing - Brushless construction	3.42
			HaroMax 21	Size 21 bearingless - High-accuracy - Light weight aluminum housing - Brushless construction	3.43



LIGHT DUTY



SERVO DUTY



INDUSTRIAL DUTY



HEAVY DUTY



# HEAVY DUTY ENCODERS & RESOLVERS GUIDE

## DYNAPAR 2010

Dynapar has been designing and manufacturing tough, reliable encoders for over 5 decades. Leading Dynapar's Heavy Duty line up is the NorthStar™ brand of heavy duty Magnetic and Optical encoders.

The **NorthStar line of MAGNETO-RESISTIVE (MR) encoders** uses state-of-the-art “direct read” sensing technology to precisely track machine speed for optimum control. It is resistant to common mill contaminants such as water, oil, grease, dirt, and designed to operate in hostile environments where shock and vibration are the norm. This provides the customer with reliable digital output for the life of the encoder and is why it is the most requested Magneto-resistive encoder today. It is also the standard by which other MR encoder manufactures strive to match.

NorthStar SLIMTach and RIMTach encoders have proven themselves in tough steel and paper mill applications and other hostile environments where downtime is not an option. These tough tachs are offered in C-face bearingless, hollow shaft with oversized bearings, and foot-mounted configurations.

The new **NorthStar line of OPTICAL encoders** incorporates patented phased array opto-ASIC technology that is setting the standard for future tough and reliable optical designs. This technology, along with other innovations from NorthStar, drastically improves the reliability of optical encoders. It is the reason major oil & gas companies specify NorthStar HD Optical Encoders for their demanding applications in extreme temperatures and hazardous environments.

The product is also well suited for use in other demanding applications as heavy rail traction drives, wind turbines, and severe wash down processing equipment. These applications benefit from

- High resolution unbreakable code discs
- Phased array ASIC that eliminates potentiometers and manufacturing error
- Seals and housings that provide IP67 rating
- ATEX certification for Intrinsically Safe application requirements
- Oversized bearings for increased life
- PCB designs for high shock and vibration resistance
- Industrial grade components rated for -40 to 100+ C



Regardless of the NorthStar encoder used, you can rely on Dynapar for reliable feedback in tough environments. NorthStar encoders are made right here in the USA using the advanced cellular manufacturing concept, ensuring Just-In-Time delivery to meet your needs.



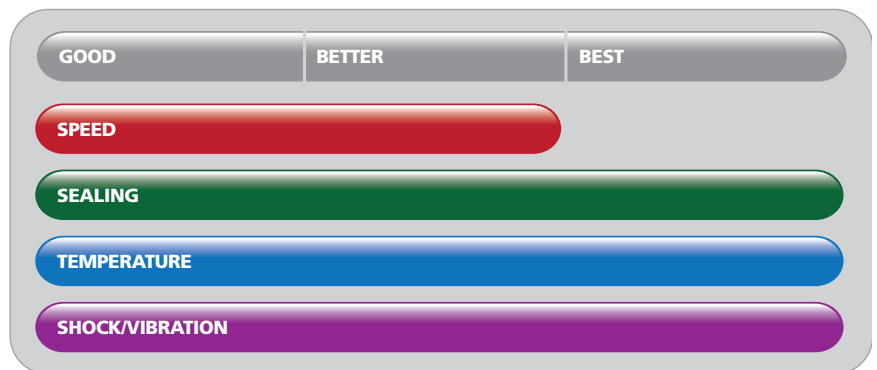


Heavy Duty encoders and resolvers are designed to survive some of the toughest environments. Paper and steel mills, aerospace applications, and food and beverage processing machinery are all areas that benefit from heavy duty encoders. Using magnetic, inductive, or specially designed optical technology, their tight sealing, heavy-duty bearings (where applicable), and high temperature range all suit them for use in harsh environments.

**HEAVY DUTY ENCODER GENERAL PERFORMANCE DATA**



RIMTach 8500 Pictured





## OPTICAL - INCREMENTAL

								
Product	HD20	HD25	HSD25	HSD37	HSD38	DWD38	HSD44	
Shaft/Bore Sizes	3/8" or 10mm Shaft	3/8" or 10mm Shaft	3/8" to 3/4" Shaft	12mm to 1" hollow shaft	6mm to 1-1/4" hollow shaft	1"-14UNS x 5/8"-18 Threaded Shaft or 1"-14UNS Threaded Shaft	5/8" / 16mm isolated hub shaft	
Available Resolutions (PPR)	1 to 3600	1 to 5000	1 to 3600	15 to 5000	15 to 5000	15 to 5000	1024 or 2048	
Input Voltage (VDC)	5-26 or 7-26	5-26 or 7-26	5-26 or 7-26	5-26	5-15 or 5-26	5-26 or 7-26	5-30	
Operating Temperature (°C)	-40 to +100 (40 to +80 ATEX)	-40 to +100 (40 to +80 ATEX)	-40 to +100 (40 to +80 C ATEX)	-40 to +100 (40 to +80 C ATEX)	-40 to +100	-40 to +100 (40 to +80 ATEX)	-40 to +100	
Enclosure Rating	IP67	IP67	IP67	IP67	IP67	IP67	IP67	
Special Features	ATEX certification available	Dual isolated outputs available	Compact hub shaft design	ATEX certification available	Rugged bearing structure	Draw works threaded shaft	Isolated coupling compensates for motor shaft endplay	
Page Number	1.04	1.06	1.08	1.16	1.20	1.24	1.26	

## MAGNETIC - INCREMENTAL

							
Product	SLIM Tach® SL56	SLIM Tach® RL67	SLIM Tach® SL85	SLIM Tach® SL1250	RIM Tach® 8500	RIM Tach® 1250	
Shaft/Bore Sizes	5/8" to 2-7/8" Standard, Up to 3.75" Available	5/8" to 2-7/8" Standard, Up to 3.75" Available	5/8" to 2-7/8" Standard, Up to 3.75" Available	5/8" to 2-7/8" Standard, Up to 3.75" Available	5/8" to 2-7/8" Standard, Up to 3.75" Available	5/8" to 2-7/8" Standard, Up to 8" Available	
Available Resolutions (PPR)	64 to 2048	64 to 2048	64 to 2048	64 to 2048	60 to 1200	60 to 2048	
Input Voltage (VDC)	5 to 15 or 5 to 26	5 to 15 or 5 to 26	5 to 15 or 5 to 26	5 to 15 or 5 to 26	5 to 15 or 15 to 26	5 to 15 or 15 to 26	
Operating Temperature (°C)	-40 to +90 (opt to +120)	-40 to +90 (opt to +120)	-40 to +90 (opt to +120)	-40 to +90 (opt to +120)	-40 to +80	-40 to +80	
Enclosure Rating	Resistant to grease, salt water, dust	Resistant to grease, salt water, dust	Resistant to grease, salt water, dust	Resistant to grease, salt water, dust	Resistant to grease, salt water, dust	Resistant to grease, salt water, dust	
Special Features	Bearingless design	Bearingless design	Bearingless design	Bearingless design	Bearingless design with removable sensors	Bearingless design with removable sensors	
Page Number	1.42	1.44	1.46	1.50	1.52	1.54	



OPTICAL - INCREMENTAL

OPTICAL - ABSOLUTE

INDUCTIVE - RESOLVER

HSD35	EN42	EN44	H56 Rotopulser®	X25	AX70/71	R25 Resolver	Product
6mm to 1-1/4" hollow shaft	5/8" to 1", 15mm, 16mm	5/8" / 16 mm Integral coupling	5/8"	1/4" or 3/8"	10mm shaft	Shaft Size: 0.3745" (9.51mm)	Shaft/Bore Sizes
1 to 5000	15 to 5000	1024 or 2048	1 to 2500	1 to 5000	Up to 16 bit ST, 12 bit MT	Single speed or Multi-Speed	Available Resolutions (PPR)
5-15 or 5-26	5-15 or 5-26	5-15 or 5-26	5-26	5-26	10-30	2 to 8 Vrms	Input Voltage (VDC)
-40 to +100	-50 to +100	-50 to +100	-40 to +85	0 to +70	-40 to +60 or -40 to +40	Up to 125	Operating Temperature (°C)
IP65	IP67	IP67	NEMA 4/ IP66	NEMA 4/ IP66	IP64 or IP67	IP65	Enclosure Rating
Field serviceable connector	Barrier-less ATEX Zone 1 Certification	Barrier-less ATEX Zone 1 Certification	Encoder within encoder design	NEC Class 1&2, Div 1&2, Groups C,D,E,F,G	Explosion proof	Shock resistant to 200g	Special Features
1.12	1.28	1.30	1.32	1.34	1.66	1.70	Page Number

MAGNETIC - INCREMENTAL

MAGNETIC ABSOLUTE

RIM Tach® 6200 (4)	SLIM Tach® HS56	SLIM Tach® HS60	RIM Tach® HS85	R45 Rotopulser®	AR62/63	Product
5/8"	5/8" to 1-1/8"	1-1/8" to 2-7/8" hollow shaft	5/8" to 2-7/8" Standard, Up to 4.5" Available	5/8" or 7/8"	3/8" or 10mm shaft	Shaft/Bore Sizes
60 to 2048	64 to 2048	64 to 2048	60 to 2048	60	12 bit	Available Resolutions (PPR)
5 to 15 or 15 to 26	5-15 or 5-26	5-15 or 5-26	5-15 or 5-26	5 to 26	10-30	Input Voltage (VDC)
-40 to +70	-20 to +80	-20 to +80	-20 to +70	-40 to +85	-40 to +100	Operating Temperature (°C)
Immune to grease, salt water, dust	Resistant to grease, dust	Immune to grease, salt water, dust	Immune to grease, salt water, dust	Immune to grease, water, dust	IP67 or IP69k	Enclosure Rating
Shafted foot-mount or face mount	Hollowshaft design	Large bore Hollowshaft design	Hollow shaft design with removable sensors	56C-face mounting	Shock resistant to 200g	Special Features
1.56	1.58	1.60	1.62	1.40	1.64	Page Number

# SERIES HD20

**NorthStar™ brand**

## Harsh Duty Optical Encoder

### Key Features

- Size 20 Heavy-Duty Encoder with Single or Dual Isolated Outputs
- ATEX Certification Available for Intrinsically Safe Applications
- Unbreakable Code Disc up to 3600PPR
- Special Housing and Seals for IP67 Rating
- Anodized Aluminum, Stainless Steel, or Nickel Plated Housing



## SPECIFICATIONS

### 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:** For resolutions to 625PPR: 90° ± 15° electrical; For resolutions over 625 PPR: 90° ± 30° electrical

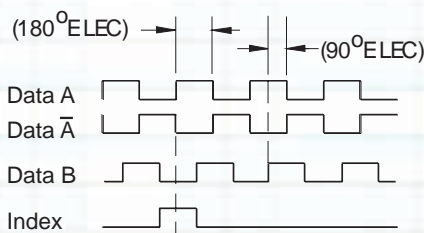
**Symmetry:**  
For resolutions to 1024PPR: 180° ± 18° electrical  
For resolutions over 1024PPR: 180° ± 25° electrical

**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.

A shown for reference



A Leads B CCW

### 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" 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)

10 pin, NEMA 4 style (604505 & 604506)

### MECHANICAL

**Shaft Material:** 303 stainless steel (passivated)

**Shaft speed:** 6000 RPM, maximum

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

**Shaft runout:** 0.0005 TIR at midpoint

**Starting torque:** 2.5 in-oz. maximum (at 25°C)

**Bearings:** 5200 ZZ double row

**Bearing life:** 5 x 10<sup>8</sup> revs at rated shaft Loading,

5 x 10<sup>11</sup> revs at 10% of rated shaft loading. (manufacturers' specs)

**Housing and cover:** Hard Anodized Aluminum.

Also available in Electroless Nickel finish and Stainless Steel.

**Disc material:** Metal or plastic

**Weight:** 14 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:** IP67

### 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 #108594-6 Pin Single Ended		Cable # 108595-7 Pin Single Ended		Cable #108596-7 Pin Dif Line Drv w/o ldx		Cable # 1400635- or 109209-(NEMA4) 10 Pin Dif Line Drv w/ ldx		Cable Exit with Seal
	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Wire Color
Sig. A	E	BRN	A	BRN	A	BRN	A	BRN	GREEN
Sig. B	D	ORG	B	ORG	B	ORG	B	ORG	BLUE
Sig. Z	C	YEL	C	YEL	—	—	C	YEL	ORANGE
Power +V	B	RED	D	RED	D	RED	D	RED	RED
Com	A	BLK	F	BLK	F	BLK	F	BLK	BLACK
Case	—	—	G	GRN	G	GRN	G	GRN	WHITE
N/C	F	—	E	—	—	—	E	—	—
Sig. A	—	—	—	—	C	BRN/WHT	H	BRN/WHT	VIOLET
Sig. B	—	—	—	—	E	ORG/WHT	I	ORG/WHT	BROWN
Sig. Z	—	—	—	—	—	—	J	YEL/WHT	YELLOW

Note: "MS" type mating connectors and prebuilt cables are rated NEMA 12.

For watertight applications, use NEMA4 10 pin cable & connector 109209-XXXX.



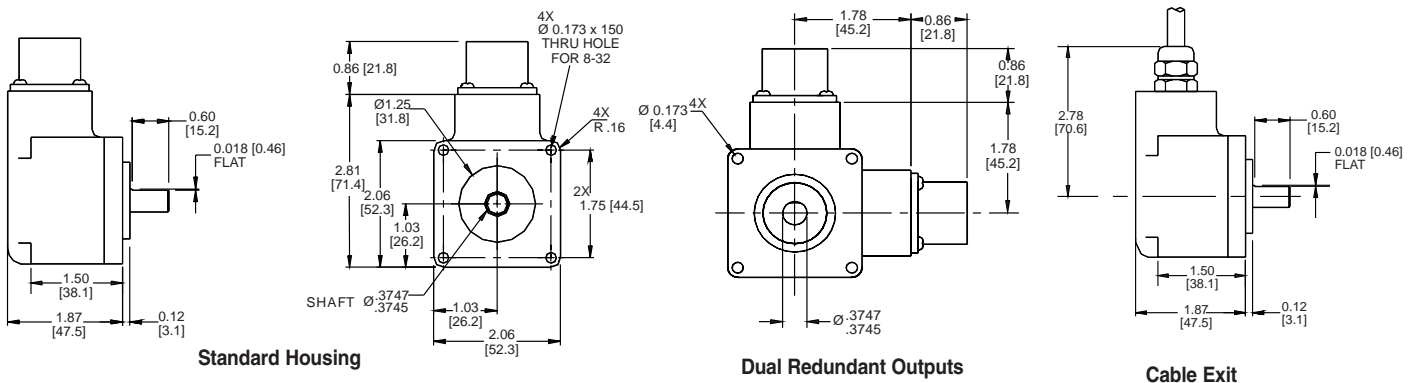
# SERIES HD20

## 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>HD20</b> □	□□□□	□	□	□	□
Ordering Information					
Size 20 Extreme Heavy Duty Encoder  1 Unidirectional 2 Bidirectional 3 Bidirectional with Index	<b>0001 0500</b> <b>0010 0512</b> <b>0024 0600</b> <b>0025 0625</b> <b>0035 0720</b> <b>0040 1000</b> <b>0060 1024</b> <b>0100 1200</b> <b>0120 1250</b> <b>0192 1440</b> <b>0200 2000</b> <b>0240 2048</b> <b>0250 2500</b> <b>0256 2540</b> <b>0300 2600</b> <b>0360 3600</b>	<b>0</b> 3/8" Dia. Shaft with flat  <b>4</b> 10mm Dia. Shaft, no flat	<b>0</b> 5-26V in, 5-26V Open Collector out (7273)  <b>2</b> 5-26V in, 5-26V Push-Pull out  <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 through H, or Code 1 is 3 and Code 5 is 5 through H:  <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>1</b> 6 Pin Connector <b>3</b> 7 Pin Connector <b>5</b> 10 Pin 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>0</b> No Options <b>1</b> Nickel Finish Housing <b>2</b> Stainless Steel Housing <b>A</b> Same as "0" w/ ATEX Type 1 <b>B</b> Same as "1" w/ ATEX Type 1 <b>C</b> Same as "2" w/ ATEX Type 1  Available when Code 4 is 0, 2, 3, F or G <b>G</b> Same as "0" w/ ATEX Type 2 <b>H</b> Same as "1" w/ ATEX Type 2 <b>I</b> Same as "2" w/ ATEX Type 2  Available when Code 4 is 4 <b>M</b> Same as "0" w/ ATEX Type 3 <b>N</b> Same as "1" w/ ATEX Type 3 <b>O</b> Same as "2" w/ ATEX Type 3  Available when Code 4 is 0, 2, F or G <b>3</b> Redundant Outputs (Dual Connector Housing). See † NOTE <b>4</b> Nickel Finish Housing with Redundant Outputs. See † NOTE <b>5</b> Stainless Steel Housing with Redundant Outputs. See † NOTE <b>D</b> Same as "3" w/ ATEX Type 1. See †NOTE <b>E</b> Same as "4" w/ ATEX Type 1. See †NOTE <b>F</b> Same as "5" w/ ATEX Type 1. See †NOTE <b>J</b> Same as "3" w/ ATEX Type 2. See †NOTE <b>K</b> Same as "4" w/ ATEX Type 2. See †NOTE <b>L</b> Same as "5" w/ ATEX Type 2. See †NOTE <b>P</b> Same as "3" w/ ATEX Type 3. See †NOTE <b>Q</b> Same as "4" w/ ATEX Type 3. See †NOTE <b>R</b> Same as "5" w/ ATEX Type 3. See †NOTE  † NOTE: Simultaneous use of redundant outputs may void ATEX certification. Consult factory for details.
<b>Notes:</b> <b>10 foot Cable Assemblies with MS Connector</b> <b>108594-0010</b> 6 Pin MS, Cable Assy. For Use with Single Ended Outputs <b>108595-0010</b> 7 Pin MS, Cable Assy. For Use with Single Ended Outputs <b>108596-0010</b> 7 Pin MS, Cable Assy. For Use with Differential Line Driver w/o Index Outputs <b>1400635-0010</b> 10 Pin MS, Cable Assy. For Use with Differential Line Driver with Index Outputs <b>109209-0010</b> NEMA4 10 pin MS, Cable Assy. For use with differential line driver with index outputs  <b>Mating Connectors (no cable)</b> 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, NEMA 4 style (604505 & 604506)					
*Note: Available ATEX Certified Options <b>ATEX Type 1:</b> ATEX Certified; 5V in, 5V out only <b>ATEX Type 2:</b> ATEX Certified; 7-26V in, 7-26V out <b>ATEX Type 3:</b> ATEX Certified; 7-26V in, 5V out NOTE: ATEX voltages replace those shown in Code 4.					

## DIMENSIONS inches [mm]



# SERIES HD25

NorthStar™ brand

## Harsh Duty Optical Encoder

### Key Features

- Size 25 Heavy-Duty Encoder with Single or Dual Isolated Outputs
- ATEX Certification Available for Intrinsically Safe Applications
- Unbreakable Code Disc up to 5000PPR
- Special Housing and Seals for IP67 Rating
- Anodized Aluminum, Stainless Steel, or Nickel Plated Housing



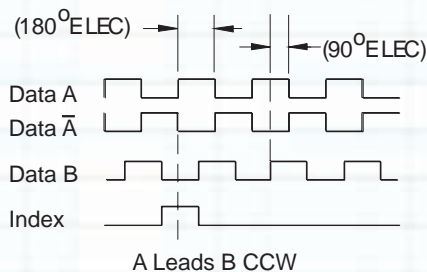
## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental  
**Resolution:** 1 to 5000 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:** For resolutions to 625PPR: 90° ± 15° electrical; For resolutions over 625 PPR: 90° ± 30° electrical  
**Symmetry:**  
 For resolutions to 1024PPR: 180° ± 18° electrical  
 For resolutions over 1024PPR: 180° ± 25° 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.  
 A shown for reference



### ELECTRICAL

**Input Power:** 5-26VDC, 5-15VDC dependant on output type. 50 mA max., not including output loads. ATEX: 5VDC, 7-26VDC  
**Outputs:** 2N2222, 4469, ET7272, ET7273  
**Frequency Response:** 125 kHz (data & index)  
**Termination:** 6, 7, or 10 pin MS Connector; 18" 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)  
 10 pin, NEMA 4 style (604505 & 604506)

### MECHANICAL

**Shaft Material:** 303 stainless steel (passivated)  
**Shaft Speed:** 6,000 RPM, maximum  
**Shaft loading:** Up to 100 lbs axial and radial  
**Shaft runout:** 0.0005 TIR at midpoint  
**Starting torque:** 2.5 in-oz. maximum (at 25°C)  
**Bearings:** 5200 ZZ double row  
**Bearing life:** 5 x 10<sup>8</sup> revs at rated shaft Loading, 5 x 10<sup>11</sup> revs at 10% of rated shaft loading. (manufacturers' specs)  
**Housing and cover:** Hard Anodized Aluminum. Also available in Electroless Nickel finish and Stainless Steel.  
**Disc material:** Metal or plastic  
**Weight:** 14 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:** IP67

### ELECTRICAL CONNECTIONS

#### 6, 7 & 10 Pin MS, 5 Pin M12, 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 #108594-6 Pin Single Ended		Cable # 108595-7 Pin Single Ended		Cable #108596-7 Pin Dif Line Drv w/o Idx		Cable # 1400635- or 109209- (NEMA4) 10 Pin Dif Line Drv w/Idx		Cable # 112859-M12, 5 Pin Single Ended		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	4	BLK	GREEN
Sig. B	D	ORG	B	ORG	B	ORG	B	ORG	2	WHT	BLUE
Sig. Z	C	YEL	C	YEL	—	—	C	YEL	5	GRY	ORANGE
Power +V	B	RED	D	RED	D	RED	D	RED	1	BRN	RED
Com	A	BLK	F	BLK	F	BLK	F	BLK	3	BLU	BLACK
Case	—	—	G	GRN	G	GRN	G	GRN	—	—	WHITE
N/C	F	—	E	—	—	—	E	—	—	—	—
Sig. A	—	—	—	—	C	BRN/WHT	H	BRN/WHT	—	—	VIOLET
Sig. B	—	—	—	—	E	ORG/WHT	I	ORG/WHT	—	—	BROWN
Sig. Z	—	—	—	—	—	—	J	YEL/WHT	—	—	YELLOW

Note: "MS" type mating connectors and prebuilt cables are rated NEMA 12.

For watertight applications, use NEMA4 10 pin cable & connector 109209-XXXX.

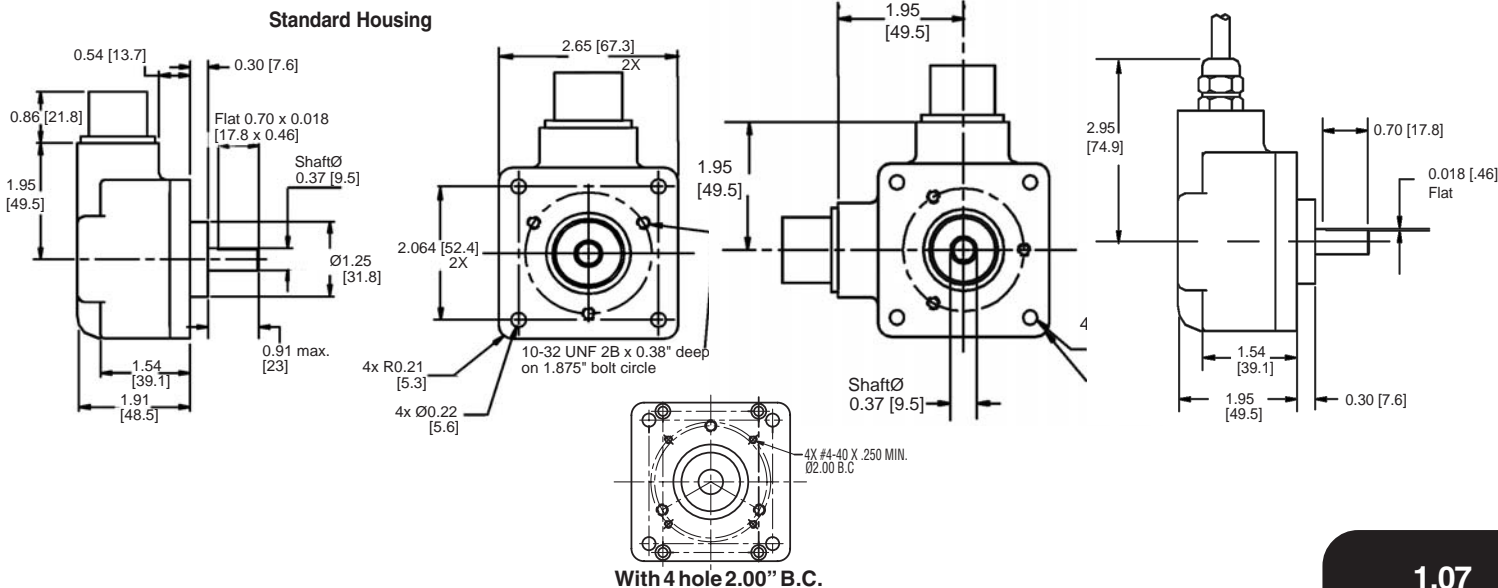
# SERIES HD25

## 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> □	□□□□	□	□	□	□
<b>Ordering Information</b>					
Size 25 Extreme Heavy Duty Encoder  1 Unidirectional 2 Bidirectional 3 Bidirectional with Index	<b>0001 0625</b> <b>0024 0720</b> <b>0025 0900</b> <b>0035 1000</b> <b>0040 1024</b> <b>0050 1200</b> <b>0060 1250</b> <b>0100 1440</b> <b>0120 1524</b> <b>0192 1600</b> <b>0200 1800</b> <b>0240 2000</b> <b>0250 2048</b> <b>0256 2500</b> <b>0300 2540</b> <b>0360 2600</b> <b>0500 3600</b> <b>0512 4096</b> <b>0600 5000</b>	<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> Same as option 0 with 4 hole 2.00" B.C.	<b>0</b> 5-26V in, 5-26V Open Collector out (7273)  <b>2</b> 5-26V in, 5-26V Push-Pull out  <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 D through P, or Code 1 is 3 and code 5 is 5 or D 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>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	<b>0</b> No Options <b>1</b> Nickel Finish Housing <b>2</b> Stainless Steel Housing <b>3</b> Redundant Outputs (Dual Connector Housing). See †NOTE <b>4</b> Nickel Finish Housing with Redundant Outputs. See †NOTE <b>5</b> Stainless Steel Housing with Redundant Outputs. See †NOTE  <b>A</b> Same as "0" w/ ATEX Type 1 <b>B</b> Same as "1" w/ ATEX Type 1 <b>C</b> Same as "2" w/ ATEX Type 1 <b>D</b> Same as "3" w/ ATEX Type 1. See †NOTE <b>E</b> Same as "4" w/ ATEX Type 1. See †NOTE <b>F</b> Same as "5" w/ ATEX Type 1. See †NOTE  Available when Code 4 is 0-3, F or G <b>G</b> Same as "0" w/ ATEX Type 2 <b>H</b> Same as "1" w/ ATEX Type 2 <b>I</b> Same as "2" w/ ATEX Type 2 <b>J</b> Same as "3" w/ ATEX Type 2. See †NOTE <b>K</b> Same as "4" w/ ATEX Type 2. See †NOTE <b>L</b> Same as "5" w/ ATEX Type 2. See †NOTE  Available when Code 4 is 4 <b>M</b> Same as "0" w/ ATEX Type 3 <b>N</b> Same as "1" w/ ATEX Type 3 <b>O</b> Same as "2" w/ ATEX Type 3 <b>P</b> Same as "3" w/ ATEX Type 3. See †NOTE <b>Q</b> Same as "4" w/ ATEX Type 3. See †NOTE <b>R</b> Same as "5" w/ ATEX Type 3. See †NOTE  Available when Code 4 is 6: <b>S</b> Same as 0, w/ATEX Type 4 <b>T</b> Same as 1, w/ATEX Type 4 <b>U</b> Same as 2, w/ATEX Type 4 <b>V</b> Same as 3, w/ATEX Type 4. See †NOTE <b>W</b> Same as 4, w/ATEX Type 4. See †NOTE <b>Y</b> Same as 5, w/ATEX Type 4. See †NOTE
<b>Note:</b> <b>10 foot Cable Assemblies with MS Connector</b> <b>108594-0010</b> 6 Pin MS, Cable Assy. For Use with Single Ended Outputs <b>108595-0010</b> 7 Pin MS, Cable Assy. For Use with Single Ended Outputs <b>108596-0010</b> 7 Pin MS, Cable Assy. For Use with Differential Line Driver w/o Index Outputs <b>1400635-0010</b> 10 Pin MS, Cable Assy. For Use with Differential Line Driver with Index Outputs <b>109209-0010</b> NEMA4 10 pin MS, Cable Assy. For use with differential line driver with index outputs  <b>Mating Connectors (no cable)</b> 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, NEMA 4 style (604505 & 604506)		<b>*Note: Available ATEX Certified Options</b> <b>ATEX Type 1:</b> ATEX Certified; 5V in, 5V out only <b>ATEX Type 2:</b> ATEX Certified; 7-26V in, 7-26V out <b>ATEX Type 3:</b> ATEX Certified; 7-26V in, 5V out <b>ATEX Type 4:</b> ATEX Certified; 5-15V in, 5-15V out <b>NOTE: ATEX voltages replace those shown in Code 4.</b>		<b>† NOTE: Simultaneous use of redundant outputs may void ATEX certification. Consult factory for details.</b>	

## DIMENSIONS inches [mm]



# SERIES HSD25

# NorthStar™ brand

## Harsh Duty Optical Encoder

### Key Features

- Compact Hubshaft Design with Field Replaceable Shaft Isolators
- Unbreakable Code Disc up to 3600PPR
- ATEX Certification Available for Intrinsically Safe Applications
- IP67 Sealing
- Anodized Aluminum, Stainless Steel, or Nickel Plated Housing



## SPECIFICATIONS

### 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:** For resolutions to 625PPR:  $90^\circ \pm 15^\circ$  electrical; For resolutions over 625 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. ATEX: 5VDC, 7-26VDC

**Outputs:** 2N2222, ET7272, ET7273

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

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

10 pin, NEMA 4 style (604505 & 604506)

### MECHANICAL

**Shaft Material:** 303 stainless steel (passivated)

**Bore Diameter:** 3/8", 10mm, 1/2", 5/8", 3/4".

Insulated inserts provided

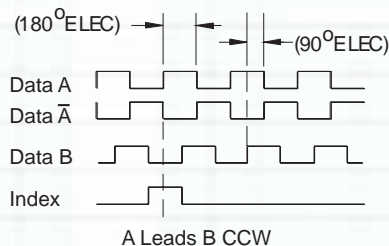
**Bore runout:** 0.0005 TIR at midpoint

**Starting torque:** 6.5 in-oz. maximum (at 25°C)

### DATA AND INDEX

Not all complements shown.

A shown for reference



**Bearings:** 61805-2RZ

**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. Tether Available

**Disc material:** Metal or plastic

**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:** IP67





# SERIES HSD25

## 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: Output Format	Code 5: Termination	Code 6: Options	Code 7: Special Options
□□□25	□□□□	□	□	□	□	□□

### Ordering Information

<b>HSD25</b> Heavy Duty Hub Shaft Encoder  <b>ISD25</b> ATEX Intrinsically Safe Hub Shaft Encoder	<b>0001 0500</b> <b>0010 0512</b> <b>0024 0600</b> <b>0025 0625</b> <b>0035 0720</b> <b>0040 1000</b> <b>0060 1024</b> <b>0100 1200</b> <b>0120 1250</b> <b>0192 1440</b> <b>0200 2000</b> <b>0240 2048</b> <b>0250 2500</b> <b>0256 2540</b> <b>0300 2600</b> <b>0360 3600</b>	<b>0</b> 6mm <b>1</b> 1/4" <b>2</b> 5/16" <b>3</b> 8mm <b>4</b> 3/8" <b>5</b> 10mm <b>6</b> 12mm <b>7</b> 1/2" <b>8</b> 5/8" <b>9</b> 15mm <b>A</b> 16mm <b>C</b> 19mm <b>D</b> 3/4"	<b>0</b> Single Ended ABZ, 5-26VDC push-pull <b>1</b> Single Ended ABZ, 5-26VDC Open collector (7273) <b>2</b> Single Ended ABZ, 5-26VDC Open collector (2222) <b>3</b> Single Ended ABZ, 5-26VDC Open collector (2222) w/2.2kOhm <i>Options 4 &amp; 5 not available when Code 5 is H; and Code 6 is 3, 4, 5</i> <b>4</b> Differential AB only, 5-26 in, 5-26 out (7272) <b>5</b> Differential AB only, 5-26 in, 5V out (7272) <i>Options 6 &amp; 7 not available when Code 5 is 0, 1, 5, 6, H; and Code 6 is 3, 4, 5</i> <b>6</b> Differential ABZ, 5-26 in, 5V out (7272) <b>7</b> Differential ABZ, 5-26 in, 5-26 out (7272)	<b>0</b> 6 pin <b>1</b> 7 pin <b>2</b> 10 pin <b>5</b> 6 pin+mating <b>6</b> 7 pin+mating <b>7</b> 10 pin+mating <b>8</b> 12 CW pin+mating <b>A</b> .5m (18") cable <b>C</b> 1m (36") cable <b>D</b> 2m (72") cable <b>E</b> 3m (120") cable <b>L</b> 4m (144") cable <b>H</b> 5 pin M12 <b>J</b> 8 pin M12 <b>K</b> 1.5 ft (18") cable w/ in line 10pin connector <b>M</b> 5 ft (60") cable <b>N</b> 10 ft (120") cable	<b>0</b> No Options <b>1</b> Slotted Tether <b>2</b> Single point tether <b>3</b> No tether, Dual isolated outputs <b>4</b> Slotted Tether, Dual isolated Outputs <b>5</b> Single Point Tether, Dual isolated Outputs	<b>Blank</b> None <b>01</b> Nickel Plated <b>02</b> Stainless Steel
			<p><b>Following options are only available when Code 1 is ISD25</b></p> <p><b>A</b> Single Ended ABZ, 7-26 in, 7-26 out push-pull (7272)  <b>C</b> Single Ended ABZ, 5V in, 5V out push-pull (7272)  <b>D</b> Single Ended ABZ, 7-26V in, 7-26V out Open Collector (7273)  <b>E</b> Single Ended ABZ, 7-26V in, 7-26V out Open Collector (2222)  <b>F</b> Single Ended ABZ, 7-26V in, 7-26V out Open Collector w/2.2kOhm pullup (2222)  <i>Options G, H &amp; J not available when Code 5 is H and Code 6 is 3, 4, 5</i>  <b>G</b> Differential AB only, 5V in, 5V out (7272)  <b>H</b> Differential AB only, 7-26 in, 7-26 out (7272)  <b>J</b> Differential AB only, 7-26 in, 5V out (7272)  <i>Options K, L &amp; M not available when Code 5 is 0, 1, 5, 6, H and Code 6 is 3, 4, 5</i>  <b>K</b> Differential ABZ, 5V in, 5V out (7272)  <b>L</b> Differential ABZ, 7-26 in, 7-26 out (7272)  <b>M</b> Differential ABZ, 7-26 in, 5V out (7272)</p>	<p><b>Note:</b>  <b>10 foot Cable Assemblies with MS Connector</b>  <b>108594-0010</b> 6 Pin MS, Cable Assy. For Use with Single Ended Outputs  <b>108595-0010</b> 7 Pin MS, Cable Assy. For Use with Single Ended Outputs  <b>108596-0010</b> 7 Pin MS, Cable Assy. For Use with Differential Line Driver w/o Index Outputs  <b>1400635-0010</b> 10 Pin MS, Cable Assy. For Use with Differential Line Driver with Index Outputs  <b>109209-0010</b> NEMA4 10 pin MS, Cable Assy. For use with differential line driver with index outputs</p> <p><b>15 foot Cable Assemblies with M12 Connector</b>  <b>112859-0015</b> 5 Pin M12, Cable Assy. For Use with Single Ended Outputs  <b>112860-0015</b> 8 Pin M12, Cable Assy. For Use with Single Ended Outputs  <b>112860-0015</b> 8 Pin M12, Cable Assy. For Use with Differential Line Driver Outputs</p> <p><b>Mating Connectors (no cable)</b>          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, NEMA 4 style (604505 &amp; 604506)</p>		

**\*\*Note:** Tether may be required for proper encoder operation and may be supplied by the customer or ordered as the following accessories:  
 113764-0001 Single Point Tether Kit  
 113766-0001 Slotted Tether Kit  
 † **NOTE:** Simultaneous use of redundant outputs may void ATEX certification. Consult factory for details.

# SERIES HSD25

**NorthStar™ brand**

## ELECTRICAL CONNECTIONS

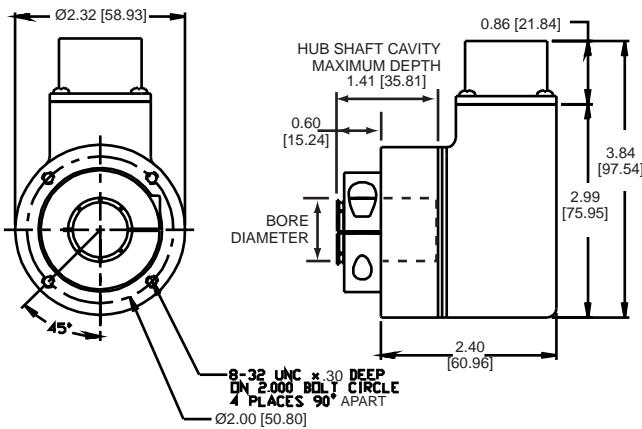
### 6, 7 & 10 Pin MS Connectors and Cables

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.

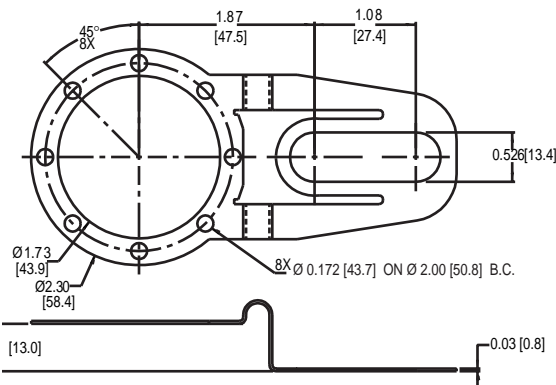
Encoder Function	Cable # 108594-6 Pin Single Ended		Cable # 108595-7 Pin Single Ended		Cable # 108596-7 Pin Diff Line Drv w/o ldx		Cable # 140635- or 109209- (NEMA) 10 Pin Diff Line Drv w/ldx		Cable #108615-* 12 Pin CCW		Cable Exit with Seal
	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	
Sig. A	E	BRN	A	BRN	A	BRN	A	BRN	5	BRN	BRN
Sig. B	D	ORG	B	ORG	B	ORG	B	ORG	8	ORN	ORG
Sig. Z	C	YEL	C	YEL	—	—	C	YEL	3	YEL	YEL
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	—	—
N/C-SLD	F	—	E	—	—	—	E	—	7	—	—
Sig. A	—	—	—	—	C	BRN/WHT	H	BRN/WHT	6	BRN/WHT	BRN / WHT
Sig. B	—	—	—	—	E	ORG/WHT	I	ORG/WHT	1	ORN/WHT	ORG /WHT
Sig. Z	—	—	—	—	—	—	J	YEL/WHT	4	YEL/WHT	YEL / WHT
0 Volt Sense	—	—	—	—	—	—	—	—	2	GRN	—
5 Volt Sense	—	—	—	—	—	—	—	—	11	BLK/WHT	—

Note: "MS" type mating connectors and prebuilt cables are rated NEMA 12. "M12" Cable assemblies are rated IP67. For watertight applications, use NEMA4 10 pin cable & connector 109209-XXXX.

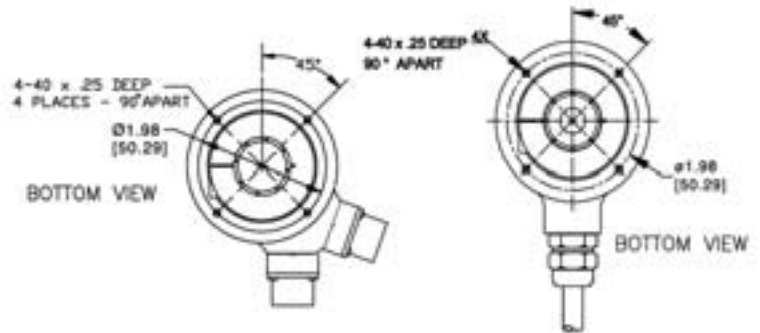
## DIMENSIONS inches [mm]



Standard Housing

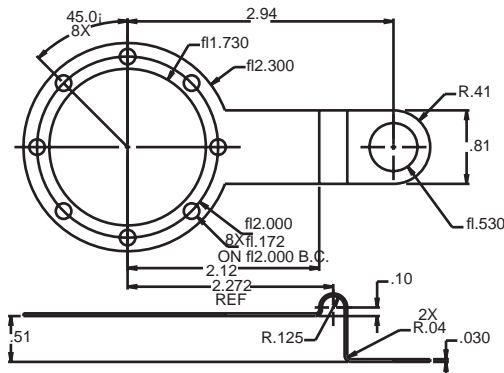


Slotted Tether



Dual Redundant Outputs

Cable Exit



Single Point Tether

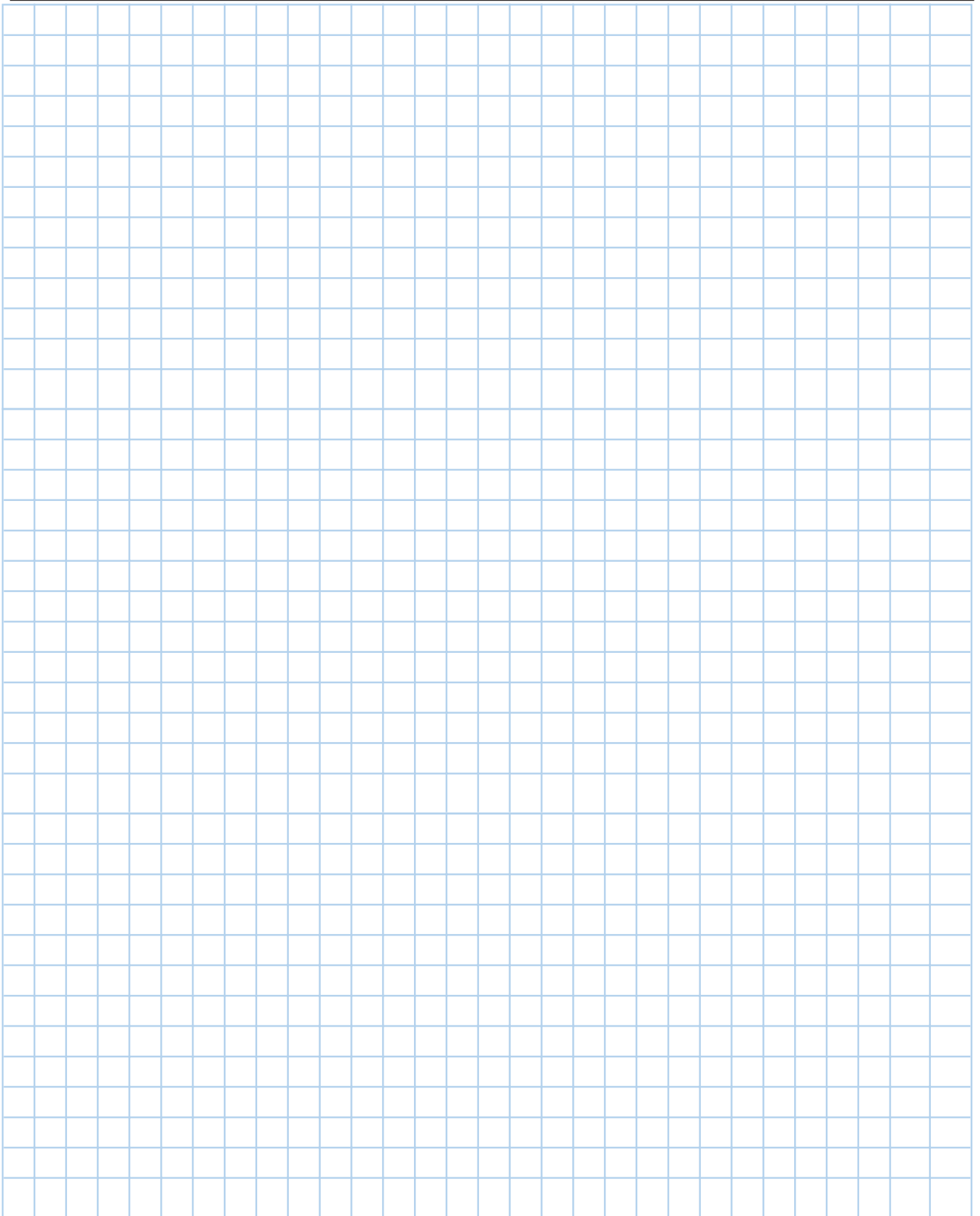
### 5 & 8 Pin M12 Accessory Cables when Code 5= H or J

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



# SERIES HSD35

# NorthStar™ brand

## Heavy Duty Optical Encoder

### Key Features

- Rugged Design Resists up to 400g Shock
- Stainless Steel Clamp and Hub Shaft for Mill Duty
- Compact Design with Field Serviceable Connector for Solder-Less Connections
- Accommodates Shaft Sizes up to 1.25" (Electrically Isolated up to 1.125")
- Dual Isolated Output Option for Redundancy



## PRELIMINARY 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 CW 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 CONNECTIONS

Signal	Connector Pin
Common	1
B	2
A	3
Z *	4
Case (optional)	5
Vcc 5-26 VDC	6
B	7
A	8
Z *	9
No Connection	10

\* Index (Z) optional. See Ordering Information

### ELECTRICAL

**Input Power:** 5-26VDC, 5-15VDC. 50 mA max., not including output loads.

**Outputs:** ET7272, ET7273, 4469

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

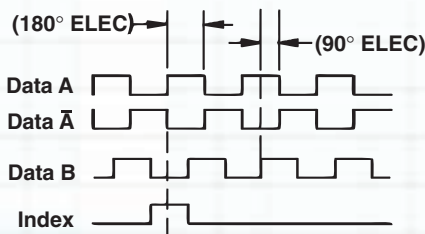
**Termination:** MS Connector; M12 Connector; cable exit w/seal. See Ordering Information

**Mating Connector:** 10 pin style HA-10

### DATA AND INDEX

Not all complements shown

A shown for reference



A leads B, CW (from clamp end)

### MECHANICAL

**Shaft Material:** Stainless Steel

**Bore Diameter:** 6mm to 28mm, 1.4" to 1.25", electrically isolated

**Mating Shaft Length:** 1.25", Minimum, 1.60", Recommended

**Shaft Speed:** 6000 RPM, Maximum (Enclosure Rating is IP64 at speed over 5000 RPM)

**Starting torque:** 8.0 in-oz. maximum (at 25°C)

**Running torque:** 5.0 in-oz. maximum (at ambient)

**Bearings:** ABEC 3

**Housing and cover:** Hard Anodized and Powder Coated Aluminum

**Disc material:** Plastic or metal (unbreakable)

**Weight:** 1.76lb (28 Oz) Typical

### ENVIRONMENTAL

**Standard Operating Temperature:** -40 to +85°C (0 to +70°C with 4469 line driver, see "Ordering Information"). At shaft speed above 3000 RPM, derate 10°C per 1000 RPM

**Extended Temperature Range:** -40 to +100°C (See ordering information)

**Storage temperature:** -40 to +100°C

**Shock:** 400g, 6mSec

**Vibration:** 5 to 3000 Hz, 20g

**Humidity:** 100%

**Enclosure Rating:** IP67 (IP64 at shaft speeds above 5000RPM)

**Connector Rating:** IP65

Replaces the Magcoder HS35M (shown below)



Contact Customer Service for appropriate replacement model. +1.800.873.8731

# SERIES HSD35

## 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: Fixing	Code 5: Output Format	Code 6: Options	
<b>HSD35</b>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Ordering Information						
<b>HSD35</b> Heavy-duty, hollowshaft encoder	<b>0001 0512</b> <b>0003 0600</b> <b>0010 0900</b> <b>0012 1000</b> <b>0015 1024</b> <b>0032 1200</b> <b>0050 1500</b> <b>0060 2000</b> <b>0100 2048</b> <b>0120 2400</b> <b>0200 2500</b> <b>0240 3072</b> <b>0250 4000</b> <b>0300 4096</b> <b>0360 5000</b> <b>0500</b>	<b>0</b> 6mm <b>1</b> 1/4" <b>2</b> 5/16" <b>3</b> 8mm <b>4</b> 3/8" <b>5</b> 10mm <b>6</b> 12mm <b>7</b> 1/2" <b>8</b> 5/8" <b>9</b> 15mm <b>A</b> 16mm <b>C</b> 19mm <b>D</b> 3/4" <b>E</b> 20mm <b>F</b> 7/8" <b>G</b> 24mm <b>H</b> 1" <b>J</b> 1-1/8" <b>K</b> 1-1/4" <b>M</b> 14mm <b>N</b> 18mm <b>P</b> 25mm <b>R</b> 28mm	<b>Stamped Metal</b> <b>0</b> None <b>1</b> 4.5" C-Face tether <b>2</b> 8.5" C-Face tether <b>3</b> Slotted tether <b>4</b> Same as 1 w/cover <b>5</b> Same as 3 w/cover	<b>Swivel Rod</b> <b>A</b> AC motor fan cover tether with T-bolt <b>B</b> 4.5" C-face tether with 3/8" bolt <b>C</b> 8.5" C-face tether with 1/2" bolt <b>D</b> Same as "A" w/ cover kit <b>E</b> Same as "B" w/ cover kit	<b>0</b> Single Ended ABZ, 5-26VDC push-pull <b>1</b> Single Ended ABZ, 5-26VDC O/C <b>2</b> Single Ended ABZ, 5-26VDC O/C w2.2kOhm <b>4</b> Differential AB only, 5-26, 5-26 out (7272) <b>5</b> Differential AB only, 5-26 in, 5V out (7272) <b>A</b> Differential AB, 5-26V in, 5V out (4469) <b>C</b> Differential AB, 5-15V in, 5-15V out (4469) <b>6</b> Differential ABZ, 5-26 in, 5V out (7272) <b>7</b> Differential ABZ, 5-26 in, 5-26 out (7272) <b>8</b> Differential ABZ, 5-26 in, 5V out (4469) <b>9</b> Differential ABZ, 5-15 in, 5-15 out (4469) <b>D</b> Dual isolated outputs, same as "6" <b>E</b> Dual isolated outputs, same as "7" <b>F</b> Dual isolated outputs, same as "8" <b>G</b> Dual isolated outputs, same as "9" <b>H</b> Same as "0" with Extended temp range <b>J</b> Same as "1" with Extended temp range <b>K</b> Same as "2" with Extended temp range <b>L</b> Same as "4" with Extended temp range <b>M</b> Same as "5" with Extended temp range <b>N</b> Same as "6" with Extended temp range <b>P</b> Same as "7" with Extended temp range <b>Q</b> Same as "D" with Extended temp range <b>R</b> Same as "E" with Extended temp range	<b>Blank</b> None

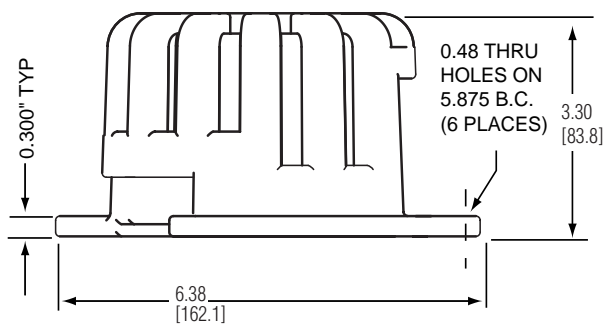
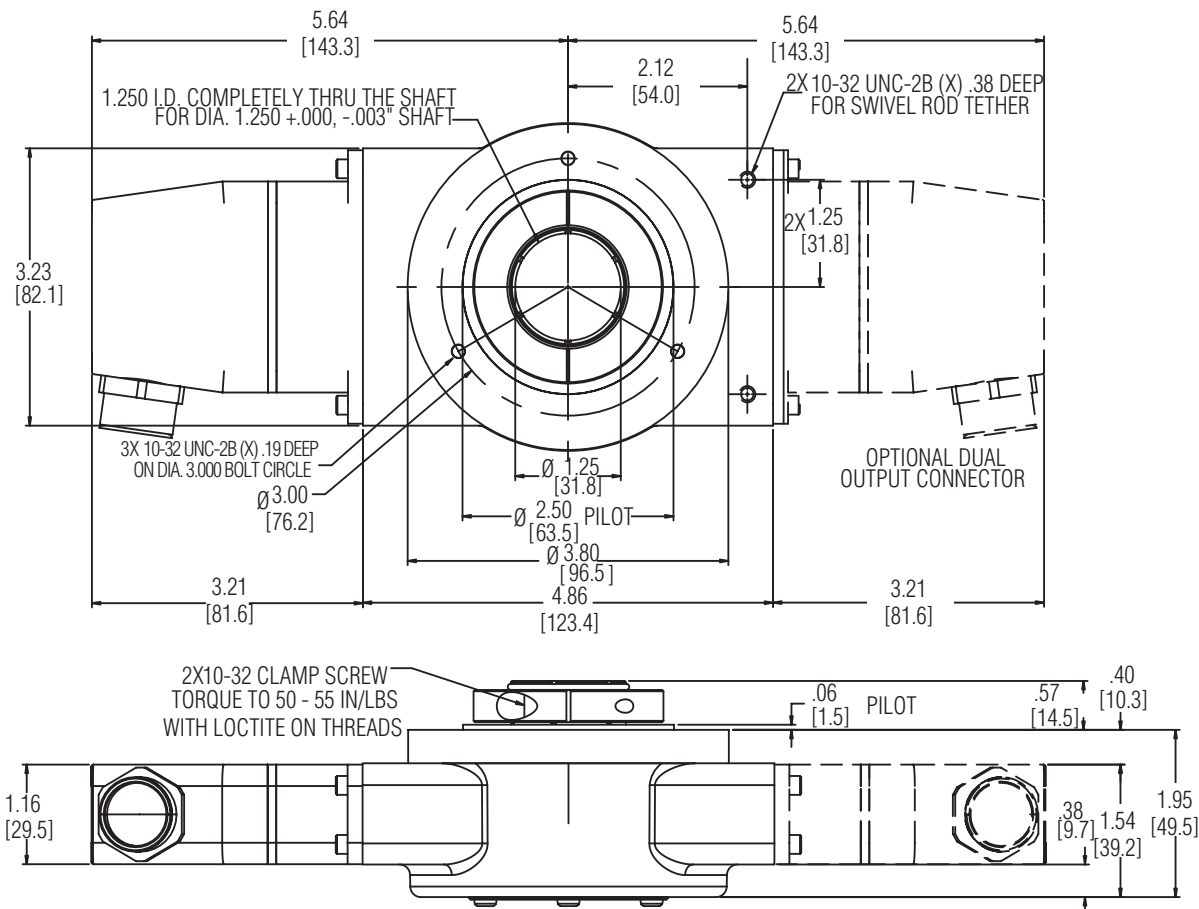
### Accessory Kits:

- 114573-0001** Tether Kit, 4.5" C-face single point with 3/8" bolt
- 114574-0001** Tether Kit for Standard AC motor fan covers with T-bolt
- 114575-0001** Tether Kit, 8.5" C-face single point with 1/2" bolt
- 756-042-01** Rod Tether, AC motor fan cover with T-bolts
- 756-043-01** Rod Tether Kit, 4.5" C Face with 3/8" bolt
- 756-044-01** Rod Tether Kit, 8.5" C Face with 1/2" bolt
- 114622-0001** Cover Kit, 56C face (single or dual output)
- 114623-0001** Cover Kit, Fan cover (single or dual output)

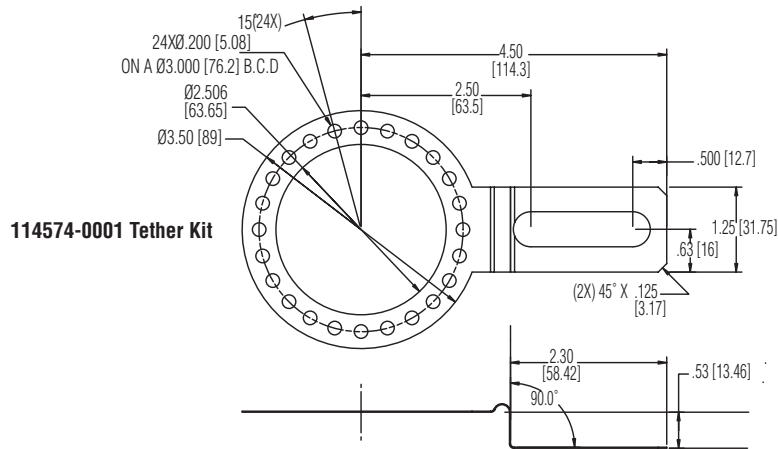
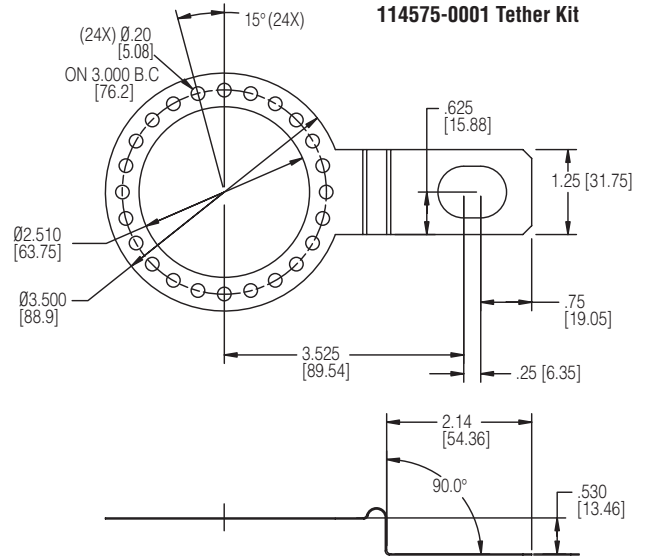
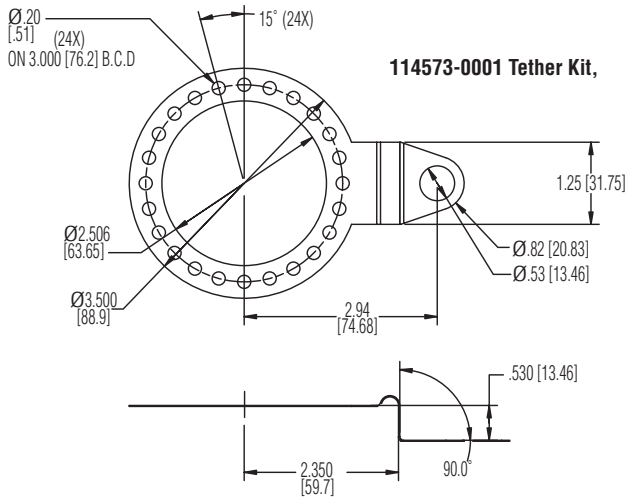
# SERIES HSD35

**NorthStar™ brand**

**DIMENSIONS** inch [mm]



**DIMENSIONS** inch [mm]



# SERIES HSD37

# NorthStar™ brand

## Harsh Duty Optical Encoder

### Key Features

- Unbreakable Code Disc up to 5000PPR
- ATEX Certification Available for Intrinsically Safe Applications
- Dual Isolated Outputs Available for Redundancy
- Anodized Aluminum, Stainless Steel, or Nickel Plated Housing
- IP67 Sealing



## 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. ATEX: 5VDC, 7-26VDC

**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)

10 pin, NEMA 4 style (604505 & 604506)

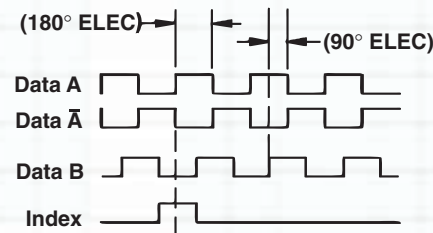
Cable w/ 5 pin M12 connector, p/n 112859-xxx

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

### DATA AND INDEX

Not all complements shown

$\bar{A}$  shown for reference



A leads B, CCW (From Clamp End)

### MECHANICAL

**Shaft Material:** Stainless Steel (Anodized 6061 aluminum for 1" isolated bore option)

**Bore Diameter:** 1.00", 0.875", 0.750", 0.625", 0.500", 16mm, 15mm, 12mm. Insulated inserts provided for bores under 1 inch (1" bore not electrically isolated for stainless shaft option)

**Bore runout:**  $\pm 0.0005$  TIR at midpoint

**Min. Shaft Engagement:** 1.60" (Recommended)

**Starting torque:** 4.5 in-oz. maximum (at 25°C)

**Running torque:** 4.0 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.

Also available in Stainless Steel.

**Disc material:** Metal or plastic

**Weight:** 35 ounces, typical

### ENVIRONMENTAL

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

**Operating Temperature ATEX:** -40 to 80°C

**Storage temperature:** -40 to 100°C

**Shock:** 400g for 6msec duration

**Vibration:** 5 to 3000Hz @ 20g

**Humidity:** 100%

**Enclosure Rating:** IP67

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



# SERIES HSD37

## 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: Output Format	Code 5: Termination	Code 6: Options	Code 7: Special Option
<input type="checkbox"/> <b>SD37</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>HSD37</b> Heavy Duty Hollowshaft Encoder	<b>0015</b> <b>0032</b> <b>0050</b> <b>0060</b> <b>0100</b>	<b>0</b> 6mm <b>1</b> 1/4" <b>2</b> 5/16" <b>3</b> 8mm <b>4</b> 3/8"	<b>0</b> Single Ended ABZ, 5-26VDC push-pull <b>1</b> Single Ended ABZ, 5-26VDC open collector (7273) <b>2</b> Single Ended ABZ, 5-26VDC open collector (2222) <b>3</b> Single Ended ABZ, 5-26VDC open collector w/1kOhm (2222)	<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+mating connector <b>6</b> 7 pin+mating connector <b>7</b> 10 pin+mating connector <b>8</b> 12 CW pin+mating connector <b>9</b> 10 pin Bayonet+mating connector	<b>0</b> No options <b>1</b> Slotted Tether <b>2</b> Single point 4.5" C-face tether <b>3</b> Single point 8.5" C-face tether <b>4</b> Dual Isolated Outputs, No tether <b>5</b> Dual Isolated Outputs, Slotted Tether <b>6</b> Dual Isolated Outputs, 4.5" c-face tether <b>7</b> Dual Isolated Outputs, 8.5" c-face tether	<b>Blank</b> None <b>01</b> Nickel Plated <b>02</b> Stainless Steel
<b>ISD37</b> ATEX Intrinsically Safe	<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>5</b> 10mm <b>6</b> 12mm <b>7</b> 1/2" <b>8</b> 5/8" <b>9</b> 15mm <b>A</b> 16mm <b>C</b> 19mm <b>D</b> 3/4" <b>E</b> 20mm <b>F</b> 7/8" <b>G</b> 24mm <b>H</b> 1" Non Isolated <b>P</b> 25mm Non Isolated <b>R</b> 1" Isolated	<i>Options 4 &amp; 5 not available when Code 5 is H</i> <b>4</b> Differential AB only, 5-26, 5-26 out (7272) <b>5</b> Differential AB only, 5-26 in, 5V out (7272) <i>Options 6 &amp; 7 not available when Code 5 is 0, 1, 5, 6, H</i> <b>6</b> Differential ABZ, 5-26 in, 5V out (7272) <b>7</b> Differential ABZ, 5-26 in, 5-26 out (7272)	<b>A</b> .5m (18") cable <b>C</b> 1m (36") cable <b>D</b> 2m (72") cable <b>H</b> 5 pin M12 connector <b>J</b> 8 pin M12 connector <b>K</b> 1.5 ft (18") cable w/ in line 10pin connector <b>M</b> 5 ft (60") cable <b>N</b> 10 ft (120") cable <b>T</b> Terminal box w/conduit entry	<b>A</b> Swivel Rod tether <b>C</b> Metric Swivel Rod tether <b>D</b> Dual Isolated Outputs, Swivel Rod Tether <b>E</b> Dual Isolated Outputs, Metric Swivel Rod Tether	
<p><b>Following options are only available when Code 1 is ISD37</b></p> <p><b>A</b> Single Ended ABZ, 7-26V in, 7-26V out push-pull (7272) <b>C</b> Single Ended ABZ, 5V in, 5V out push-pull (7272) <b>D</b> Single Ended ABZ, 7-26V in, 7-26 out push-pull (7272) <b>E</b> Single Ended ABZ, 7-26V in, 7-26V out Open Collector (2222) <b>F</b> Single Ended ABZ, 7-26V in, 7-26V out Open Collector with 1kOhm (2222)</p> <p><i>Options G, H &amp; J not available when Code 5 is H</i> <b>G</b> Differential AB only, 5V in, 5V out (7272) <b>H</b> Differential AB only, 7-26 in, 7-26 out (7272) <b>J</b> Differential AB only, 7-26 in, 5V out (7272)</p> <p><i>Options K, L, M not available when Code 5 is 0, 1, 5, 6, H</i> <b>K</b> Differential ABZ, 5V in, 5V out (7272) <b>L</b> Differential ABZ, 7-26 in, 7-26 out (7272) <b>M</b> Differential ABZ, 7-26 in, 5V out (7272)</p>						

**Accessories**

- 114573-0001** Tether Kit, 4.5" C-face single point with 3/8" bolt
- 114574-0001** Tether Kit for Standard AC motor fan covers with T-bolt
- 114575-0001** Tether Kit, 8.5" C-face single point with 1/2" bolt

The following Cover Kits are not compatible when Code 5 is T

- 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
- 1400635-0010** 10 Pin MS, 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

**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)
- 10 pin, NEMA 4 style (604505 & 604506)

# SERIES HSD37

NorthStar™ brand

## 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- or 109209- (NEMA4) 10 Pin Dif Line Drv w/idx		Cable # 114448-* 10 Pin Bayonet		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	A	BRN	BRN
Sig. B	D	ORN	B	ORG	B	ORG	B	ORG	B	ORG	ORN
Sig. Z	C	YEL	C	YEL	—	—	C	YEL	C	YEL	YEL
Power +V	B	RED	D	RED	D	RED	D	RED	D	RED	RED
Com	A	BLK	F	BLK	F	BLK	F	BLK	E	—	BLACK
Case	—	—	G	GRN	G	GRN	G	GRN	F	BLK	—
N/C-Shield	F	—	E	—	—	—	E	—	G	GRN	—
Sig. Ā	—	—	—	—	C	BRN/WHT	H	BRN/WHT	H	BRN/WHT	BRN / WHT
Sig. B̄	—	—	—	—	E	ORG/WHT	I	ORG/WHT	J	ORG/WHT	ORG / WHT
Sig. Z̄	—	—	—	—	—	—	J	YEL/WHT	K	YEL/WHT	YEL / WHT

For watertight applications, use NEMA4 10 pin cable & connector 109209-XXXX.

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

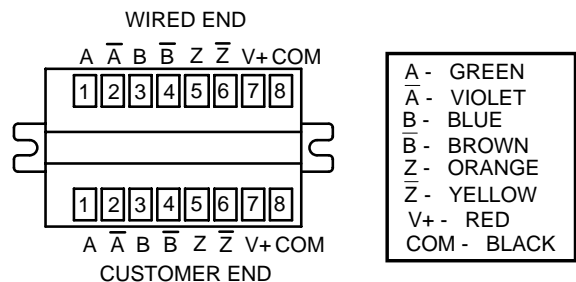
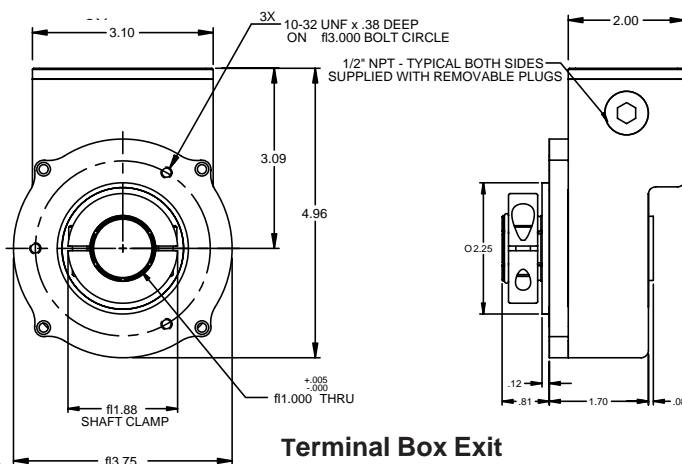
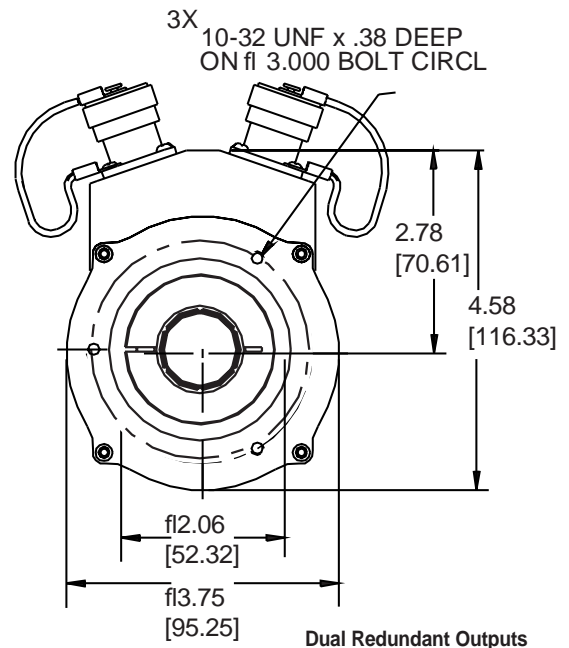
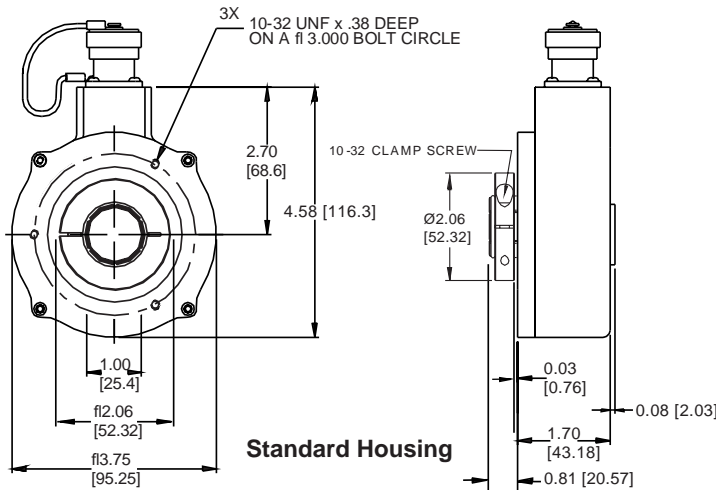
Connector pin numbers and cable assembly wire color information is provided here for reference.

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. Ā	—	—	—	—	3	BRN/WHT
Sig. B̄	—	—	—	—	5	ORG/WHT
*Sig. Z̄	—	—	—	—	8	YEL/WHT

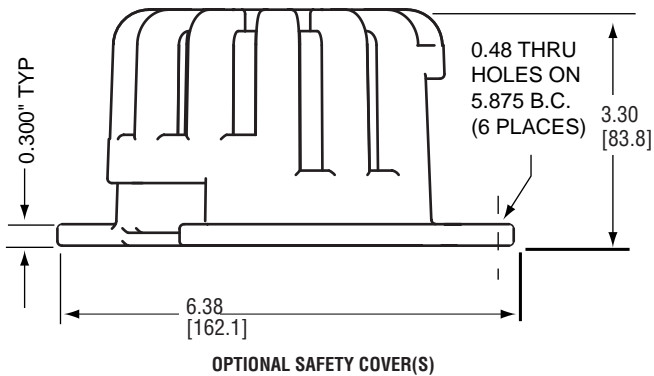
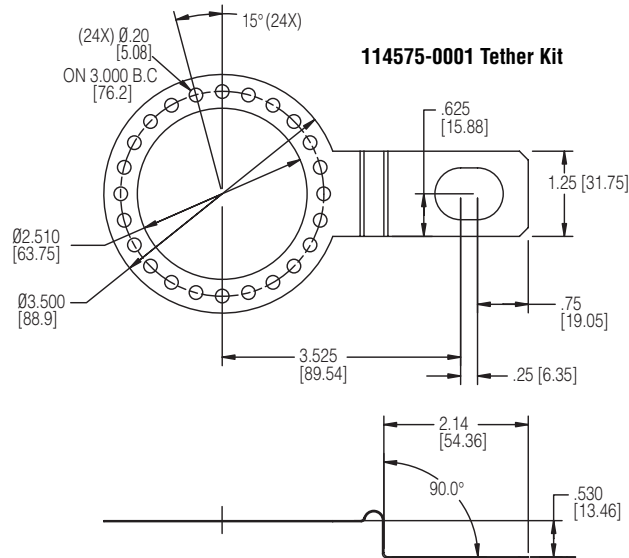
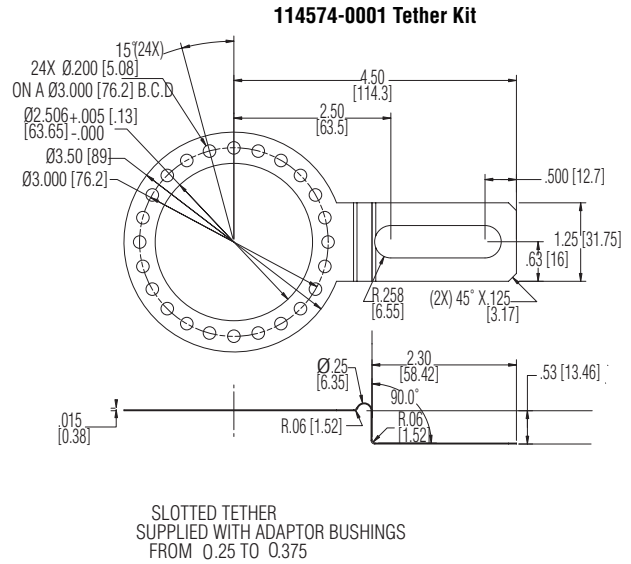
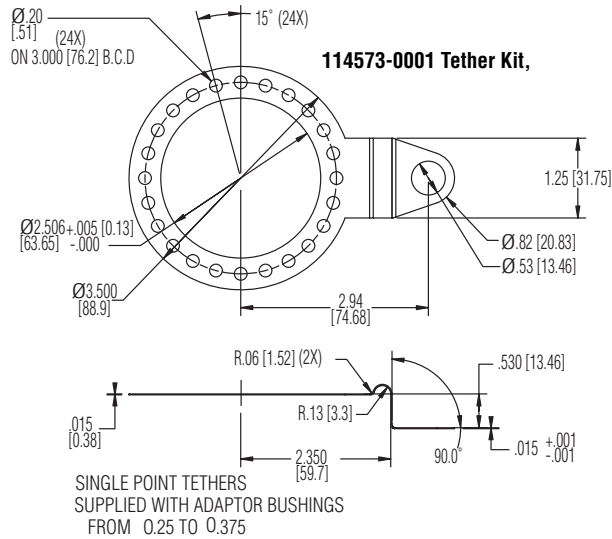
\* Index not provided on all models. See ordering information

**Cable Configuration:** PVC jacket, 105 °C rated, overall foil shield; 24 AWG conductors, minimum

## DIMENSIONS (inches [mm])



**DIMENSIONS** (inches [mm])



# 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)  
10 pin, NEMA 4 style (604505 & 604506)  
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°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 plastic (unbreakable)

**Weight:** 26 ounces, typical

### ENVIRONMENTAL

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

**Storage temperature:** -40 to 100°C

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

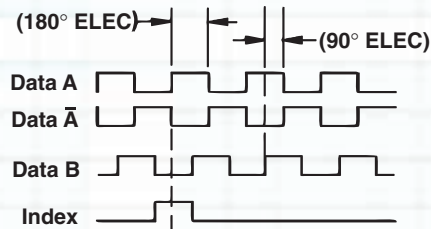
**Vibration:** 5 to 2000Hz @ 20 G's

**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



# SERIES HSD38

## 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>	□□□□	□	□	□	□	□	□
Ordering Information							
<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" <b>T</b> 5/8" Stainless Steel Collar  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, A, G, J or K: <b>3</b> differential, bidirectional (AĀ BB)  available when Code 5 is 3 or 4 and Code 6 is 2, 4, 8, 7, A, G, J or K: <b>4</b> differential, bidirectional with index (AĀ BB ZZ)	<b>0</b> 5-26V in, 5-26V Open Collector out (7273) <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)	<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>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 or 2 <b>H</b> 5 pin M12 connector	<b>0</b> No Option <b>1</b> Internally Isolated 1" bore <b>2</b> Reverse Phasing (A leads B, CW)	<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 4.5" 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>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)
- 10 pin, NEMA 4 style (604505 & 604506)

# 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 (CW) (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
M/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.

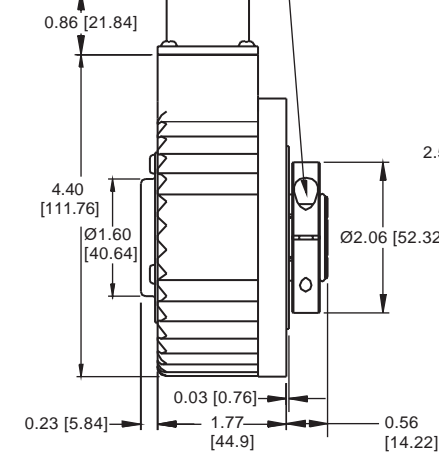
Encoder Function	Cable # 112859-5 Pin Single Ended		Cable # 112860-8 Pin Single Ended		Cable # 112860-8 Pin Differential	
	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color
Sig. A	4	BLK	1	BRN	1	BRN
Sig. B	2	WHT	4	ORG	4	ORG
*Sig. Z	5	GRY	6	YEL	6	YEL
Power +V	1	BRN	2	RED	2	RED
Com	3	BLU	7	BLK	7	BLK
Sig. A	—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

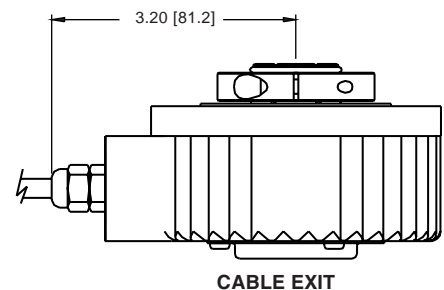
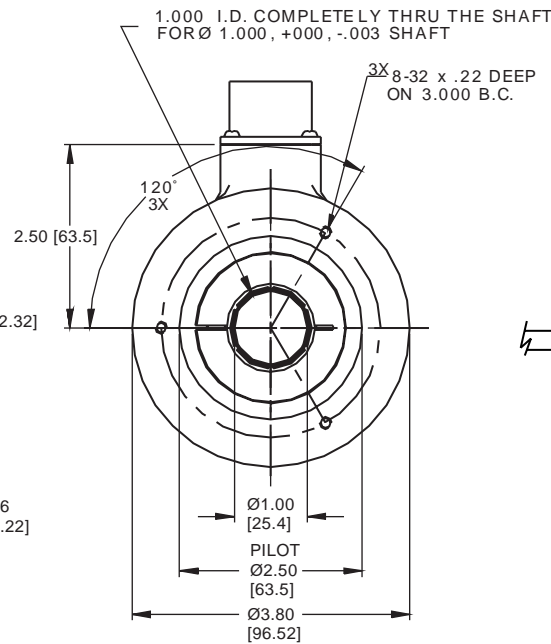
- \* Note: 1) Standard cable length is 10 feet but may be ordered in any length in 5 foot increment. For example, -0020 is a 20 foot cable.
- 2) "MS" type mating connectors and prebuilt cables are rated NEMA 12. "M12" Cable assemblies are rated IP67
- 3) For watertight applications, use NEMA4 10 pin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

## DIMENSIONS [mm]

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



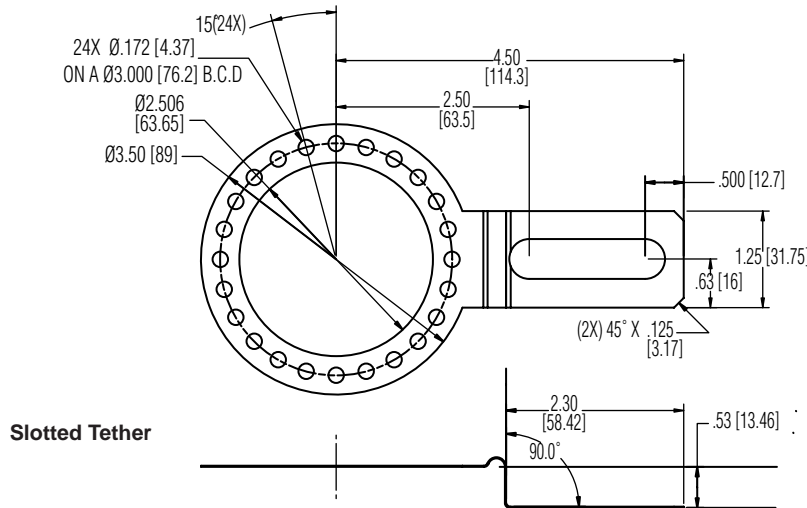
**STANDARD HOUSING**



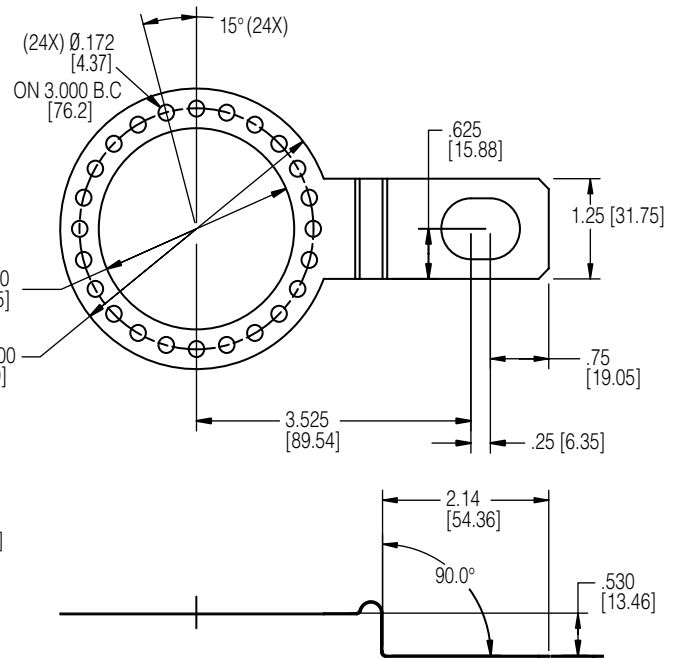
**CABLE EXIT**

# SERIES HSD38

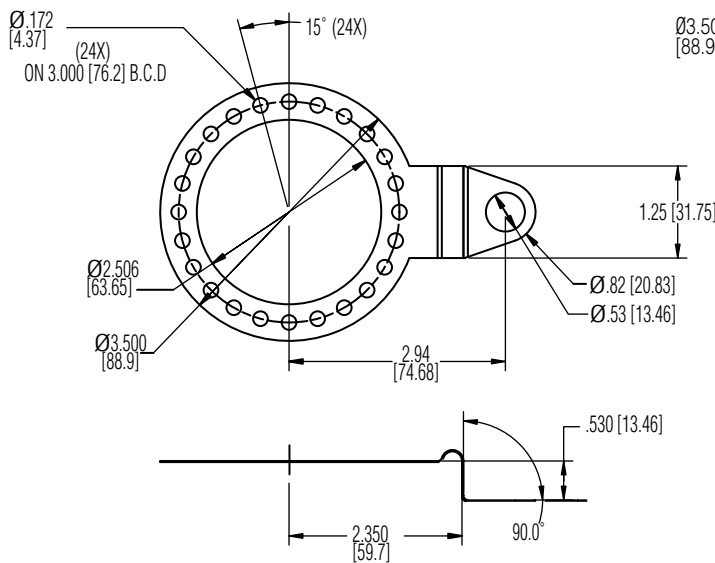
**DIMENSIONS** <sup>inch</sup>  
[mm]



Slotted Tether



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



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

# SERIES DWD38

NorthStar™ brand

## Harsh Duty Optical Encoder

### Key Features

- Draw Works Threaded Shaft with Field Replaceable Adapters for Reduced Downtime
- ATEX Certification Available for Intrinsically Safe Requirements
- Dual Isolated Outputs Available for Redundancy
- Anodized Aluminum or Stainless Steel Housing
- NAMUR Sensor Output Available



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental  
**Resolution:** 1 to 5000 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:** For resolutions to 1200 PPR: 90° ± 15° electrical; For resolutions over 1250 PPR: 90° ± 30° electrical  
**Symmetry:**  
 For resolutions to 1024PPR: 180° ± 18° electrical  
 For resolutions over 1024PPR: 180° ± 25° electrical

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

### ELECTRICAL CONNECTIONS

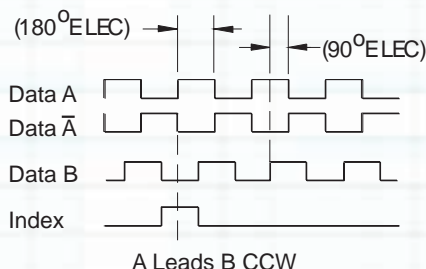
#### 6, 7 & 10 Pin MS Connectors and Cables

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 #108594-6 Pin Single Ended		Cable # 108595-7 Pin Single Ended		Cable #108596-7 Pin Dif Line Drv w/o Idx		Cable # 1400635- or 109209-(NEMA4) 10 Pin Dif Line Drv w/Idx		Cable Exit with Seal
	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Wire Color
Sig. A	E	BRN	A	BRN	A	BRN	A	BRN	BRN
Sig. B	D	ORG	B	ORG	B	ORG	B	ORG	ORG
Sig. Z	C	YEL	C	YEL	—	—	C	YEL	YEL
Power +V	B	RED	D	RED	D	RED	D	RED	RED
Com	A	BLK	F	BLK	F	BLK	F	BLK	BLK
Case	—	—	G	GRN	G	GRN	G	GRN	—
N/C	F	—	E	—	—	—	E	—	—
Sig. A	—	—	—	—	C	BRN/WHT	H	BRN/WHT	BRN/WHT
Sig. B	—	—	—	—	E	ORG/WHT	I	ORG/WHT	ORG/WHT
Sig. Z	—	—	—	—	—	—	J	YEL/WHT	YEL/WHT

Note: "MS" type mating connectors and prebuilt cables are rated NEMA 12.  
 For watertight applications, use NEMA4 10 pin cable & connector 109209-XXXX.

DATA AND INDEX  
 Not all complements shown.  
 A shown for reference



### ELECTRICAL

**Input Power:** 5-26VDC; 50 mA max., not including output loads. ATEX: 5VDC, 5-26VDC  
**Outputs:** 2N2222, ET7272, ET7273  
**Frequency Response:** 125 kHz (data & index)  
**Termination:** 6, 7, or 10 pin MS Connector; 18" 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);  
 10 pin, NEMA 4 style (604505 & 604506)

### MECHANICAL

**Shaft Sizes:**  
 1"-14 UNS x 5/8" - 18 UNF Threaded Shaft;  
 1"-14 UNS Threaded Shaft;  
 1"-14 UNS x 5/8" - 18 UNF Field Replaceable Threaded Shaft  
**Shaft Material:** 300 series stainless steel  
**Bore loading:** Up to 20 lbs axial and radial  
**Bore runout:** 0.0005 TIR at midpoint  
**Starting/Running torque:** 4.5/4.0 in-oz. maximum (at 25°C)  
**Bearings:** 61806-ZZ  
**Bearing life:** 5 x 10<sup>8</sup> revs at rated shaft Loading,  
 5 x 10<sup>11</sup> revs at 10% of rated shaft loading. (manufacturers' specs)  
**Housing and cover:** Hard Anodized Aluminum. Also available in Electroless Nickel finish and Stainless Steel.  
**Disc material:** Metal or plastic  
**Weight:** 35 ounces, typical

### ENVIRONMENTAL

**Operating Temperature:** -40 to 100°C  
**Operating Temperature ATEX:** -40 to 80°C  
**Storage temperature:** -40 to 100°C  
**Shock:** 400g for 6msec duration  
**Vibration:** 5 to 3000Hz @ 20g  
**Humidity:** 100%  
**Enclosure Rating:** IP67

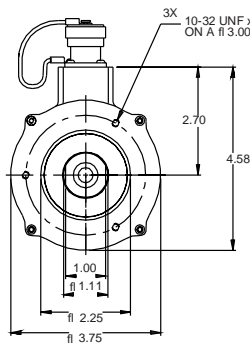


**Ordering Information**

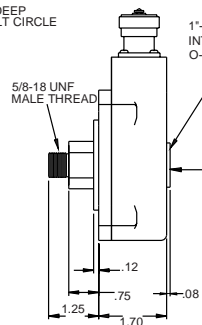
To order, complete the model number with code numbers from the table below:

Code 1: Model	Code 2: PPR	Code 3: Shaft	Code 4: Output Format	Code 5: Termination	Code 6: Options
□□□ <b>38</b>	□□□□	□	□	□	□
<b>Ordering Information</b>					
<b>DWD38</b> Draw Works Encoder  <b>ISW38</b> ATEX Intrinsically Safe	<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>4000</b> <b>4096</b> <b>5000</b>	<b>0</b> 1"-14 UNS x 5/8" - 18 UNF Threaded Shaft  <b>1</b> 1"-14 UNS Threaded Shaft  <b>2</b> 1"-14 UNS x 5/8" - 18 UNF Field Replaceable Threaded Shaft	<b>0</b> Single Ended ABZ, 5-26VDC push-pull <b>1</b> Single Ended ABZ, 5-26VDC open collector (7273) <b>2</b> Single Ended ABZ, 5-26VDC open collector (2222) <b>3</b> Single Ended ABZ, 5-26VDC open collector w/1kOhm (2222)	<b>0</b> 6 pin connector <b>1</b> 7 pin connector <b>2</b> 10 pin connector <b>5</b> 6 pin+mating connector <b>6</b> 7 pin+mating connector <b>7</b> 10 pin+mating connector <b>8</b> 12 CW pin+mating connector <b>A</b> .5m (18") cable <b>C</b> 1m (36") cable <b>D</b> 2m (72") cable <b>H</b> 5 pin M12 connector <b>J</b> 8 pin M12 connector <b>K</b> 1.5 ft (18") cable w/ in line 10pin connector <b>M</b> 5 ft (60") cable <b>N</b> 10 ft (120") cable	<b>0</b> Aluminum housing <b>1</b> Nickel finish housing <b>2</b> Stainless Steel housing <b>3</b> Dual Isolated Outputs, Aluminum Housing <b>4</b> Dual Isolated Outputs, Nickel Housing <b>5</b> Dual Isolated Outputs, Stainless Steel Housing
			Options 4 & 5 not available when Code 5 is H <b>4</b> Differential AB only, 5-26, 5-26 out (7272) <b>5</b> Differential AB only, 5-26 in, 5V out (7272)		
<b>Note:</b> <b>10 foot Cable Assemblies with MS Connector</b> <b>108594-0010</b> 6 Pin MS, Cable Assy. For Use with Single Ended Outputs <b>108595-0010</b> 7 Pin MS, Cable Assy. For Use with Single Ended Outputs <b>108596-0010</b> 7 Pin MS, Cable Assy. For Use with Differential Line Driver w/o Index Outputs <b>1400635-0010</b> 10 Pin MS, Cable Assy. For Use with Differential Line Driver with Index Outputs <b>109209-0010</b> NEMA4 10 pin MS, Cable Assy. For use with differential line driver with index outputs <b>Mating Connectors (no cable)</b> 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, NEMA 4 style (604505 & 604506)			Options 6 & 7 not available when Code 5 is 0, 1, 5, 6, H <b>6</b> Differential ABZ, 5-26 in, 5V out (7272) <b>7</b> Differential ABZ, 5-26 in, 5-26 out (7272)		
			<b>Following options are only available when Code 1 is ISW38</b> <b>A</b> Single Ended ABZ, 7-26V in, 7-26V out push-pull (7272) <b>C</b> Single Ended ABZ, 5V in, 5V out push-pull (7272) <b>D</b> Single Ended ABZ, 7-26V in, 5V out push-pull (7272) <b>E</b> Single Ended ABZ, 7-26V in, 7-26V out Open Collector (7273) <b>F</b> Single Ended ABZ, 7-26V in, 7-26V out Open Collector (2222) <b>G</b> Single Ended ABZ, 7-26V in, 7-26V out Open Collector w/ 1kOhm (2222)		
			Options H, J & K not available when Code 5 is H <b>H</b> Differential AB only, 5V in, 5V out (7272) <b>J</b> Differential AB only, 7-26 in, 7-26 out (7272) <b>K</b> Differential AB only, 7-26 in, 5V out (7272)		
			Options L, M, P not available when Code 5 is 0, 1, 5, 6, H <b>L</b> Differential ABZ, 5V in, 5V out (7272) <b>M</b> Differential ABZ, 7-26 in, 7-26 out (7272) <b>P</b> Differential ABZ, 7-26 in, 5V out (7272)		
			<b>N</b> Namur output, 15mA max		
			† NOTE: Simultaneous use of redundant outputs may void ATEX certification. Consult factory for details.		

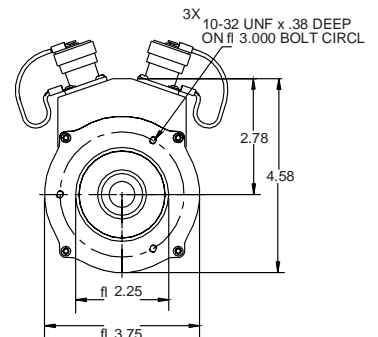
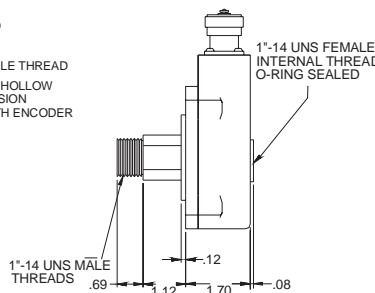
**DIMENSIONS** inches [mm]



With Convertable Shaft



With Non-Convertible Shaft



Redundant Version

# SERIES HSD44

**NorthStar™ brand**

## Extreme Heavy Duty Encoder

### Key Features

- **O-Ring Housing with Pilot Seals Against Motor for the Ultimate in Protection**
- **Isolated Coupling Compensates for Motor Shaft Runout and Endplay**
- **Perfect for Off-Highway Vehicle Applications with High Shock and Vibration**
- **Unbreakable Code Disc**



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental  
**Resolution:** 1024 PPR (pulses/revolution), Others at special order  
**Format:** Two channel quadrature (AB) with 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  
**Electrical Immunity:** 50 Meg ohm minimum encoder shaft/frame to all connector pins

### ELECTRICAL

**Input Power:** 5-30VDC. 50 mA max., not including output loads.  
**Outputs:** 5 -30 Volts DC, TTL  
**Frequency Response:** 125 kHz (data & index)  
**Termination:** 18" pigtail or 18" pigtail with MS Connector. See Ordering Information  
**Mating Connector:** 10 pin MS, style MS3106A-18-1S (MCN-N6)

### MECHANICAL

**Mechanical Interface:** Electrically isolated stainless steel shaft flex coupling  
**Mating Shaft Length:** 0.47" to 0.625" (11.9mm to 15.9mm)  
**Coupling:** 16mm or 5/8", flexible  
**Shaft Speed:** 6000 RPM, max.  
**Bearings:** 6107  
**Bearing life:** 5 x 10<sup>8</sup> revs at rated shaft Loading, 5 x 10<sup>11</sup> revs at 10% of rated shaft loading. (manufacturers' specs)  
**Housing Material:** Aluminum Alloy, Black Anodized  
**Disc material:** Stainless steel  
**Weight:** 4 lbs.

### ELECTRICAL CONNECTIONS

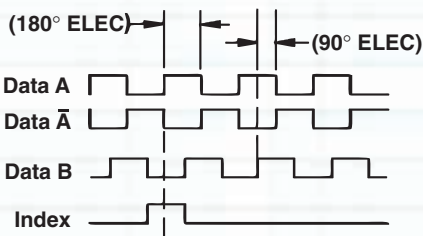
Function	Pin	Wire Color
Sig. A	A	BRN
Sig. B	B	ORG
Sig. Z	C	YEL
Power +V	D	RED
Com.	F	BLK
Case	G	GRN
N/C	E	—
Sig. $\bar{A}$	H	BRN/WHT
Sig. $\bar{B}$	I	ORG/WHT
Sig. $\bar{Z}$	J	YEL/WHT

### ENVIRONMENTAL

**Operating Temperature:** -40 to 100°C  
**Storage temperature:** -40 to 100°C  
**Shock:** 400g, 6mSec  
**Vibration:** 5-3000 Hz, 20g  
**Humidity:** 98%, non-condensing  
**Enclosure Rating:** NEMA 6

### DATA AND INDEX

Not all complements shown  
 $\bar{A}$  shown for reference



A leads B, CCW (From Clamp End)

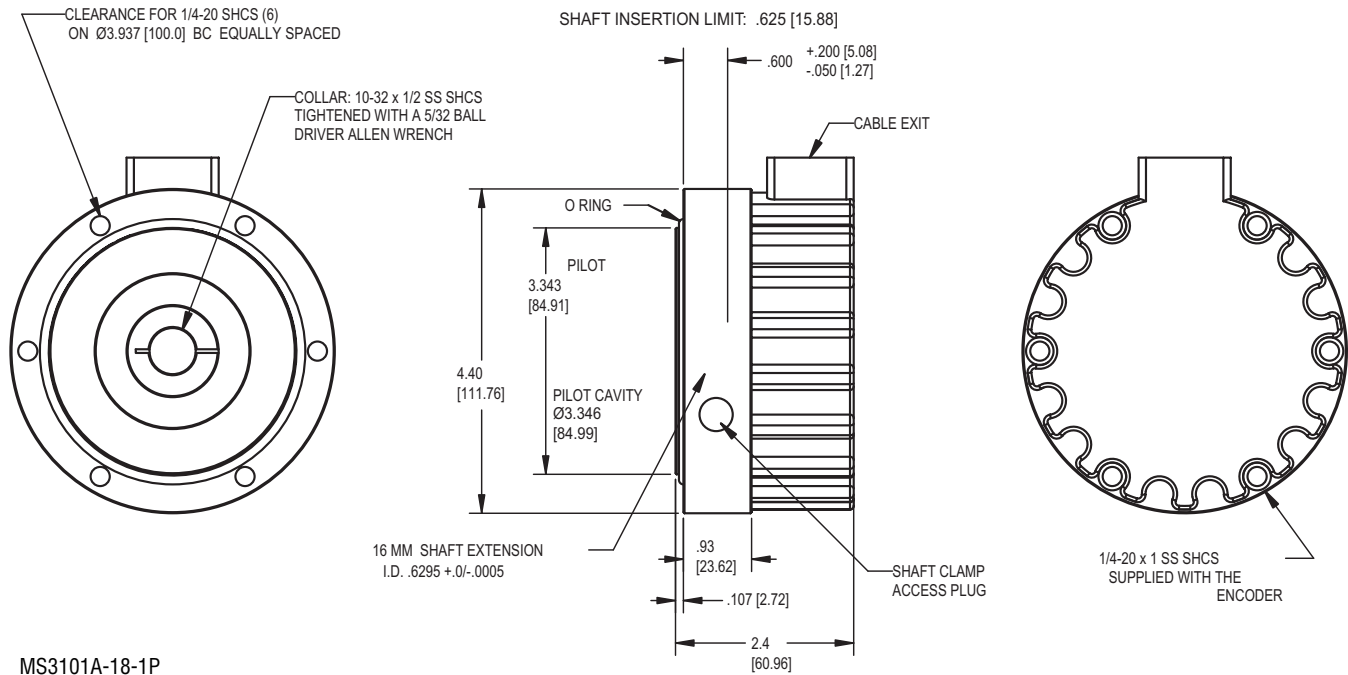
**Ordering Information**

Part Number	Description
HSD44T1024A3A	Extreme Heavy Duty Encoder with 18 inch pigtail wire connections
HSD44T1024A3A-01	Extreme Heavy Duty Encoder with 18 inch pigtail wire connections and extended pilot (.156")
HSD44T1024A3K	Extreme Heavy Duty Encoder with 18 inch pigtail with 10 pin MS connector
HSD44T1024A3K-01	Extreme Heavy Duty Encoder with 18 inch pigtail with 10 pin MS connector and extended pilot (.156")

**Accessories**

Part Number	Description
HSD44ADAPTER45	4-1/2" NEMA Motor Adapter Plate
HSD44ADAPTER85	8-1/2" NEMA Motor Adapter Plate

**DIMENSIONS (in. [mm])**



MS3101A-18-1P

# SERIES EN42

**NorthStar™ brand**

## Zone 1 Heavy Duty Encoder

### Key Features

- Encapsulated Electronics with Increased Safety Interface for Zone 1 Use
- Innovative Design Eliminates Need for I.S. Barriers
- Industry-leading -50 to +100°C Temperature Range
- High current line driver for long cable runs
- Perfect for use in Oilfield Drilling Motor Applications



Ex ia mb e IIC T4 Gb



## SPECIFICATIONS

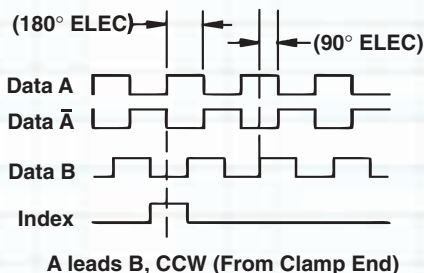
### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental  
**Resolution:** to 5000 PPR (pulses/revolution) See Ordering Information  
**Format:** Two channel quadrature (AB) with optional Index (Z, ungated), and complementary outputs  
**Index:** 180 degrees ±18 degrees (electrical), ungated  
**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° ± 15° electrical; For resolutions over 1250 PPR: 90° ± 30° electrical  
**Symmetry:** 180° ± 18° electrical  
**Waveforms:** Squarewave with rise and fall times less than 1 microsecond into a load capacitance of 1000 pf

### ELECTRICAL

**Input Voltage:** 5-15VDC, 5-26VDC (see ordering information)  
**Input Current:** 65mA max., not including output loads  
**Outputs:** TC4428, 125mA Max per channel W/ ATEX output format 0, 2 (See ordering information); 10mA max per channel @100C, 15mA max per channel @95C w/ATEX output format 1, 3 (See ordering information)  
**Frequency Response:** 125 kHz (data & index)  
**Termination:** Terminal block - Ex screwless w/ spring cage-clamp; Optional Ex gland with "S" seal for armored or non-armored cables .33" to .53" O.D. (See ordering information)

### DATA AND INDEX Not all complements shown A shown for reference



### ELECTRICAL CONNECTIONS

Encoder Function	Terminal Box Connection
Sig. A	1
Sig. $\bar{A}$	2
Sig. B	3
Sig. $\bar{B}$	4
Sig. Z	5
Sig. $\bar{Z}$	6
Power +V	7
Com	8

### MECHANICAL

**Shaft Material:** Stainless steel or anodized aluminum (See ordering information)  
**Bore Diameter:** 1.00", 0.875, 0.750", 0.625", 16mm, 15mm. Insulated inserts provided for bores under 1 inch  
**Mating Shaft length:** 2.0", Minimum; 2.5", Recommended  
**Shaft Speed:** 3600RPM Maximum continuous; 6000RPM Peak  
**Starting torque:** 8.0 in-oz. maximum (at 25°C)  
**Running Torque:** 5.0 in-oz. maximum (at ambient)  
**Bearings:** 61806-ZZ  
**Bearing Life:** 5 x 10<sup>8</sup> revs at rated shaft Loading, 5 x 10<sup>11</sup> revs at 10% of rated shaft loading. (manufacturers' specs)  
**Housing and Cover:** Hard Anodized Aluminum.  
**Disc Material:** Metal or Plastic  
**Weight:** 6.5 lb, typical

### ENVIRONMENTAL

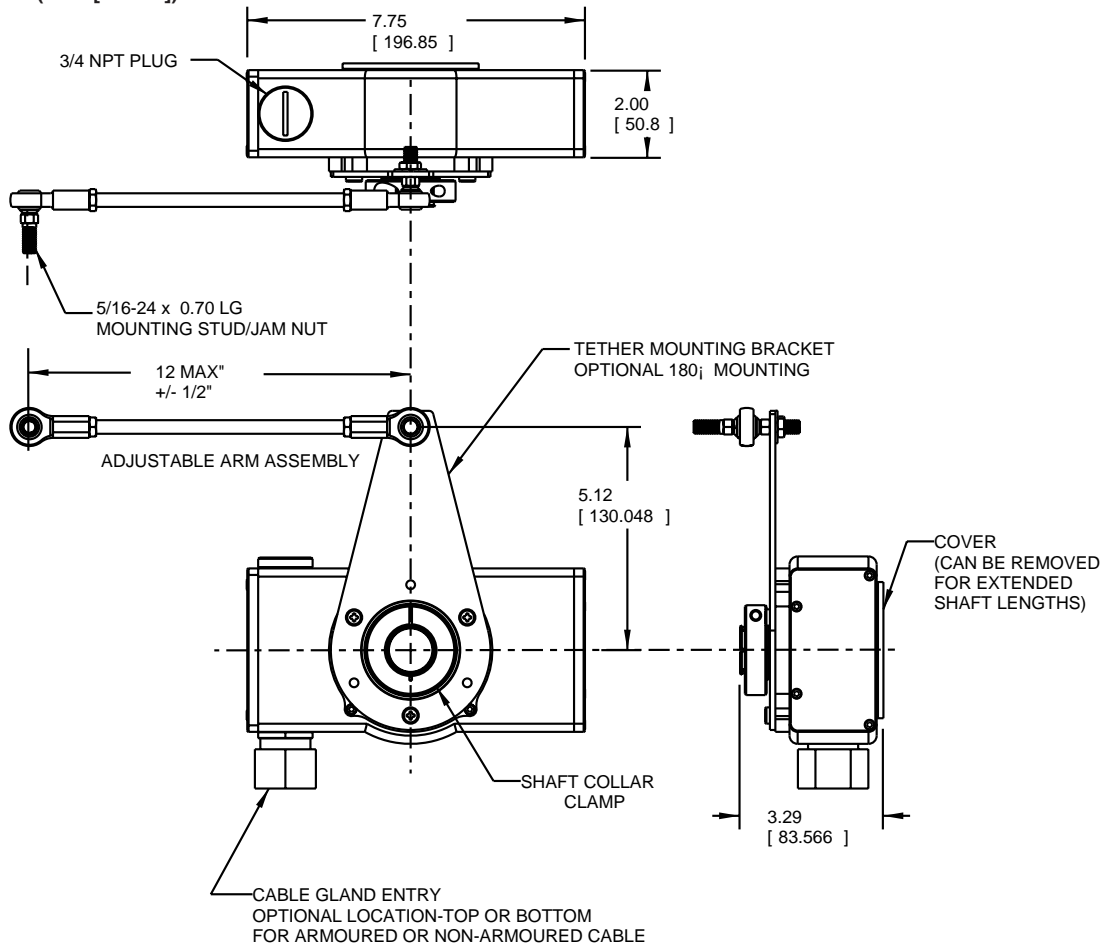
**Operating Temperature:** -50 to 100°C  
**Storage temperature:** -50 to 100°C  
**Shock:** 50G's for 11msec duration  
**Vibration:** 5 to 2000Hz @ 20 G's  
**Humidity:** 100%  
**Enclosure Rating:** IP67

**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: ATEX Output Format	Code 5: Termination	Code 6: Tether	Code 7: Cover
<b>EN42</b>	□□□□	□	□	□	□	□
Ordering Information						
<b>EN42</b> ATEX Zone 1 Barrier-Less Hollowshaft Encoder	<b>0015</b> <b>0032</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>2500</b> <b>4000</b> <b>5000</b>	<b>8</b> 5/8" <b>9</b> 15 mm <b>A</b> 16mm <b>D</b> 3/4" <b>F</b> 7/8" <b>H</b> 1" Non- Isolated <b>R</b> 1" Isolated	<b>0</b> Differential AB, 5-15V in, 5-15V out <b>1</b> Differential AB, 5-26V in, 5V out <b>2</b> Differential ABZ, 5-15V in, 5-15V out <b>3</b> Differential ABZ, 5-26V in, 5V out	<b>0</b> Dual Exit Terminal block, no gland <b>1</b> Dual Exit Terminal block, 3/4" NPT, with Ex gland including S seal for .33" to .53" o.d. non-armored cables <b>2</b> Dual Exit Terminal block, 3/4" NPT, with Ex gland including S seal for .33" to .53" o.d. armored cables	<b>0</b> None <b>1</b> Heavy Duty 5/16" Swivel Rod Tether	<b>0</b> Standard Flat cover

**DIMENSIONS (Inch [metric])**



# SERIES EN44

**NorthStar™ brand**

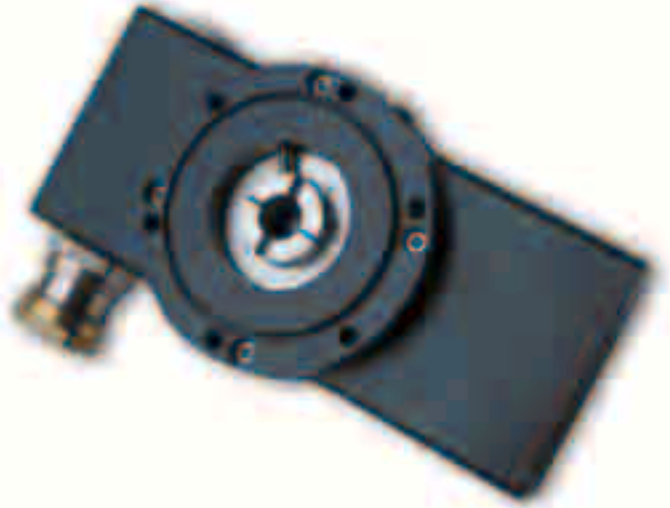
## Extreme Heavy Duty Encoder

### Key Features

- Encapsulated Electronics with Increased Safety Interface for Zone 1 Use
- Innovative Design Eliminates Need for I.S. Barriers
- Industry-leading -50 to +100°C Temperature Range
- High current line driver for long cable runs
- Perfect for use in Oilfield Drilling Motor Applications



Ex ia mb e IIC T4 Gb



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

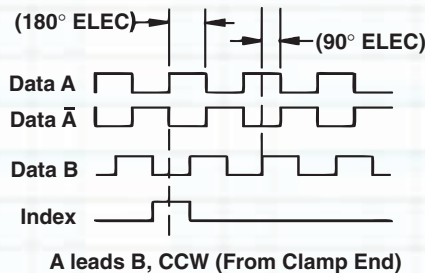
**Code:** Incremental  
**Resolution:** 1024, 2048 PPR  
**Format:** Two channel quadrature (AB) with optional Index (Z, ungated), and complementary outputs  
**Phase Sense:** A leads B for CCW shaft rotation viewing the shaft clamp end of the encoder  
**Quadrature Phasing:** For resolutions to 1200 PPR: 90° ± 15° electrical; For resolutions over 1250 PPR: 90° ± 30° electrical  
**Symmetry:** 180° ± 18° electrical  
**Waveforms:** Squarewave with rise and fall times less than 1 microsecond into a load capacitance of 1000 pf  
**Electrical Immunity:** 500VAC hypot from encoder shaft/frame to all connector pins

### ELECTRICAL

**Input Voltage:** 5-15VDC, 5-26VDC (see ordering information)  
**Input Current:** 65mA max., not including output loads  
**Outputs:** TC4428, 125mA Max per channel W/ ATEX output format 0, 2 (See ordering information); 10mA max per channel @100C, 15mA max per channel @95C w/ATEX output format 1, 3 (See Ordering Information)  
**Frequency Response:** 125 kHz (data & index)  
**Termination:** Terminal block - Ex screwless w/ spring cage-clamp; Optional Ex gland with "S" seal for armored or non-armored cables .33" to .53" O.D. (See ordering information)

### DATA AND INDEX

Not all complements shown  
 $\bar{A}$  shown for reference



### ELECTRICAL CONNECTIONS

Encoder Function	Terminal Box Connection
Sig. A	1
Sig. $\bar{A}$	2
Sig. B	3
Sig. $\bar{B}$	4
Sig. Z	5
Sig. $\bar{Z}$	6
Power +V	7
Com	8

### MECHANICAL

**Mechanical Interface:** Stainless steel shaft clamp  
**Mating Shaft Length:** 0.47" to 0.625" (11.9mm to 15.9mm)  
**Coupling:** 16mm or 5/8", flexible  
**Shaft Speed:** 6000 RPM, max.  
**Bearings:** 6107  
**Bearing life:** 5 x 10<sup>8</sup> revs at rated shaft Loading, 5 x 10<sup>11</sup> revs at 10% of rated shaft loading. (manufacturers' specs)  
**Housing Material:** Aluminum Alloy, Black Anodized  
**Disc material:** Stainless steel  
**Weight:** 6 lb. 6 oz, typical

### ENVIRONMENTAL

**Operating Temperature:** -50 to 100°C  
**Storage temperature:** -50 to 100°C  
**Shock:** 50G's for 11msec duration  
**Vibration:** 5 to 2000Hz @ 20 G's  
**Humidity:** 100%  
**Enclosure Rating:** IP67

\* Specifications are for base models with standard features only unless otherwise noted. Specifications subject to change without notice in accordance with our DBS policy of continuous improvement. All product and brand names are trademarks of their respective owners. All rights reserved.  
 NorthStar™ brand is a trademark of Dynapar. All rights reserved. © 2009 Dynapar

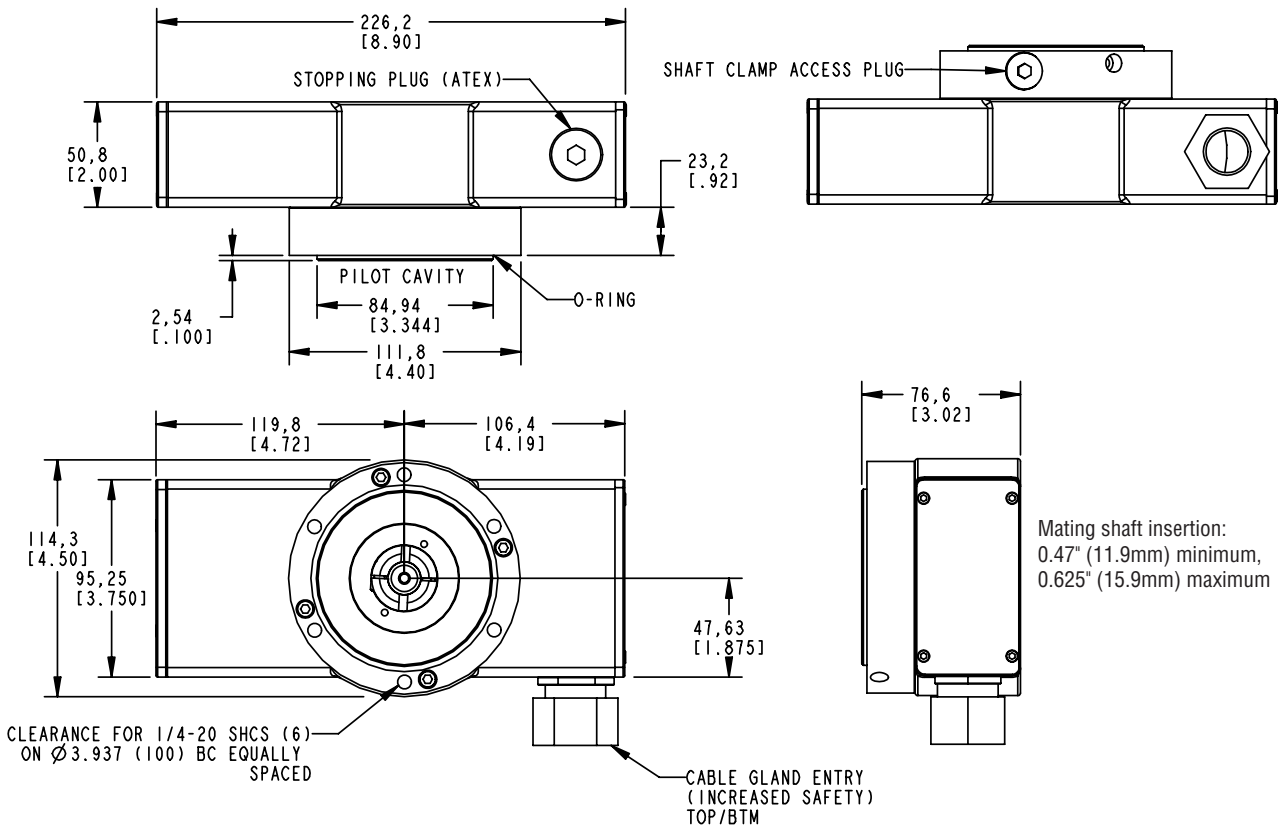
# SERIES EN44

## 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: ATEX Output Format	Code 5: Termination
<b>EN44</b>	□□□□	□	□	□
Ordering Information				
<b>EN44</b> ATEX Zone 1 Barrier-Less Hubshaft Encoder	<b>1024</b> <b>2048</b>	<b>A</b> 16mm (5/8")	<b>0</b> Differential AB, 5-15V in, 5-15V out <b>1</b> Differential AB, 5-26V in, 5V out <b>2</b> Differential ABZ, 5-15V in, 5-15V out <b>3</b> Differential ABZ, 5-26V in, 5V out	<b>0</b> Dual Exit Terminal block, no gland <b>1</b> Dual Exit Terminal block, 3/4" NPT, with Ex gland including S seal for .33" to .53" o.d. non-armored cables <b>2</b> Dual Exit Terminal block, 3/4" NPT, with Ex gland including S seal for .33" to .53" o.d. armored cables

## DIMENSIONS (Inch [metric])



# SERIES H56

**Dynapar™ brand**

## Heavy Duty Encoder

### Key Features

- Encoder-Within-Encoder Design
- Large Outer Bearings Isolate Shaft Loads
- Foot Mount or 56C Mace Mount Easily Replaces BC42 and 46 Tachs



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental  
**Resolution:** 1 to 2500 PPR (pulses/revolution)  
**Accuracy:** (Worst case any edge to any other edge)  $\pm 7.5$  arc-min.  
**Format:** Two channel quadrature (AB) with optional Index (Z) and complementary outputs  
**Phase Sense:** A leads B for CW shaft rotation as viewed from the C-face of the encoder  
**Quadrature Phasing:**  $90^\circ \pm 22.5^\circ$  electrical  
**Symmetry:**  $180^\circ \pm 18^\circ$  electrical  
**Index:**  $180^\circ \pm 18^\circ$  electrical (gated with B low)  
**Waveforms:** Squarewave with rise and fall times less than 1 microsecond into a load capacitance of 1000 pF

### ELECTRICAL

**Input Power:** (each output) 4.5 min. to 26 VDC max. at 100 mA max., not including output loads  
**Outputs:**  
 7273 Open Collector: 30 VDC max., 40 mA sink max.  
 7272 Push-Pull and Differential Line Driver: 40 mA sink or source  
 4469 Differential Line Driver: 100 mA, sink or source  
**Frequency Response:** 100 kHz min.  
**Electrical Protection:** Overvoltage, reverse voltage and output short circuit protected  
**Noise Immunity:** Tested to EN50082-2 (Heavy Industrial) for Electro Static Discharge, Radio Frequency Interference, Electrical Fast Transients, Conducted and Magnetic Interference  
**Mating Connector:**  
 6 pin, style MS3106A-14S-6S (MCN-N4);  
 10 pin, style MS3106A-18-1S (MCN-N6)  
 Pluggable Screw-Terminal (110532-0001)

### ELECTRICAL CONNECTIONS

\* This is a mating connector/cable assembly described in the Encoder Accessories section of this catalog. Color-coding information is provided here for reference.

Function (lf)	Cable #14002090010* 6 Pin Single Ended		Twisted Pairs Cable #14004190010* 10 Pin Differential		Pluggable Screw Terminal Pin Number
	Pin	Wire Color	Pin	Wire Color	
Sig. A	B	RED	B	RED	3
Sig. $\bar{A}$	—	—	G	BLK	8
Sig. B	D	BLU	D	BLU	7
Sig. $\bar{B}$	—	—	H	BLK	2
Sig. Z	A	GRN	A	GRN	4
Sig. $\bar{Z}$	—	—	I	BLK	9
+V	E	WHT	E	WHT	6
Common	C	BLK	C	BLK	1
Shield	F	SHIELD	F	SHIELD	10

### MECHANICAL

**Bearing Life:** see table, below  
**Shaft Loading:** 100 lbs. radial, 50 lbs. axial  
**Shaft Speed:** 3600 RPM max.  
**Starting Torque:** 15 oz-in max.;  
**Moment of Inertia:**  $7.9 \times 10^{-4}$  oz-in-sec<sup>2</sup>  
**Weight:** 144 oz. (9 lbs.)

### ENVIRONMENTAL

**Operating Temperature:** -40 to +80 °C  
**Storage Temperature:** -40 to +80 °C  
**Shock:** 50 G's for 11 milliseconds duration  
**Vibration:** 5 to 2000 Hz at 2.5 G's  
**Humidity:** to 98% without condensation  
**Enclosure Rating:** NEMA4/IP66 (dust proof, washdown)

### Bearing Life versus Load

Radial	Axial	Revolutions
75	15	$1.3 \times 10^{10}$
75	25	$6.4 \times 10^9$
100	25	$4.1 \times 10^9$
100	50	$1.3 \times 10^9$



**Ordering Information**

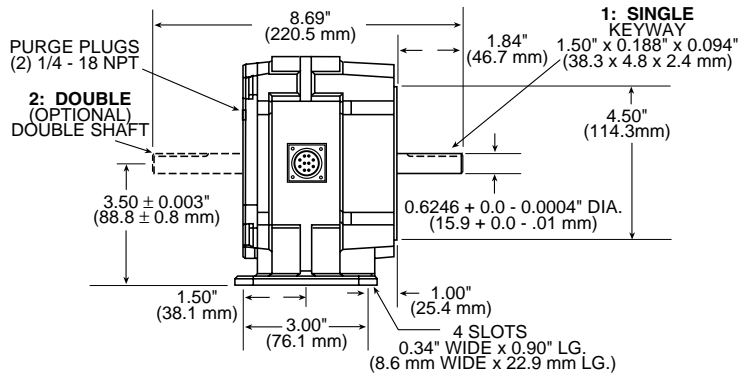
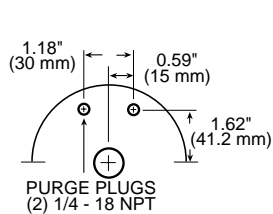
To order, complete the model number with code numbers from the table below:

Code 1: Model	Code 2: PPR	Code 3: Shaft	Code 4: Format	Code 5: Electrical	Code 6: Termination	Code 7: Options	
<b>H56</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>H56</b> Mill Duty, 56C-Face or Foot Mount Rotopulser®	<b>0001</b>	<b>0300</b>	<b>1</b> Single	Compliments available when Code 5 is 3 or 4  <b>2</b> Single, bidirectional quadrature (AB)  <b>3</b> Single, bidirectional quadrature with index (ABZ)  <b>4</b> Dual, isolated bidirectional quadrature (dual AB)  <b>6</b> Dual, isolated bidirectional quadrature with index (dual ABZ)	<b>0</b> 5-26V in, 5-26V open collector out  <b>1</b> 5-26V in, 5-26V open collector out w/ 2.2kΩ pullups  <b>2</b> 5-26V in, 5-26V single ended push-pull out  <b>3</b> 5-26V in, 5V differential line driver out (7272)  <b>4</b> 5-26V in, 5-26V differential line driver out (7272)  <b>5</b> 5-26V in, 5V Differential Line Driver out (4469)  <b>6</b> 5-15V in, 5-15V Differential Line Driver out (4469)	<b>0</b> MS Connector(s)  <b>1</b> MS Connector(s), plus mating connector(s)  <b>2</b> Pluggable screw terminal connector(s)  <b>3</b> Pluggable screw terminal(s), plus mating connector(s)	available when Code 6 is 0 or 1:  <b>PS</b> LED Output Indicator
	<b>0002</b>	<b>0360</b>	<b>2</b> Double				
	<b>0003</b>	<b>0400</b>					
	<b>0005</b>	<b>0500</b>					
	<b>0006</b>	<b>0512</b>					
	<b>0010</b>	<b>0600</b>					
	<b>0012</b>	<b>0625</b>					
	<b>0025</b>	<b>0720</b>					
	<b>0050</b>	<b>0900</b>					
	<b>0060</b>	<b>1000</b>					
<b>0064</b>	<b>1024</b>						
<b>0100</b>	<b>1200</b>						
<b>0120</b>	<b>1270</b>						
<b>0128</b>	<b>1500</b>						
<b>0180</b>	<b>1800</b>						
<b>0200</b>	<b>2000</b>						
<b>0240</b>	<b>2048</b>						
<b>0250</b>	<b>2400</b>						
	<b>2500</b>						

**DIMENSIONS** inches [mm]

**Code 3: Shaft**

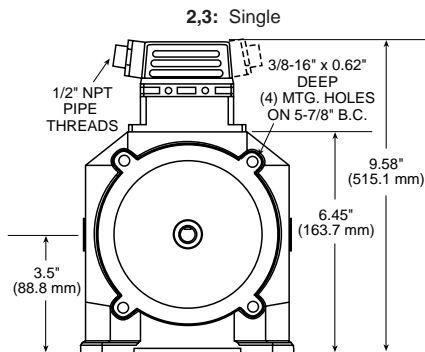
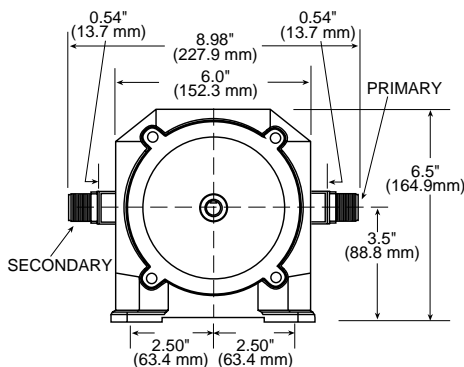
**Purge Plug Location**



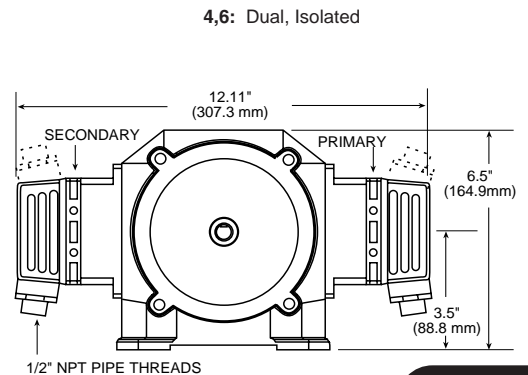
**Code 6: Termination**

**0,1: MS Connectors**  
Shown with LED Output Indicator Option  
Code 9: PS

**2,3: Pluggable Screw Terminals**



**Code 4: Format**



# SERIES X25

**Dynapar™ brand**

## For Hazardous Location Application

### Key Features

- **Approved for NEC Class 1&2, Div 1&2, Groups C,D,E,F,G**
- **Rugged Enclosure with 1/2" Conduit Entry**
- **High 5000 PPR Capability**



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental  
**Resolution:** 1 to 5000 PPR (pulses/revolution)  
**Accuracy:** (Worst case any edge to any other edge) ≤1024 PPR (metal disk): ±7.5 arc-min.  
 >1024 PPR (glass disk): ±2.5 arc-min.  
**Format:** Two channel quadrature (AB) with optional Index (Z) and complementary outputs  
**Phase Sense:** A leads B for CCW shaft rotation as viewed from the shaft end of the encoder  
**Quadrature Phasing:** 90° ± 25° electrical  
**Symmetry:** 90° ± 25° electrical  
**Index:** 2540 PPR and below: 180° ± 25° electrical; Greater than 2540 PPR: 90° ± 25° electrical  
**Waveforms:** Squarewave with rise and fall times less than 1 microsecond into a load capacitance of 1000 pf

### ELECTRICAL

**Input Power:** 4.5 min. to 26 VDC max. at 80 mA max., not including output loads  
**Outputs:**  
 7273 Open Collector: 30 VDC max., 40 mA sink max.  
 7272 Push-Pull and Differential Line Driver: 40 mA sink or source  
**Frequency Response:** 100 kHz min.  
**Electrical Protection:** Overvoltage, reverse voltage and output short circuit protected  
**Noise Immunity:** Tested to EN50082-2 (Heavy Industrial) for Electro Static Discharge, Radio Frequency Interference, Electrical Fast Transients, Conducted and Magnetic Interference

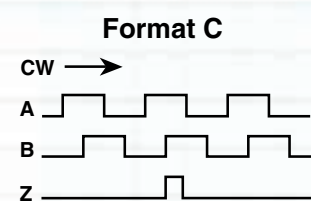
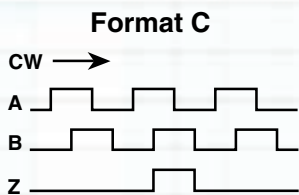
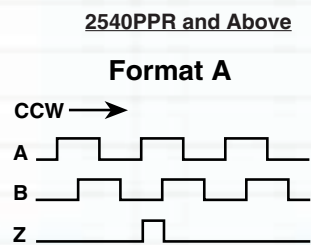
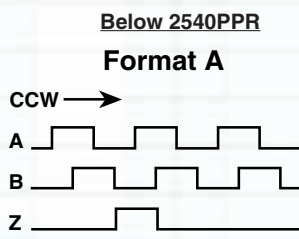
### MECHANICAL

**Shaft Loading:** 40 lbs. radial, 40 lbs. axial  
**Shaft Speed:** 5,000 RPM max.  
**Shaft Runout:** 0.001" max. TIR  
**Starting Torque:** (max at 25 °C) 2.0 oz.-in  
**Moment of Inertia:** 9.0 x 10<sup>-4</sup> oz-in-sec<sup>2</sup>

### ENVIRONMENTAL

**Operating Temperature:** 0 to +70 °C;  
**Storage Temperature:** -40 to +90 °C  
**Shock:** 50 G's for 11 milliseconds duration  
**Vibration:** 5 to 2000 Hz at 2 G's  
**Humidity:** to 98% without condensation  
**Weight:** 4.5 lbs. (2.0 kg)  
**Enclosure Rating:** NEMA4X/IP56 (dust proof, washdown)

### OUTPUT FORMAT



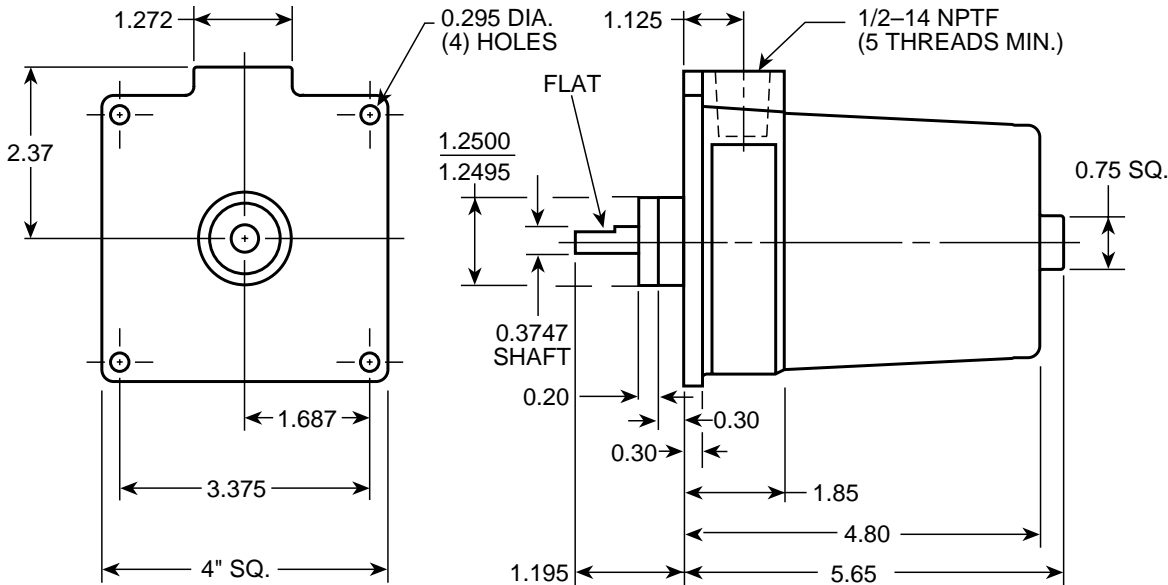
**Ordering Information**

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

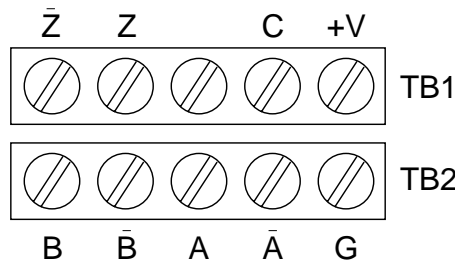
Code 1: Model	Code 2: Pulses/Rev			Code 3: Mechanical	Code 4: Output	Code 5: Electrical
<b>X25</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>X25</b> Explosion Proof, Shielded Bearings with Shaft Seal	0001 0005 0010 0012 0025 0050 0060 0086 0100 0120 0180 0200 0240 0250 0254 0256 0300	0360 0400 0500 0512 0600 0635 0720 0768 0800 0900 1000 1024 1200 1250 1270 1500	1600 1800 1968 2000 2048 2400 2500 2540 3000 3400 3600 3750 4000 4096 4800 5000	0 3/8" Shaft 1 1/4" Shaft	0 Single Ended, no index, Format C 1 Single Ended, with index, Format C 2 Differential, no Index, Format C 3 Differential, with index, Format C 4 Single Ended, with index, Format A 5 Differential, with index, Format A	0 5-26V in; 5-26V Open Collector with 2.2kΩ Pullup out 1 5-26V in; 5-26V Open Collector out 2 5-26V in; 5V Totem Pole out 3 5-26V in; 5V Line Driver out 4 5-26V in; 5-26V Line Driver out

**DIMENSIONS**

Approximate Dimensions (in inches)



**Terminal Board Connections**



Screw terminals with pressure plates that accept #14 AWG to #22 AWG.

# SERIES 60

**Dynapar™ brand**

## Heavy Duty Rotopulser®

### Key Features

- Heavy-duty bearings with 1/2" diameter shaft
- LED optical light source
- Unbreakable disk
- Wide selection of resolutions available up to 2500 PPR
- Servo ring and face mount options



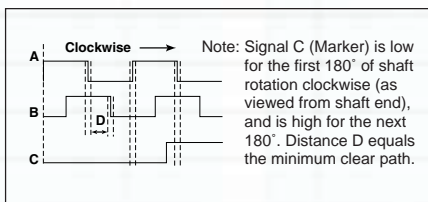
## SPECIFICATIONS

### ELECTRICAL

**Power Requirements:** 5 to 15 VDC max.  
115 mA max. plus load requirements

**Frequency Response:** 50 kHz

**Minimum Free Path:** Between any A and B transition, will not be less than 12.5% of one full electrical cycle. This includes effects of jitter, phase and symmetry shifts.



**Differential Output:** 7272, 40 mA sink/source; connections  
Mating Connector: Style MS3106A-18-1S; Dynapar Part No. MCN-N6

**Single-Ended Output:** 7272, 40 mA sink/source;  
Mating Connector: Style MS3106A-14S-6S; Dynapar Part No. MCN-N4

### ELECTRICAL CONNECTIONS

Single-Ended Output (6-pin)		
Function (If Used)	MS Pin No.	#14002090010* Cable Accessory Color Code
Signal A	B	RED
Signal B	D	BLUE
Signal C (Marker)	A	GREEN
+V	E	WHITE
Common	C	BLACK
Shield	F	SHIELD

Differential Line Driver (10-pin)		
Function (If Used)	MS Pin No.	#14004190010* Cable Accessory Color Code
Signal A	B	RED
Signal $\bar{A}$	G	BLACK
Signal B	D	BLUE
Signal $\bar{B}$	H	BLACK
Signal C (Marker)	A	GREEN
Signal $\bar{C}$	I	BLACK
+V	E	WHITE
Common	C	BLACK
Shield	F	SHIELD
Not Used	J	

\*This is a mating connector/cable assembly described in the Encoder Accessories section of this catalog. Color-coding information is provided here for reference.

### MECHANICAL

**Weight:** 26 oz.

**Speed Range:** Up to 3600 RPM

**Shaft Loading:** Radial: 15 lbs. overhung; Axial: 5 lbs.

**Inertia:** 170 gm-cm<sup>2</sup>

**Starting Torque:** 0.45 oz-in (0.30 oz-in for 1/4 in. dia. shaft)

**Running Torque:** 0.35 oz-in (0.15 oz-in for 1/4 in. dia. shaft)

**Shaft Diameters:** 1/4", 1/2" (-0.0003"/-0.0007")

### ENVIRONMENTAL

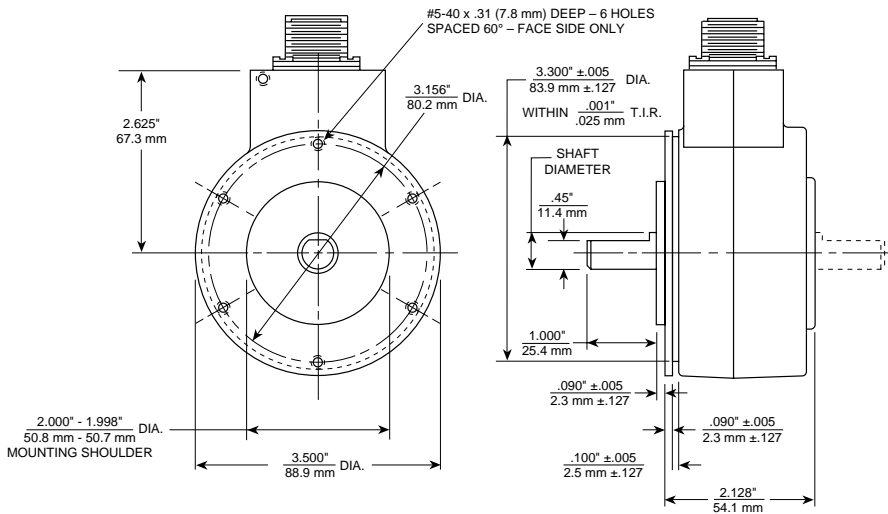
**Enclosure Rating:** NEMA 12 / IP54;  
**Temperature Range:** 0-54°C

**Ordering Information**

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

Code 1: Model	Code 2: Housing	Code 3: Shaft	Code 4: Output	Code 5: Voltage	Code 6: Pulses/Rev	Code 7: Wiring	Code 8: Misc
<b>6</b> □	□	□	□	<b>F</b>	□ □ □ □	<b>A</b>	□
<b>2</b> Bidirectional, Heavy Duty <b>3</b> Bidirectional with Marker, Heavy Duty	<b>A</b> Standard Housing for Single Shaft <b>C</b> Standard Housing for Double Shaft <b>H</b> Hand-Held Housing with Double Shaft and two 12" Circumference Measuring Wheels	<b>A</b> 1/2" Dia, 1.0" Len with Flat <b>B</b> 1/2" Dia, 1.0" Len without Flat <b>C</b> 1/2" Dia, 1.5" Len with Flat <b>D</b> 1/2" Dia, 1.5" Len without Flat Available when Code 2 = A or C: <b>G</b> 1/4" Dia, 1.0" Len without Flat <b>H</b> 1/4" Dia, 1.0" Len with Flat	<b>E</b> Single Ended Available when Code 2 = A or C: <b>D</b> Differential	<b>F</b> 5 to 15 VDC	<b>0001 0150 0530</b> <b>0002 0180 0550</b> <b>0004 0192 0600</b> <b>0005 0200 0625</b> <b>0006 0203 0720</b> <b>0010 0240 0750</b> <b>0012 0250 0800</b> <b>0015 0256 0805</b> <b>0018 0300 0833</b> <b>0020 0306 0900</b> <b>0025 0315 1000</b> <b>0040 0360 1024</b> <b>0045 0375 1200</b> <b>0050 0382 1270</b> <b>0060 0384 1500</b> <b>0064 0390 1800</b> <b>0090 0400 2000</b> <b>0096 0402 2160</b> <b>0100 0430 2250</b> <b>0120 0450 2400</b> <b>0125 0500 2500</b> <b>0127 0508</b> <b>0128 0512</b>	<b>A</b> MS Connector	<b>0</b> No Shaft Seals Available when Code 3 = A, B, C, or D: <b>B</b> Shaft Seals

**DIMENSIONS** inches [mm]



**Hand-Held Speed Monitor**



(Includes a Series 60 and dual 12" measuring wheels)

A Series 60H hand-held speed monitor is available as an accessory for web or roll calibration of steel, rubber, or paper continuous processes. These units are typically used as accessories for occasional calibration of a system speed, draw, or readout.

These hand-held monitors may be ordered with any PPR from the Series 60 code table. However, typical calibration applications with 12" measuring wheels use 60 PPR or 120 PPR, and provide excellent calibration resolution from zero up to full speeds. Refer to electrical connections 6-pin chart for pin-out functions of Series 62H.

**Order Model No. 62H-AEF-\_\_\_-AO.**

# SERIES 60P

**Dynapar™ brand**

## Heavy Duty Rotopulser®

### Key Features

- Classic Mill-Duty Foot or Face Mount Design
- MS Connector or 1/2" Conduit Entry
- Unbreakable Code Disc



## SPECIFICATIONS

### ELECTRICAL

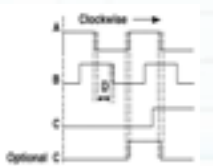
Power Requirements: 5 to 15 VDC max.  
115 mA max. plus load requirements  
Output: TC1428 Differential Line Driver,  
40 mA Sink/ Source

Frequency Response: 50 kHz  
Minimum Free Path: Between any A and B  
transition (Distance D) will not be less than  
12.5% of one full electrical cycle. This  
includes effects of jitter, phase and  
symmetry shifts.

Mating Connector: 10- pin: style MS3106A- 18- 1S,  
Dynapar Part No. MCN- N6

### ELECTRICAL OUTPUT

Note: Signal C (Marker) is low for the first 180° of shaft rotation clockwise (as viewed from shaft end), and is high for the next 180°.



### ELECTRICAL CONNECTIONS

#### Single-Ended Output

Function (If Used)	Cable #14002090010* 6 PIN		Twisted Pairs Cable #14004190010* 10 PIN		Terminal Strip Connector No.
	Pin	Color	Pin	Color	
Signal A	B	RED	B	RED	1
Signal $\bar{A}$	-	-	G	BLK	12
Signal B	D	BLU	D	BLU	3
Signal $\bar{B}$	-	-	H	BLK	11
Signal C (Marker)	A	GRN	A	GRN	4
Signal $\bar{C}$	-	-	I	BLK	10
+V	E	WHT	E	WHT	5
Common	C	BLK	C	BLK	2
Shield	F	SHIELD	F	SHIELD	6
Not Used	-	-	J	-	7, 8, 9

\*This is a mating connector/cable assembly described in the Encoder Accessories section of this catalog. Color-coding information is provided here for reference.

#### Dual Isolated Output

Function (If Used)	Code 4 is K or L			Code 4 is M*	
	6 PIN Primary	10 PIN Primary	7 PIN Secondary	10 PIN Primary	10 PIN Secondary
Signal A	B	B	A	B	B
Signal $\bar{A}$	-	G	C	G	G
Signal B	D	D	B	D	D
Signal $\bar{B}$	-	H	E	H	H
Signal C	A	A	(No Marker)	-	(No Marker)
Signal $\bar{C}$	-	I	(No Marker)	-	(No Marker)
Primary Power	E	E	D	E	E
Primary Common	C	C	F	C	C
Secondary Power	-	-	-	-	J
Secondary Common	-	-	-	-	I
Shield	F	F	G	F	F
Not Used	-	J	-	A,I,J	A

\*To provide quick backup, jumper cable assembly pins E & J and C & I; then, if the primary output fails, move the connection from the primary to secondary connector.

### MECHANICAL

Slew Speed: 3600 RPM  
Shaft Diameter: 5/ 8"  
Inertia: 285 gm- cm 2 max.  
Typical Starting Torque: 15 oz- in  
Bearings: Motor Duty Bearings  
Weight: 10 lbs.  
Shaft Loading: Radial: 45 lbs. overhung;  
Axial: 15 lbs.

### ENVIRONMENTAL

Operating Temp. Range: 0 to 54 °C  
Enclosure Rating: NEMA 12 / IP54;  
NEMA 4 / IP66 with optional shaft seals

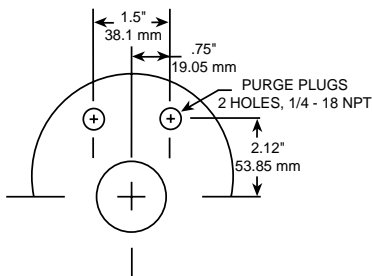
**Ordering Information**

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

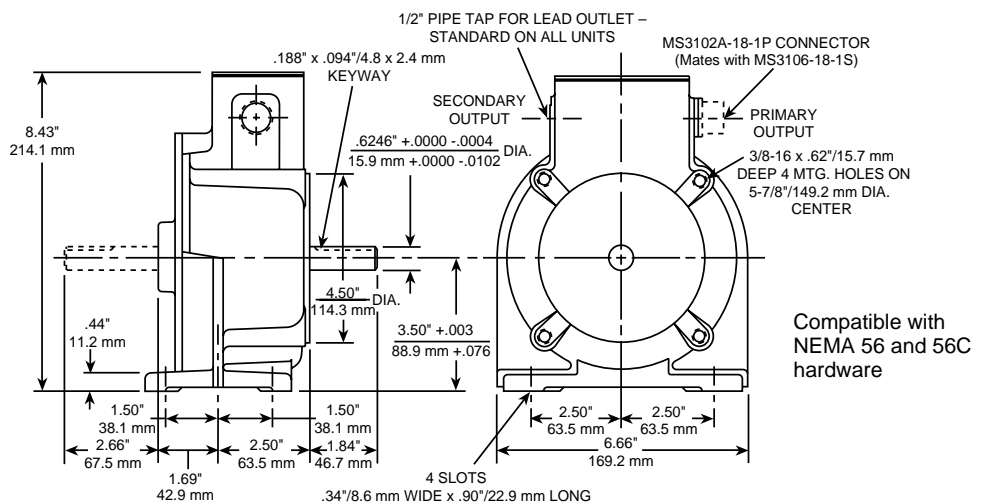
Code 1: Model	Code 2: Housing	Code 3: Shaft	Code 4: Output	Code 5: Voltage	Code 6: Pulses/Rev	Code 7: Wiring	Code 8: Misc
<b>6</b> □	<b>P</b> □	□	□	<b>F</b> □	□ □ □ □	□	□
<b>2</b> Bidirectional, Heavy Duty <b>3</b> Bidirectional with Marker, Heavy Duty	<b>P</b> Mill Duty	<b>M</b> 5/8" Dia, Single Shaft with Keyway <b>N</b> 5/8" Dia, Double Shaft with Keyway	<b>D</b> Differential <b>E</b> Single Ended <b>K</b> Single Ended, Dual Isolated, 6 and 7 pin connectors <b>L</b> Differential, Dual Isolated, 10 and 7 Pin Connectors  Available when Code 1 is 62: <b>M</b> Differential, Dual Isolated, 10 and 10 Pin Connectors	<b>F</b> 5 to 15 VDC	<b>0001 0096 0360 0750</b> <b>0002 0100 0375 0800</b> <b>0004 0120 0382 0805</b> <b>0005 0125 0384 0833</b> <b>0006 0127 0390 0900</b> <b>0010 0128 0400 1000</b> <b>0012 0150 0402 1024</b> <b>0015 0180 0430 1200</b> <b>0018 0192 0450 1250</b> <b>0020 0200 0500 1270</b> <b>0025 0203 0508 1500</b> <b>0040 0240 0512 1800</b> <b>0045 0250 0530 2000</b> <b>0050 0256 0550 2160</b> <b>0060 0300 0600 2250</b> <b>0064 0306 0625 2400</b> <b>0090 0315 0720 2500</b>	<b>A</b> MS Connector  Available when Code 4 is D or E: <b>T</b> Terminal Strip	<b>O</b> No Purge Plugs, No Shaft Seals <b>A</b> Purge Plugs, No Shaft Seals <b>B</b> No Purge Plugs, Shaft Seals <b>C</b> Purge Plugs and Shaft Seals

**DIMENSIONS** inches [mm]

Purge Plug Location



Approximate Dimensions



# SERIES R45

**Dynapar™ brand**

## Bearingless Ring Kit

### Key Features

- 56C-face Ring Kit Motor Mounting
- Dependable Gear Tooth & Pickup Design
- Field-Replaceable Readhead for Easy Service
- Thin 5/8" Profile Saves Valuable Space



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental

**Resolution:** 60 PPR (pulses/revolution), optional 120 PPR with X2 output

**Format:** Single channel unidirectional (A), or two channel quadrature (AB) outputs

**Quadrature Phasing:**  $90^\circ \pm 45^\circ$  electrical

**Symmetry:**  $180^\circ \pm 36^\circ$  electrical

### ELECTRICAL

**Input Power:** (not including output loads)  
Single ended 4.5 min. to 16.5 VDC max. at 50 mA max.;

Open collector and differential line driver: 4.5 min. to 26 VDC max. at 75 mA max.

**Outputs:**

Single ended with 2 k $\Omega$  pullup: 16.5 VDC max., 20 mA sink at 0.5 V max.;

Open Collector: 30 VDC max., 40 mA sink max.;

7272 Differential Line Driver: 40 mA sink or source

**Frequency Response:** 10 kHz min.

**Electrical Protection:** Overvoltage and reverse voltage to 30 VDC; output short circuit protected to Common or other outputs, to +V (differential line driver only)

**Noise Immunity:** Tested to EN50082-2 (Heavy Industrial) for Electro Static Discharge, Radio Frequency Interference, Electrical Fast Transients, Conducted and Magnetic Interference

**Terminations:**

Wire leads: 7" long min., 18 AWG;

Screw terminals: accept 22 to 14 AWG solid or stranded wires

### ELECTRICAL CONNECTIONS

Function (If Used)	Wire Color	Terminal
Signal X2	ORG	1
Signal B	BRN	2
Signal A	YEL	3
+V in	RED	4
Common	BLK	5
Signal $\bar{A}$	WHT	6
Signal $\bar{B}$	GRN	7
Signal $\bar{X2}$	BLU	8

### MECHANICAL

**Motor frame sizes:** 56C, 143TC, 145TC, 182C and 184C

**Motor shaft/hub sizes:** 5/8", 7/8" nominal

**Housing:** Cast Aluminum, chromate finish

**Gear:** 1010 Steel

**Moment of Inertia:** 0.0035 in-lb-sec<sup>2</sup>

**Shaft Speed:** 5,000 RPM max.

**Readhead to gear gap:** 0.020" nominal, 0.030 max.

**Allowable Endplay:**  $\pm 0.060$

### ENVIRONMENTAL

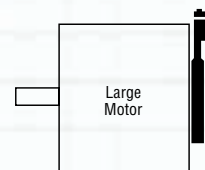
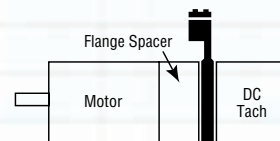
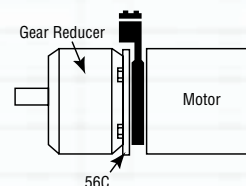
**Operating Temperature:** -40 to +85 °C

**Storage Temperature:** -40 to +90 °C

**Shock:** 20 G's for 11 milliseconds duration

**Vibration:** 5 to 2000 Hz at 2.5 G's

**Humidity:** to 98% without condensation





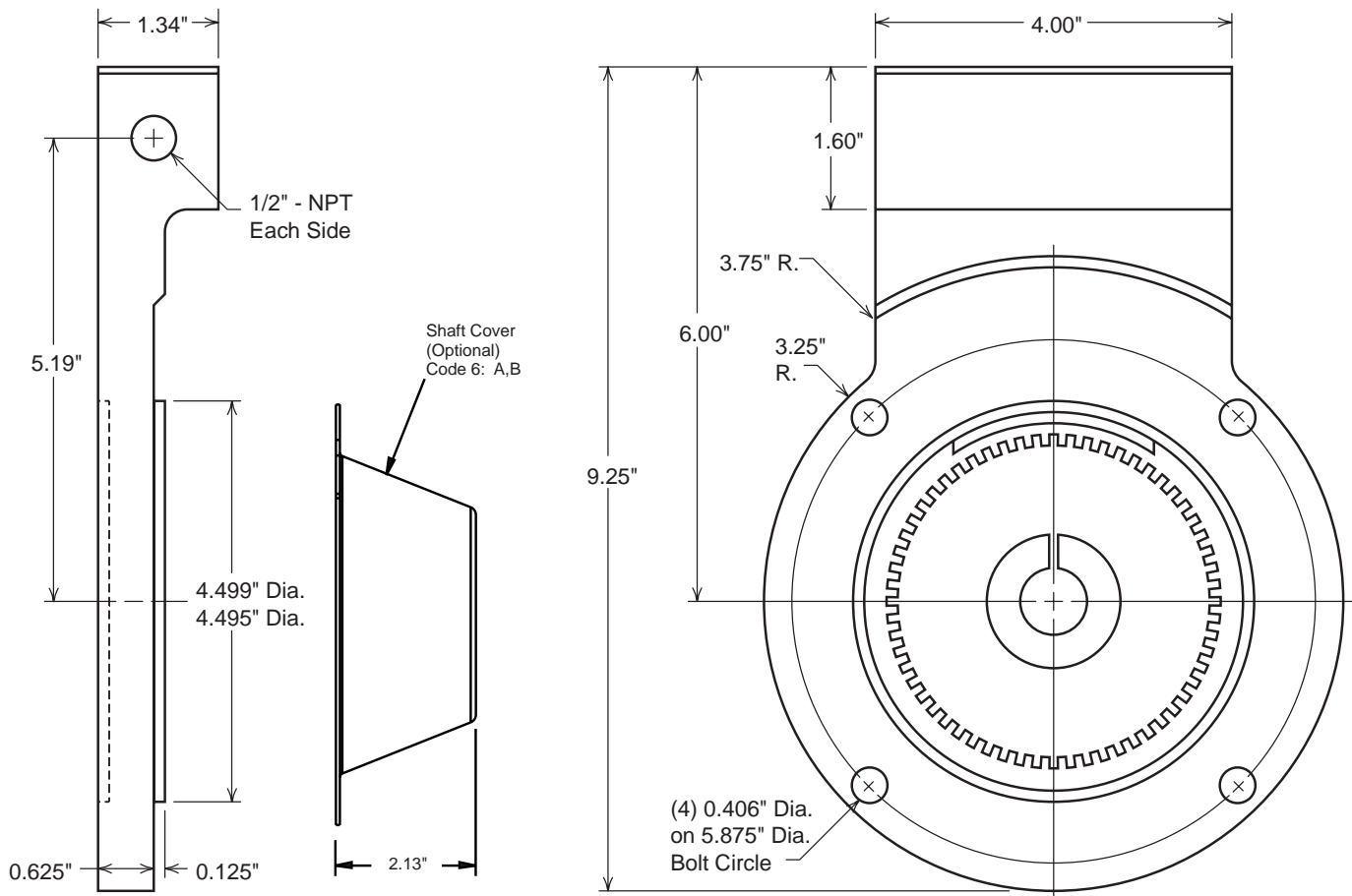
**Ordering Information**

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

Code 1: Model	Code 2: PPR	Code 3: Gear, Bore	Code 4: Output	Code 5: Electrical	Code 6: Termination
<b>R45</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"/>
Ordering Information					
<b>R45</b> Motor Mount Ring, for NEMA 4-1/2" C-Face Motors	<b>0060</b>	<b>0</b> no gear, readhead only <b>1</b> 5/8" bore (56C) <b>2</b> 7/8" bore (143TC, 145TC, 182C, 184C)	<b>0</b> no readhead, gear only <b>1</b> single channel (A), unidirectional <b>2</b> dual channel (AB), bidirectional <b>3</b> dual channel (AB), bidirectional with unidirectional (X2) speed output	<b>0</b> no readhead, gear only Available when Code 4 is 1, 2 or 3: <b>1</b> 5-15V in, 5-15V single ended out <b>2</b> 5-26V in, 5-26V differential line driver out <b>3</b> 5-26V in, 5-26V open collector out	<b>0</b> no readhead, gear only Available when Code 4 is 1, 2 or 3: <b>1</b> wire leads <b>2</b> screw terminals <b>A</b> Same as 1, with protective cover <b>B</b> Same as 2, with protective cover
112122-0001 R45 protective shaft cover accessory					

Example Model number: 5/8" bore, gear only = R00 0060 1000

**DIMENSIONS**



# SERIES SL56

**NorthStar™ brand**

## Bearingless Encoder

### Key Features

- **Bearingless Design Mounts to 56 and 140 C-Face Motors**
- **Thin 3/4" Profile Saves Space and Can be "Sandwiched" Between Motor & Reducer**
- **Magneto-Resistive Technology Resists Dust, Dirt, Oil, Water and Other Contaminants**
- **Anodized Aluminum Housing with Field-Serviceable Connector**
- **Single or Dual Isolated Outputs Available**



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental  
**Pulses per Revolution:** 64-2048  
**Phasing Sense:** A leads B for Counter-Clockwise rotation (CCW) viewing encoder-mounted end  
**Quadrature Phasing:** 90° ± 22°  
**Symmetry:** 180° ± 54°  
**Index:** 270°, ungated (optional gated to falling B edge)  
**Number of Output Modules:** Single or Dual Redundant

### ELECTRICAL

**Input Voltage Requirement:** 5-15 or 5-26 Volts DC

#### Current Requirement:

With Electrical Option L or H: 45 mA typical per sensor module plus line driver load  
 With Electrical Option V or 5: 65 mA typical per sensor module plus line driver load

#### Output Signals:

With Elec Option L or H: 5-15 V Line Driver, 150mA

With Elec Option V: 5-26 V Line Driver, 100mA  
 With Elec Option 5: 5V Line Driver, 150mA

**Frequency Response:** 0 - 120kHz Data & Index

**Electrical Immunity:** 2kV ESD, Reverse Polarity, Short Circuit

**Connector:** 10 pin industrial duty latching, sealed NEMA 4 & 12, IP65; MS connector or pig-tail

### MECHANICAL

**Max. Shaft Speed:** 5,000 RPM  
**Mounting Configuration:** 4.5" 56C face mount for NEMA MG1 standards  
**Housing Material:** Cast Aluminum (Stainless Steel optional)  
**Acceleration Rate:** 12,000 rpm/sec max  
**Shaft Length Required:** 0.7" min  
**Allowable Shaft End-Play:** ± 0.045"  
**Allowable Shaft Runout:** 0.002" TIR  
**Weight:** Aluminum: 1.7 lbs (0.77 kg); Stainless: 3 lbs (1.36 kg)

### ELECTRICAL CONNECTIONS

Signal	Connector Pin	Pigtail Cable	MS 3102E18-IT#	Conduit Box
Common	1	Black	F	1
B	2	Green	B	5
A	3	Blue	A	3
Z *	4	Violet	C	7
No Connection	5	—	E	—
Vcc (5-15 VDC)	6	Red	D	2
B̄	7	Yellow	I	6
Ā	8	Gray	H	4
Z̄ *	9	Orange	J	8
Shield	10	Braid	G	—

\* Index (Z) optional. See Ordering Information

### ENVIRONMENTAL

**Operating Temperature Range:**  
 Standard: -40°C to +90°C  
 Extended: -40°C to +120°C  
**Storage Temperature Range:** -40°C to +120°C  
**Humidity:** to 98% RH (non-condensing)  
**Shock (Sensor Module):** 1 meter drop test, 30 G's Min  
**Vibration:** 18 G's @ 5-2000 Hz spectrum

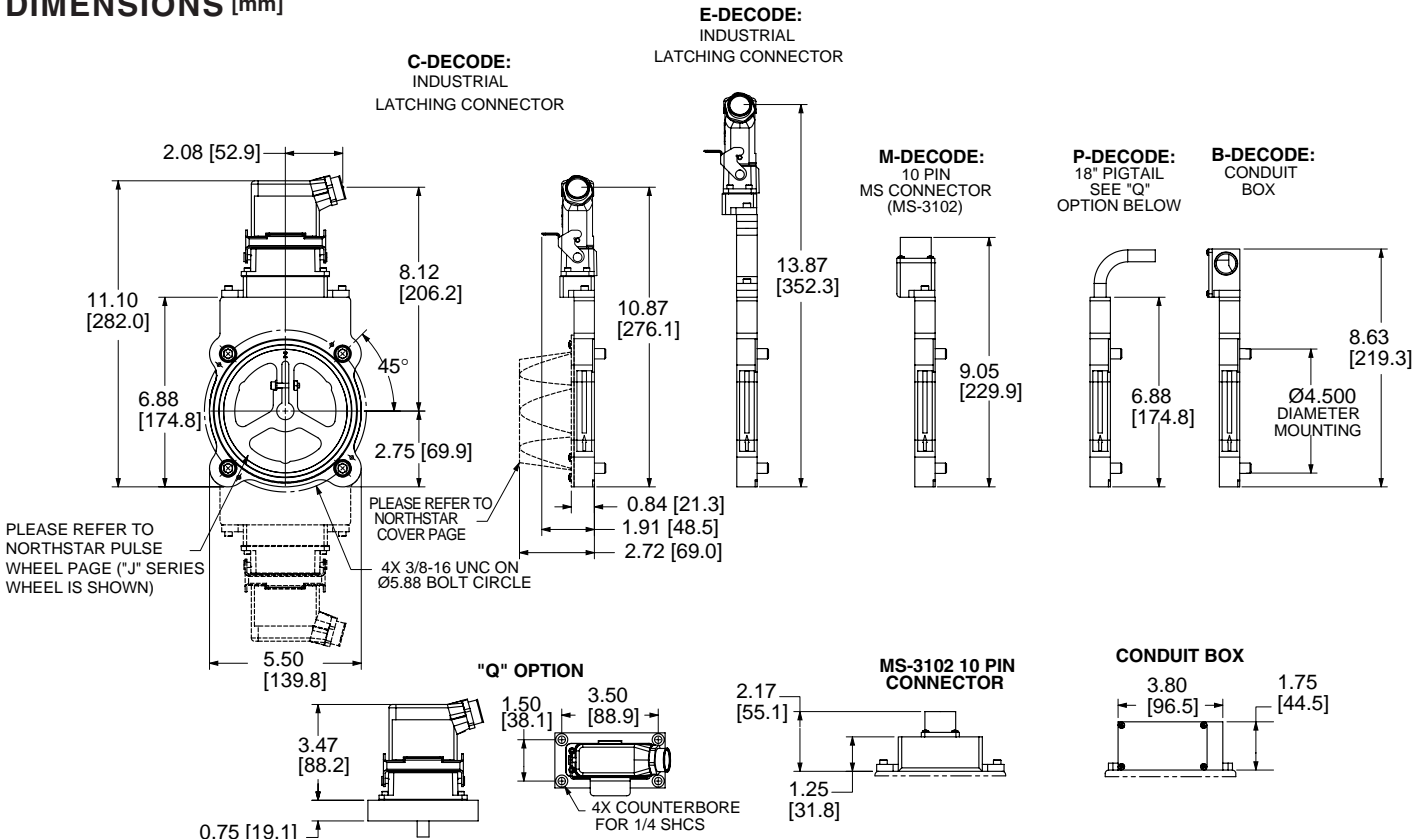
**Ordering Information**

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

Code 1: Model	Code 2: PPR	Code 3: Index	Code 4: Wheel Bore	Code 5: Termination	Code 6: Electrical	Code 7: Cover/Adapter
<input type="checkbox"/> 5	<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"/>	<input type="checkbox"/>
Ordering Information						
<b>S5</b> Motor Mount Ring, for 4 1/2" C-Face Motors (56C) Single Output	<b>0064</b>	L No Index Available when Code 2 is 0512, 1024 or 2048	<b>J04</b> 5/8" bore	<b>B</b> Conduit box	L 5-15V in, 5-15V Line Driver (4428) out	<b>C</b> Standard Cover
	<b>0128</b>		<b>J05</b> 7/8" bore	<b>C</b> Latching Industrial Connector with 1/2" NPT		
<b>0256</b>	G Gated Index (Z, Z̄) Z Differential Index (Z, Z̄)	<b>J06</b> 1.00" bore	<b>E</b> 3" extended height Latching Industrial Connector with 1/2" NPT	<b>V</b> 5-26V in, 5-26V Line Driver (IC-WE) out	<b>F</b> Flat Thru-hole cover	
<b>0512</b>		<b>J07</b> 1-1/8" bore				<b>M</b> 10 pin MS Connector
<b>1024</b>	Additional Shaft Sizes Available Up to 3.75" Maximum	<b>K09</b> 1-3/8" bore	<b>P</b> 18" pigtail cable	<b>T</b> Flat No Hole Cover		
<b>2048</b>		<b>K10</b> 1-1/2" bore			Available when Code 1 is S5 and Code 4 is J04 thru J07:	
<b>D5</b> Motor Mount Ring, for 4 1/2" C-Face Motors (56C) Dual Output			<b>K11</b> 1-5/8" bore	<b>Q</b> Latching Industrial Connector on 18" pigtail cable		Differential, bidirectional signals (A, Ā, B, B̄)
			<b>K12</b> 1-3/4" bore			
			<b>K13</b> 1-7/8" bore			
			<b>K14</b> 2.00" bore			
			<b>K15</b> 2-1/8" bore			
			<b>K16</b> 2-1/4" bore			
			<b>K17</b> 2-3/8" bore			
			<b>K18</b> 2-1/2" bore			
			<b>K19</b> 2-7/8" bore			

**Note:** See ACCESSORIES Section For Connectors, Spare Parts and Pulse Wheels

**DIMENSIONS** <sup>inch</sup> [mm]



# SERIES RL67

**NorthStar™ brand**

## Bearingless Encoder

### Key Features

- **Designed for Reliance Motors (6.75" fit and 56 and 140 C-Face)**
- **Magneto-Resistive Technology Resists Dust, Dirt, Oil, Water and Other Contaminants**
- **Anodized Aluminum Housing With Field-Serviceable Connector**



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental  
**Pulses per Revolution:** 64-2048  
**Phasing Sense:** A leads B for Counter-Clockwise rotation (CCW) viewing encoder-mounted end  
**Quadrature Phasing:** 90° ± 22°  
**Symmetry:** 180° ± 54°  
**Index:** 270°, ungated (optional gated to falling B edge)

### ELECTRICAL

**Input Voltage Requirement:** 5-15 or 5-26 Volts DC

#### Current Requirement:

With Electrical Option L or H: 45 mA typical per sensor module plus line driver load  
 With Electrical Option V or 5: 65 mA typical per sensor module plus line driver load

#### Output Signals:

With Elec Option L or H: 5-15 V Line Driver, 150mA  
 With Elec Option V: 5-26 V Line Driver, 100mA  
 With Elec Option 5: 5V Line Driver, 150mA

**Frequency Response:** 0 - 120kHz Data & Index  
**Electrical Immunity:** 2kV ESD, Reverse Polarity, Short Circuit

**Connector:** 10 pin industrial duty latching, sealed NEMA 4 & 12, IP65

### MECHANICAL

**Shaft Speed:** 7,000 RPM  
**Mounting Configuration:** 4.5" diameter, 56 C motor face or accessory flange to meet NEMA MG1-4 standards or mounts directly in the 6.75" machined accessory recess of the 4.5" accessory flange found on Reliance RPM™ motors  
**Housing Material:** Cast Aluminum  
**Acceleration Rate:** 12,000 rpm/sec max  
**Shaft Length Required:** 2.5" min  
**Allowable Shaft End-Play:** ± 0.045"  
**Allowable Shaft Runout:** 0.003" TIR

### ELECTRICAL CONNECTIONS

Signal	Connector Pin	Pigtail Cable	MS 3102E18-IT#
Common	1	Black	F
B	2	Green	B
A	3	Blue	A
Z *	4	Violet	C
No Connection	5	—	E
Vcc (+ VDC)	6	Red	D
B̄	7	Yellow	I
Ā	8	Gray	H
Z *	9	Orange	J
Shield	10	Braid	G

\* Index (Z) optional. See Ordering Information

### ENVIRONMENTAL

**Operating Temperature Range:** -40°C to +90°C  
**Storage Temperature Range:** -40°C to +120°C  
**Humidity:** to 98% RH (non-condensing)  
**Shock (Sensor Module):** 1 meter drop test, 30 G's Min  
**Vibration:** 18 G's @ 5-2000 Hz spectrum

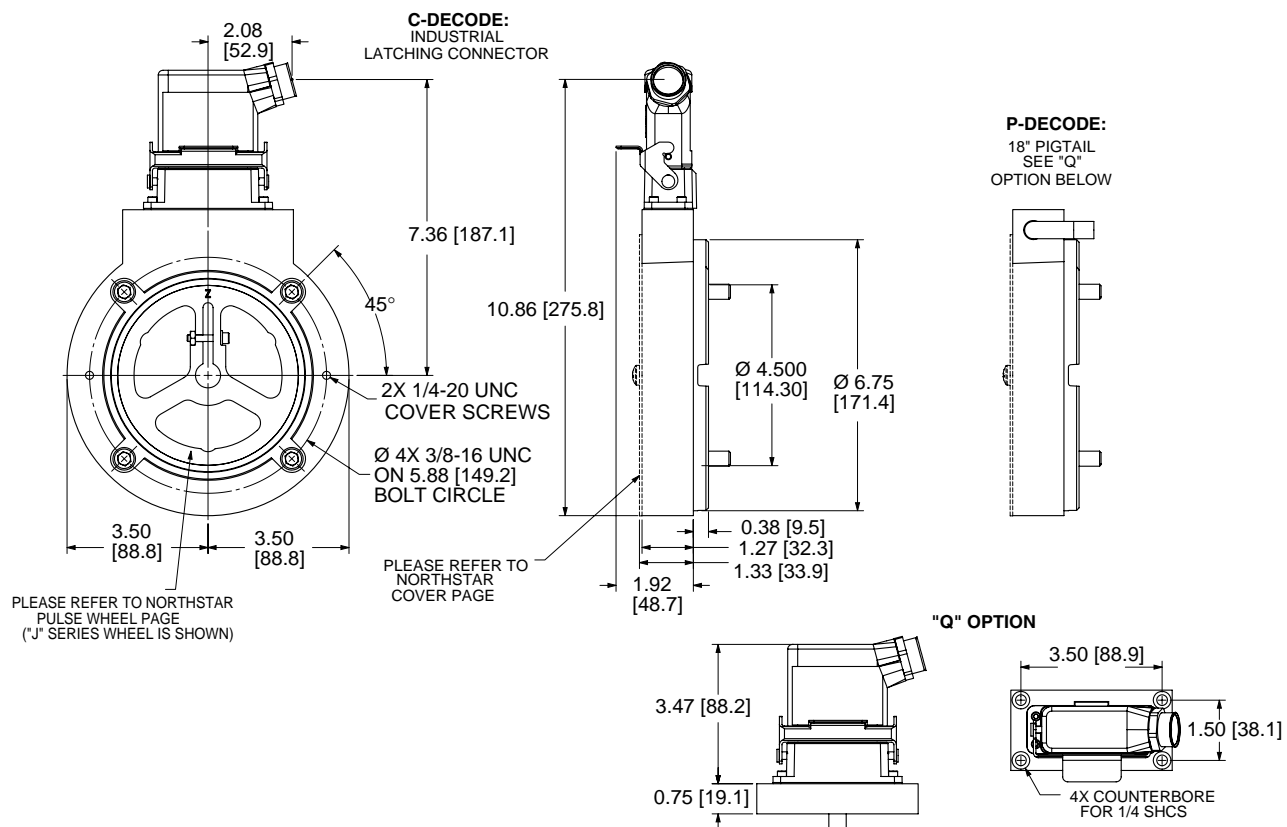
**Ordering Information**

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

Code 1: Model	Code 2: PPR	Code 3: Index	Code 4: Wheel Bore	Code 5: Termination	Code 6: Electrical	Code 7: Cover
<b>S6</b>	□□□□	□	□□□	□	□	□
Ordering Information						
<b>S6</b> Motor Mount Ring, for 4 1/2" NEMA 56-C C-Face Motors or Reliance Electric Style 6.75" Recess	<b>0064</b>	<b>L</b> No Index	<b>J04</b> 5/8" bore	<b>C</b> Latching Industrial Connector with 1/2" NPT	<b>L</b> 5-15V in, 5-15V Line Driver (4428) out	<b>C</b> Standard cover <b>F</b> Flat Thru-hole cover
	<b>0128</b>	Available when Code 2 is 0512, 1024 or 2048	<b>J05</b> 7/8" bore			
	<b>0256</b>	<b>G</b> Gated Index (Z, Z̄) <b>Z</b> Differential Index (Z, Z̄)	<b>J06</b> 1.00" bore	<b>M</b> 10 pin MS Connector	<b>H</b> Same as L with extended temp. to 120°C	
	<b>0512</b>		<b>J07</b> 1-1/8" bore			
	<b>1024</b> <b>2048</b>		<b>K09</b> 1-3/8" bore	<b>P</b> 18" pigtail cable <b>Q</b> Latching Industrial Connector on 18" pigtail cable	<b>V</b> 5-26V in, 5-26V Line Driver (IC-WE) out <b>5</b> 5-15V in, 5V Line Driver (4428) out  Differential, bidirectional signals (A, Ā, B, B̄)	
			<b>K10</b> 1-1/2" bore			
			<b>K11</b> 1-5/8" bore			
			<b>K12</b> 1-3/4" bore			
			<b>K13</b> 1-7/8" bore			
			<b>K14</b> 2.00" bore			
<b>K15</b> 2-1/8" bore						
<b>K16</b> 2-1/4" bore						
<b>K17</b> 2-3/8" bore						
<b>K18</b> 2-1/2" bore						
<b>K19</b> 2-7/8" bore	Additional Shaft Sizes Available Up to 3.75" Maximum					

**Note:** See ACCESSORIES Section For Connectors, Spare Parts and Pulse Wheels

**DIMENSIONS** inch [mm]



# SERIES SL85

**NorthStar™ brand**

## Bearingless Encoder

### Key Features

- **Bearingless Design Mounts to 180 C-Face Motors**
- **Magneto-Resistive Technology Resists Dust, Dirt, Oil, Water, and Other Contaminants**
- **Dual-C-Face Versions Available for “Sandwich” Mounting**
- **Single or Dual Isolated Outputs Available**



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental  
**Pulses per Revolution:** 64-2048  
**Phasing Sense:** A leads B for Counter-Clockwise rotation (CCW) viewing encoder-mounted end  
**Quadrature Phasing:**  $90^\circ \pm 22^\circ$   
**Symmetry:**  $180^\circ \pm 54^\circ$   
**Index:**  $270^\circ$ , ungated (optional gated to falling B edge)  
**Number of Output Modules:** Single or Dual Redundant

### ELECTRICAL

**Input Power Requirements:** 5-15 Volts DC, 45 mA typical per sensor module plus line driver load  
**Output Signals:** Line Driver, 150mA source/sink  
**Frequency Response:** 0 - 120kHz Data & Index  
**Electrical Immunity:** 2kV ESD, Reverse Polarity, Short Circuit  
**Connector:** 10 pin industrial duty latching, sealed NEMA 4 & 12, IP65

### MECHANICAL

**Max: Shaft Speed:** 5,000 RPM  
**Mounting Configuration:** 8.5" 180C face mount for NEMA MG1 standards  
**Housing Material:** Cast Aluminum  
**Acceleration Rate:** 3600 rpm/sec max  
**Shaft Length Required:** 1.0" min  
**Allowable Shaft End-Play:**  $\pm 0.050"$   
**Allowable Shaft Runout:** 0.003" TIR

### ENVIRONMENTAL

**Operating Temperature Range:**  $-40^\circ\text{C}$  to  $+90^\circ\text{C}$   
**Storage Temperature Range:**  $-40^\circ\text{C}$  to  $+120^\circ\text{C}$   
**Humidity:** to 98% RH (non-condensing)  
**Shock (Sensor Module):** 1 meter drop test, 30 G's Min  
**Vibration:** 18 G's @ 5-2000 Hz spectrum

### ELECTRICAL CONNECTIONS

Signal	Connector Pin	Pigtail Cable	MS 3102E18-IT#
Common	1	Black	F
B	2	Green	B
A	3	Blue	A
Z *	4	Violet	C
No Connection	5	—	E
Vcc (5-15 VDC)	6	Red	D
B̄	7	Yellow	I
Ā	8	Gray	H
Z *	9	Orange	J
Shield	10	Braid	G

\* Index (Z) optional. See Ordering Information

**Ordering Information**

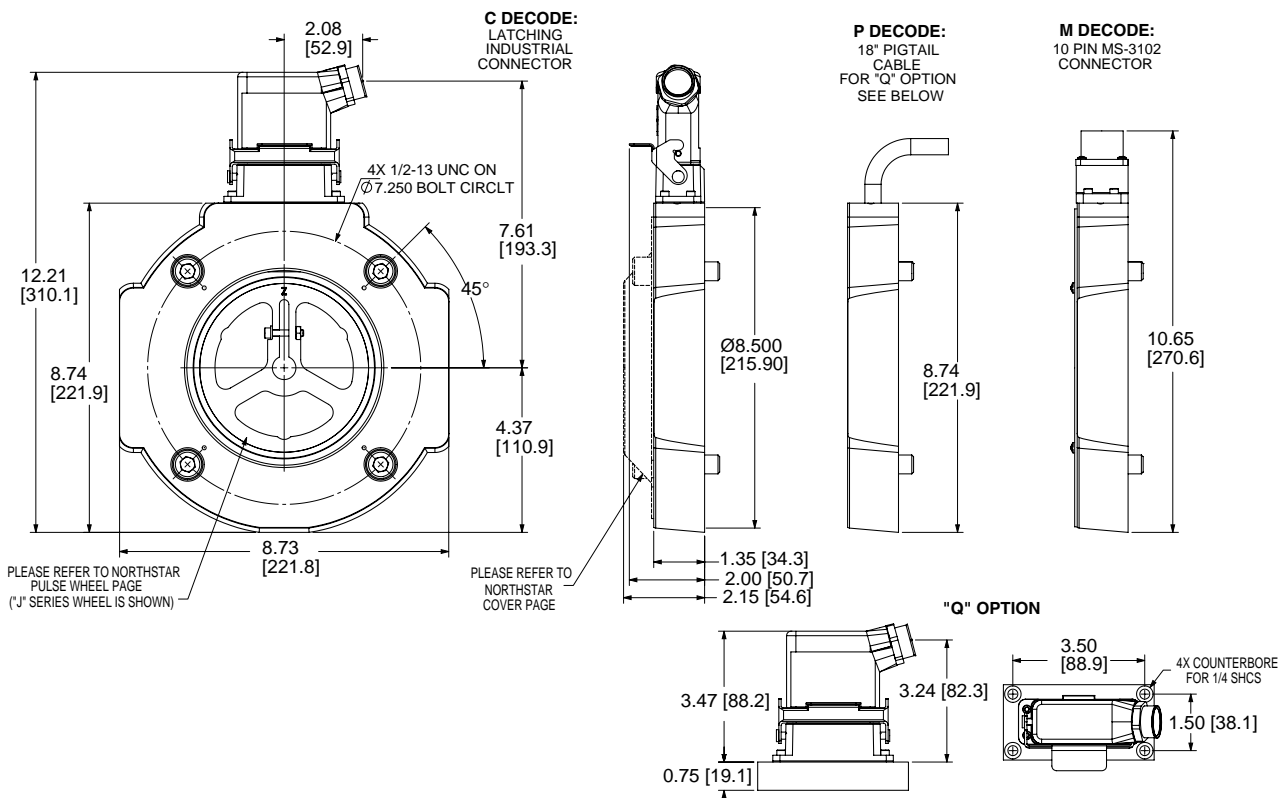
To order, complete the model number with code numbers from the table below:

Code 1: Model	Code 2: PPR	Code 3: Index	Code 4: Wheel Bore	Code 5: Termination	Code 6: Electrical	Code 7: Cover/Adapter
<input type="checkbox"/> <b>8</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"/>	<input type="checkbox"/>
Ordering Information						
<b>S8</b> Motor Mount Ring, for 8 1/2" C-Face Motors (180C) Single Output  <b>D8</b> Motor Mount Ring, for 8 1/2" C-Face Motors (180C) Dual Output	<b>0064</b> <b>0128</b> <b>0256</b> <b>0512</b> <b>1024</b> <b>2048</b>	<b>L</b> No Index  Available when Code 2 is 0512, 1024 or 2048  <b>G</b> Gated Index (Z, Z̄)  <b>Z</b> Differential Index (Z, Z̄)	<b>J04</b> 5/8" bore <b>J05</b> 7/8" bore <b>J06</b> 1.00" bore <b>J07</b> 1-1/8" bore  <b>K09</b> 1-3/8" bore <b>K10</b> 1-1/2" bore <b>K11</b> 1-5/8" bore <b>K12</b> 1-3/4" bore <b>K13</b> 1-7/8" bore <b>K14</b> 2.00" bore <b>K15</b> 2-1/8" bore <b>K16</b> 2-1/4" bore <b>K17</b> 2-3/8" bore <b>K18</b> 2-1/2" bore <b>K19</b> 2-7/8" bore Additional Shaft Sizes Available Up to 3.75" Maximum  <b>End of Shaft Mounting for GE &amp; Emerson Motors</b> <b>N01</b> 1.125" EOS <b>N06</b> 2.375" EOS <b>N08</b> 2.625" EOS <b>N10</b> 2.875" EOS	<b>C</b> Latching Industrial Connector with 1/2" NPT  <b>M</b> 10 pin MS Connector  <b>Double C-face Sandwich Version</b>  <b>D</b> 1" Extended height connector  <b>E</b> 3" extended height connector  <b>P</b> 18" pigtail cable  <b>Q</b> Latching Industrial Connector on 18" pigtail cable	<b>L</b> 5-15V in, 5-15V Line Driver (4428) out  <b>H</b> Same as L with extended temp. to 120°C  <b>V</b> 5-26V in, 5-26V Line Driver (IC-WE) out  <b>5</b> 5-15V in, 5V Line Driver (4428) out  Differential, bidirectional signals (A, Ā, B, B̄)	<b>C</b> Standard Flat Cover <b>E</b> Extra heavy duty steel pie pan cover <b>F</b> Flat Thru-hole cover  <div style="border: 1px solid black; padding: 5px; width: fit-content;">                         Grounding brush kits available for End of Shaft Mounting, Consult Factory for ordering                     </div>

**Note:** See ACCESSORIES Section For Connectors, Spare Parts and Pulse Wheels

**DIMENSIONS** <sup>inch</sup> [mm]

**STANDARD HOUSING – SINGLE C-FACE**



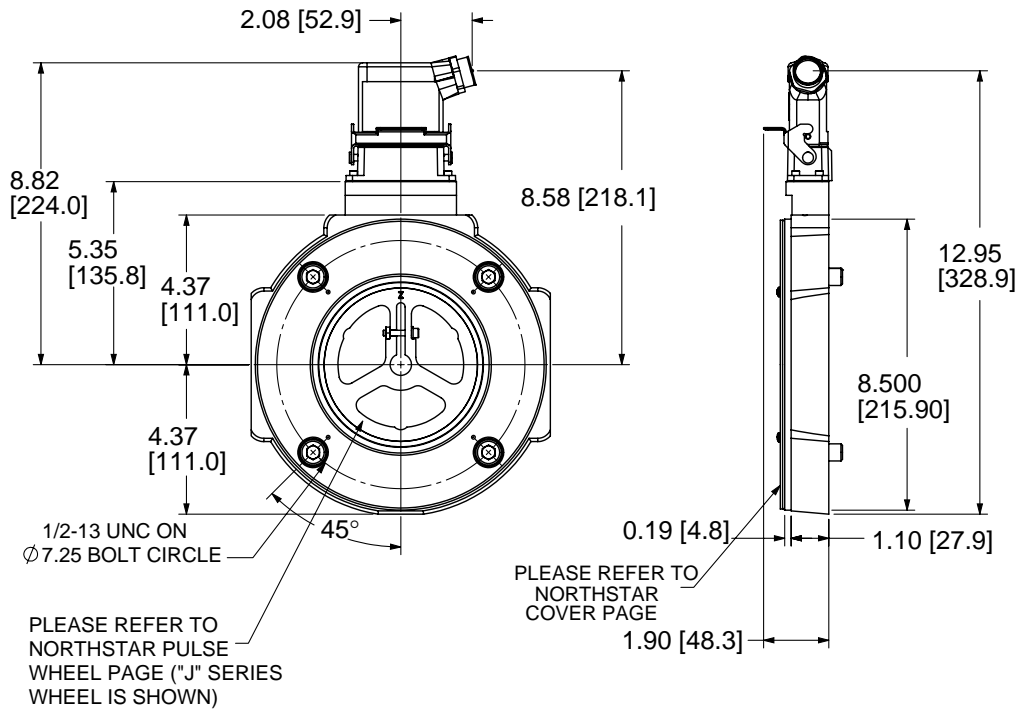
# SERIES SL85

**NorthStar™ brand**

**DIMENSIONS** inch [mm]

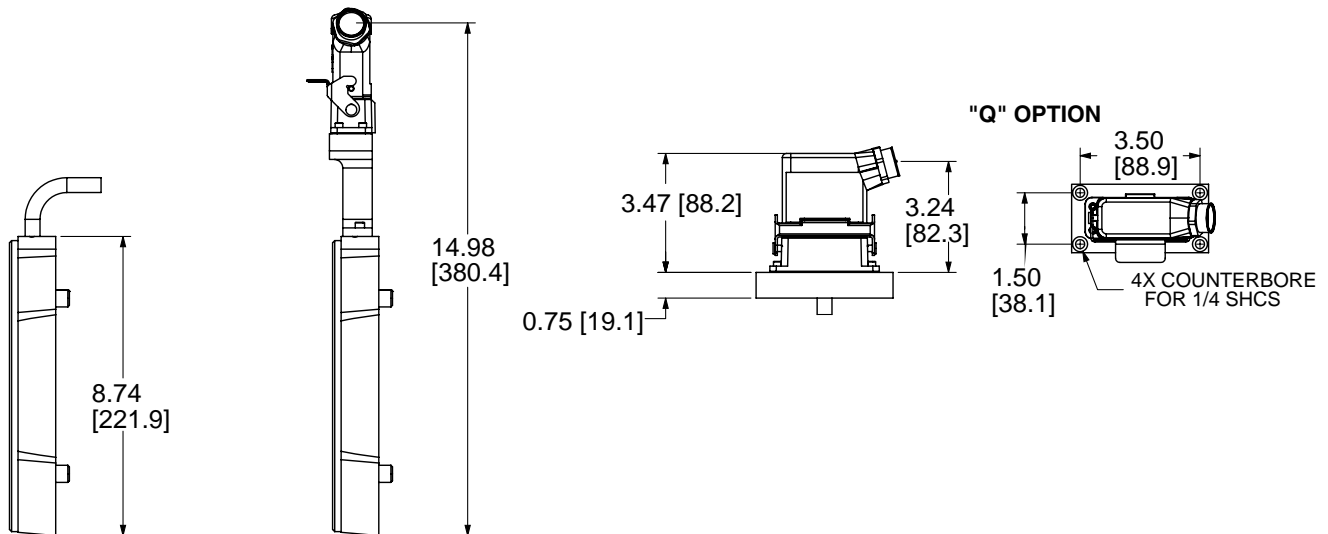
## DOUBLE C-FACE HOUSING

**D-DECODE:**  
DOUBLE C-FACE  
INDUSTRIAL  
1" EXTENDED HEIGHT  
LATCHING CONNECTOR



**P-DECODE:**  
DOUBLE C-FACE  
18" PIGTAIL  
SEE "Q"  
OPTION BELOW

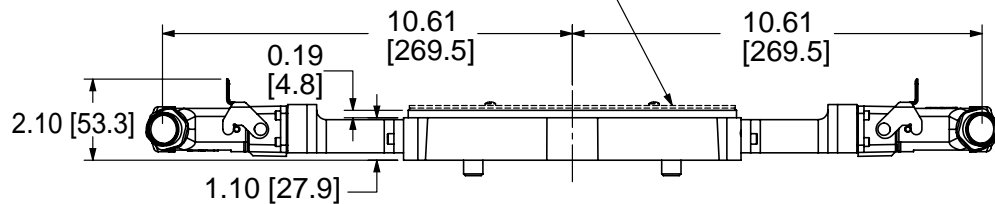
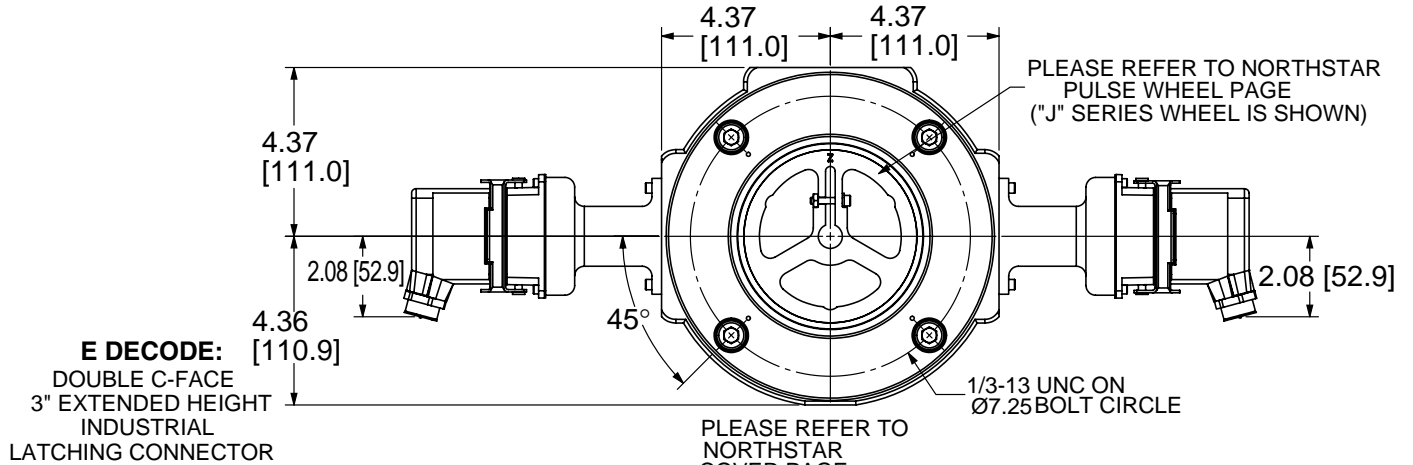
**E-DECODE:**  
DOUBLE C-FACE  
3" EXTENDED HEIGHT  
INDUSTRIAL  
LATCHING CONNECTOR



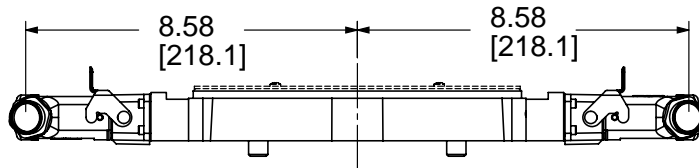


**DIMENSIONS** <sup>inch</sup>  
[mm]

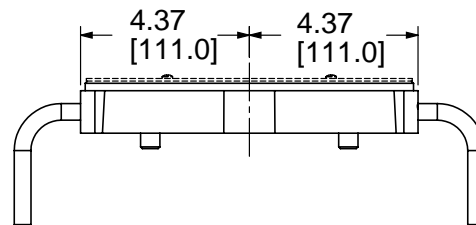
**DUAL OUTPUT HOUSING**



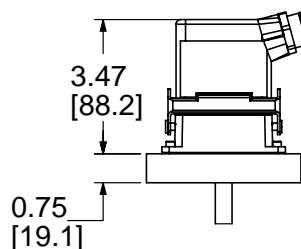
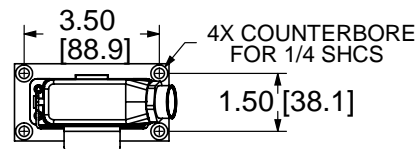
**D DECODE:**  
DOUBLE C-FACE  
1" EXTENDED HEIGHT  
INDUSTRIAL  
LATCHING CONNECTOR



**P DECODE:**  
DOUBLE C-FACE  
18" PIGTAIL  
SEE "Q" OPTION  
AT RIGHT



**"Q" OPTION**



# SERIES SL1250

# NorthStar™ brand

## Bearingless Encoder

### Key Features

- **Bearingless Design Mounts to 250-C Face Motors and Requires only 1.4" of Motor Shaft**
- **Magneto-Resistive Technology Resists Dust, Dirt, Oil, Water and Other Common Contaminants**
- **Single or Dual Isolated Outputs Available**



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental

**Pulses per Revolution:** 64-1024

**Phasing Sense:** A leads B for Counter-Clockwise rotation (CCW) viewing encoder-mounted end

**Quadrature Phasing:**  $90^\circ \pm 22^\circ$

**Symmetry:**  $180^\circ \pm 54^\circ$

**Index:**  $270^\circ$ , ungated (optional gated to falling B edge)

### ELECTRICAL

**Input Voltage Requirement:** 5-15 or 5-26 Volts DC

#### Current Requirement:

With Electrical Option L or H: 45 mA typical per sensor module plus line driver load

With Electrical Option V or 5: 65 mA typical per sensor module plus line driver load

#### Output Signals:

With Elec Option L or H: 5-15 V Line Driver, 150mA

With Elec Option V: 5-26 V Line Driver, 100mA

With Elec Option 5: 5V Line Driver, 150mA

**Frequency Response:** 0 - 120kHz Data & Index

**Electrical Immunity:** 2kV ESD, Reverse Polarity, Short Circuit

**Connector:** 10 pin industrial duty latching, sealed NEMA 4 & 12, IP65; MS connector or pig-tail

### MECHANICAL

**Shaft Speed:** 5,000 RPM

**Mounting Configuration:** 12.5" C face mount for NEMA MG1-4 standards (excluding C-Face runout)

**Housing Material:** Cast Aluminum

**Acceleration Rate:** 12,000 rpm/sec max

**Shaft Length Required:** 1.1" min

**Allowable Shaft End-Play:**  $\pm 0.045"$

**Allowable Shaft Runout:** 0.003" TIR

**Weight:** 11 lbs.

### ELECTRICAL CONNECTIONS

Signal	Connector Pin	Pigtail Cable	MS 3102E18-IT#
Common	1	Black	F
B	2	Green	B
A	3	Blue	A
Z*	4	Violet	C
No Connection	5	—	E
Vcc (5-15 VDC)	6	Red	D
$\bar{B}$	7	Yellow	I
$\bar{A}$	8	Gray	H
$\bar{Z}^*$	9	Orange	J
Shield	10	Braid	G

\* Index (Z) optional. See Ordering Information

### ENVIRONMENTAL

**Operating Temperature Range:**

Standard:  $-40^\circ\text{C}$  to  $+90^\circ\text{C}$

Extended:  $-40^\circ\text{C}$  to  $+120^\circ\text{C}$

**Storage Temperature Range:**  $-40^\circ\text{C}$  to  $+120^\circ\text{C}$

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

**Shock (Sensor Module):** 1 meter drop test, 30 G's Min

**Vibration:** 18 G's @ 5-2000 Hz spectrum

# SERIES SL1250

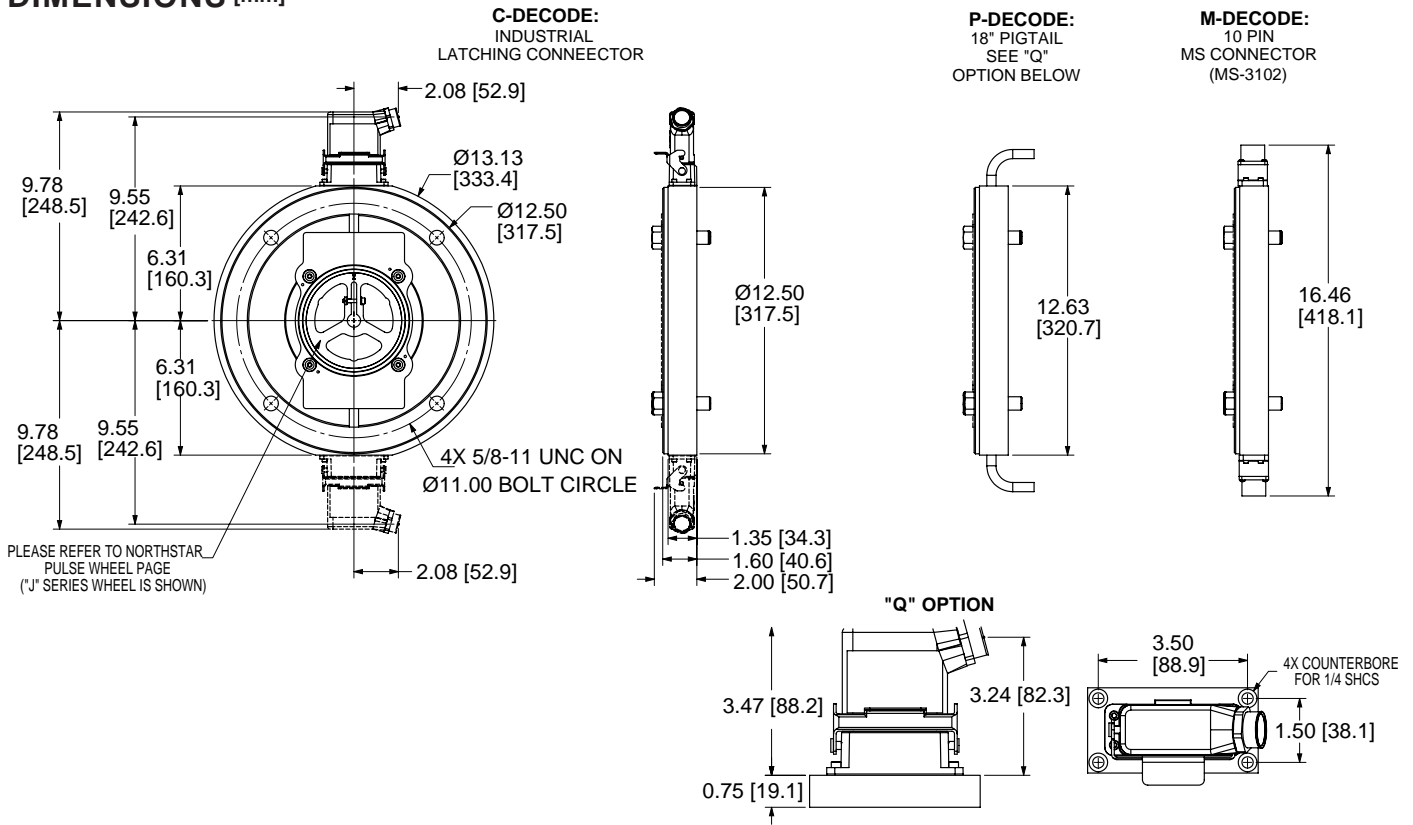
## Ordering Information

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

Code 1: Model	Code 2: PPR	Code 3: Index	Code 4: Wheel Bore	Code 5: Termination	Code 6: Electrical	Code 7: Cover/Adapter
1	□□□□	□	□□□	□	□	□
Ordering Information						
<b>S1</b> Motor Mount Ring, for 12 1/2" NEMA C-Face Motors Single Output  <b>D1</b> Motor Mount Ring, for 12 1/2" NEMA C-Face Motors Dual Output	<b>0064</b> <b>0128</b> <b>0256</b> <b>0512</b> <b>1024</b>	<b>L</b> No Index	<b>J04</b> 5/8" bore <b>J05</b> 7/8" bore <b>J06</b> 1.00" bore <b>J07</b> 1-1/8" bore	<b>C</b> Latching Industrial Connector with 1/2" NPT	<b>L</b> 5-15V in, 5-15V Line Driver (4428) out  <b>H</b> Same as L with extended temp. to 120°C	<b>C</b> No Cover <b>F</b> Flat Thru-hole cover
		<b>G</b> Gated Index (Z, Z̄) <b>Z</b> Differential Index (Z, Z̄)	<b>K09</b> 1-3/8" bore <b>K10</b> 1-1/2" bore <b>K11</b> 1-5/8" bore <b>K12</b> 1-3/4" bore <b>K13</b> 1-7/8" bore <b>K14</b> 2.00" bore <b>K15</b> 2-1/8" bore <b>K16</b> 2-1/4" bore <b>K17</b> 2-3/8" bore <b>K18</b> 2-1/2" bore <b>K19</b> 2-7/8" bore Additional Shaft Sizes Available Up to 3.75" Maximum	<b>D</b> 1" extended height Latching industrial connector with 1/2" NPT  <b>M</b> 10 pin MS Connector <b>P</b> 18" pigtail cable <b>Q</b> Latching Industrial Connector on 18" pigtail cable	<b>V</b> 5-26V in, 5-26V Line Driver (IC-WE) out  <b>5</b> 5-15V in, 5V Line Driver (4428) out  Differential, bidirectional signals (A, Ā, B, B̄)	

**Note:** See ACCESSORIES Section For Connectors, Spare Parts and Pulse Wheels

## DIMENSIONS inch [mm]



# SERIES RIM8500

**NorthStar™ brand**

## Bearingless Encoder

### Key Features

- **Compact, Bearingless Design Mounts to 180-C Face Motors**
- **Sensor Modules are Removable On-The-Fly and Require No Gapping**
- **Stainless Steel and Ductile Cast Iron Construction for Harsh Mill Environments**
- **Magneto-Resistive Technology Resists Dust, Dirt, Oil, Water and Other Common Contaminants**



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental  
**Pulses per Revolution:** 60-1200  
**Phasing Sense:** A leads B for Counter-Clockwise rotation (CCW) viewing encoder-mounted end  
**Quadrature Phasing:** 90° ± 22°  
**Symmetry:** 180° ± 54°  
**Index:** 270°, ungated (optional gated to falling B edge)

### ELECTRICAL

**Input Power Requirements:** 5-15 Volts DC, 45 mA typical per sensor module plus line driver load  
**Output Signals:** Line Driver, 150mA source/sink  
**Frequency Response:** 0 - 120kHz Data & Index  
**Electrical Immunity:** 2kV ESD, Reverse Polarity, Short Circuit  
**Connector:** 10 pin industrial duty latching, sealed NEMA 4 & 12, IP65

### MECHANICAL

**Shaft Speed:** 7,000 RPM  
**Mounting Configuration:** 8.5" 180C face mount for NEMA MG1 standards  
**Housing Material:** Cast Iron/Stainless Steel  
**Acceleration Rate:** 3600 rpm/sec max  
**Shaft Length Required:** 2.5" min  
**Allowable Shaft End-Play:** ± 0.050"  
**Allowable Shaft Runout:** 0.003" TIR

### ENVIRONMENTAL

**Operating Temperature Range:** -40°C to +80°C  
**Storage Temperature Range:** -40°C to +120°C  
**Humidity:** to 98% RH (non-condensing)  
**Shock (Sensor Module):** 1 meter drop test, 30 G's Min  
**Vibration:** 18 G's @ 5-2000 Hz spectrum

### ELECTRICAL CONNECTIONS

Signal	Connector Pin	Pigtail Cable	MS 3102E18-IT#
Common	1	Black	A
B	2	Green	E
A	3	Blue	D
Z *	4	Violet	C
No Connection	5	—	—
Vcc (5-15 VDC)	6	Red	B
B̄	7	Yellow	H
Ā	8	Gray	G
Z̄ *	9	Orange	I
Shield	10	Braid	J

\* Index (Z) optional. See Ordering Information

# SERIES RIM8500

## Ordering Information

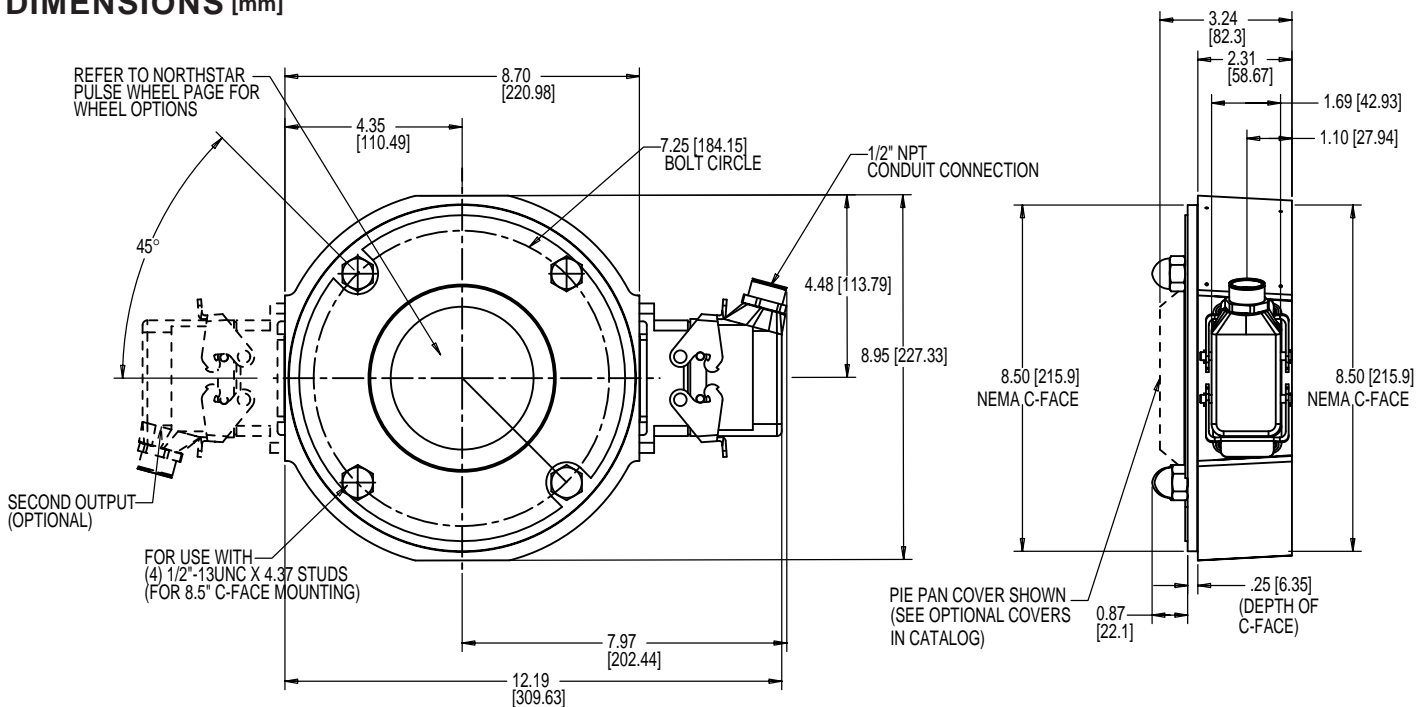
To order, complete the model number with code numbers from the table below:

Code 1: Model	Code 2: PPR	Code 3: Index	Code 4: Wheel Bore	Code 5: Output	Code 6: Electrical	Code 7: Termination
<b>R8</b>	□□□□	□	□□□	□	□	□

### Ordering Information

<b>R8</b> Motor Mount Ring, for Nema 8 1/2" C-Face Motors (180C)	<b>0060</b>	<b>0300</b>	<b>L</b> No Index Available when Code 2 is 0480, 0512, 0600, 0960 1024 or 1200	<b>J04</b> 5/8" bore	<b>1</b> Single <b>2</b> Dual (Isolated)  Differential, bidirectional signals (A, $\bar{A}$ , B, $\bar{B}$ )	<b>L</b> 5-15V in, 5-15V Line Driver (4428) out  <b>H</b> Same as L with extended temp. to 120°C  <b>R</b> 15-26V in, 15V Line Driver (4428) out  <b>5</b> 5-15V in, 5V Line Driver (4428) out	<b>C</b> Latching Industrial Connector with 1/2" NPT  <b>M</b> 10 pin MS Connector <b>P</b> 18" Pigtail <b>Q</b> Latching industrial connector on 18" cable
	<b>064</b>	<b>0480</b>		<b>J05</b> 7/8" bore			
	<b>0075</b>	<b>0512</b>	<b>G</b> Gated Index (Z, $\bar{Z}$ ) <b>Z</b> Differential Index (Z, $\bar{Z}$ )	<b>J06</b> 1.00" bore	<b>Note:</b> See ACCESSORIES Section For Connectors, Spare Parts and Pulse Wheels		
	<b>0120</b>	<b>0600</b>		<b>J07</b> 1-1/8" bore			
	<b>0128</b>	<b>0960</b>	<b>K09</b> 1-3/8" bore				
	<b>0150</b>	<b>1024</b>	<b>K10</b> 1-1/2" bore				
	<b>0240</b>	<b>1200</b>	<b>K11</b> 1-5/8" bore				
	<b>0256</b>		<b>K12</b> 1-3/4" bore				
			<b>K13</b> 1-7/8" bore				
			<b>K14</b> 2" bore				
			<b>K15</b> 2-1/8" bore				
			<b>K16</b> 2-1/4" bore				
			<b>K17</b> 2-3/8" bore				
			<b>K18</b> 2-1/2" bore				
			<b>K19</b> 2-7/8" bore				
			Additional Shaft Sizes Available Up to 3.75" Maximum				
			<b>End of shaft mounting for GE &amp; Emerson Motors</b>				
			E01 1.125" EOS				
			E06 2.125" EOS				
			E08 2.375" EOS				
			E10 2.875" EOS				

## DIMENSIONS inch [mm]



# SERIES RIM 1250

# NorthStar™ brand

## Bearingless Encoder

### Key Features

- **Bearingless Design Mounts to 250-C Face Motors (12.5" Diameter Mounting Flange)**
- **Sensor Modules are Removable On-The-Fly and Require No Gapping**
- **Stainless Steel and Ductile Cast Iron Construction for Harsh Mill Environments**
- **Magneto-Resistive Technology Resists Dust, Dirt, Oil, Water and Other Common Contaminants**



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental  
**Pulses per Revolution:** 60-2048  
**Phasing Sense:** A leads B for Counter-Clockwise rotation (CCW) viewing encoder-mounted end  
**Quadrature Phasing:**  $90^\circ \pm 22^\circ$   
**Symmetry:**  $180^\circ \pm 54^\circ$   
**Index:**  $270^\circ$ , ungated (optional gated to falling B edge)

### ELECTRICAL

**Input Power Requirements:** 5-15 Volts DC, 45 mA typical per sensor module plus line driver load  
**Output Signals:** Line Driver, 150mA source/sink  
**Frequency Response:** 0 - 120kHz Data & Index  
**Electrical Immunity:** 2kV ESD, Reverse Polarity, Short Circuit  
**Connector:** 10 pin industrial duty latching, sealed NEMA 4 & 12, IP65

### MECHANICAL

**Shaft Speed:** 7,000 RPM (J or K wheels); 3600 RPM (TL wheels)  
**Mounting Configuration:** 12.5" face mount for NEMA MG1 standards  
**Housing Material:** Cast Iron/Stainless Steel  
**Acceleration Rate:** 3600 rpm/sec max  
**Shaft Length Required:** 3.0" min  
**Allowable Shaft End-Play:**  $\pm 0.050"$   
**Allowable Shaft Runout:** 0.003" TIR

### ENVIRONMENTAL

**Operating Temperature Range:**  $-40^\circ\text{C}$  to  $+80^\circ\text{C}$   
**Storage Temperature Range:**  $-40^\circ\text{C}$  to  $+120^\circ\text{C}$   
**Humidity:** to 98% RH (non-condensing)  
**Shock (Sensor Module):** 1 meter drop test, 30 G's Min  
**Vibration:** 18 G's @ 5-2000 Hz spectrum

### ELECTRICAL CONNECTIONS

Signal	Connector Pin	Pigtail Cable	MS 3102E18-IT#
Common	1	Black	A
B	2	Green	E
A	3	Blue	D
Z *	4	Violet	C
No Connection	5	—	—
Vcc	6	Red	B
$\bar{B}$	7	Yellow	H
$\bar{A}$	8	Gray	G
$\bar{Z}$ *	9	Orange	I
Shield	10	Braid	J

\* Index (Z) optional. See Ordering Information

# SERIES RIM 1250

## Ordering Information

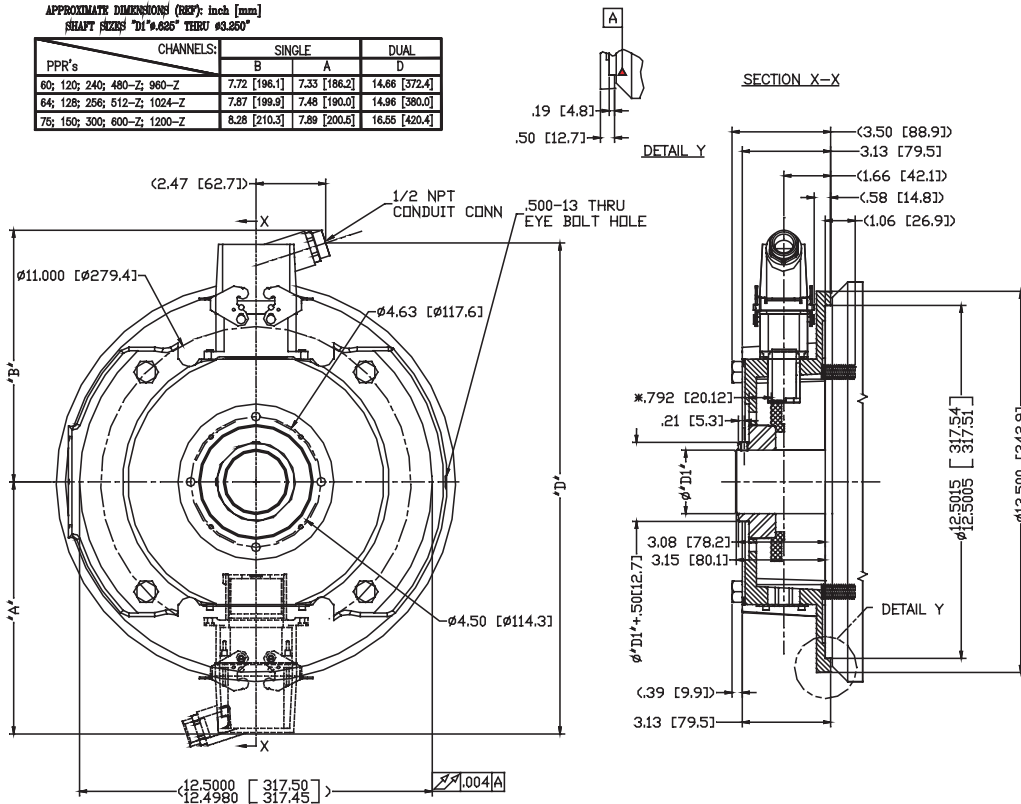
To order, complete the model number with code numbers from the table below:

Code 1: Model	Code 2: PPR	Code 3: Index	Code 4: Wheel Bore	Code 5: Output	Code 6: Electrical	Code 7: Termination	
<b>R1</b>	□□□□	□	□□□	□	□	□	
Ordering Information							
<b>R1</b> Motor Mount Ring, for 12-1/2" C-Face Motors	<b>0060</b> <b>0064</b> <b>0075</b> <b>0120</b> <b>0128</b> <b>0150</b> <b>0240</b> <b>0256</b>	<b>0300</b> <b>0480</b> <b>0512</b> <b>0600</b> <b>0960</b> <b>1024</b> <b>1200</b> <b>2048</b>	<b>L</b> No Index  Available when Code 2 is 0480, 0512, 0600, 0960, 1024, 1200 or 2048 <b>G</b> Gated Index (Z, Z) <b>Z</b> Differential Index (Z, Z)	<b>J04</b> 5/8" bore <b>J05</b> 7/8" bore <b>J06</b> 1.00" bore <b>J07</b> 1-1/8" bore <b>K09</b> 1-3/8" bore <b>K10</b> 1-1/2" bore <b>K11</b> 1-5/8" bore <b>K12</b> 1-3/4" bore <b>K13</b> 1-7/8" bore <b>K14</b> 2" bore <b>K15</b> 2-1/8" bore <b>K16</b> 2-1/4" bore <b>K17</b> 2-3/8" bore <b>K18</b> 2-1/2" bore <b>K19</b> 2-7/8" bore Additional Shaft Sizes Available Up to 8.00" Maximum	<b>1</b> Single <b>2</b> Dual (Isolated)  Differential, bidirectional signals (A, $\bar{A}$ , B, $\bar{B}$ )	<b>L</b> 5-15V in, 5-15V Line Driver (4428) out  <b>R</b> 15-26V in, 15V Line Driver (4428) out  <b>5</b> 5-15V in, 5V Line Driver (4428) out	<b>C</b> Latching Industrial Connector with 1/2" NPT  <b>M</b> 10 pin MS Connector  <b>P</b> 18" Pigtail

## DIMENSIONS inch [mm]

APPROXIMATE DIMENSIONS (REF): inch [mm]  
SHAFT SIZE:  $\text{D}1 \pm 0.005$  THRU  $\#3.250$ "

PPR's	CHANNELS:		SINGLE		DUAL	
	B	A	B	A	D	D
60; 120; 240; 480-Z; 960-Z	7.72 [196.1]	7.33 [186.2]	14.66 [372.4]	14.66 [372.4]		
64; 128; 256; 512-Z; 1024-Z	7.87 [199.9]	7.48 [190.0]	14.96 [380.0]	14.96 [380.0]		
75; 150; 300; 600-Z; 1200-Z	8.28 [210.3]	7.89 [200.5]	16.55 [420.4]	16.55 [420.4]		



# SERIES RIM 6200

# NorthStar™ brand

## Severe Duty Encoder

### Key Features

- Foot-Mount or 56-C Face Mount Ideal for “Flower Pot” or Belt Drive Applications
- Extra Heavy Duty Bearings for Long Life
- Stainless Steel and Ductile Cast Iron Construction
- Sensor Modules are Removable On-The-Fly and Provide up to 2048PPR



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental

**Pulses per Revolution:** 60-2048

**Phasing Sense:** A leads B for Counter-Clockwise rotation (CCW) viewing encoder-mounted end

**Quadrature Phasing:**  $90^\circ \pm 22^\circ$

**Symmetry:**  $180^\circ \pm 54^\circ$

**Index:**  $270^\circ$ , ungated (optional gated to falling B edge)

### ELECTRICAL

**Input Voltage Requirement:** 5-15 or 15-26 Volts DC

#### Current Requirement:

With Electrical Option L: 45 mA typical per sensor module plus line driver load

With Electrical Option R: 65 mA typical per sensor module plus line driver load

With Electrical Option 5: 65 mA typical per sensor module plus line driver load

### Output Signals:

With Elec Option L: 5-15 V Line Driver, 150mA

With Elec Option R: 15 V Line Driver, 150mA

With Elec Option 5: 5V Line Driver, 150mA

**Frequency Response:** 0 - 120kHz Data & Index

**Electrical Immunity:** 2kV ESD, Reverse Polarity, Short Circuit

**Connector:** 10 pin industrial duty latching, sealed NEMA 4 & 12, IP65

### MECHANICAL

**Shaft Speed:** 7,000 RPM

**Mounting Configuration:** 4.5" [115mm] diameter, 56 C motor face or accessory flange to meet NEMA MG1-4 standards; foot mount with 4 slotted bolt holes

**Housing Material:** Cast Iron/Stainless Steel

**Acceleration Rate:** 3600 rpm/sec max

**Shaft :** 0.625" (16mm) diameter with standard key, single or double ended

**Shaft Material Options:** Hot Rolled Carbon Steel or Stainless steel

#### Shaft Axial/Radial Loading:

**Hot Rolled Steel:** 50 lbf axial, 50 lbf radial

**Stainless Steel:** 35 lbf axial, 35 lbf radial

### ENVIRONMENTAL

**Operating Temperature Range:**  $-40^\circ\text{C}$  to  $+70^\circ\text{C}$

**Storage Temperature Range:**  $-40^\circ\text{C}$  to  $+120^\circ\text{C}$

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

**Shock (Sensor Module):** 1 meter drop test, 30 G's Min

**Vibration:** 18 G's @ 5-2000 Hz spectrum

### ELECTRICAL CONNECTIONS

Signal	Connector Pin	Pigtail Cable	MS 3102E18-IT#
Common	1	Black	A
B	2	Green	E
A	3	Blue	D
Z *	4	Violet	C
No Connection	5	—	—
Vcc	6	Red	B
B	7	Yellow	H
A	8	Gray	G
Z *	9	Orange	I
Shield	10	Braid	J

\* Index (Z) optional. See Ordering Information



# SERIES RIM 6200

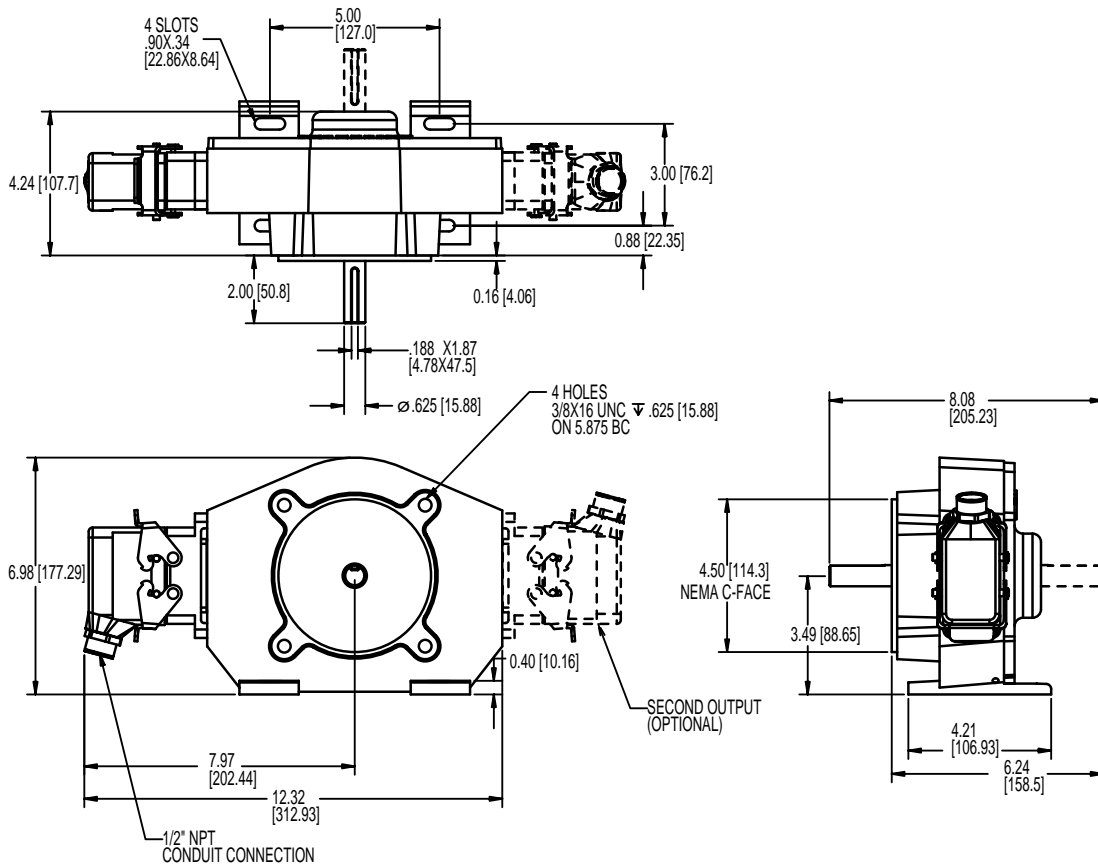
## Ordering Information

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

Code 1: Model	Code 2: PPR	Code 3: Index	Code 4: Shaft	Code 5: Output	Code 6: Electrical	Code 7: Termination
<b>R6</b>	□□□□	□	□□□	□	□	□
Ordering Information						
<b>R6</b> Foot Mount or Close Coupled	<b>0060</b>	<b>L</b> No Index  Available when Code 2 is 0480, 0512, 0600, 0960 1024, 1200 or 2048  <b>G</b> Gated Index (Z, $\bar{Z}$ )  <b>Z</b> Differential Index (Z, $\bar{Z}$ )	<b>A</b> Single Shaft, Stainless Steel	<b>1</b> Single Output	<b>L</b> 5-15V in, 5-15V Line Driver (4428) out	<b>C</b> Latching Industrial Connector with 1/2" NPT
	<b>0064</b>		<b>B</b> Dual Shaft, Stainless Steel			
	<b>0075</b>		<b>S</b> Single Shaft, Steel	Differential, bidirectional signals (A, $\bar{A}$ , B, $\bar{B}$ )	<b>R</b> 15-26V in, 15V Line Driver (4428) out	<b>M</b> 10 pin MS Connector
	<b>0120</b>		<b>D</b> Dual Shaft, Steel			
	<b>0128</b>					
	<b>0150</b>				<b>5</b> 5-15V in, 5V Line Driver (4428) out	<b>P</b> 18" Pigtail
	<b>0240</b>					
	<b>0256</b>					
	<b>0300</b>					
	<b>0480</b>					
	<b>0512</b>					
	<b>0600</b>					
	<b>0960</b>					
<b>1024</b>						
<b>1200</b>						
<b>2048</b>						

**Note:** See ACCESSORIES Section For Connectors, Spare Parts and Pulse Wheels

## DIMENSIONS <sup>inch</sup> [mm]



# SERIES HS56

**NorthStar™ brand**

## Hollow Shaft Encoder

### Key Features

- **Hollowshaft Design with Heavy-Duty Bearings Ideal for TEFC AC Motor Mounting**
- **Magneto-Resistive Technology**
- **Accommodates Shaft Sizes from 5/8" to 1-1/8"**
- **Stainless Steel and Anodized Aluminum Construction**
- **Dual Isolated Outputs Available for Redundancy**



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental  
**Pulses per Revolution:** 64-2048  
**Phasing Sense:** A leads B for Counter-Clockwise rotation (CCW) viewing encoder-mounted end  
**Quadrature Phasing:** 90° ± 22°  
**Symmetry:** 180° ± 54°  
**Index:** 270°, ungated (optional gated to falling B edge)

### ELECTRICAL

**Input Voltage Requirement:** 5-15 or 5-26 Volts DC  
**Current Requirement:**  
 With Electrical Option L: 45 mA typical per sensor module plus line driver load  
 With Electrical Option V or 5: 65 mA typical per sensor module plus line driver load  
**Output Signals:**  
 With Elec Option L: 5-15 V Line Driver, 150mA  
 With Elec Option V: 5-26 V Line Driver, 100mA  
 With Elec Option 5: 5V Line Driver, 150mA  
**Frequency Response:** 0 - 120kHz Data & Index  
**Electrical Immunity:** 2kV ESD, Reverse Polarity, Short Circuit  
**Connector:** 10 pin industrial duty latching, sealed NEMA 4 & 12, IP65; MS connector or pig-tail

### MECHANICAL

**Mating Shaft Sizes:** 5/8" to 1-1/8"  
**Shaft Speed:** 3,600 RPM  
**Mounting Configuration:** Hollow Shaft mount with Anti-Rotation Tether  
**Housing Material:** Hard Anodized Aluminum W/Stainless Steel Hub  
**Acceleration Rate:** 3,600 rpm/sec max  
**Shaft Length Required:** 2.0" min  
**Allowable Shaft End-Play:** ± 0.150" (tether limit)  
**Allowable Shaft Runout:** 0.015" TIR typical (rpm dependent)

### ELECTRICAL CONNECTIONS

Signal	Connector Pin	Pigtail Cable	MS 3102E18-IT#
Common	1	Black	F
B	2	Green	B
A	3	Blue	A
Z *	4	Violet	C
No Connection	5	—	E
Vcc +	6	Red	D
B̄	7	Yellow	I
Ā	8	Gray	H
Z *	9	Orange	J
Shield	10	Braid	G

\* Index (Z) optional. See Ordering Information

### ENVIRONMENTAL

**Operating Temperature Range:** -20°C to +80°C  
**Storage Temperature Range:** -40°C to +120°C  
**Humidity:** to 98% RH (non-condensing)  
**Shock (Sensor Module):** 1 meter drop test, 30 G's Min  
**Vibration:** 18 G's @ 5-2000 Hz spectrum

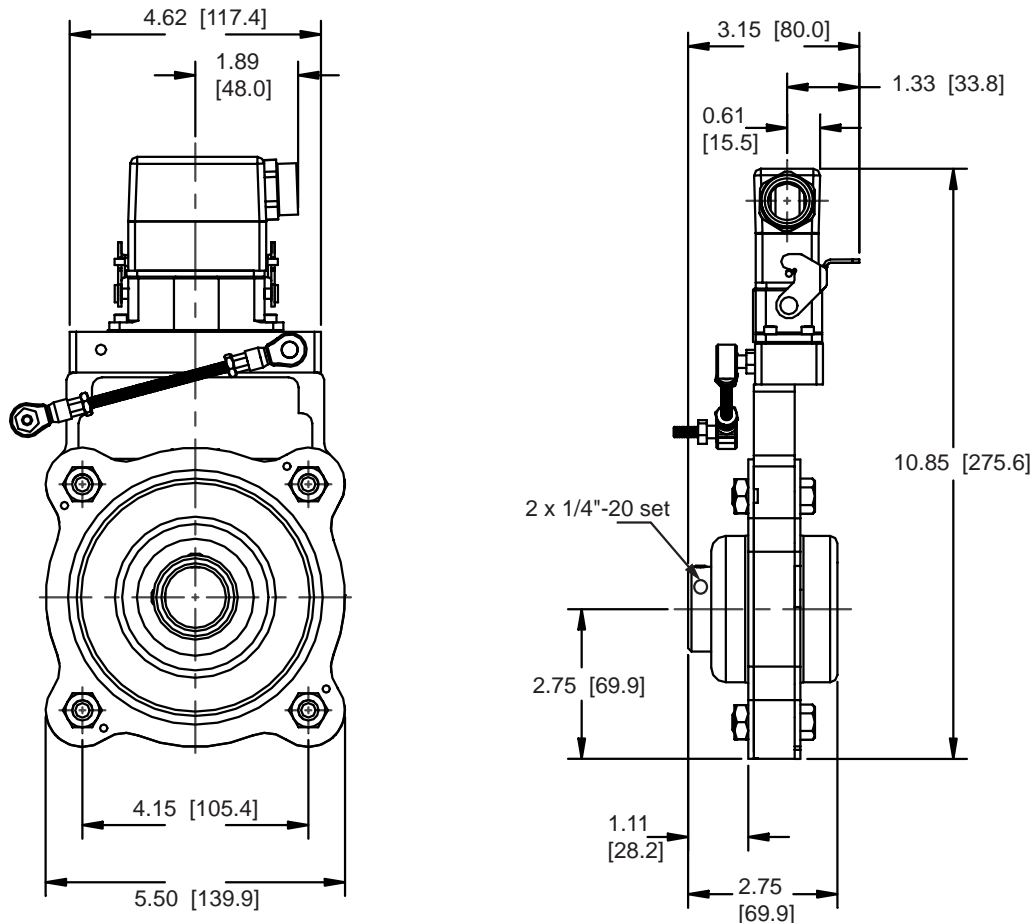
**Ordering Information**

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

Code 1: Model	Code 2: PPR	Code 3: Index	Code 4: Wheel Bore	Code 5: Termination	Code 6: Electrical
<b>H</b> □	□□□□	□	□□□	□	□
Ordering Information					
<b>H5</b> Hollow Shaft Mount	<b>0064</b> <b>0128</b> <b>0256</b> <b>0512</b>	<b>L</b> No Index  Available when Code 2 is 0512, 1024 or 2048	<b>J04</b> 5/8" bore <b>J05</b> 7/8" bore <b>J06</b> 1.00" bore <b>J07</b> 1-1/8" bore	<b>C</b> Latching Industrial Connector with 1/2" NPT  <b>M</b> 10 pin MS Connector  <b>P</b> 18" pigtail cable  <b>Q</b> Latching Industrial Connector on 18" pigtail cable	<b>L</b> 5-15V in, 5-15V Line Driver (4428) out <b>V</b> 5-26V in, 5-26V Line Driver (IC-WE) out <b>5</b> 5-15V in, 5V Line Driver (4428) out  Differential, bidirectional signals (A, $\bar{A}$ , B, $\bar{B}$ )
<b>HD</b> Hollow Shaft Mount Dual Output	<b>1024</b> <b>2048</b>	<b>G</b> Gated Index (Z, $\bar{Z}$ ) <b>Z</b> Differential Index (Z, $\bar{Z}$ )			

**Note:** See ACCESSORIES Section For Connectors, Spare Parts and Pulse Wheels

**DIMENSIONS** <sup>inch</sup> [mm]



# SERIES HS60

**NorthStar™ brand**

## Hollowshaft Encoder

### Key Features

- Industry-Leading 2-7/8" Hollowshaft Capability
- Multi-Stage Sealing for Wash-Down Applications
- Stainless Steel Shaft for Corrosion Resistance
- Dual-Split Clamping Collar for Positive Shaft Engagement
- Oversized Bearings for Long Service Life
- Magnetic Sensor Technology and Encapsulated Electronics Resist Moisture and Contamination



EN 61326



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental  
**Pulses per Revolution:** 64-2048  
**Phasing Sense:** A leads B for Counter-Clockwise rotation (CCW) viewing encoder-mounted end  
**Quadrature Phasing:** 90° ± 22°  
**Symmetry:** 180° ± 54°  
**Index:** Once per revolution

### ELECTRICAL

**Input Voltage Requirement:** 5-15 or 5-26 Volts DC  
**Current Requirement:**  
 With Electrical Option L: 45 mA typical per sensor module plus line driver load  
 With Electrical Option V or 5: 65 mA typical per sensor module plus line driver load  
**Output Signals:**  
 With Elec Option L: 5-15 V Line Driver, 150mA  
 With Elec Option V: 5-26 V Line Driver, 100mA  
 With Elec Option 5: 5V Line Driver, 150mA  
**Frequency Response:** 0 - 120kHz Data & Index  
**Electrical Immunity:** 2kV ESD, Reverse Polarity, Short Circuit  
**Connector:** 10 pin industrial duty latching, sealed NEMA 4 & 12, IP65; MS connector or pig-tail

### MECHANICAL

**Mating Shaft Sizes:** 1-1/8" to 2-7/8"  
**Shaft Speed:** Labyrinth Shaft Seal: 3,600 RPM; V-Ring Shaft Seal: 1,000 RPM  
**Mounting Configuration:** Hollow Shaft mount with Anti-Rotation Tether  
**Housing Material:** Hard Anodized Aluminum W/Stainless Steel Hub  
**Acceleration Rate:** 3,600 rpm/sec max  
**Shaft Length Required:** 2.36" min  
**Allowable Shaft End-Play:** ± 0.150" (tether limit)  
**Allowable Shaft Runout:** 0.015" TIR typical (rpm dependent)

### ENVIRONMENTAL

**Operating Temperature Range:** -20°C to +80°C  
**Storage Temperature Range:** -40°C to +120°C  
**Humidity:** to 98% RH (non-condensing)  
**Shock (Sensor Module):** 1 meter drop test, 30 G's Min  
**Vibration:** 18 G's @ 5-2000 Hz spectrum

### ELECTRICAL CONNECTIONS

Signal	Connector Pin	Pigtail Cable	MS 3102E18-IT#
Common	1	Black	F
B	2	Green	B
A	3	Blue	A
Z *	4	Violet	C
No Connection	5	—	E
Vcc +	6	Red	D
B	7	Yellow	I
A	8	Gray	H
Z *	9	Orange	J
Shield	10	Braid	G

\* Index (Z) optional. See Ordering Information

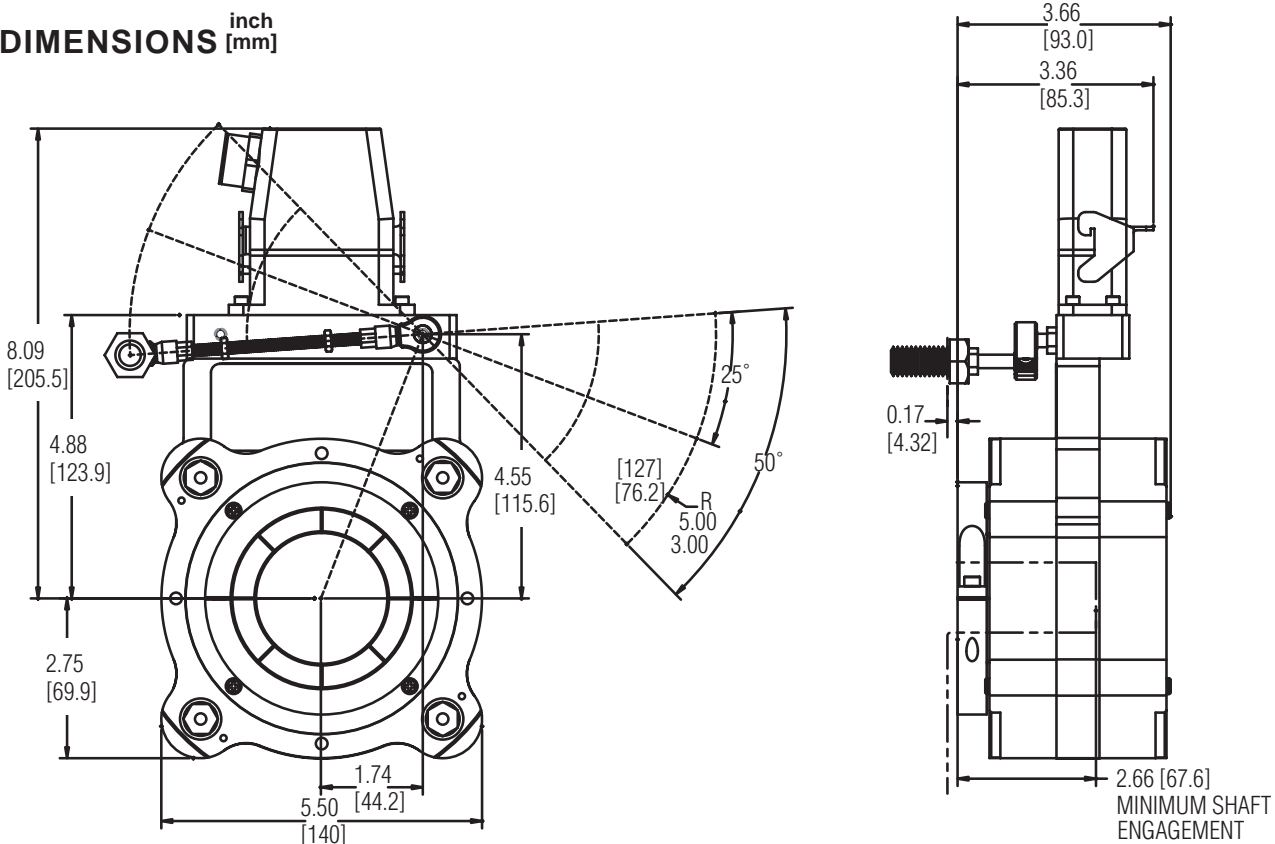
**Ordering Information**

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

Code 1: Model	Code 2: PPR	Code 3: Index	Code 4: Wheel Bore	Code 5: Termination	Code 6: Electrical	Code 7: Seal	
<b>6</b>	<b>□□□□</b>	<b>□</b>	<b>T□□</b>	<b>□</b>	<b>□</b>	<b>□</b>	
Ordering Information							
<b>H6 HS60</b> Hollowshaft, single output	<b>0064</b>	<b>L</b> No index  available when code 2 is 0512, 1024, or 2048	<b>T01</b> 1-1/8"	<b>C</b> Latching Industrial Connector with 1/2" NPT	<b>L</b> 5-15VDC in, 5-15V Line driver (4428) out	<b>L</b> Labyrinth seal	
	<b>0128</b>		<b>T02</b> 1-3/8"				
<b>D6</b> Dual output	<b>0256</b>	<b>G</b> With Gated, differential index	<b>T03</b> 1-5/8"	<b>M</b> 10 pin MS Connector	<b>V</b> 5-26VDC in, 5-26V Line driver (IC-WE) out	<b>V</b> V-ring seal	
	<b>0512</b>		<b>T04</b> 1-7/8"				
	<b>1024</b>		<b>T05</b> 2.00"				
	<b>2048</b>		<b>T06</b> 2-1/8"				
		<b>Z</b> With differential index	<b>T07</b> 2-1/4"	<b>P</b> 18" pigtail cable	<b>5</b> 5-15VDC in, 5V Line driver (4428) out  Differential, bidirectional signals		
			<b>T08</b> 2-3/8"			<b>Q</b> Latching industrial connector on 18" pigtail cable	
			<b>T09</b> 2-1/2"				
			<b>T10</b> 2-7/8"				
			<i>Metric bore sizes available. Consult factory for details.</i>				

**Note:** See ACCESSORIES Section For Connectors, Spare Parts and Pulse Wheels

**DIMENSIONS** inch  
[mm]



# SERIES HS85

# NorthStar™ brand

## Hollow Shaft Encoder

### Key Features

- Hollowshaft Design Mounts Easily to Large Motor Shafts, up to 4.5" in Diameter
- Magneto-Resistive Technology with Removable On-The-Fly Sensor Modules
- Multiple Bore Sizes Available, Including Tapered Shafts
- Stainless Steel and Ductile Cast Iron Construction



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental  
**Pulses per Revolution:** 60-2048  
**Phasing Sense:** A leads B for Counter-Clockwise rotation (CCW) viewing encoder-mounted end  
**Quadrature Phasing:** 90° ± 22°  
**Symmetry:** 180° ± 54°  
**Index:** 270°, ungated (optional gated to falling B edge)

### ELECTRICAL

**Input Voltage Requirement:** 5-15 or 15-26 Volts DC

#### Current Requirement:

With Electrical Option L: 45mA typical per sensor module plus line driver load  
 With Electrical Option R: 65mA typical per sensor module plus line driver load  
 With Electrical Option 5: 65mA typical per sensor module plus line driver load

#### Output Signals:

With Elec Option L: 5-15 V Line Driver, 150mA  
 With Elec Option R: 15 V Line Driver, 150mA  
 With Elec Option 5: 5V Line Driver, 150mA

**Electrical Immunity:** 2kV ESD, Reverse Polarity, Short Circuit

**Connector:** 10 pin industrial duty latching, sealed NEMA 4 & 12, IP65; MS connector or pig-tail

### MECHANICAL

**Mating shaft sizes:** 1-1/8" to 4-1/2", straight or tapered bore

**Shaft Speed:** 3,600 RPM

**Mounting Configuration:** Hollow Shaft mount with Anti-Rotation Tether

**Housing Material:** Cast Iron/Stainless Steel

**Acceleration Rate:** 3,600 rpm/sec max

**Allowable Shaft End-Play:** 0.25" (Subject to RPM Limitation)

**Allowable Shaft Runout:** 0.010" TIR (Subject to RPM Limitation)

### ENVIRONMENTAL

**Operating Temperature Range:** -20°C to +70°C

**Storage Temperature Range:** -40°C to +120°C

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

**Shock (Sensor Module):** 1 meter drop test, 30 G's Min

**Vibration:** 18 G's @ 5-2000 Hz spectrum

### ELECTRICAL CONNECTIONS

Signal	Connector Pin	Pigtail Cable	MS 3102E18-IT#
Common	1	Black	A
B	2	Green	E
A	3	Blue	D
Z *	4	Violet	C
No Connection	5	—	—
Vcc	6	Red	B
B̄	7	Yellow	H
Ā	8	Gray	G
Z *	9	Orange	I
Shield	10	Braid	J

\* Index (Z) optional. See Ordering Information

# SERIES HS85

## Ordering Information

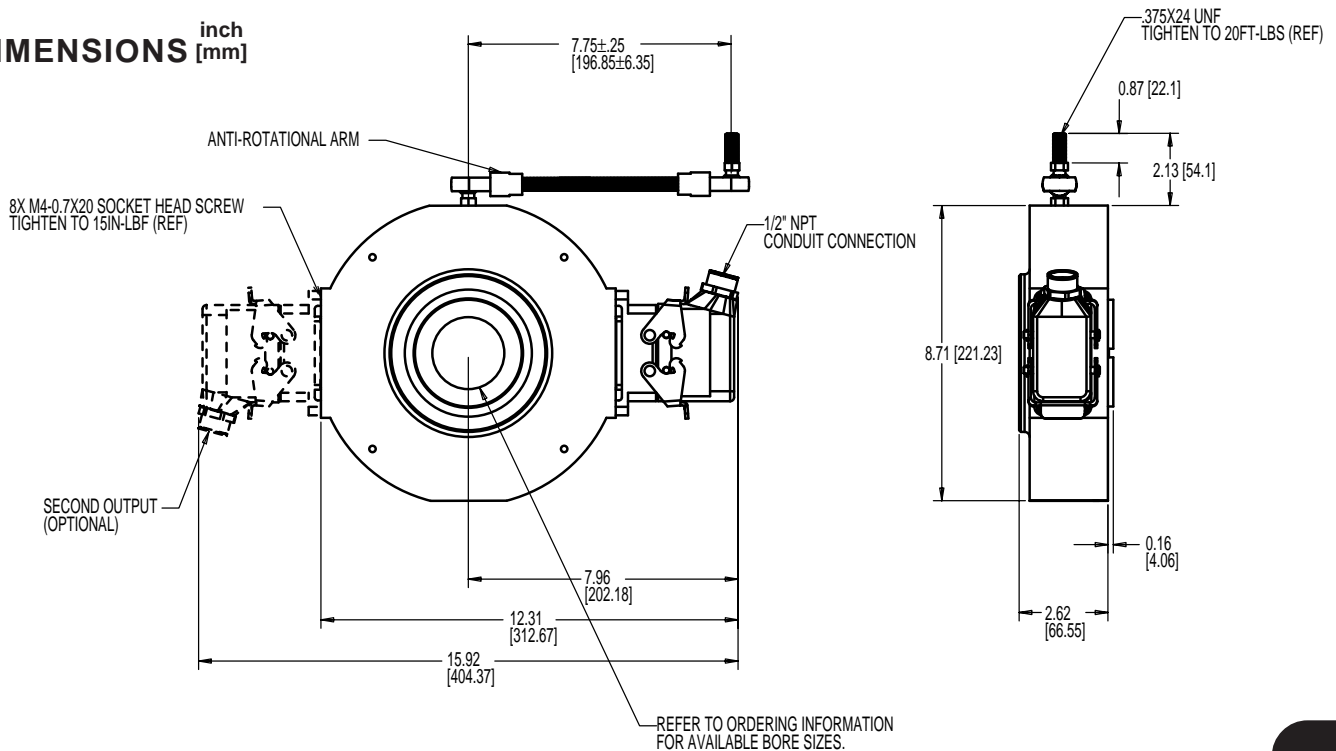
To order, complete the model number with code numbers from the table below:

Code 1: Model	Code 2: PPR	Code 3: Index	Code 4: Wheel Bore	Code 5: Output	Code 6: Electrical	Code 7: Termination
<b>H8</b>	□□□□	□	□□□□	□	□	□

### Ordering Information

<b>H8</b> Hollow Shaft	<b>0060</b>	<b>0300</b>	L No Index Available when Code 2 is 0480, 0512, 0600, 0960, 1024, 1200 or 2048	<b>Thru-bores</b> <b>T01</b> 1-1/8" bore <b>T02</b> 1-3/8" bore <b>T03</b> 1-5/8" bore <b>T04</b> 1-7/8" bore <b>T05</b> 2.00" bore <b>T06</b> 2-1/8" bore <b>T07</b> 2-1/4" bore <b>T08</b> 2-3/8" bore <b>T09</b> 2-1/2" bore <b>T10</b> 2-7/8" bore	<b>1</b> Single <b>2</b> Dual (Isolated)  Differential, bidirectional signals (A, $\bar{A}$ , B, $\bar{B}$ )	<b>L</b> 5-15V in, 5-15V Line Driver (4428) out  <b>R</b> 15-26V in, 15V Line Driver (4428) out  <b>5</b> 5-15V in, 5V Line Driver (4428) out	<b>C</b> Latching Industrial Connector with 1/2" NPT  <b>M</b> 10 pin MS Connector  <b>P</b> 18" Pigtail
	<b>0064</b>	<b>0480</b>					
	<b>0075</b>	<b>0512</b>	<b>G</b> Gated Index (Z, $\bar{Z}$ )	<b>Bores with 1.25" per foot taper</b> <b>P01</b> 1-1/8" bore <b>P02</b> 1-3/8" bore <b>P03</b> 1-5/8" bore <b>P04</b> 1-7/8" bore <b>P05</b> 2.00" bore <b>P06</b> 2-1/8" bore <b>P07</b> 2-1/4" bore <b>P08</b> 2-3/8" bore <b>P09</b> 2-1/2" bore <b>P10</b> 2-7/8" bore  Additional Shaft Sizes Up to 4.50" Maximum Available (thru and taper shaft) Call factory for details			
	<b>0120</b>	<b>0600</b>	<b>Z</b> Differential Index (Z, $\bar{Z}$ )				
<b>Note:</b> See ACCESSORIES Section For Connectors, Spare Parts and Pulse Wheels							

## DIMENSIONS [mm]



# SERIES AR62/AR63

**ACURO™ brand**

## Magnetic Absolute Encoder

### Key Features

- 12 Bit Single-Turn Resolution, up to 16 Bit Multi-Turn
- Oversized Bearings for up to 3x Life of Standard Absolute Encoders
- Wide -40° to 100°C Temperature Range
- Submersible — IP69k Sealing Available
- Rated to 200g Shock, 20g Vibration for Harsh Environments
- Stainless Steel or Aluminum Housing

**NEW!**



## SPECIFICATIONS

### ELECTRICAL

**Supply voltage:** 5VDC, 10-30VDC, or 17-30VDC (see "Ordering Information")

**EMC:** EN 61326 (external protective circuit required)

**Resolution singleturn:** 12 Bit

**Resolution multiturn:** 12, 13, 16 Bit

**Absolute accuracy:** ±0.6°

**Repeatability:** ±0.2°

**Parametrization:** Preset

### MECHANICAL

**Housing diameter:** 58 mm

**Mounting depth:** 32 mm

**Shaft diameter:** 3/8", 10 mm

**Flange:** Synchro clamping or 2.5" Square flange

**Protection Class (EN 60529):** Housing & Shaft, IP67 or IP69k

**Shaft load:** axial 300 N max.; radial 300 N max.

### ENVIRONMENTAL

**Shaft speed (maximum):** 5000 rpm

**Vibration resistance:** (DIN EN 60068-2-6) 200 m/s<sup>2</sup>

**Shock resistance:** (DIN EN 60068-2-27) 2000 m/s<sup>2</sup> (6 ms)

**Operating temperature:** -40 °C to +100 °C

**Connection:** Cable, radial; M12 connector, radial

### ELECTRICAL CONNECTIONS – BiSS / SSI

Cable Color	PIN	Signal
Yellow	6	Clock
Pink	5	Data
Green	4	Clock
Grey	8	Data
White	1	UB
Brown	2	0V
Red	3	Preset (set to 0)
Screen	Screen	Screen

### ELECTRICAL CONNECTIONS – CANopen

Color cable	PIN	Signal
Yellow	6	CAN in+
Green	4	CAN in-
Pink	3	CAN out+
Grey	7	CAN out-
Bue	n.c.	n.c.
Red	n.c.	n.c.
White	1	UB
Brown	2	0 V
Screen	Screen	Screen Screen

### ELECTRICAL CONNECTIONS – Analog

Cable Color	PIN	Signal
Pink	6	0 to 10 V (max. 5mA)
Blue	7	0 to 20 mA or 4 to 20 mA (current output)
Grey	5	AGND
Red	8	preset (set to 0)
White	1	UB
Brown	2	0 V
Yellow <sup>1</sup>	4	Diagnostic 1
Green <sup>1</sup>	3	Diagnostic 2
Screen	Screen	Screen

<sup>1</sup>. Diagnostic signals only for service purposes. The cable wires have to be isolated.



# SERIES AR62/AR63

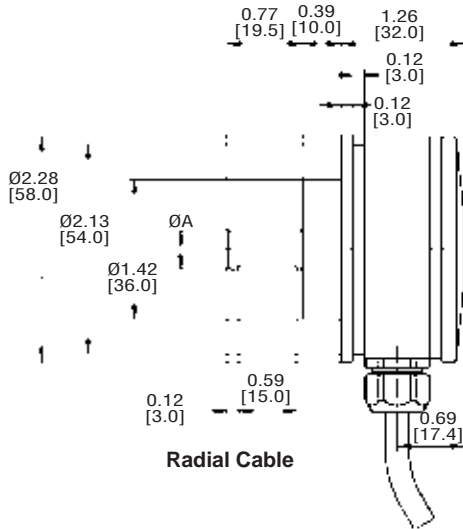
## Ordering Information

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

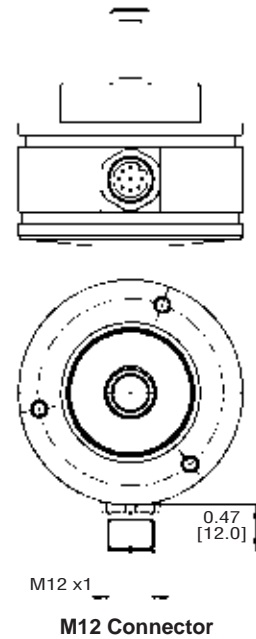
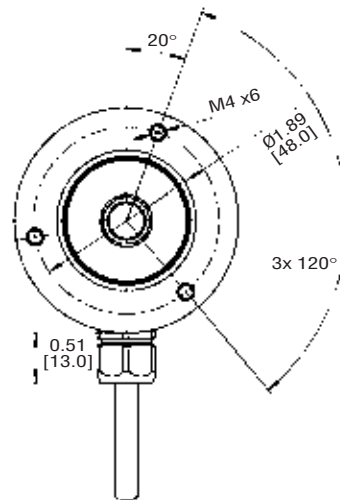
Code 1: Model	Code 2: Resolution	Code 3: Voltage	Code 4: Mounting	Code 5: Protection	Code 6: Shaft Size	Code 7: Interface	Code 8: Connection	Code 9: Cable Length
Ordering Information								
<b>AR62</b>	<input type="text" value="12"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>AR62</b> Aluminum	<b>0012</b> 12 bit single-turn	<b>A</b> 5 VDC <b>E</b> 10-30VDC	<b>L</b> Synchro, Clamping	<b>7</b> IP67 <b>9</b> IP69k	<b>2</b> 10mm "2" is available only when Code 4 is L	<b>BI</b> BiSS <b>SG</b> SSI-Gray <b>SB</b> SSI-Binary <b>OL</b> CAN Open	<b>B</b> Radial Cable Available when Code 1 is AR62 and code 5 is 7	<b>Blank</b> 1.5m <b>DD</b> 3m <b>FO</b> 5m <b>KO</b> 10m <b>PO</b> 15m <b>UO</b> 20m <b>VO</b> 25m <b>WO</b> 30m <b>XO</b> 40m <b>YO</b> 50m
<b>AR63</b> Stainless	<b>1212</b> 12 bit single turn, 12 bit multi-turn <b>1312</b> 12 bit single turn, 13 bit multi-turn <b>1612</b> 12 bit single turn, 16 bit multi-turn	"F" is available only when Code 7 is AV or A4 <b>F</b> 17-30VDC	<b>Q</b> Square Flange		<b>6</b> 3/8" "6" is available only when Code 4 is Q	Available only when Code 2 is 0012, 1212, or 1612 <b>AV</b> Analog, 0-10V <b>A4</b> Analog, 4-20mA	<b>8</b> M12 radial connector, 8-pin	

### DIMENSIONS [mm]

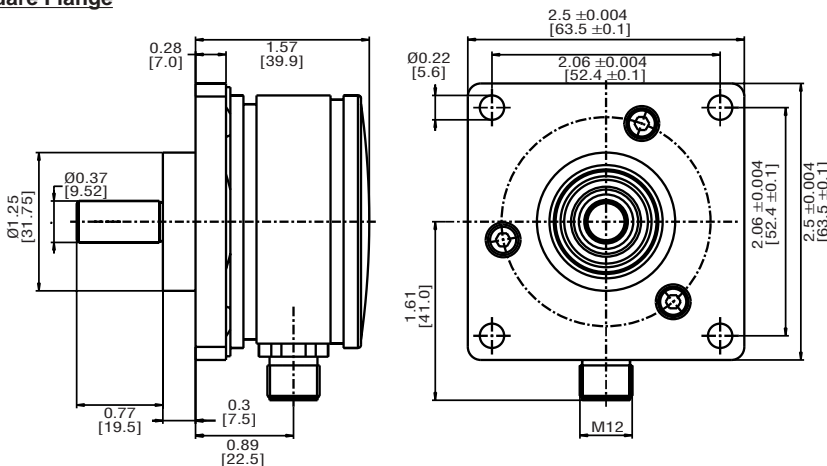
#### Synchro Clamping



ØA: See "Ordering Information" Code 6



#### Square Flange



# SERIES AX70/AX71

**ACURO™ brand**

## Magnetic Absolute Encoder

**NEW!**

### Key Features

- Up to 17 bit of Singleturn, 12 bit of True Multiturn Absolute Positioning
- ATEX Certification for Explosion Proof Requirements
- Stainless Steel or Aluminum Housing
- Multiple Communication Options



EN 61326



E Ex d II C T6/T4



## SPECIFICATIONS

### ELECTRICAL - DeviceNet / CANopen

Parameter	DeviceNet	CANopen
Supply voltage:	DC 10-30 V	DC 10-30 V
Current consumption ST/MT:	max.250 mA	max.250 mA
Profile/ Protocol:	DeviceNet according to Rev. 2.0, programmable encoder	CANopen according DS 301 with encoder profile DSP 406
Output code:	Binary	Binary
Resolution Singleturn:	10 - 14 Bit	10 - 16 Bit
Resolution Multiturn:	12 Bit	12 Bit
Baud rate:	set via Bus	set via Bus
Bus termination:	External resistor	External resistor
MAC-ID:	set via Bus	-
Node ID:	-	set via Bus
Integrated special functions:	-	Speed, acceleration, round axis, limit values
Programmable:	Resolution, Preset, Direction	Resolution, Preset, Limits value, Direction
Connection:	Cable axial	Cable axial

### ELECTRICAL CONNECTIONS - DeviceNet / CANopen

Color	DeviceNet	CANopen
Yellow	CAN in+	CAN in+
Green	CAN in -	CAN in -
Pink	CAN out+	CAN out+
Grey	CAN out -	CAN out -
Blue	DRAIN	CAN GND in
Black	DRAIN	CAN GND out
White	UB in	UB in
Brown	0 V in	0 V in
Screen	Screen connected to encoder housing	



# SERIES AX70/AX71

### ELECTRICAL - SSI/ SSI-P

Parameter	SSI	SSI-P
Supply voltage	DC 10-30 V	DC 10-30 V
Max. current w/o load	220 mA (ST), 250 mA (MT)	250 mA (ST /MT)
Resolution singleturn	10 -17 Bit	10 -17 Bit
Resolution multiturn	12 Bit	12 Bit
Output code	Binary,Gray	Binary,Gray
Drives	Clock and Data /RS422	Clock and Data /RS422
Control inputs	Direction	Direction, Preset 1, Preset 2
Alarm output	Alarm bit (SSI Option)	Alarm bit
Parametrization	N/A	Resolution, Code type, Direction, Warning, Output format, Alarm, Preset values

Note: Parameterization is programmable with WIN SSI software

### ELECTRICAL CONNECTIONS — SSI-P

Wire Color	Pin No.	SSI-P Function
White 0.14 mm	6	RS232 RxD
Brown 0.14 mm	5	RS232 TxD
Green	10	Clock
Yellow	9	Clock
Gey	8	Data
Pink	7	Data
Blue	3	Direction
Black	4	0 V signal output
Red	1	Preset 1
Violet	2	Preset 2
Brown 0.5 mm	11	0 V supply voltage
White 0.5 mm	12	DC 10 ...30 V
Screen	—	Screen connected to encoder housing

### SSI / SSI-P RECOMMENDED DATA TRANSFER RATE (bei SSI)

Cable length	Frequency
<50 m	<400 kHz
<100 m	<300 kHz
<200 m	<200 kHz
<400 m	<100 kHz

The max.data transfer rate depends on the cable length.

For Clock /Clock and Data /Data please use twisted pairs. Use shielded cable.

### ELECTRICAL CONNECTIONS — SSI

Wire Color	Pin No.	SSI Function
White 0.14 mm	12	Vcc 10 to 30VDC
Brown 0.14 mm	11	0 V Gnd.
Green	10	Clock
Yellow	9	Clock
Gey	8	Data
Pink	7	Data
Blue	3	Direction
Black	4	0 V Gnd.

### ELECTRICAL - Profibus

Parameter	Profibus
Supply voltage	10-30 VDC
Max. current w/o load	220 mA (ST),250 mA (MT)
Resolution singleturn	10 -14 Bit
Resolution multiturn	12 Bit
Output code	Binary
Profile/protocol	Profibus DP with encoder profile class C2 (parameterizable)
Parametrization	Resolution,Preset,Direction
Integrated special functions	Speed, Acceleration, Operating time
Baud rate	Automatically set within a range of 9.6 KBaud through 12 MBaud
Device address	Set via Bus
Bus termination resistor	External mounting

### ELECTRICAL CONNECTIONS — Profibus

Wire Color	Profibus Function
Yellow	B in
Green	A in
Pink	B out
Grey	A out
Blue	GND1 (M5V <sup>1</sup> )
Brown	VCC1 (P5V <sup>1</sup> )
White 0.5 mm	DC 10 - 30 V
Brown 0.5 mm	0 V
Screen	Connected to encoder housing

<sup>1</sup> used for power supply for an external bus termination resistor

### MECHANICAL - All Types

**Shaft diameter:** 10 mm (Solid shaft)  
**Mounting:** Clamping flange  
**Max. Shaft load:** Axial= 40 N; Radial= 100 N  
**Max. shaft speed:** T4= 10 000 rpm; T6= 6000 rpm  
**Torque:** ≤1 Ncm  
**Moment of inertia:** approx. 20 gcm<sup>2</sup>  
**Material shaft:** Stainless Steel  
**Material housing:** AX 70= Aluminum; AX 71= Stainless Steel  
**Weight:** AX 70= approx. 1.4 kg; AX 71= approx. 4.8 kg  
**Connection:** Cable, axial

### ENVIRONMENTAL - All Types

**Protection class, shaft (EN 60529):** T4= IP64 or IP67; T6= IP64  
**Protection class, housing (EN 60529):** T4= IP65 or IP67;  
 T6= IP65 (IP64 for CANopen or DeviceNet)  
**Vibration resistance (DIN EN 60068-2-6):** 100 m/s<sup>2</sup> (10 to 500 Hz)  
**Shock resistance (DIN EN 60068-2-27):** 1000 m/s<sup>2</sup> (6 ms)  
**Operating temperature:** T4= -40°C to +60°C;  
 T6= -40°C to +40°C  
**Storage temperature:** -25°C to +85°C  
<sup>1</sup> No dust explosion-proof (D) for IP64

T6 = Highest permissible surface temperature +85°C (max. speed = 6000 /min<sup>-1</sup>)  
 T4 = Highest permissible surface temperature +130°C (max. speed = 10,000 /min<sup>-1</sup>)

# SERIES AX70/AX71

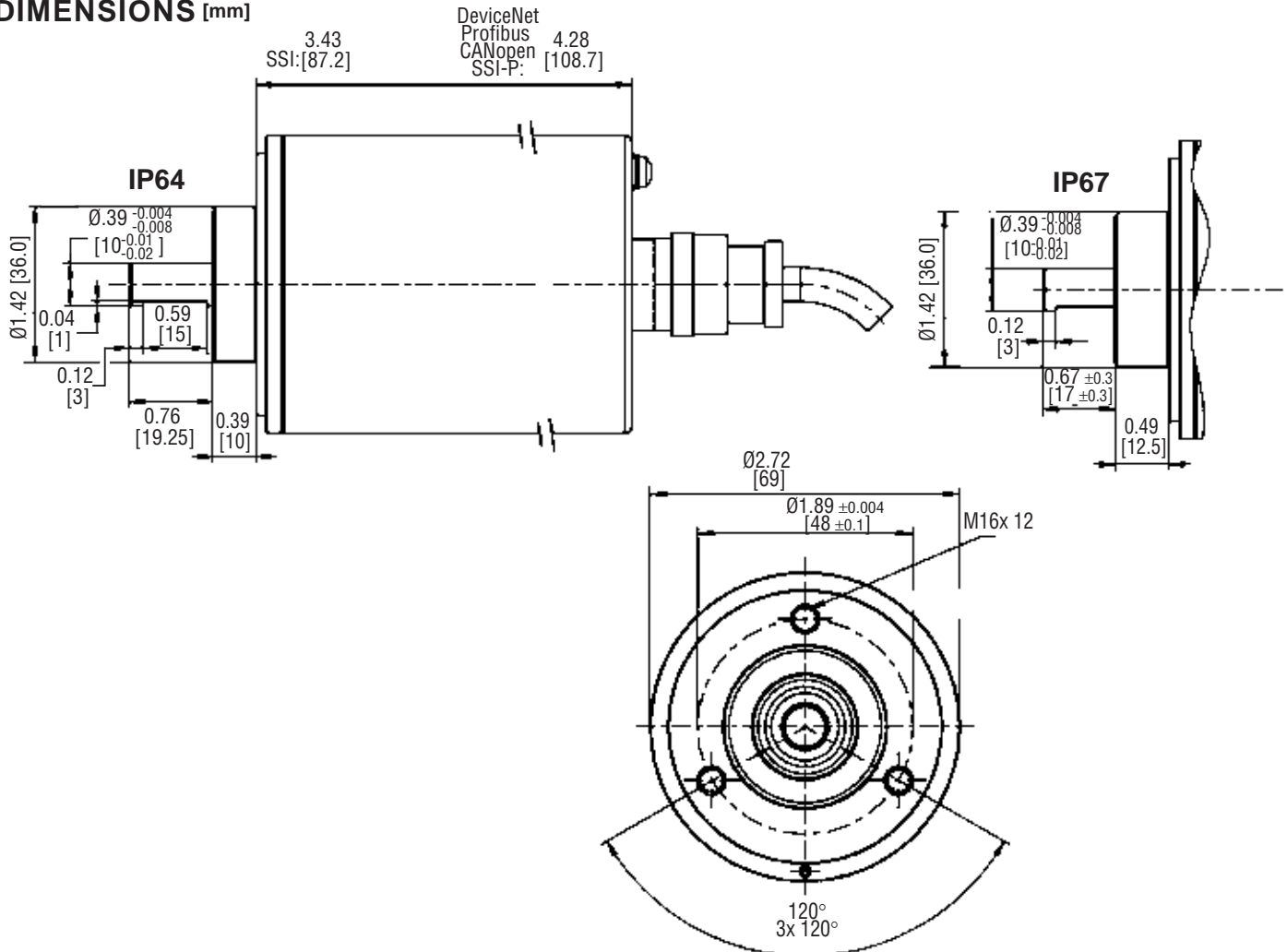
**ACURO™** brand

### Ordering Information

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

Code 1: Model	Code 2: Resolution	Code 3: Voltage	Code 4: Mounting	Code 5: Protection Class	Code 6: Shaft Size	Code 7: Interface	Code 8: Connection	Code 9: Cable Length	
Ordering Information									
<b>AX70</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"/>	
Acuro Series <b>AX70</b> Heavy Duty Absolute encoder, Aluminum Housing  <b>AX71</b> Stainless Steel Housing	SSI Only <b>Single Turn</b> 0010 0012 0013 0014 0017 <b>Multi Turn</b> 1212 1213 1214 1217	CAN, Profibus, DeviceNet <b>Single Turn</b> 0014 <b>Multi Turn</b> 1214	<b>A</b> 5 VDC <b>E</b> 10-30VDC	<b>K</b> Clamping Flange	<b>4</b> IP64 <b>7</b> IP67	<b>2</b> 10mm	<b>SB</b> SSI-Binary <b>SG</b> SSI-Gray <b>SP</b> SSI-Programmable <b>DP</b> Profibus DP <b>VD</b> DeviceNet <b>CL</b> CAN-L2 <b>OL</b> CAN-Open	<b>A</b> Axial Cable	<b>FO</b> 5m <b>KO</b> 10m <b>PO</b> 15m <b>UO</b> 20m <b>VO</b> 25m

### DIMENSIONS inch [mm]





# SERIES R25

Harowe™ brand

## Heavy Duty Resolver

### Key Features

- Rugged Housing with IP65 Rating
- Spaced Bearings for up to 10x the Life of Traditional Duplex Bearings
- Withstands 200g Shock and 40g Vibration



Most Models



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

Electrical Kit	Speed (Number of Poles)	Transformer Ratio (V in/V out)	Input Voltage (Vrms)	Max. Current Input (mA)	Reference Frequency (Hz)	Phase Shift (nominal)	Primary Winding
1A	1 (2)	0.500	5.3	3	4000	-3	Stator
1B	1 (2)	0.500	4.0	25	5000	-6	Rotor
1C	1 (2)	0.470	4.25	55	7000	+4	Rotor
1D	1 (2)	0.500	7.0	25	2500	+6	Rotor
1E	1 (2)	0.950	7.0	12	5000	-8	Rotor
1F	1 (2)	1.000	2.0	10	5000	-8	Rotor
1H	1 (2)	1.069	8	17	2600	8	Rotor
1J	1 (2)	0.454	26	22	2400	6	Rotor
1K	1 (2)	0.454	26	65	2400	8	Rotor
1M *	1 (2)	0.5	4	25	5000	-6	Rotor
2A	2 (4)	0.250	8.0	20	4000	+5.5	Rotor
3A	3 (6)	0.470	4.25	55	7000	+5.5	Rotor
3B	3 (6)	0.95	7	12	5000	4	Rotor

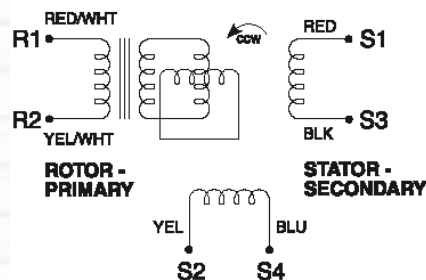
\*Radiation Hardened

### MECHANICAL

**Inertia:** 0.0040 oz-in-sec<sup>2</sup>  
**Friction:** 2 oz-in (5 oz-in w/shaft seal)  
**Shaft Load: (max.)** 40 lb (axial), 60 lb (radial)  
**Shaft Material:** #416 S/S  
**Play: (max.)** Radial: .0015 in @ 1 lb load; End: .005 in @ 5 lb load  
**Bearing Life:** 2 x 10<sup>8</sup> revs at rated shaft loading

### ELECTRICAL CONNECTIONS

Connector: MS3106F-	16S-1S	18-1S	
Signal	Pin	Pin	Cable Color
R1 (Rotor Hi)	A	A	White
R2 (Rotor Lo)	B	H	Black w/White
S1 (Cos Hi)	C	B	Green
S3 (Cos Lo)	D	I	Black w/Green
S4 (Sin Lo)	F	C	Blue
S2 (Sin Hi)	E	J	Black w/Blue
N/C	G	G	—

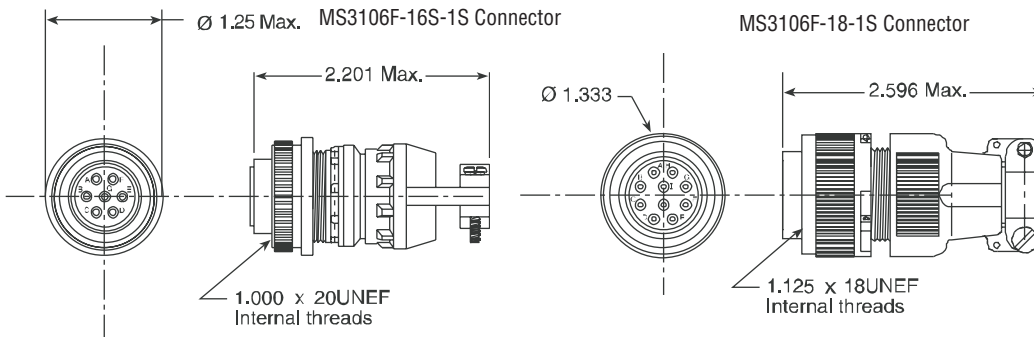
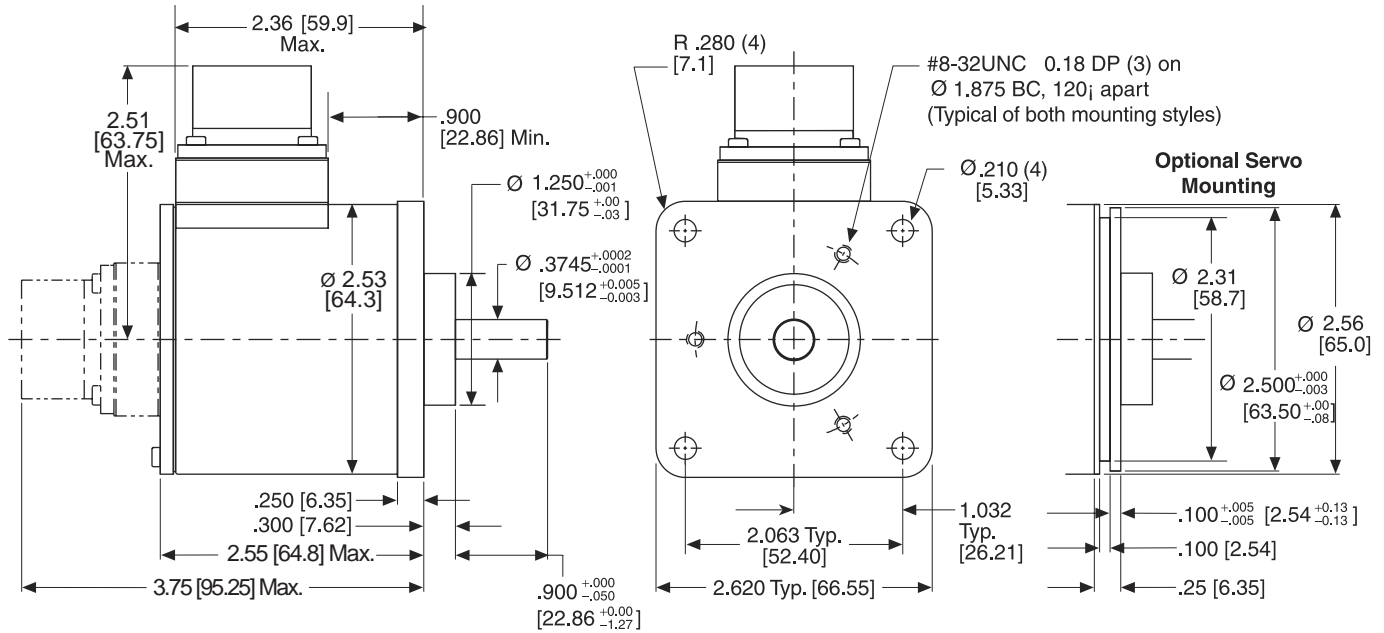


**Ordering Information**

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

Code 1: Model	Code 2: Mounting	Code 3: Connector Type	Code 4: Conn. Exit	Code 5: Shaft	Code 6: Seal	Code 7: Elec. Parts Kit	Code 8: Accuracy	Code 9: Special
<b>R25</b>	□	□	□	□	□	□□	□□	<b>00</b>
Ordering Information								
<b>R25</b> Heavy-duty, resolver	<b>F</b> Flange	<b>B</b> MS3102E-16S-1P	<b>R</b> Rear Exit	<b>R</b> Round	<b>Y</b> Shaft Seal	Available when Code 8 is 07 to 20	<b>02</b> 2 arc min	<b>00</b> Factory Assigned Designator
	<b>S</b> Servo	<b>C</b> MS3102E-18-1P	<b>S</b> Side Exit	<b>F</b> Round with flat	<b>N</b> No Shaft Seal	<b>1A 1E 1J</b>	<b>03</b> 3 arc min	
		<b>F</b> FLYING LEADS		<b>W</b> Round with 2 flats @ 90 degrees		<b>1B 1F 1K</b>	<b>04</b> 4 arc min	
		<b>G</b> MS3112E-10-6P				<b>1C 1H 1M</b>	<b>05</b> 5 arc min	
	<b>L</b> MS3112-18-11P					<b>1D</b>	<b>07</b> 7 arc min	
	<b>P</b> PT02E-14-19-P					Available when Code 8 is 04 to 10	<b>10</b> 10 arc min	
						<b>2A</b>	<b>2S</b> 20 arc min Spread	
						Available when Code 8 is 02 to 10	<b>15</b> 15 arc min	
						<b>3A 3B</b>	<b>20</b> 20 arc min	

**DIMENSIONS** inches [mm]



**Accessories:**

- CA-18-R-0010** 10 ft.cable with MS3106F-18-1S Connector
- CA-16-R-0010** 10 ft.cable with MS3106F-16S-1S Connector

**Note:** Part numbers listed with -0010 are for 10 Foot Cable; use -0050 for 50 Foot Cable, etc



# INDUSTRIAL DUTY ENCODERS GUIDE

DYNAPAR 2010

Dynapar's Industrial duty encoders are well-suited for general purpose use in today's factories and manufacturing environments. Applications such as vector motor feedback, machine tool positioning, printing equipment, medical equipment, material handling machinery, and elevators all benefit from such features as:

- Dual-row ball bearings for long life
- Optional shaft seals for environmental protection
- Unbreakable code disks on select models
- High resolution capability to 10,000PPR on select models
- Variety of communication options on absolute encoders
- True battery-less multi-turn positioning on absolute models

High performance feedback in industry standard sizes with some of the shortest lead times in the industry is the benchmark of the Dynapar product line. Most models are manufactured right here in the USA in Gurnee, IL using the advanced cellular manufacturing concept, ensuring Just-In-Time delivery to meet your needs.





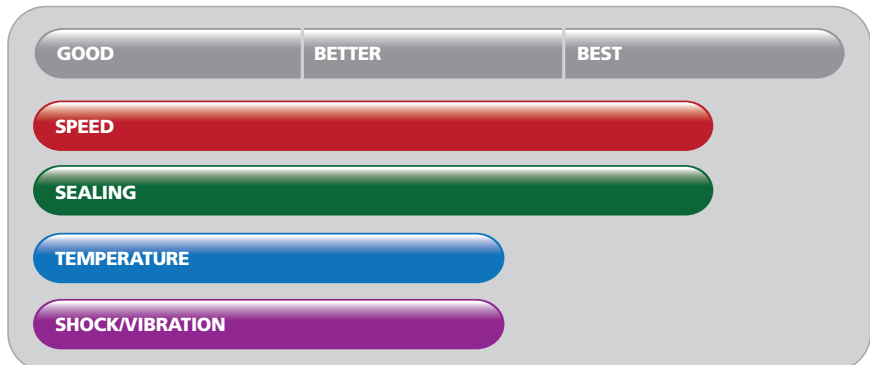


Often considered the “workhorse” of the encoder world, industrial duty encoders achieve a good compromise between ruggedness and performance. These encoders are typically used in factory environments where contaminants like dust and moisture are common. The hollow-shaft variety of industrial duty encoders is often the preferred choice of vector motor OEM's for speed feedback.



HA25 Pictured

INDUSTRIAL DUTY ENCODER GENERAL PERFORMANCE DATA










## OPTICAL - INCREMENTAL

									
Product	Qube 22	H20	HA25	HR25	HC25	H58	H42	HA725	
Shaft/Bore Sizes	1/4" or 3/8"	1/4" or 3/8"	1/4" or 3/8"	1/4" or 3/8"	1/4" or 3/8"	6 or 10mm	3/8"	3/8"	
Available Resolutions (PPR)	1 to 1270	1 to 2540	1 to 2540	1 to 1024	3000 to 5000	1 to 2540	1 to 600	8192 to 10000	
Input Voltage (VDC)	5-26	5-26	5-26	5-26	5 to 26	5-26	5-26	5 or 10 to 30	
Operating Temperature (°C)	0 to +70	0 to +70 (-40 to +85 opt.)	0 to +70 (-40 to +85 opt.)	0 to +70 (-40 to +85 opt.)	0 to +70 (-40 to +85 opt.)	0 to +70 (-40 to +85 opt.)	0 to +70	-10 to +70	
Enclosure Rating	NEMA 12/IP54	NEMA 12/IP54 (NEMA 4/IP66 opt.)	NEMA 12/IP54 (NEMA 4/IP66 opt.)	NEMA 12/IP54 (NEMA 4/IP66 opt.)	NEMA 12/IP54 (NEMA 4/IP66 opt.)	NEMA 12/IP54 (NEMA 4/IP66 opt.)	NEMA 12/IP54	NEMA 4/IP66	
Key Features	Economical anodized housing	Reliable dual-row bearing design	Wide range of resolutions available	Unbreakable code disc	High 5000PPR capability	Euro-Standard 58mm mounting	Simplified economical design	Direct-read resolution up to 10,000PPR	
Page Number	2.04	2.08	2.12	2.16	2.20	2.24	2.28	2.30	

## OPTICAL - ABSOLUTE

						
Product	AI25 (DeviceNet)	AI25 (Profibus)	AI25 (Interbus)	AI25 (CANBus)	AI25 (CANLayer2)	
Shaft/Bore Sizes	Shaft: 6 & 10mm, 3/8" Bore: 10 & 12mm, 3/8"	Shaft: 6 & 10mm, 3/8" Bore: 10 & 12mm, 3/8"	Shaft: 6 & 10mm, 3/8" Bore: 10 & 12mm, 3/8"	Shaft: 6 & 10mm, 3/8" Bore: 10 & 12mm, 3/8"	Shaft: 6 & 10mm, 3/8" Bore: 10 & 12mm, 3/8"	
Available Resolutions (Bits)	Up to 14 bit SingleTurn, 12 bit Multiturn	Up to 14 bit SingleTurn, 12 bit Multiturn	Up to 12 bit SingleTurn, 12 bit Multiturn	Up to 14 bit SingleTurn, 12 bit Multiturn	Up to 14 bit SingleTurn, 12 bit Multiturn	
Input Voltage (VDC)	10 to 30	10 to 30	10 to 30	10 to 30	10 to 30	
Operating Temperature (°C)	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85	
Enclosure Rating	IP64 or IP67	IP64 or IP67	IP64 or IP67	IP64 or IP67	IP64 or IP67	
Key Features	DeviceNet interface	Profibus interface	Interbus interface	CANBus interface	CANLayer 2 interface	
Page Number	2.64	2.70	2.72	2.66	2.68	



OPTICAL - INCREMENTAL

H20 Hub	HS20	HS35	HS35R	RI80E	HA26	HR26	HC26	Product
3/8" or 5/8"	1/4" to 5/8" 6mm to 16mm	1/4" to 1 1/8" 6mm to 24mm	up to 1-1/4" hollow shaft	Max 45mm	1/4", 3/8" or 1/2"	1/4", 3/8" or 1/2"	1/4", 3/8" or 1/2"	Shaft/Bore Sizes
1 to 2540	1 to 2540	1 to 2500	1 to 5000	1024, 2048, 4096	1 to 2540	1 to 1024	3000 to 5000	Available Resolutions (PPR)
5-26	5-26	5-26	5-26	5-30	5-26	5-26	5-26	Input Voltage (VDC)
0 to +70 (-40 to +85 opt.)	0 to +70 (-40 to +85 opt.)	-40 to +70 (0 to +100)	-40 to +70 (0 to +100)	-20 to +70	0 to +70 (-40 to +85 opt.)	0 to +70 (-40 to +85 opt.)	0 to +70 (-40 to +85 opt.)	Operating Temperature (°C)
NEMA 12/IP54 (NEMA 4/IP66 opt.)	NEMA 4/IP65	NEMA 4/IP65	IP67	NEMA 1/IP50	NEMA 12/IP54	NEMA 12/IP54	NEMA 12/IP54	Enclosure Rating
Hubshaft with spring tether	Electrically isolated hollow shaft	Electrically isolated hollow shaft sizes up to 1.25"	New ruggedized design	Fault detection	Integral coupling	Unbreakable code disc	High 5000PPR resolution capability	Key Features
2.32	2.36	2.40	2.44	2.48	2.50	2.54	2.58	Page Number

OPTICAL - ABSOLUTE

AI25 (Parallel)	AI25 (SSI)	AI25 (BiSS)	AC36	AC110	Product
Shaft: 6 & 10mm, 3/8" Bore: 10 & 12mm, 3/8"	Shaft: 6 & 10mm, 3/8" Bore: 10 & 12mm, 3/8"	Shaft: 6 & 10mm, 3/8" Bore: 10 & 12mm, 3/8"	8mm	50mm	Shaft/Bore Sizes
Up to 14 bit SingleTurn, 12 bit Multiturn	Up to 17 bit SingleTurn, 12 bit Multiturn	Up to 22 bit SingleTurn, 12 bit Multiturn	Up to 22 bit SingleTurn 12 bit Multiturn	Up to 22 bit SingleTurn 12 bit Multiturn	Available Resolutions (Bits)
5 or 10-30	5 or 10-30	5 or 10-30	5 or 7-30	5 or 10-30	Input Voltage (VDC)
-40 to +100	-40 to +100	-40 to +100	-15 to +120	-20 to +70	Operating Temperature (°C)
IP64 or IP67	IP64 or IP67	IP64 or IP67	IP64	IP40	Enclosure Rating
Parallel output	SSI output	BiSS interface	Multi-turn positioning in compact size	Large 50mm hollow shaft	Key Features
2.80	2.76	2.74	2.62	2.84	Page Number

# SERIES 22

**Dynapar™ brand**

## “QUBE” Encoder

### Key Features

- Economical Anodized Housing
- Dual Shaft Output Option
- Up to 1270PPR with Optional Index



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental

**Resolution:** 1 to 1270 PPR (pulses/revolution)

**Accuracy:** (Worst case any edge to any other edge)  $\pm 2.5$  arc-min.

**Format:** Two channel quadrature (AB) with optional Index (Z) and complementary outputs

**Phase Sense:** A leads B for CW shaft rotation as viewed from the shaft end of the encoder farthest from the connector or cable

**Quadrature Phasing:**  $90^\circ \pm 18^\circ$  electrical

**Symmetry:**  $180^\circ \pm 18^\circ$  electrical

**Index:**  $225^\circ \pm 90^\circ$  electrical (active high)

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

### ELECTRICAL

**Input Power:** 4.5 min. to 26 VDC max. at 110 mA max., not including output loads

**Outputs:**  
7273 Open Collector: 30 VDC max., 40 mA sink max.  
7272 Push-Pull and Differential Line Driver: 40 mA sink or source

**Frequency Response:** 120 kHz min. data, 50 kHz min. Index

### CONNECTIONS

#### Mating Connector:

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

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

5 pin, style M12: Cable with connector available

8 pin, style M12: Cable with connector available

Mechanical

**Shaft Loading:** 40 lbs. radial, 30 lbs. axial

**Shaft Speed:** 6,000 RPM max.

**Shaft Tolerance:** Nominal  $-0.0003"/-0.0007"$

**Starting Torque:** 2.5 oz-in max.

**Moment of Inertia:**  $1.3 \times 10^{-4}$  oz-in-sec<sup>2</sup>

**Weight:** 14 oz. max.

### ENVIRONMENTAL

**Operating Temperature:** 0 to +70 °C;

**Storage Temperature:** -40 to +90 °C



# SERIES 22

## Ordering Information

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

Code 1: Model	Code 2: Pulses/Rev	Code 3: Mechanical	Code 4: Output	Code 5: Electrical	Code 6: Termination
□ □ □	□ □ □ □	□	□	□	□
Ordering Information					
22 Qube Encoder, Bidirectional	0001	0360	0 3/8" Double Ended Shaft	0 Single Ended, Table 1	available when Code4 = 0, 1, 5, 6, 7 or 8: 0 5-26 VDC in, 5-26 VDC Open Collector w/2.2k pull-ups out 1 5-26 VDC in, 5-26 VDC Open Collector w/o pull-up out 2 5-26 VDC in, 5V Totem Pole out
	0010	0400	1 3/8" Single Ended Shaft	2 Differential, Table 2	
22M Metric Qube Encoder, Bidirectional	0050	0480	2 1/4" Double Ended Shaft	4 Differential, Table 4	available when Code4 = 2, 3, 4, 9 or A: 3 5-26 VDC in, 5V Line Driver out 4 5-26 VDC in, 5-26 VDC CMOS Line Driver
	0060	0500	3 1/4" Single Ended Shaft	1 Single Ended, with Index, Table 3	
	0100	0512	available when Code 1 = 22M:	available only when Code 6 is 1 to 5:	
	0120	0600	4 6mm Double Ended Shaft	3 Differential, with Index, Table 5	
	0125	0720	5 6mm Single Ended Shaft	available only when Code 6 is 6:	
	0150	0800		5 5 pin M12 connector, single ended, no index, Table 6	
	0180	0900		6 5 pin M12 connector, single ended, with index, Table 6	
	0192	1000		7 8 pin M12 connector, single ended, no index, Table 7	
	0200	1024		8 8 pin M12 connector, single ended, with index, Table 7	
	0250	1200		9 8 pin M12 connector, differential, no index, Table 8	
0256	1250		A 8 pin M12 connector, differential, with index, Table 8		
0300	1270				
					0 MS Connector 1 18" Cable 2 3' Cable 3 6' Cable 4 10' Cable 5 15' Cable 6 M12 Connector

**10 foot Cable Assemblies with MS Connector**

- 1400607-0010 6 Pin MS, Cable Assy. For Use with Single Ended Outputs
- 108241-0010 6 Pin MS, Cable Assy. For Use with Single Ended w/Index Outputs
- 1400664-0010 6 Pin MS, Cable Assy. For Use with Differential Line Driver Outputs
- 1400431-0010 7 Pin MS, Cable Assy. For Use with Differential Line Driver Outputs

**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)

## ELECTRICAL CONNECTIONS

### MS Connector Accessory Cables - when Code 4= 0 to 4

**Table 1 – Current Sink Output**

Pin	Function	Wire Color Code	Cable Acc'y #14006070010 Color Code
A	Common	BLK	BLK
B	Power Source	RED	RED
C	Case (Ground)	GRN/BLK	GRN
D	Signal A	GRN	BRN
E	Signal B	ORN	ORN
F	Supply Common	BLK	BLK

**Table 2 – 7 Pin Line Driver Output**

Pin	Function	Wire Color Code	Cable Acc'y #14004310010 Color Code
A	Signal A	GRN	RED
B	Signal B	ORN	BLU
C	Signal $\bar{A}$	RED/BLK	YEL
D	Power Source	RED	WHT
E	Signal $\bar{B}$	WHT/BLK	GRN
F	Common	BLK	BLK
G	Case (Ground)	GRN/BLK	

**Table 3 – Current Sink Output w/Marker**

Pin	Function	Wire Color Code	Cable Acc'y #108241-0010 Color Code
A	Common	BLK	BLK
B	Power Source	RED	RED
C	Signal Z	WHT	GRN
D	Signal A	GRN	BRN
E	Signal B	ORN	ORN
F	Common	BLK	BLK

**Table 4 – 6-Pin Line Driver**

Pin	Function	Wire Color Code	Cable Acc'y #14006640010 Color Code
A	Common	BLK	BLK
B	Power Source	RED	RED
C	Signal A	GRN	BRN
D	Signal $\bar{A}$	RED/BLK	BRN/WHT
E	Signal B	ORN	ORN
F	Signal $\bar{B}$	WHT/BLK	ORN/WHT

**Table 5 – Cable termination Line Driver Output with Marker**

Function	Wire Color Code
Signal A	GRN
Signal B	ORN
Signal Z	WHT
Power Source	RED
Supply Common	BLK
Case (Ground)	GRN/BLK
Signal $\bar{A}$	RED/BLK
Signal $\bar{B}$	WHT/BLK
Signal $\bar{Z}$	BLU

**Cable Configuration:** PVC jacket, 105 °C rated, overall foil shield; 3 twisted pairs 26 AWG (output signals), plus 2 twisted pairs 24 AWG (input power)

### 5 & 8 Pin M12 Accessory Cables - when Code 4= 5 to 9 and A

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

Encoder Function	Table 6 5 Pin Single Ended		Table 7 8 Pin Single Ended		Table 8 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. $\bar{A}$	–	–	–	–	3	BRN/WHT
Sig. $\bar{B}$	–	–	–	–	5	ORG/WHT
*Sig. $\bar{Z}$	–	–	–	–	8	YEL/WHT

\* Index not provided on all models. See ordering information

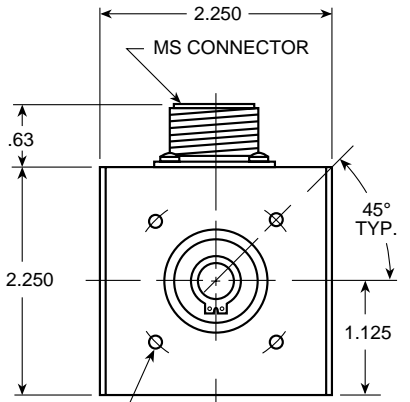
**Cable Configuration:** PVC jacket, 105 °C rated, overall foil shield; 24 AWG conductors, minimum

See “Accessories” Section for Connectors and Cable Assemblies Ordering Information

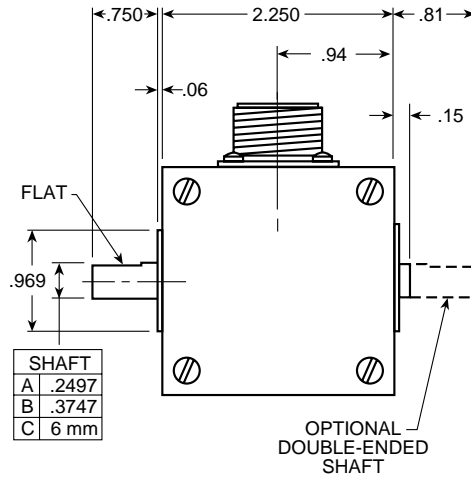
## DIMENSIONS

### MS Connector Models

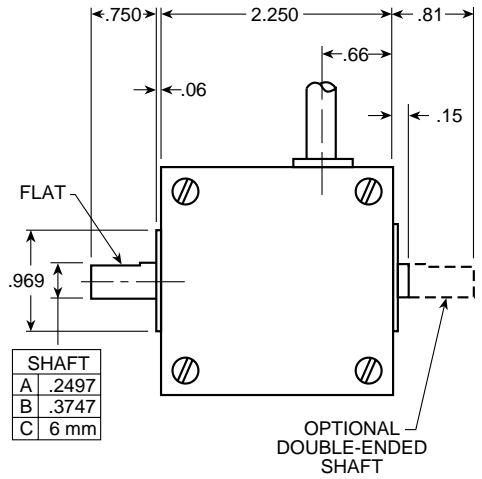
Approximate Dimensions (in inches)



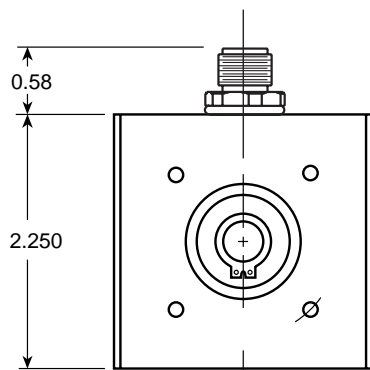
6-32 UNC-2B THREADS x .187 DEEP ON 2.00 DIA. B.C., 4 HOLES ON 3 FACES (FRONT, REAR & BOTTOM).  
 FOR MODELS 22M ONLY: M3 x 0.5<sup>6H</sup> THREADS x 5mm DEEP ON A 50.8mm DIA. B.C. ON (3) FACES



### Prewired Cable Models



### M12 Connector Models



# SERIES H20

# Dynapar™ brand

## Shafted Encoder

### Key Features

- **Reliable Dual-Row Bearing Design**
- **IP66 Sealing Option**
- **Optional Unbreakable Code Disc**

CE



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental

**Resolution:** 1 to 2540 PPR (pulses/revolution)

**Accuracy:** (Worst case any edge to any other edge)  $\leq 1024$  PPR (metal disk):  $\pm 7.5$  arc-min.  
 $> 1024$  PPR (glass disk):  $\pm 2.5$  arc-min.

**Format:** Two channel quadrature (AB) with optional Index (Z) and complementary outputs

**Phase Sense:** A leads B for CCW shaft rotation as viewed from the shaft end of the encoder

**Quadrature Phasing:**  $90^\circ \pm 22.5^\circ$  electrical

**Symmetry:**  $180^\circ \pm 18^\circ$  electrical

**Index:**  $180^\circ \pm 18^\circ$  electrical (gated with B low)

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

### ELECTRICAL

**Input Power:**

4.5 min. to 26 VDC max. at 80 mA max., not including output loads

**Outputs:**

7273 Open Collector: 30 VDC max., 40 mA sink

7272 Push-Pull and Differential Line Driver: 40 mA sink or source

4469 Differential Line Driver: 100 mA, sink or source

**Frequency Response:** 100 kHz min.

**Electrical Protection:** Overvoltage, reverse voltage and output short circuit protected

**Noise Immunity:** Tested to EN61326 (Industrial) for Electro Static Discharge, Radio Frequency Interference, Electrical Fast Transients.

### CONNECTIONS

**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)

5 pin, style M12: Cable with connector available

8 pin, style M12: Cable with connector available

### MECHANICAL

**Shaft Loading:** (at 0.25" from encoder face)

Resolutions  $\leq 1024$  PPR: 80 lbs. radial, axial

Resolutions  $> 1024$  PPR: 40 lbs. radial, axial

**Shaft Speed:**

Resolutions  $\leq 1024$  PPR: 10,000 RPM max.

Resolutions  $> 1024$  PPR: 5,000 RPM max.

**Starting Torque:** (max at 25 °C)

without shaft seal: 1.0 oz-in;

with shaft seal: 2.0 oz.-in

**Moment of Inertia:**  $3.0 \times 10^{-4}$  oz-in-sec<sup>2</sup>

**Disk Material:** Glass or plastic based on PPR

**Weight:** 10 oz. max.

### ENVIRONMENTAL

**Operating Temperature:**

Standard: 0 to +70 °C;

Extended: -40 to +85 °C

**Storage Temperature:** -40 to +90 °C

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

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

**Humidity:** to 98% without condensation

**Enclosure Rating:** NEMA12/IP54 (dirt tight, splashproof); NEMA4/IP66 (dust proof, washdown) when ordered with shaft seal and either MS connector or watertight cable exit





# SERIES H20

## Ordering Information

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

Code 1: Model	Code 2: PPR	Code 3: Housing	Code 4: Shaft	Code 5: Face Mount	Code 6: Pilot, Seal	Code 7: Electrical	Code 8: Termination	Code 9: Options
<b>H2</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"/>								
Ordering Information								
<b>1</b> Unidirectional <b>2</b> Bidirectional <b>3</b> Bidirectional with Index	<b>0001 0500</b> <b>0005 0512</b> <b>0010 0600</b> <b>0012 0800</b> <b>0050 0900</b> <b>0060 1000</b> <b>0086 1024</b> <b>0100 1200</b> <b>0120 1250</b> <b>0125 1270</b> <b>0180 1500</b> <b>0200 1600</b> <b>0240 1800</b> <b>0250 1968</b> <b>0254 2000</b> <b>0256 2048</b> <b>0300 2400</b> <b>0360 2500</b> <b>0400 2540</b>	<b>0</b> Servo Mount <b>1</b> Flange Mount	<b>0</b> 3/8" Dia. Shaft with flat <b>1</b> 1/4" Dia. Shaft, no flat <b>4</b> 10mm Dia. Shaft, no flat	<b>0</b> no face mount available when Code 3 is 0: <b>1</b> (4) #10-32 @ 1.63" BC <b>2</b> (3) #4-40 @ 1.50" BC <b>3</b> (3) #6-32 @ 1.75" BC available when Code 3 is 1: <b>4</b> (4) #6-32 @ 2.00" BC	<b>0</b> 1.18" Dia. Female Pilot <b>1</b> 1.25" Dia. Male Pilot <b>2</b> 1.25" Dia. Male Pilot with Shaft Seal <b>3</b> 0.69" Dia. Male Pilot <b>4</b> 0.69" Dia. Male Pilot with Shaft Seal	<b>0</b> 5-26V in, 5-26V Open Collector out <b>1</b> 5-26V in, 5-26V Open Collector out with 2.2 kΩ Pullups <b>2</b> 5-26V in, 5-26V Push-Pull out <b>A</b> Same as "0" with extend. temp range <b>B</b> Same as "1" with extend. temp range <b>C</b> Same as "2" with extend. temp range available when: Code 1 is 1 or 2 and Code 8 is 2 through M, Q or R; or Code 1 is 3 and Code 8 is 4 thru M, Q or R: <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>5</b> 5-26V in, 5V Differential Line Driver out (4469) <b>6</b> 5-15V in, 5-15V Differential Line Driver out (4469) <b>D</b> Same as "3" with extend. temp range <b>E</b> Same as "4" with extend. temp range	<b>0</b> 6 Pin Conn, End Mount <b>1</b> 6 Pin Conn, Side Mount <b>2</b> 7 Pin Conn, End Mount <b>3</b> 7 Pin Conn, Side Mount <b>4</b> 10 Pin Conn, End Mount <b>5</b> 10 Pin Conn, Side Mount <b>6</b> 18" Cable, End Exit <b>7</b> 18" Cable, Side Exit <b>8</b> 36" Cable, End Exit <b>9</b> 36" Cable, Side Exit <b>A</b> 10' Cable, End Exit <b>B</b> 10' Cable, Side Exit <b>J</b> 25' Cable, End Exit <b>K</b> 25' Cable, Side Exit <b>N</b> 5 Pin M12 Connector, End Mount <b>P</b> 5 Pin M12 Connector, Side Mount <b>Q</b> 8 Pin M12 Connector, End Mount <b>R</b> 8 Pin M12 Connector, Side Mount available when Code 6 is 2 or 4: <b>C</b> 18" Sealed Cbl, End Exit <b>D</b> 18" Sealed Cbl, Side Exit <b>E</b> 36" Sealed Cbl, End Exit <b>F</b> 36" Sealed Cbl, Side Exit <b>G</b> 10' Sealed Cbl, End Exit <b>H</b> 10' Sealed Cbl, Side Exit <b>L</b> 25' Sealed Cbl, End Exit <b>M</b> 25' Sealed Cbl, Side Exit	available when Code 8 is 0 to 5: <b>PS</b> LED Output Indicator

See "Accessories" Section for Connectors and Cable Assemblies Ordering Information

**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
- 1400635-0010** 10 Pin MS, Cable Assy. For Use with Differential Line Driver with Index Outputs

**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)

# SERIES H20

# Dynapar™ brand

## CONNECTIONS

### 6, 7 & 10 Pin MS Connectors and Cables - Code 8= 0 to 9, A to M

Connector & mate/accessory cable assembly pin numbers and wire color information is provided here for reference. H20 models with direct cable exit carry the same color coding as shown for each output configuration.

Encoder Function	Cable # 108594-6 Pin Single Ended		Cable # 108595-7 Pin Single Ended		Cable # 108596-7 Pin Dif Line Drv w/o Idx		Cable # 1400635-10 Pin Dif Line Drv w/ Idx	
	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color
Sig. A	E	BRN	A	BRN	A	BRN	A	BRN
Sig. B	D	ORN	B	ORG	B	ORG	B	ORG
Sig. Z	C	YEL	C	YEL	—	—	C	YEL
Power +V	B	RED	D	RED	D	RED	D	RED
Com	A	BLK	F	BLK	F	BLK	F	BLK
Case	—	—	G	GRN	G	GRN	G	GRN
N/C	F	—	E	—	—	—	E	—
Sig. $\bar{A}$	—	—	—	—	C	BRN/WHT	H	BRN/WHT
Sig. $\bar{B}$	—	—	—	—	E	ORG/WHT	I	ORG/WHT
Sig. $\bar{Z}$	—	—	—	—	—	—	J	YEL/WHT

**Cable Configuration:** PVC jacket, 105 °C rated, overall foil shield; 3 twisted pairs 26 AWG (output signals), plus 2 twisted pairs 24 AWG (input power)

### 5 & 8 Pin M12 Accessory Cables when Code 8= N to R

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. $\bar{A}$	—	—	—	—	3	BRN/WHT
Sig. $\bar{B}$	—	—	—	—	5	ORG/WHT
*Sig. $\bar{Z}$	—	—	—	—	8	YEL/WHT

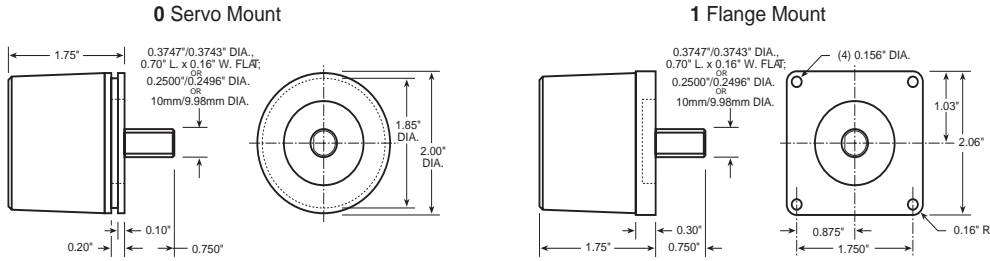
\* Index not provided on all models. See ordering information

**Cable Configuration:** PVC jacket, 105 °C rated, overall foil shield; 24 AWG conductors, minimum

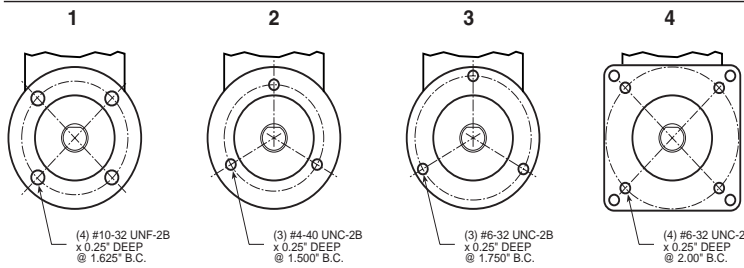
See "Accessories" Section for Connectors and Cable Assemblies Ordering Information

## DIMENSIONS

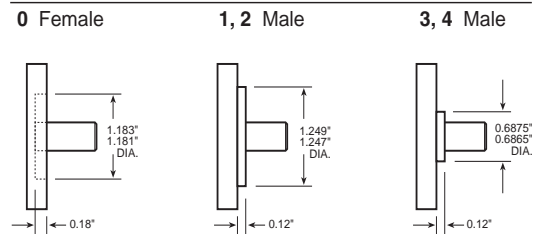
### Code 3: Housings



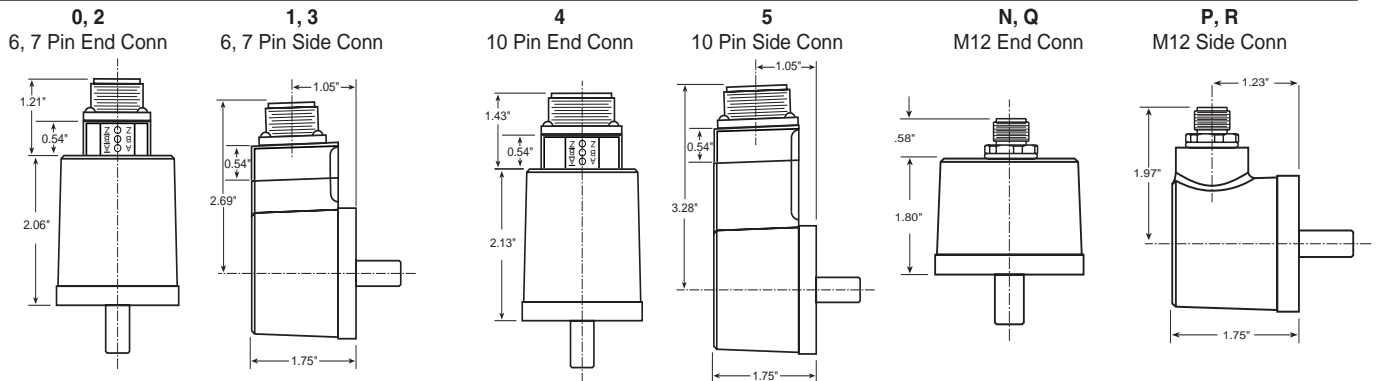
### Code 5: Face Mounts



### Code 6: Pilots

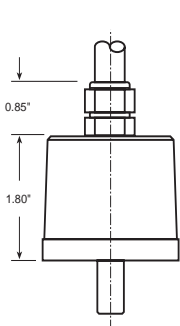


### Code 8: Terminations

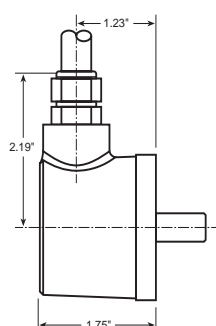


Code 8: 0-5 dimensions shown with LED Output Indicator Option (Code 9: PS)

### 6, 8, A, C, E, G End Exit Cable



### 7, 9, B, D, F, H Side Exit Cable



# SERIES HA25

**Dynapar™ brand**

## Shafted Encoder

### Key Features

- Industry Standard Size 25 (2.5")
- Wide Range of Resolutions Available
- Optional Extended Temperature Range of  $-40^{\circ}$  to  $+85^{\circ}\text{C}$

CE



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental

**Resolution:** 1 to 2540 PPR (pulses/revolution)

**Accuracy:** (Worst case any edge to any other edge)  $\pm 2.5$  arc-min.

**Format:** Two channel quadrature (AB) with optional Index (Z) and complementary outputs

**Phase Sense:** A leads B for CW or CCW shaft rotation as viewed from the shaft end of the encoder; see Ordering Information

**Quadrature Phasing:**  $90^{\circ} \pm 22.5^{\circ}$  electrical

**Symmetry:**  $180^{\circ} \pm 18^{\circ}$  electrical

**Index:**  $180^{\circ} \pm 18^{\circ}$  electrical (gated with B low)

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

### ELECTRICAL

#### Input Power:

4.5 min. to 26 VDC max. at 80 mA max., not including output loads

#### Outputs:

7273 Open Collector: 30 VDC max., 40 mA sink max.

7272 Push-Pull and Differential Line Driver: 40 mA sink or source

4469 Differential Line Driver: 100 mA, sink or source

**Frequency Response:** 100 kHz min.

**Electrical Protection:** Overvoltage, reverse voltage and output short circuit protected

**Noise Immunity:** Tested to EN61326 (Industrial) for Electro Static Discharge, Radio Frequency Interference, Electrical Fast Transients, Conducted and Magnetic Interference

### CONNECTIONS

#### Mating Connector:

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

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

5 pin, style M12: Cable with connector available

8 pin, style M12: Cable with connector available

### MECHANICAL

**Shaft Loading:** (at 0.25" from encoder face) 35 lbs. radial, 40 lbs. axial

**Shaft Speed:** 5,000 RPM max.

**Starting Torque:** (max at  $25^{\circ}\text{C}$ )

HA525: 1.0 oz-in;

HA625: 2.5 oz.-in

**Moment of Inertia:**  $3.0 \times 10^{-4}$  oz-in-sec<sup>2</sup>

### ENVIRONMENTAL

#### Operating Temperature:

Standard: 0 to  $+70^{\circ}\text{C}$ ;

Extended:  $-40$  to  $+85^{\circ}\text{C}$

**Storage Temperature:**  $-40$  to  $+90^{\circ}\text{C}$

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

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

**Humidity:** to 98% without condensation

#### Enclosure Rating:

HA525: NEMA12/IP54 (dirt tight, splashproof);

HA625: NEMA4/IP66 (dust proof, washdown)



# SERIES HA25

## Ordering Information

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

Code 1: Model	Code 2: PPR	Code 3: Mechanical	Code 4: Output	Code 5: Electrical	Code 6: Termination	Code 7: Options
HA <input type="checkbox"/> 25	<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>HA525</b> Size 25 Enclosed, Shielded Bearings, Glass Disk  <b>HA625</b> Size 25 Enclosed, with Shaft Seal, Glass Disk	<b>0001 0600</b> <b>0005 0625</b> <b>0010 0635</b> <b>0012 0720</b> <b>0050 0800</b> <b>0060 0900</b>  <b>0100 1000</b> <b>0120 1024</b> <b>0150 1200</b> <b>0180 1250</b> <b>0200 1270</b> <b>0240 1500</b> <b>0250 1600</b> <b>0256 1800</b> <b>0300 1968</b> <b>0360 2000</b> <b>0400 2048</b> <b>0500 2400</b> <b>0512 2500</b> <b>2540</b>	<b>0</b> Flange Mount, 3/8" Shaft  <b>1</b> 2.50" Servo Mount/ 4 Hole, 2.00" BC Face Mount, 3/8" Shaft  <b>2</b> Flange Mount, 1/4" Shaft  <b>3</b> 2.50" Servo Mount/ 4 Hole 2.00" BC Face Mount, 1/4" Shaft  <b>4</b> 2.50" Servo Mount/ 3 Hole, 2.00" BC Face Mount, 3/8" Shaft  <b>5</b> 2.50" Servo Mount/ 3 Hole, 2.00" BC Face Mount, 1/4" Shaft  <b>6</b> 2.50" Servo Mount/ 3 Hole, 1.88" BC Face Mount, 3/8" Shaft  <b>7</b> 2.50" Servo Mount/ 3 Hole, 1.88" BC Face Mount, 1/4" Shaft  <b>8</b> 2.62" Servo Mount/ 3 Hole, 1.88" BC Face Mount, 3/8" Shaft  <b>9</b> 2.62" Servo Mount/ 3 Hole, 1.88" BC Face Mount, 1/4" Shaft	<b>7 Pin MS Connector or Cable</b> <b>0</b> Single Ended, no Index, Format A, Table 2 <b>1</b> Single Ended, with Index, Format A, Table 2 <b>4</b> Single Ended, with Index, Format B, Table 2 <b>6</b> Differential, no Index, Format C, Table 3 <b>A</b> Single Ended, with Index, Format C, Table 2 <b>C</b> Single Ended, no Index, Format C, Table 2 <b>G</b> Single Ended, with Index, Format D, Table 2  <b>10 Pin MS Connector or Cable</b> <b>2</b> Differential, no Index, Format A, Table 1 <b>3</b> Differential, with Index, Format A, Table 1 <b>5</b> Differential, with Index, Format B, Table 1 <b>B</b> Differential, with Index Format C, Table 1 <b>D</b> Differential, no Index, Format C, Table 1  <b>5 Pin M12 Connector</b> <b>H</b> Single ended, no index, Format A, Table 4 <b>J</b> Single ended, with index, Format A, Table 4 <b>K</b> Single ended, with index, Format B, Table 4 <b>L</b> Single ended, with index, Format C, Table 4 <b>M</b> Single ended, no index, Format C, Table 4 <b>N</b> Single ended, with index, Format D, Table 4  <b>8 Pin M12 Connector</b> <b>P</b> Single ended, no index, Format A, Table 5 <b>Q</b> Single ended, with index, Format A, Table 5 <b>R</b> Single ended, with index, Format B, Table 5 <b>S</b> Single ended, with index, Format C, Table 5 <b>T</b> Single ended, no index, Format C, Table 5 <b>U</b> Single ended, with index, Format D, Table 5 <b>V</b> Differential, no index, Format A, Table 6 <b>W</b> Differential, with index, Format A, Table 6 <b>X</b> Differential, with index, Format B, Table 6 <b>Y</b> Differential, with index, Format C, Table 6 <b>Z</b> Differential, no index, Format C, Table 6	<b>0</b> 5-26V in; 5-26V Open Collector with 2.2kΩ Pullup out <b>1</b> 5-26V in; 5-26V Open Collector out <b>2</b> 5-26V in; 5V Totem Pole out <b>3</b> 5-26V in; 5V Line Driver out (7272) <b>4</b> 5-26V in; 5-26V Line Driver out (7272) <b>5</b> 5-26V in, 5V Differential Line Driver out (4469) <b>6</b> 5-15V in, 5-15V Differential Line Driver out (4469)  <b>A</b> Same as "0" with extend. temp range <b>B</b> Same as "1" with extend. temp range <b>C</b> Same as "2" with extend. temp range <b>D</b> Same as "3" with extend. temp range <b>E</b> Same as "4" with extend. temp range	<b>0</b> End Mount Connector <b>1</b> Side Mount Connector <b>2</b> 18" Cable, Side <b>3</b> 3' Cable, Side <b>4</b> 6' Cable, Side <b>5</b> 10' Cable, Side <b>6</b> 15' Cable, Side <b>J</b> 18" Cable, End <b>K</b> 3' Cable, End <b>L</b> 6' Cable, End <b>M</b> 10' Cable, End <b>N</b> 15' Cable, End  available when Code 1 is HA625: <b>A</b> 18" Watertight, Side <b>B</b> 3' Watertight, Side <b>C</b> 6' Watertight, Side <b>D</b> 10' Watertight, Side <b>F</b> 15' Watertight, Side <b>P</b> 18" Watertight, End <b>Q</b> 3' Watertight, End <b>R</b> 6' Watertight, End <b>S</b> 10' Watertight, End <b>T</b> 15' Watertight, End	available when Code 4 is 0 thru G, and Code 6 is 0 or 1:  <b>PS</b> LED Output Indicator

**10 foot Cable Assemblies with MS Connector**

- 1400431-0010** 7 Pin MS, Cable Assy. For Use with Single Ended w/Index Outputs
- 108596-0010** 7 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

**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)**

- 7 pin, style MS3106A-16S-1S (MCN-N5)
- 10 pin, style MS3106A-18-1S (MCN-N6)

# SERIES HA25

## ELECTRICAL CONNECTIONS

### Prewired Cable or Accessory Cables with 7 or 10 Pin MS Connector - when Code 4= 0 to 6, or A, B, C, D or G

Table 1 – Differential			
Pin	Function (If Used)	Wire Color Code	Cable* Accessory Color Code
A	Signal A	BRN	BRN
B	Signal B	ORN	ORN
C	Signal Z	YEL	YEL
D	Power Source	RED	RED
E	No Connection	—	—
F	Common	BLK	BLK
G	Case	GRN	GRN
H	Signal $\bar{A}$	BRN/WH	BRN/WH
I	Signal $\bar{B}$	ORN/WH	ORN/WH
J	Signal $\bar{Z}$	YEL/WH	YEL/WH
*Cable Accessory: P/N 14006350010			

Note: Wire color codes are referenced here for models that are specified with pre-wired cable. Connector/cables are described in the Encoder Accessories section of this catalog and color-coding information is provided here for reference.

Table 2 – Single Ended			
Pin	Function (If Used)	Wire Color Code	Cable* Accessory Color Code
A	Signal A	BRN	RED
B	Signal B	ORN	BLUE
C	Signal Z	YEL	YEL
D	Power Source	RED	WHT
E	No Connection	—	GRN
F	Common	BLK	BLK
G	Case	GRN	SHIELD
*Cable Accessory: P/N 14004310010			

Table 3 – Differential		
Pin	Function (If Used)	Cable Accessory Color Code
A	Signal A	BRN
B	Signal B	ORN
C	Signal $\bar{A}$	BRN/WHT
D	Power Source	RED
E	Signal $\bar{B}$	ORN/WHT
F	Common	BLK
G	Case	GRN
*Cable Accessory: P/N 108596		

**Cable Configuration:** PVC jacket, 105 °C rated, overall foil shield; 3 twisted pairs 26 AWG (output signals), plus 2 twisted pairs 24 AWG (input power)

### 5 & 8 Pin M12 Accessory Cables - when Code 4= H to Z

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

Encoder Function	Table 4 5 Pin Single Ended		Table 5 8 Pin Single Ended		Table 6 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. $\bar{A}$	—	—	—	—	3	BRN/WHT
Sig. $\bar{B}$	—	—	—	—	5	ORG/WHT
*Sig. $\bar{Z}$	—	—	—	—	8	YEL/WHT

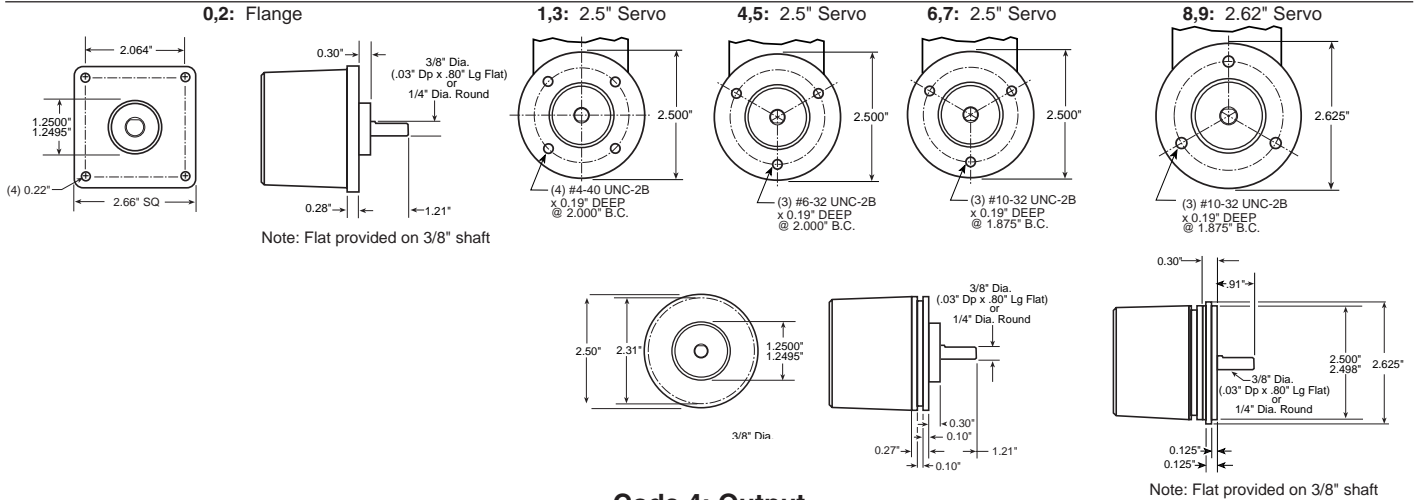
\* Index not provided on all models. See ordering information

**Cable Configuration:** PVC jacket, 105 °C rated, overall foil shield; 24 AWG conductors, minimum

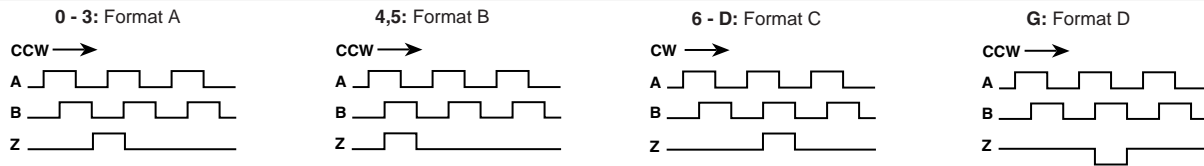
See “Accessories” Section for Connectors and Cable Assemblies Ordering Information

## DIMENSIONS

### Code 3: Mechanical



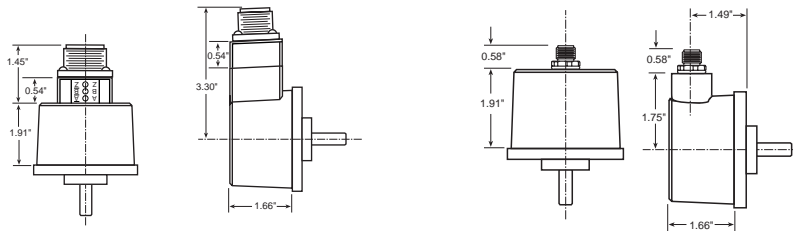
### Code 4: Output



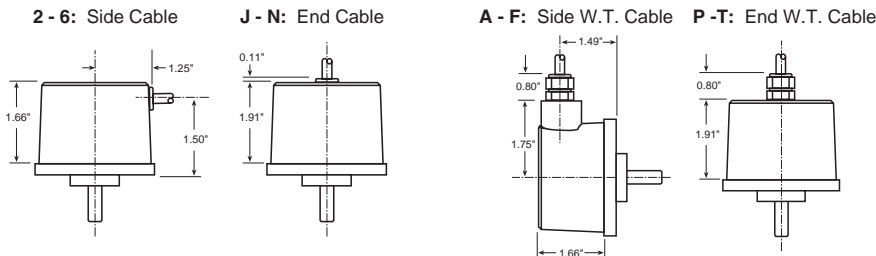
### Code 6: Termination

**0:** End MS Connector    **1:** Side MS Connector  
 When Code 5 is 0 to 6 or A to G

**0:** End M12 Connector    **1:** Side M12 Connector  
 When Code 5 is H to Z



Code 6: 0 & 1 dimensions shown with LED Output Indicator Option (Code 7: PS)



# SERIES HR25

# Dynapar™ brand

## Shafted Encoder

### Key Features

- **Reliable Dual Row Bearing Design**
- **Unbreakable Code Disc**
- **Industry Standard Size 25 (2.5")**

CE



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental

**Resolution:** 1 to 1024 PPR (pulses/revolution)

**Accuracy:** (Worst case any edge to any other edge)  $\pm 7.5$  arc-min.

**Format:** Two channel quadrature (AB) with optional Index (Z) and complementary outputs

**Phase Sense:** A leads B for CW or CCW shaft rotation as viewed from the shaft end of the encoder; see Ordering Information

**Quadrature Phasing:**  $90^\circ \pm 22.5^\circ$  electrical

**Symmetry:**  $180^\circ \pm 18^\circ$  electrical

**Index:**  $180^\circ \pm 18^\circ$  electrical (gated with B low)

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

### ELECTRICAL

#### Input Power:

4.5 min. to 26 VDC max. at 80 mA max., not including output loads

#### Outputs:

7273 Open Collector: 30 VDC max., 40 mA sink max.

7272 Push-Pull and Differential Line Driver: 40 mA sink or source

4469 Differential Line Driver: 100 mA, sink or source

**Frequency Response:** 100 kHz min.

**Electrical Protection:** Overvoltage, reverse voltage and output short circuit protected

**Noise Immunity:** Tested to EN61326 (Industrial) for Electro Static Discharge, Radio Frequency Interference, Electrical Fast Transients, Conducted and Magnetic Interference

### CONNECTIONS

#### Mating Connector:

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

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

5 pin, style M12: Cable with connector available

8 pin, style M12: Cable with connector available

### MECHANICAL

**Shaft Loading:** (at 0.25" from encoder face) 80 lbs. radial, 80 lbs. axial

**Shaft Speed:** 10,000 RPM max.

**Shaft Runout:** 0.001" max. TIR

**Moment of Inertia:**  $3.0 \times 10^{-4}$  oz-in-sec<sup>2</sup>

### ENVIRONMENTAL

#### Operating Temperature:

Standard: 0 to +70 °C;  
Extended: -40 to +85 °C

**Storage Temperature:** -40 to +90 °C

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

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

**Humidity:** to 98% without condensation

#### Enclosure Rating:

HR525: NEMA12/IP54 (dirt tight, splashproof);  
HR625: NEMA4/IP66 (dust proof, washdown)





# SERIES HR25

## Ordering Information

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

Code 1: Model	Code 2: PPR	Code 3: Mechanical	Code 4: Output	Code 5: Electrical	Code 6: Termination	Code 7: Options
HR <input type="checkbox"/> 25	<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>HR525</b> Size 25 Enclosed, Shielded Bearings <b>HR625</b> Size 25 Enclosed, with Shaft Seal	<b>0001 0250</b> <b>0005 0256</b> <b>0010 0300</b> <b>0012 0360</b> <b>0050 0400</b> <b>0060 0500</b> <b>0086 0512</b> <b>0100 0600</b> <b>0120 0635</b> <b>0125 0800</b> <b>0180 0900</b> <b>0200 1000</b> <b>0240 1024</b>	<b>0</b> Flange Mount, 3/8" Shaft	<b>7 Pin Connector or Cable</b> <b>0</b> Single Ended, no Index, Format A, Table 2 <b>1</b> Single Ended, with Index, Format A, Table 2 <b>4</b> Single Ended, with Index, Format B, Table 2 <b>6</b> Differential, no Index, Format C, Table 3 <b>A</b> Single Ended, with Index, Format C, Table 2 <b>C</b> Single Ended, no Index, Format C, Table 2 <b>G</b> Single Ended, with Index, Format D, Table 2	<b>0</b> 5-26V in; 5-26V Open Collector with 2.2kΩ Pullup out <b>1</b> 5-26V in; 5-26V Open Collector out <b>2</b> 5-26V in; 5V Totem Pole out <b>3</b> 5-26V in; 5V Line Driver out (7272) <b>4</b> 5-26V in; 5-26V Line Driver out (7272) <b>5</b> 5-26V in, 5V Differential Line Driver out (4469) <b>6</b> 5-15V in, 5- 15V Differential Line Driver out (4469) <b>A</b> Same as "0" with extend. temp range <b>B</b> Same as "1" with extend. temp range <b>C</b> Same as "2" with extend. temp range <b>D</b> Same as "3" with extend. temp range <b>E</b> Same as "4" with extend. temp range	<b>0</b> End Mount Connector <b>1</b> Side Mount Connector <b>2</b> 18" Cable, Side <b>3</b> 3' Cable, Side <b>4</b> 6' Cable, Side <b>5</b> 10' Cable, Side <b>6</b> 15' Cable, Side <b>J</b> 18" Cable, End <b>K</b> 3' Cable, End <b>L</b> 6' Cable, End <b>M</b> 10' Cable, End <b>N</b> 15' Cable, End	available when Code 4 is 0 thru G, and Code 6 is 0 or 1:  <b>PS</b> LED Output Indicator
		<b>2</b> Flange Mount, 2.00" BC Face 1/4" Shaft <b>3</b> 2.50" Servo Mount/ 4 Hole 2.00" BC Face Mount, 1/4" Shaft <b>4</b> 2.50" Servo Mount/ 3 Hole, 2.00" BC Face Mount, 3/8" Shaft <b>5</b> 2.50" Servo Mount/ 3 Hole, 2.00" BC Face Mount, 1/4" Shaft <b>6</b> 2.50" Servo Mount/ 3 Hole, 1.88" BC Face Mount, 3/8" Shaft <b>7</b> 2.50" Servo Mount/ 3 Hole, 1.88" BC Face Mount, 1/4" Shaft <b>8</b> 2.62" Servo Mount/ 3 Hole, 1.88" BC Face Mount, 3/8" Shaft <b>9</b> 2.62" Servo Mount/ 3 Hole, 1.88" BC Face Mount, 1/4" Shaft	<b>10 Pin Connector or Cable</b> <b>2</b> Differential, no Index, Format A, Table 1 <b>3</b> Differential, with Index, Format A, Table 1 <b>5</b> Differential, with Index, Format B, Table 1 <b>B</b> Differential, with Index Format C, Table 1 <b>D</b> Differential, no Index, Format C, Table 1	<b>5 Pin M12 Connector</b> <b>H</b> Single ended, no index, Format A, Table 4 <b>J</b> Single ended, with index, Format A, Table 4 <b>K</b> Single ended, with index, Format B, Table 4 <b>L</b> Single ended, with index, Format C, Table 4 <b>M</b> Single ended, no index, Format C, Table 4 <b>N</b> Single ended, with index, Format D, Table 4	<b>8 Pin M12 Connector</b> <b>P</b> Single ended, no index, Format A, Table 5 <b>Q</b> Single ended, with index, Format A, Table 5 <b>R</b> Single ended, with index, Format B, Table 5 <b>S</b> Single ended, with index, Format C, Table 5 <b>T</b> Single ended, no index, Format C, Table 5 <b>U</b> Single ended, with index, Format D, Table 5 <b>V</b> Differential, no index, Format A, Table 6 <b>W</b> Differential, with index, Format A, Table 6 <b>X</b> Differential, with index, Format B, Table 6 <b>Y</b> Differential, with index, Format C, Table 6 <b>Z</b> Differential, no index, Format C, Table 6	available when Code 1 is HR625: <b>A</b> 18" Watertight, Side <b>B</b> 3' Watertight, Side <b>C</b> 6' Watertight, Side <b>D</b> 10' Watertight, Side <b>F</b> 15' Watertight, Side <b>P</b> 18" Watertight, End <b>Q</b> 3' Watertight, End <b>R</b> 6' Watertight, End <b>S</b> 10' Watertight, End <b>T</b> 15' Watertight, End

**10 foot Cable Assemblies with MS Connector**

- 1400431-0010** 7 Pin MS, Cable Assy. For Use with Single Ended w/Index Outputs
- 108596-0010** 7 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

**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)**

- 7 pin, style MS3106A-16S-1S (MCN-N5)
- 10 pin, style MS3106A-18-1S (MCN-N6)

# SERIES HR25

**Dynapar™ brand**

## ELECTRICAL CONNECTIONS

### Prewired Cable or Accessory Cables with 7 or 10 Pin MS Connector - when Code 4= 0 to 6, or A, B, C, D or G

Note: Wire color codes are referenced here for models that are specified with pre-wired cable. Connector/cables are described in the Encoder Accessories section of this catalog and color-coding information is provided here for reference.

Pin	Function (If Used)	Wire Color Code	Cable* Accessory Color Code
A	Signal A	BRN	BRN
B	Signal B	ORN	ORN
C	Signal Z	YEL	YEL
D	Power Source	RED	RED
E	No Connection	—	—
F	Common	BLK	BLK
G	Case	GRN	GRN
H	Signal $\bar{A}$	BRN/WH	BRN/WH
I	Signal $\bar{B}$	ORN/WH	ORN/WH
J	Signal $\bar{Z}$	YEL/WH	YEL/WH

\*Cable Accessory: P/N 14006350010

Pin	Function (If Used)	Wire Color Code	Cable* Accessory Color Code
A	Signal A	BRN	RED
B	Signal B	ORN	BLUE
C	Signal Z	YEL	YEL
D	Power Source	RED	WHT
E	No Connection	—	GRN
F	Common	BLK	BLK
G	Case	GRN	SHIELD

\*Cable Accessory: P/N 14004310010

Pin	Function (If Used)	Cable Accessory Color Code
A	Signal A	BRN
B	Signal B	ORN
C	Signal $\bar{A}$	BRN/WHT
D	Power Source	RED
E	Signal $\bar{B}$	ORN/WHT
F	Common	BLK
G	Case	GRN

\*Cable Accessory: P/N 1085960010

**Cable Configuration:** PVC jacket, 105 °C rated, overall foil shield; 3 twisted pairs 26 AWG (output signals), plus 2 twisted pairs 24 AWG (input power)

### 5 & 8 Pin M12 Accessory Cables - when Code 4= H to Z

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

Encoder Function	Table 4 5 Pin Single Ended		Table 5 8 Pin Single Ended		Table 6 8 Pin Differential	
	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color
<b>Sig. A</b>	4	BLK	1	BRN	1	BRN
<b>Sig. B</b>	2	WHT	4	ORG	4	ORG
<b>*Sig. Z</b>	5	GRY	6	YEL	6	YEL
<b>Power +V</b>	1	BRN	2	RED	2	RED
<b>Com</b>	3	BLU	7	BLK	7	BLK
<b>Sig. <math>\bar{A}</math></b>	—	—	—	—	3	BRN/WHT
<b>Sig. <math>\bar{B}</math></b>	—	—	—	—	5	ORG/WHT
<b>*Sig. <math>\bar{Z}</math></b>	—	—	—	—	8	YEL/WHT

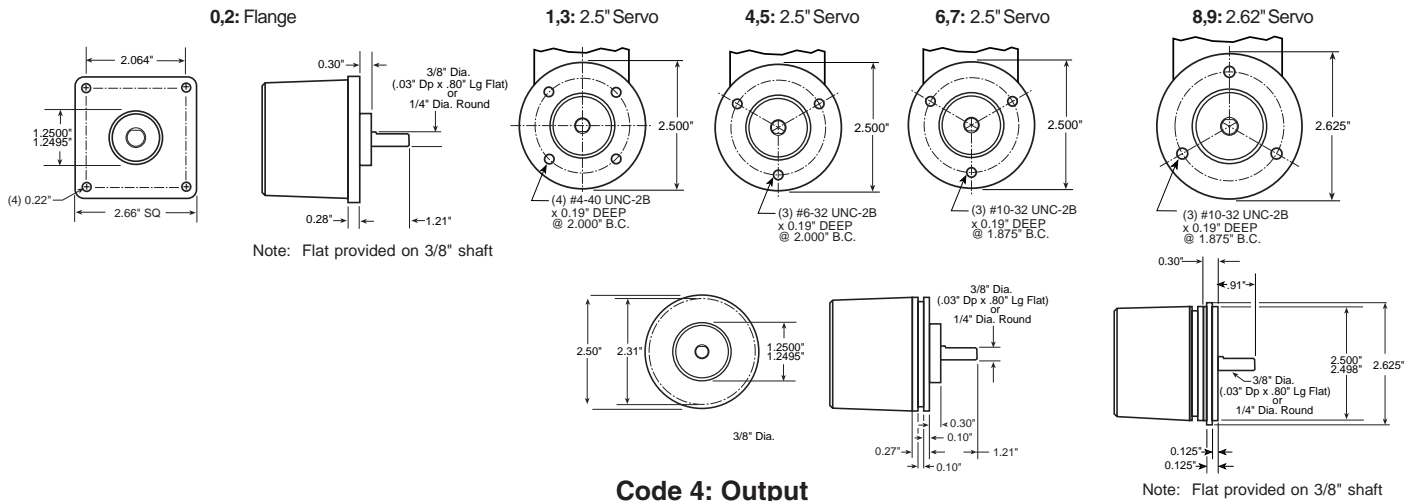
\* Index not provided on all models. See ordering information

**Cable Configuration:** PVC jacket, 105 °C rated, overall foil shield; 24 AWG conductors, minimum

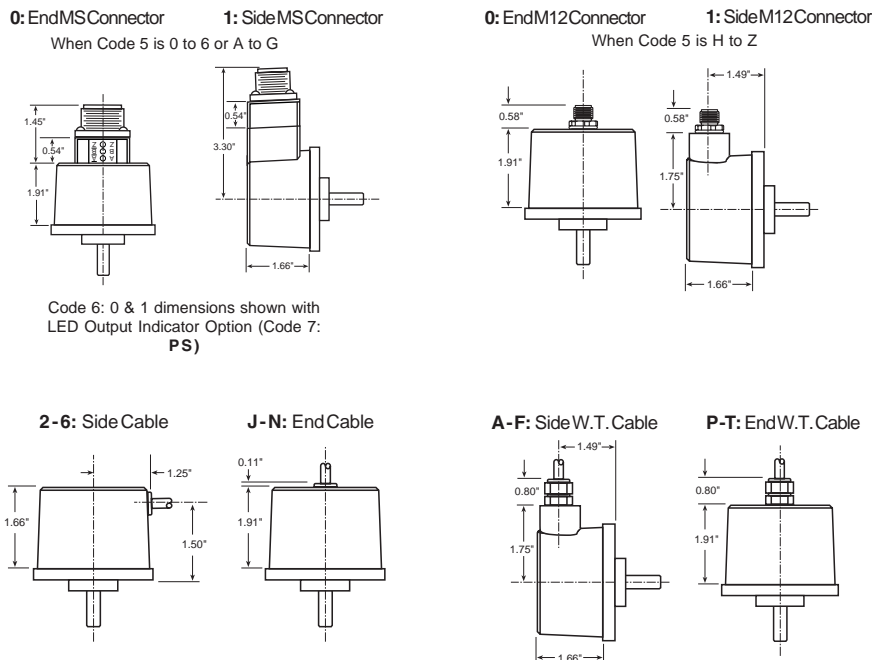
See “Accessories” Section for Connectors and Cable Assemblies Ordering Information

## DIMENSIONS

### Code 3: Mechanical



### Code 6: Termination



# SERIES HC25

# Dynapar™ brand

## Shafted Encoder

### Key Features

- **Optional Extended Temperature Range of -40° to +85°C**
- **High 5000PPR Resolution Available**
- **Industry Standard Size 25 (2.5")**

CE



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental

**Resolution:** 3000 to 5000 PPR (pulses/revolution)

**Accuracy:** (Worst case any edge to any other edge)  $\pm 10.8^\circ$ /PPR

**Format:** Two channel quadrature (AB) with optional Index (Z) and complementary outputs

**Phase Sense:** A leads B for CW or CCW shaft rotation as viewed from the shaft end of the encoder; see Ordering Information

**Quadrature Phasing:**  $90^\circ \pm 25^\circ$  electrical

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

**Index:**  $90^\circ \pm 25^\circ$  electrical (gated with B low)

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

### ELECTRICAL

#### Input Power:

4.5 min. to 26 VDC max. at 80 mA max., not including output loads

#### Outputs:

7273 Open Collector: 30 VDC max., 40 mA sink max.

7272 Push-Pull and Differential Line Driver: 40 mA sink or source

**Frequency Response:** 250 kHz

**Electrical Protection:** Overvoltage, reverse voltage and output short circuit protected

**Noise Immunity:** Tested to EN61326 (Industrial) for Electro Static Discharge, Radio Frequency Interference, Electrical Fast Transients, Conducted and Magnetic Interference

### CONNECTIONS

#### Mating Connector:

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

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

5 pin, style M12: Cable with connector available

8 pin, style M12: Cable with connector available

### MECHANICAL

**Shaft Loading:** 40 lbs. radial, 30 lbs. axial

**Shaft Speed:** 10,000 RPM max. (See Frequency Response)

**Starting Torque:** (max at 25 °C)

HC525: 1.0 oz-in;

HC625: 2.5 oz.-in

**Moment of Inertia:**  $2.83 \times 10^{-4}$  oz-in-sec<sup>2</sup>

### ENVIRONMENTAL

#### Operating Temperature:

Standard: 0 to +70 °C;

Extended: -40 to +85 °C

**Storage Temperature:** -40 to +90 °C

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

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

**Humidity:** to 98% without condensation

#### Enclosure Rating:

HC525: NEMA12/IP54 (dirt tight, splashproof);

HC625: NEMA4/IP66 (dust proof, washdown)



# SERIES HC25

## Ordering Information

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

Code 1: Model	Code 2: PPR	Code 3: Mechanical	Code 4: Output	Code 5: Electrical	Code 6: Termination	Code 7: Options
<b>HC</b> <input type="checkbox"/> <b>25</b> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>						<input type="checkbox"/> <input type="checkbox"/>

### Ordering Information

<b>HC525</b> Size 25 Enclosed, Shielded Bearings	<b>3000</b> 3,000 <b>3600</b> 3,600 <b>4096</b> 4,096 <b>5000</b> 5,000	<b>0</b> Flange Mount, 3/8" Shaft	<b>7 Pin Connector or Cable</b>	<b>0</b> 5-26V in; 5-26V Open Collector with 2.2kΩ Pullup out	<b>0</b> End Mount Connector	<b>Blank</b> None available when Code 4 is 0 thru G, and Code 6 is 0 or 1:
		<b>1</b> 2.50" Servo Mount/ 4 Hole, 2.00" BC Face Mount, 3/8" Shaft	<b>0</b> Single Ended, no Index, Format A, Table 2	<b>1</b> 5-26V in; 5-26V Open Collector out	<b>1</b> Side Mount Connector	
<b>HC625</b> Size 25 Enclosed, with Shaft Seal		<b>2</b> Flange Mount, 1/4" Shaft	<b>1</b> Single Ended, with Index, Format A, Table 2	<b>2</b> 5-26V in; 5V Totem Pole out	Available when Code 1 is HC525: <b>2</b> 18" Cable, Side <b>3</b> 3' Cable, Side <b>4</b> 6' Cable, Side <b>5</b> 10' Cable, Side <b>6</b> 15' Cable, Side <b>J</b> 18" Cable, End <b>K</b> 3' Cable, End <b>L</b> 6' Cable, End <b>M</b> 10' Cable, End <b>N</b> 15' Cable, End	<b>PS</b> LED Output Indicator
		<b>3</b> 2.50" Servo Mount/ 4 Hole 2.00" BC Face Mount, 1/4" Shaft	<b>4</b> Single Ended, with Index, Format B, Table 2	<b>3</b> 5-26V in; 5V Line Driver out		
		<b>4</b> 2.50" Servo Mount/ 3 Hole, 2.00" BC Face Mount, 3/8" Shaft	<b>6</b> Differential, no Index, Format C, Table 3	<b>4</b> 5-26V in; 5-26V Line Driver out		
		<b>5</b> 2.50" Servo Mount/ 3 Hole, 2.00" BC Face Mount, 1/4" Shaft	<b>A</b> Single Ended, with Index, Format C, Table 2	<b>A</b> Same as "0" with extend. temp range		
		<b>6</b> 2.50" Servo Mount/ 3 Hole, 1.88" BC Face Mount, 3/8" Shaft	<b>C</b> Single Ended, no Index, Format C, Table 2	<b>B</b> Same as "1" with extend. temp range		
		<b>7</b> 2.50" Servo Mount/ 3 Hole, 1.88" BC Face Mount, 1/4" Shaft	<b>G</b> Single Ended, with Index, Format D, Table 2	<b>C</b> Same as "2" with extend. temp range		
		<b>8</b> 2.62" Servo Mount/ 3 Hole, 1.88" BC Face Mount, 3/8" Shaft	<b>10 Pin Connector or Cable</b>	<b>D</b> Same as "3" with extend. temp range		
		<b>9</b> 2.62" Servo Mount/ 3 Hole, 1.88" BC Face Mount, 1/4" Shaft	<b>2</b> Differential, no Index, Format A, Table 1	<b>E</b> Same as "4" with extend. temp range		
			<b>3</b> Differential, with Index, Format A, Table 1			
			<b>5</b> Differential, with Index, Format B, Table 1			
	<b>B</b> Differential, with Index Format C, Table 1					
	<b>D</b> Differential, no Index, Format C, Table 1					
	<b>5 Pin M12 Connector</b>					
	<b>H</b> Single ended, no index, Format A, Table 4					
	<b>J</b> Single ended, with index, Format A, Table 4					
	<b>K</b> Single ended, with index, Format B, Table 4					
	<b>L</b> Single ended, with index, Format C, Table 4					
	<b>M</b> Single ended, no index, Format C, Table 4					
	<b>N</b> Single ended, with index, Format D, Table 4					
	<b>8 Pin M12 Connector</b>					
	<b>P</b> Single ended, no index, Format A, Table 5					
	<b>Q</b> Single ended, with index, Format A, Table 5					
	<b>R</b> Single ended, with index, Format B, Table 5					
	<b>S</b> Single ended, with index, Format C, Table 5					
	<b>T</b> Single ended, no index, Format C, Table 5					
	<b>U</b> Single ended, with index, Format D, Table 5					
	<b>V</b> Differential, no index, Format A, Table 6					
	<b>W</b> Differential, with index, Format A, Table 6					
	<b>X</b> Differential, with index, Format B, Table 6					
	<b>Y</b> Differential, with index, Format C, Table 6					
	<b>Z</b> Differential, no index, Format C, Table 6					

**10 foot Cable Assemblies with MS Connector**

- 1400431-0010** 7 Pin MS, Cable Assy. For Use with Single Ended w/Index Outputs
- 108596-0010** 7 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

**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

# SERIES HC25

**Dynapar™ brand**

## ELECTRICAL CONNECTIONS

### Prewired Cable or Accessory Cables with 7 or 10 Pin MS Connector - when Code 4= 0 to 6, or A, B, C, D or G

Note: Wire color codes are referenced here for models that are specified with pre-wired cable. Connector/cables are described in the Encoder Accessories section of this catalog and color-coding information is provided here for reference.

Table 1 – Differential			
Pin	Function (If Used)	Wire Color Code	Cable* Accessory Color Code
A	Signal A	BRN	BRN
B	Signal B	ORN	ORN
C	Signal Z	YEL	YEL
D	Power Source	RED	RED
E	No Connection	—	—
F	Common	BLK	BLK
G	Case	GRN	GRN
H	Signal $\bar{A}$	BRN/WH	BRN/WH
I	Signal $\bar{B}$	ORN/WH	ORN/WH
J	Signal $\bar{Z}$	YEL/WH	YEL/WH

\*Cable Accessory: P/N 14006350010

Table 2 – Single Ended			
Pin	Function (If Used)	Wire Color Code	Cable* Accessory Color Code
A	Signal A	BRN	RED
B	Signal B	ORN	BLUE
C	Signal Z	YEL	YEL
D	Power Source	RED	WHT
E	No Connection	—	GRN
F	Common	BLK	BLK
G	Case	GRN	SHIELD

\*Cable Accessory: P/N 14004310010

Table 3 – Differential		
Pin	Function (If Used)	Cable Accessory Color Code
A	Signal A	BRN
B	Signal B	ORN
C	Signal $\bar{A}$	BRN/WHT
D	Power Source	RED
E	Signal $\bar{B}$	ORN/WHT
F	Common	BLK
G	Case	GRN

\*Cable Accessory: P/N 1085960010

**Cable Configuration:** PVC jacket, 105 °C rated, overall foil shield; 3 twisted pairs 26 AWG (output signals), plus 2 twisted pairs 24 AWG (input power)

### 5 & 8 Pin M12 Accessory Cables - when Code 4= H to Z

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

Encoder Function	Table 4 5 Pin Single Ended		Table 5 8 Pin Single Ended		Table 6 8 Pin Differential	
	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color
<b>Sig. A</b>	4	BLK	1	BRN	1	BRN
<b>Sig. B</b>	2	WHT2	4	ORG	4	ORG
<b>*Sig. Z</b>	5	GRY	6	YEL	6	YEL
<b>Power +V</b>	1	BRN	2	RED	2	RED
<b>Com</b>	3	BLU	7	BLK	7	BLK
<b>Sig. <math>\bar{A}</math></b>	—	—	—	—	3	BRN/WHT
<b>Sig. <math>\bar{B}</math></b>	—	—	—	—	5	ORG/WHT
<b>*Sig. <math>\bar{Z}</math></b>	—	—	—	—	8	YEL/WHT

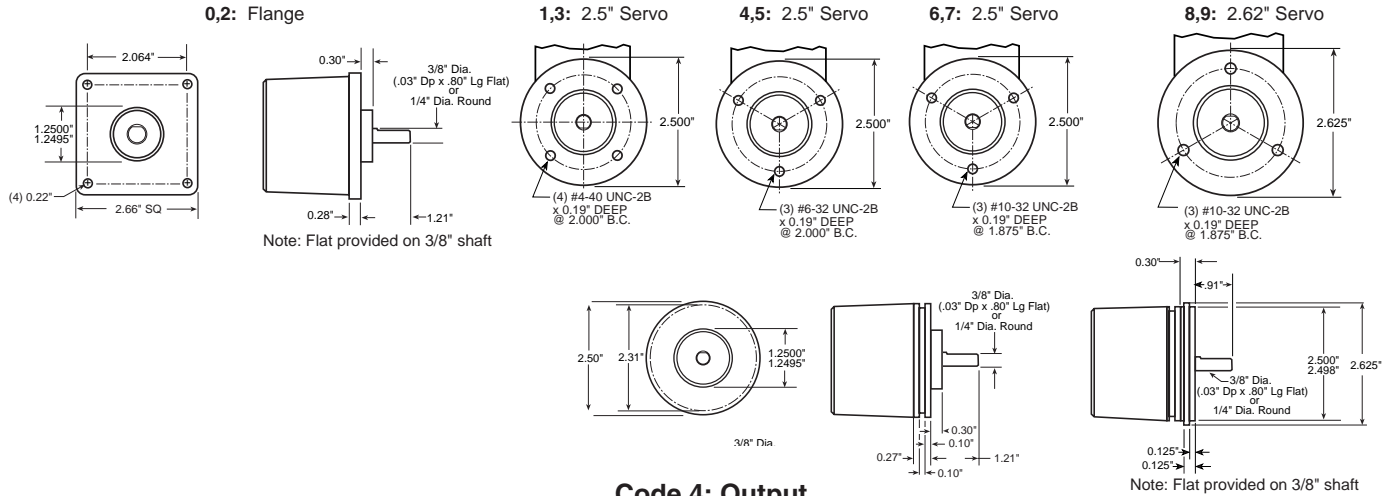
\* Index not provided on all models. See ordering information

**Cable Configuration:** PVC jacket, 105 °C rated, overall foil shield; 24 AWG conductors, minimum

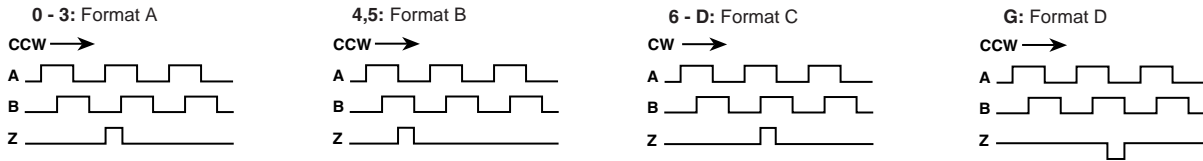
See “Accessories” Section for Connectors and Cable Assemblies Ordering Information

## DIMENSIONS

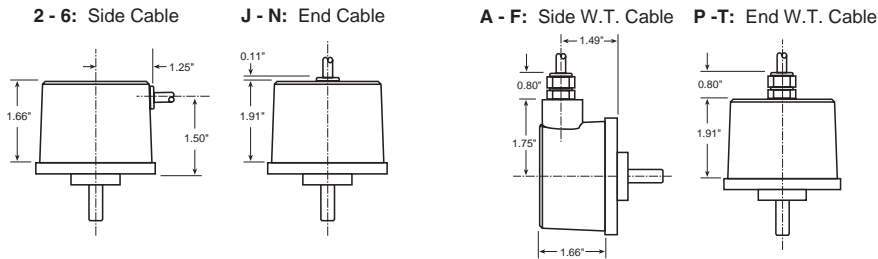
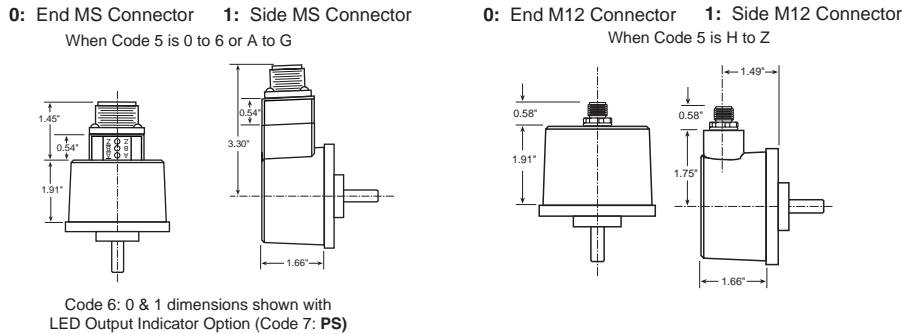
### Code 3: Mechanical



### Code 4: Output



### Code 6: Termination



# SERIES H58

# Dynapar™ brand

## Shafted Encoder

### Key Features

- Industry Standard 58mm Mounting
- Multiple Connection Options
- Rugged Design with Long-Life Bearings

CE



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental

**Resolution:** 1 to 2540 PPR (pulses/revolution)

**Accuracy:** (Worst case any edge to any other edge)  $\leq 1024$  PPR (metal disk):  $\pm 7.5$  arc-min.  
 $> 1024$  PPR (glass disk):  $\pm 2.5$  arc-min.

**Format:** Two channel quadrature (AB) with optional Index (Z) and complementary outputs

**Phase Sense:** A leads B for CCW shaft rotation as viewed from the shaft end of the encoder

**Quadrature Phasing:**  $90^\circ \pm 22.5^\circ$  electrical

**Symmetry:**  $180^\circ \pm 18^\circ$  electrical

**Index:**  $180^\circ \pm 18^\circ$  electrical (gated with B low)

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

### ELECTRICAL

**Input Power:**

4.5 min. to 26 VDC max. at 80 mA max., not including output loads

**Outputs:**

7272 Push-Pull and Differential Line Driver: 40 mA sink or source

4469 Differential Line Driver: 100 mA, sink or source

**Frequency Response:** 100 kHz min.

**Electrical Protection:** Overvoltage, reverse voltage and output short circuit protected

**Noise Immunity:** Tested to EN61326 (Industrial) for Electro Static Discharge, Radio Frequency Interference, Electrical Fast Transients, Conducted and Magnetic Interference

### CONNECTIONS

**Mating Connector:**

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

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

12 pin style M23, CW (605560-0001)

12 pin style M23, CCW (605560-0002)

5 pin, style M12: Cable with connector available

8 pin, style M12: Cable with connector available

### MECHANICAL

**Shaft Loading:** (at 6 mm from encoder face)

Resolutions  $\leq 1024$  PPR: 356 N radial, axial

Resolutions  $> 1024$  PPR: 178 N radial, axial

**Shaft Speed:**

Resolutions  $\leq 1024$  PPR: 10,000 RPM max.

Resolutions  $> 1024$  PPR: 5,000 RPM max.

**Starting Torque:** (max at 25 °C)

without shaft seal: 0.007 N-m;

with shaft seal: 0.014 N-m

**Moment of Inertia:** 21.2 g-cm<sup>2</sup>

**Weight:** 283 g. (10 oz.) max.

### ENVIRONMENTAL

**Operating Temperature:**

Standard: 0 to +70 °C;

Extended: -40 to +85 °C

**Storage Temperature:** -40 to +90 °C

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

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

**Humidity:** to 98% without condensation

**Enclosure Rating:** NEMA12/IP54 (dirt tight, splashproof); NEMA4/IP66 (dust proof, washdown) when ordered with shaft seal and either MS connector or watertight cable exit





# SERIES H58

## Ordering Information

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

Code 1: Model	Code 2: PPR	Code 3: Pilot, Face	Code 4: Shaft	Code 5: Shaft Seal	Code 6: Electrical	Code 7: Termination	Code 8: Connector	
<b>H58</b>	<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>H58</b> Bidirectional with Index (Channels A, B and Z)	<b>0001</b>	<b>0500</b>	<b>0</b> (3) M4 @ 42mm BC, no Pilot	<b>0</b> 6mm Dia. Shaft	<b>0</b> no Shaft Seal	<b>0</b> 5-26V in, 5-26V Push-Pull out  available when Code 7 is 2 thru B, E or F:  <b>1</b> 5-26V in, 5-26V Differential Line Driver out (7272) <b>2</b> 5-26V in, 5V Differential Line Driver out (7272) <b>3</b> 5-26V in, 5V Differential Line Driver out (4469) <b>4</b> 5-15V in, 5-15V Differential Line Driver out (4469)  <b>A</b> Same as "0" with extend. temp range <b>B</b> Same as "1" with extend. temp range <b>C</b> Same as "2" with extend. temp range	<b>0</b> 7 Pin Conn, End Mount	<b>0</b> no Mating Connector
	<b>0005</b>	<b>0512</b>	<b>1</b> (3) M3 @ 48mm BC, 36mm Dia. Pilot	<b>1</b> 10mm Dia. Shaft	<b>1</b> Shaft Seal		<b>1</b> 7 Pin Conn, Side Mount	<b>1</b> 7 Pin Mating Connector
	<b>0010</b>	<b>0600</b>					<b>2</b> 10 Pin Conn, End Mount	<b>2</b> 10 Pin Mating Connector
	<b>0012</b>	<b>0800</b>					<b>3</b> 10 Pin Conn, Side Mount	<b>3</b> 12 Pin CCW Mating Connector
	<b>0050</b>	<b>0900</b>					<b>4</b> 12 Pin CCW Conn, End Mount	<b>4</b> 12 Pin CW Mating Connector
	<b>0060</b>	<b>1000</b>					<b>5</b> 12 Pin CCW Conn, Side Mount	<b>4</b> 12 Pin CW Mating Connector
	<b>0086</b>	<b>1024</b>					<b>6</b> 12 Pin CW Conn, End Mount	<b>4</b> 12 Pin CW Mating Connector
	<b>0100</b>	<b>1200</b>					<b>7</b> 12 Pin CW Conn, Side Mount	<b>4</b> 12 Pin CW Mating Connector
	<b>0120</b>	<b>1250</b>					<b>C</b> 5 pin M12 Conn, End Mount	<b>4</b> 12 Pin CW Mating Connector
	<b>0125</b>	<b>1270</b>					<b>D</b> 5 pin M12 Conn, Side Mount	<b>4</b> 12 Pin CW Mating Connector
<b>0180</b>	<b>1500</b>				<b>E</b> 8 pin M12 Conn, End Mount	<b>4</b> 12 Pin CW Mating Connector		
<b>0200</b>	<b>1600</b>				<b>F</b> 8 pin M12 Conn, Side Mount	<b>4</b> 12 Pin CW Mating Connector		
<b>0240</b>	<b>1800</b>				available when Code 5 is 1: <b>8</b> 1m Sealed Cbl, End Exit <b>9</b> 1m Sealed Cbl, Side Exit <b>A</b> 3m Sealed Cbl, End Exit <b>B</b> 3m Sealed Cbl, Side Exit	<b>4</b> 12 Pin CW Mating Connector		
<b>0250</b>	<b>1968</b>							
<b>0254</b>	<b>2000</b>							
<b>0256</b>	<b>2048</b>							
<b>0300</b>	<b>2400</b>							
<b>0360</b>	<b>2500</b>							
<b>0400</b>	<b>2540</b>							

**10 foot Cable Assemblies with MS Connector**

- 108595-0010** 7 Pin MS, Cable Assy. For Use with Single Ended w/Index Outputs
- 1400635-0010** 10 Pin MS, Cable Assy. For Use with Differential Line Driver with Index Outputs
- 108615-0010** 12 Pin CCW (if used) MS, Cable Assy. For Use with Differential Line Driver with Index Outputs
- 108616-0010** 12 Pin CW (if used) MS, Cable Assy. For Use with Differential Line Driver with Index Outputs

**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

# SERIES H58

# Dynapar™ brand

## ELECTRICAL CONNECTIONS

### 7, 10 and 12 Pin Connectors and Cables - Code 7= 0 to 7

Connector & mate/accessory cable assembly pin numbers and wire color information is provided here for reference. Models with direct cable exit carry the same color coding as shown for each output configuration.

Encoder Function	Cable # 108595-7 Pin (If Used)		Cable # 1400635-10 Pin (If Used)		Cable # 108615-12 Pin CCW (If Used)		Cable # 108616-12 Pin CW (If Used)	
	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color
Sig. A	A	BRN	A	BRN	5	BRN	3	BRN
Sig. B	B	ORN	B	ORG	8	ORG	4	ORG
Sig. Z	C	YEL	C	YEL	3	YEL	7	YEL
Power +V	D	RED	D	RED	12	RED	2	RED
N/C	E	—	E	—	7	—	—	—
Com	F	BLK	F	BLK	10	BLK	1	BLK
Case	G	GRN	G	GRN	9	—	—	—
Sig. $\bar{A}$	—	—	H	BRN/WHT	6	BRN/WHT	5	BRN/WHT
Sig. $\bar{B}$	—	—	I	ORG/WHT	1	ORG/WHT	6	ORG/WHT
Sig. $\bar{Z}$	—	—	J	YEL/WHT	4	YEL/WHT	8	YEL/WHT
5V Sense	—	—	—	—	2	GRN	—	—
0V Sense	—	—	—	—	11	BLK/WHT	—	—

Mating connector/cable assembly wire color information is provided here for reference. H58 models with direct cable exit carry the same color coding as shown for each output configuration.

**Cable Configuration:** PVC jacket, 105 °C rated, overall foil shield; 3 twisted pairs 26 AWG (output signals), plus 2 twisted pairs 24 AWG (input power)

### 5 & 8 Pin M12 Accessory Cables when Code 7= C to F

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

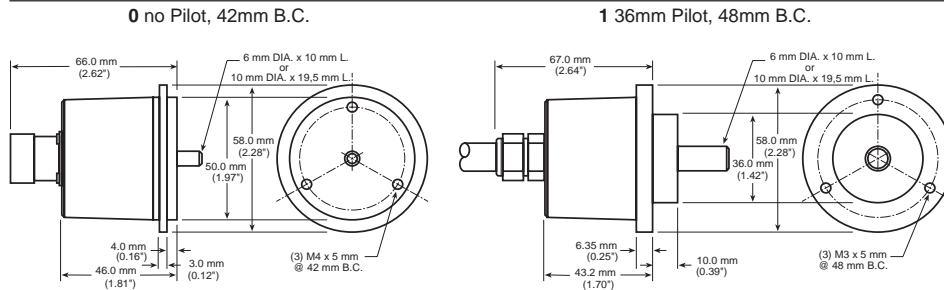
Encoder Function	Cable # 112859-5 Pin Single Ended		Cable # 112860-8 Pin Single Ended		Cable # 112860-8 Pin Differential	
	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color
Sig. A	4	BLK	1	BRN	1	BRN
Sig. B	2	WHT	4	ORG	4	ORG
Sig. Z	5	GRY	6	YEL	6	YEL
Power +V	1	BRN	2	RED	2	RED
Com	3	BLU	7	BLK	7	BLK
Sig. $\bar{A}$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

**Cable Configuration:** PVC jacket, 105 °C rated, overall foil shield; 24 AWG conductors, minimum

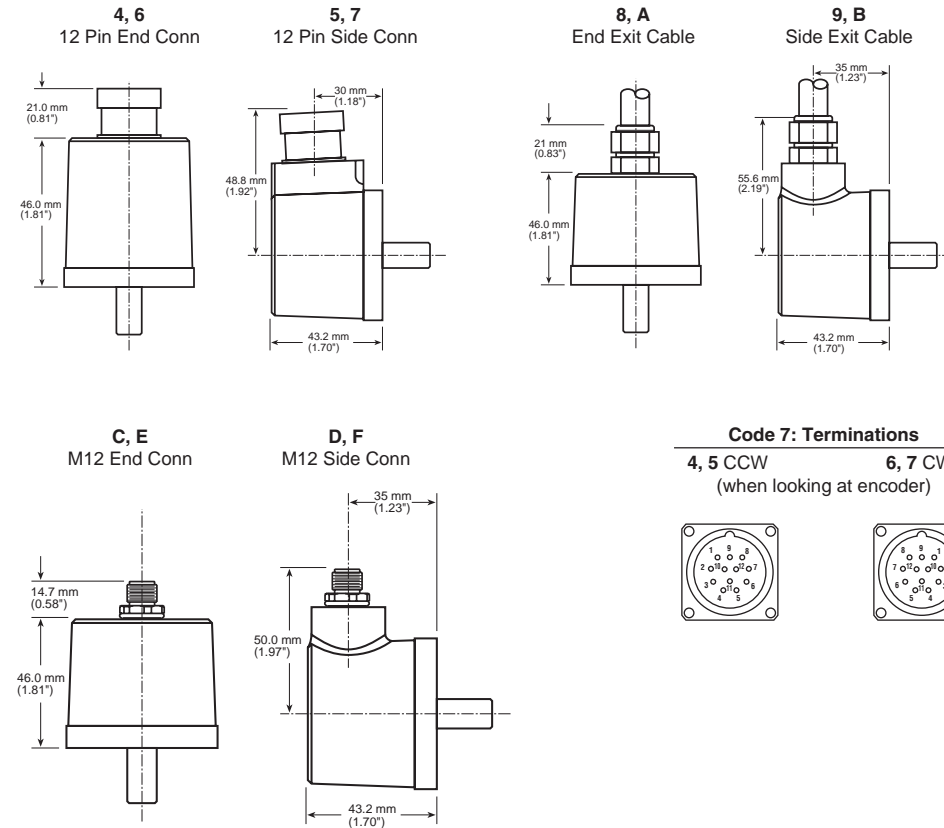
See "Accessories" Section for Connectors and Cable Assemblies Ordering Information

## DIMENSIONS

### Code 3: Pilot, Face Mounts



### Code 7: Terminations



# SERIES H42

# Dynapar™ brand

## Shafted Encoder

### Key Features

- Simplified Economical Design
- Unbreakable Code Disc
- Rugged Cast Aluminum Housing

CE



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

Code: Incremental

Resolution: 1 to 600 PPR (pulses/revolution)

Accuracy: (Worst case any edge to any other edge)  $\pm 7.5$  arc-min.

Format: Two channel quadrature (AB) with complementary outputs

Phase Sense: A leads B for CW shaft rotation as viewed from the shaft end of the encoder; see Ordering Information

Quadrature Phasing:  $90^\circ \pm 20^\circ$  electrical

Symmetry:  $180^\circ \pm 18^\circ$  electrical

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

### ELECTRICAL

Input Power:

4.5 min. to 26 VDC max. at 90 mA max., not including output loads

Outputs:

7272 Push-Pull and Differential Line Driver: 40 mA sink or source

Frequency Response: 100 kHz min.

Electrical Protection: Overvoltage, reverse voltage and output short circuit protected

Noise Immunity: Tested to EN61326 (Industrial) for Electro Static Discharge, Radio Frequency Interference, Electrical Fast Transients, Conducted and Magnetic Interference

### ELECTRICAL CONNECTIONS

With Line Driver Output		
Pin	Function (If Used)	#14004310010* Cable Accessory Color Code
A	Signal A	RED
B	Signal B	BLUE
C	Signal $\bar{A}$	YELLOW
D	Power Source	WHITE
E	Signal $\bar{B}$	GREEN
F	Common	BLACK
G	Case	SHIELD

\*This is a mating connector/cable assembly described in the Encoder Accessories section of this catalog. Color-coding information is provided here for reference.

### CONNECTIONS

Connector Termination:

7 pin, style MS3102E-16S-1P

Mating Connector:

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

### MECHANICAL

Shaft Loading: (at 0.25" from encoder face) 80 lbs. radial, 80 lbs. axial

Shaft Speed: 7200 RPM max.

Shaft Runout: 0.001" max. TIR

Moment of Inertia:  $3.0 \times 10^{-4}$  oz-in-sec<sup>2</sup>

Weight: 13 oz.

### ENVIRONMENTAL

Operating Temperature: 0 to +70 °C

Storage Temperature: -40 to +90 °C

Shock: 50 G's for 11 milliseconds duration

Vibration: 5 to 2000 Hz at 20 G's

Humidity: to 98% without condensation

Enclosure Rating: NEMA12/IP54 (dirt tight, splashproof)

### Ordering Information

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

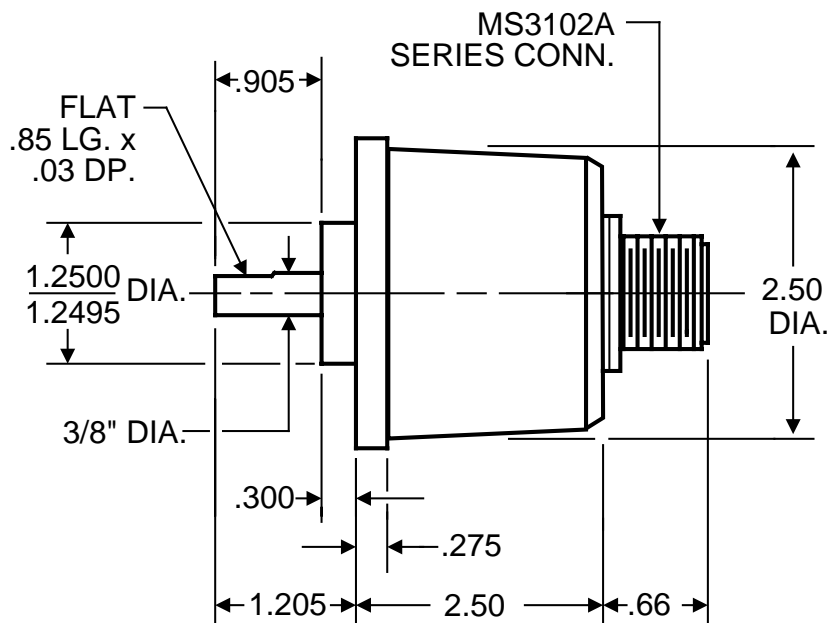
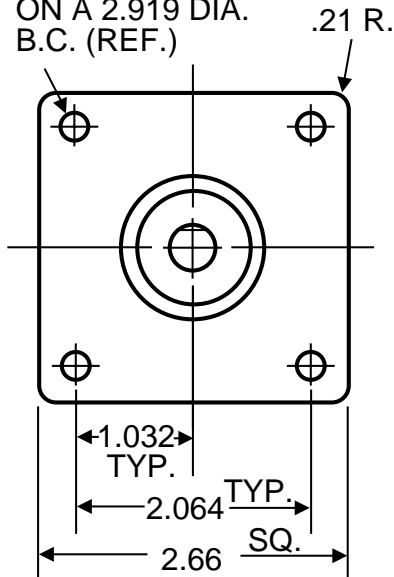
Code 1: Model	Code 2: Pulses/Rev
<b>H42</b>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
H42 Size 25, Economical	0001
	0012
	0060
	0100
	0120
	0500
	0600

**10 foot Cable Assembly with MS Connector**

**1400635-0010** 7 Pin MS, Cable Assy. For Use with Differential Line Driver Outputs

### DIMENSIONS

.218 DIA. 4 HOLES  
ON A 2.919 DIA.  
B.C. (REF.)



# SERIES HA725

**Dynapar™ brand**

## Shafted Encoder

### Key Features

- High, direct-read resolutions up to 10,000PPR
- Industry Standard size 25 (2.5")
- IP66 Sealing



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental

**Resolution:** 8192 to 10,000 PPR (pulses/revolution)

**Accuracy:**

Any edge to any like edge of the same channel:

±10.8°/PPR (±3.9 arc-sec at 10,000 PPR)

Any edge to any edge of the opposite channel:

±40°/PPR (±14 arc-sec at 10,000 PPR)

**Format:** Two channel quadrature (AB) with optional Index (Z) and complementary outputs

**Phase Sense:** A leads B for CCW shaft rotation as viewed from the shaft end of the encoder

**Quadrature Phasing:** 90° ± 25° electrical

**Symmetry:** 180° ± 25° electrical

**Index:** 90° ± 25° electrical (gated with A and B high)

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

### ELECTRICAL

**Input Power:** (not including output loads)

Push-pull: 10 min. to 30 VDC max. at 60 mA max.

Line driver: 5 VDC ±10% at 40 mA max.

**Outputs:**

Push-pull: ±30 mA, short circuit protected

Line Driver: ±20 mA

**Frequency Response:**

Push-pull: 200 kHz min

Line Driver: 300 kHz min.

**Noise Immunity:** Tested to EN61326 (Industrial) for Electro Static Discharge, Radio Frequency Interference, Electrical Fast Transients, Conducted

and Magnetic Interference

### CONNECTIONS

**Mating Connector:**

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

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

### MECHANICAL

**Shaft Loading:** 35 lbs. radial, 24 lbs. axial

**Shaft Speed:** 10,000 RPM max.mechanical

**Bearing Life:**

10<sup>9</sup> revolutions at 35% of rated load

10<sup>8</sup> revolutions at 75% of rated load

10<sup>7</sup> revolutions at 100% of rated load

**Moment of Inertia:** 2.83 x 10<sup>-4</sup> oz-in-sec<sup>2</sup>

### ENVIRONMENTAL

**Operating Temperature:** 0 to +70 °C;

**Storage Temperature:** -25 to +90 °C

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

**Vibration:** 5 to 2000 Hz at 2 G's

**Humidity:** to 98% without condensation

**Enclosure Rating:** NEMA4/IP66 (dust proof, washdown)

## ELECTRICAL CONNECTIONS

\*Mating connector/cable assembly wire color information is provided here for reference.

Encoder Function	Cable #108595-* 7 Pin Single Ended		Cable #1400635-* 10 Pin Dif Line Drv w/Inx	
	Pin	Wire Color	Pin	Wire Color
<b>Sig. A</b>	A	BRN	A	BRN
<b>Sig. B</b>	B	ORG	B	ORG
<b>Sig. Z</b>	C	YEL	C	YEL
<b>Power +V</b>	D	RED	D	RED
<b>Com</b>	F	BLK	F	BLK
<b>Case</b>	G	GRN	G	GRN
<b>N/C</b>	E	—	E	—
<b>Sig. Ā</b>	—	—	H	BRN/WHT
<b>Sig. B̄</b>	—	—	I	ORG/WHT
<b>Sig. Z̄</b>	—	—	J	YEL/WHT

### Ordering Information

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

Code 1: Model	Code 2: PPR	Code 3: Mechanical	Code 4: Output	Code 5: Electrical	Code 6: Termination
<b>HA725</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>HA725</b> Size 25, High Resolution	<b>08192</b> <b>09000</b> <b>10000</b>	<b>0</b> Flange Mount, 3/8" Shaft	<b>0</b> Single Ended <b>2</b> Differential	Available when Code 4 = 0: <b>0</b> 10-30V in; 10-30V Push-Pull out	<b>0</b> Connector, End Mount <b>1</b> Connector, Side Mount
				Available when Code 4 = 2: <b>4</b> 5V in; 5V Line Driver out	

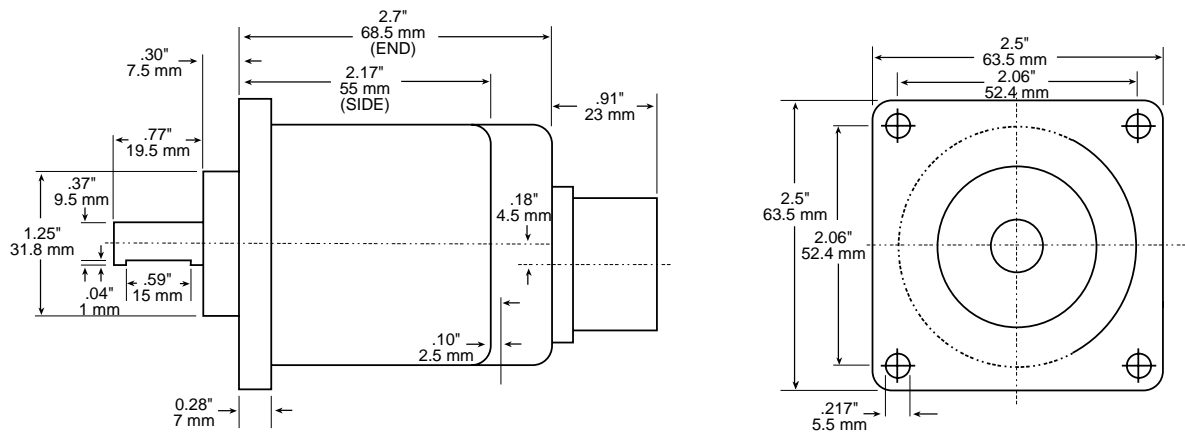
#### 10 foot Cable Assemblies with MS Connector

**108595-0010** 7 Pin MS, Cable Assy. For Use with Single Ended w/Index Outputs

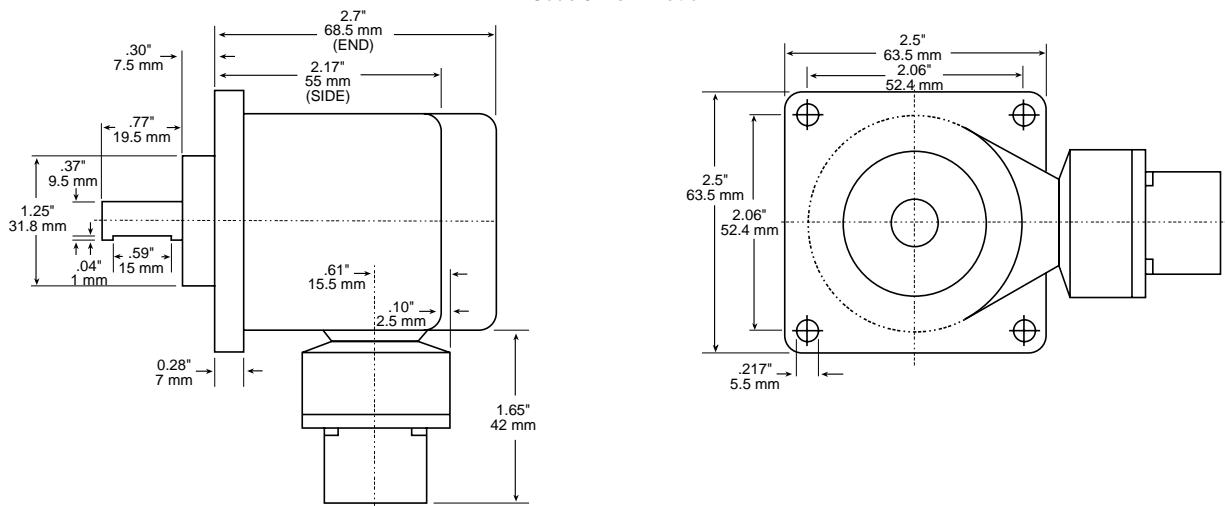
**1400635-0010** 10 Pin MS, Cable Assy. For Use with Differential Line Driver with Index Outputs

## DIMENSIONS

Code 6: Termination: 0



Code 6: Termination: 1



# SERIES H20 Hubshaft

# Dynapar™ brand

## Shafted Encoder

### Key Features

- Hubshaft with Spring Tether for Simplified Installation
- Industry Standard 2.0" Size
- IP66 Sealing Option



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental

**Resolution:** 1 to 2540 PPR (pulses/revolution)

**Accuracy:** (worst case any edge to any other edge)  $\leq 1024$  PPR (metal disk):  $\pm 7.5$  arc-min.

$> 1024$  PPR (glass disk):  $\pm 2.5$  arc-min.

**Format:** Two channel quadrature (AB) with optional Index (Z) and complementary outputs

**Phase Sense:** A leads B for CCW shaft rotation as viewed from the shaft end of the encoder

**Quadrature Phasing:**  $90^\circ \pm 22.5^\circ$  electrical

**Symmetry:**  $180^\circ \pm 18^\circ$  electrical

**Index:**  $180^\circ \pm 18^\circ$  electrical (gated with B low)

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

### ELECTRICAL

**Input Power:**

4.5 min. to 26 VDC max. at 80 mA max., not including output loads

**Outputs:**

7273 Open Collector: 30 VDC max., 40 mA sink max.

7272 Push-Pull and Differential Line Driver: 40 mA sink or source

4469 Differential Line Driver: 100 mA sink or source

**Frequency Response:** 100 kHz min.

**Electrical Protection:** Overvoltage, reverse voltage and output short circuit protected

**Noise Immunity:** Tested to EN61326 (Industrial) for Electro Static Discharge, Radio Frequency Interference, Electrical Fast Transients, Conducted and Magnetic Interference

**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)

5 pin, style M12: Cable with connector available

8 pin, style M12: Cable with connector available

### MECHANICAL

**Mating Shaft Requirements:**

Length: 0.38" min., 0.50" max.

Runout: 0.010" max. TIR

Endplay:  $\pm 0.025$ " max.

**Shaft Speed:**

Resolutions  $\leq 1024$  PPR: 10,000 RPM max.

Resolutions  $> 1024$  PPR: 5,000 RPM max.

**Starting Torque:** (max at 25 °C)

without shaft seal: 1.0 oz-in;

with shaft seal: 3.0 oz.-in

**Moment of Inertia:**  $3.0 \times 10^{-4}$  oz-in-sec<sup>2</sup>

**Weight:** 10 oz. max.

### ENVIRONMENTAL

**Operating Temperature:**

Standard: 0 to +70 °C;

Extended: -40 to +85 °C

**Storage Temperature:** -40 to +90 °C

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

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

**Humidity:** to 98% without condensation

**Enclosure Rating:** NEMA12/IP54 (dirt tight, splashproof); NEMA4/IP66 (dust proof, washdown) when ordered with shaft seal and either MS connector or watertight cable exit





# SERIES H20 Hubshaft

## Ordering Information

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

Code 1: Model	Code 2: PPR	Code 3: Housing	Code 4: Shaft	Code 5: Face Mount	Code 6: Shaft Seal	Code 7: Electrical	Code 8: Termination	Code 9: Options
<b>H2</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"/>

Ordering Information								
<b>1</b> Unidirectional (Channel A only)	<b>0001 0500</b> <b>0005 0512</b> <b>0010 0600</b> <b>0012 0800</b>	<b>0</b> Servo Mount <b>C</b> Same as "0" above includes protective cover kit for mounting on 4 1/2" C-face	<b>2</b> 5/8" Dia. Hub Shaft and flex coupling <b>3</b> 3/8" Dia. Hub Shaft and flex coupling <b>5</b> 1/2" Dia. Hub Shaft and flex coupling <b>6</b> 1/4" Dia. Hub Shaft and flex coupling	<b>2</b> (3) #4-40 @ 1.50" BC	<b>0</b> no Shaft Seal <b>5</b> Shaft Seal	<b>0</b> 5-26V in, 5-26V Open Collector out <b>1</b> 5-26V in, 5-26V Open Collector out with 2.2 kΩ Pullups <b>2</b> 5-26V in, 5-26V Push-Pull out <b>A</b> Same as "0" with extend. temp range <b>B</b> Same as "1" with extend. temp range <b>C</b> Same as "2" with extend. temp range	<b>0</b> 6 Pin Conn, End Mount <b>1</b> 6 Pin Conn, Side Mount <b>2</b> 7 Pin Conn, End Mount <b>3</b> 7 Pin Conn, Side Mount <b>4</b> 10 Pin Conn, End Mount <b>5</b> 10 Pin Conn, Side Mount <b>7</b> 18" Cable, Side Exit <b>9</b> 36" Cable, Side Exit <b>B</b> 10' Cable, Side Exit <b>K</b> 25' Cable, Side Exit <b>N</b> 5 Pin M12 Connector, End Mount <b>P</b> 5 Pin M12 Connector, Side Mount <b>Q</b> 8 Pin M12 Connector, End Mount <b>R</b> 8 Pin M12 Connector, Side Mount	available when Code 8 is 0 to 5: <b>PS</b> LED Output Indicator Option
<b>2</b> Bidirectional (Channels A and B)	<b>0050 0900</b> <b>0060 1000</b> <b>0086 1024</b> <b>0100 1200</b>	<b>F</b> Same as "0" above includes protective cover kit for mounting on fan cover				available when: Code 1 is 1 or 2 and Code 8 is 2 through M, Q or R; or Code 1 is 3 and Code 8 is 4 thru M, Q or R: <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>5</b> 5-26V in, 5 V Differential Line Driver out (4469) <b>6</b> 5-15V in, 5-15 V Differential Line Driver out (4469) <b>D</b> Same as "3" with extend. temp range <b>E</b> Same as "4" with extend. temp range		
<b>3</b> Bidirectional with Index (Channels A, B and Z)	<b>0120 1250</b> <b>0125 1270</b> <b>0180 1500</b> <b>0200 1600</b> <b>0240 1800</b> <b>0250 1968</b> <b>0254 2000</b> <b>0256 2048</b> <b>0300 2400</b> <b>0360 2500</b> <b>0400 2540</b>						available when Code 6 is 5: <b>D</b> 18" Sealed Cbl, Side Exit <b>F</b> 36" Sealed Cbl, Side Exit <b>H</b> 10' Sealed Cbl, Side Exit <b>M</b> 25' Sealed Cbl., Side Exit	

**109296-0001** Replacement flexible mount for Series H20 Hub Shaft

**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
- 1400635-0010** 10 Pin MS, Cable Assy. For Use with Differential Line Driver with Index Outputs

**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)

## ELECTRICAL CONNECTIONS

### 6, 7 & 10 Pin MS Connectors and Cables - Code 8= 0 to 9, B to M

Connector & mate/accessory cable assembly pin numbers and wire color information is provided here for reference. H20 models with direct cable exit carry the same color coding as shown for each output configuration.

Encoder Function	Cable # 108594-6 Pin Single Ended		Cable # 108595-7 Pin Single Ended		Cable # 108596-7 Pin Dif Line Drv w/o Idx		Cable # 1400635-10 Pin Dif Line Drv w/ Idx	
	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color
<b>Sig. A</b>	E	BRN	A	BRN	A	BRN	A	BRN
<b>Sig. B</b>	D	ORN	B	ORG	B	ORG	B	ORG
<b>Sig. Z</b>	C	YEL	C	YEL	—	—	C	YEL
<b>Power +V</b>	B	RED	D	RED	D	RED	D	RED
<b>Com</b>	A	BLK	F	BLK	F	BLK	F	BLK
<b>Case</b>	—	—	G	GRN	G	GRN	G	GRN
<b>N/C</b>	F	—	E	—	—	—	E	—
<b>Sig. <math>\bar{A}</math></b>	—	—	—	—	C	BRN/WHT	H	BRN/WHT
<b>Sig. <math>\bar{B}</math></b>	—	—	—	—	E	ORG/WHT	I	ORG/WHT
<b>Sig. <math>\bar{Z}</math></b>	—	—	—	—	—	—	J	YEL/WHT

**Cable Configuration:** PVC jacket, 105 °C rated, overall foil shield; 3 twisted pairs 26 AWG (output signals), plus 2 twisted pairs 24 AWG (input power)

### 5 & 8 Pin M12 Accessory Cables when Code 8= N to R

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
<b>Sig. A</b>	4	BLK	1	BRN	1	BRN
<b>Sig. B</b>	2	WHT	4	ORG	4	ORG
<b>*Sig. Z</b>	5	GRY	6	YEL	6	YEL
<b>Power +V</b>	1	BRN	2	RED	2	RED
<b>Com</b>	3	BLU	7	BLK	7	BLK
<b>Sig. <math>\bar{A}</math></b>	—	—	—	—	3	BRN/WHT
<b>Sig. <math>\bar{B}</math></b>	—	—	—	—	5	ORG/WHT
<b>*Sig. <math>\bar{Z}</math></b>	—	—	—	—	8	YEL/WHT

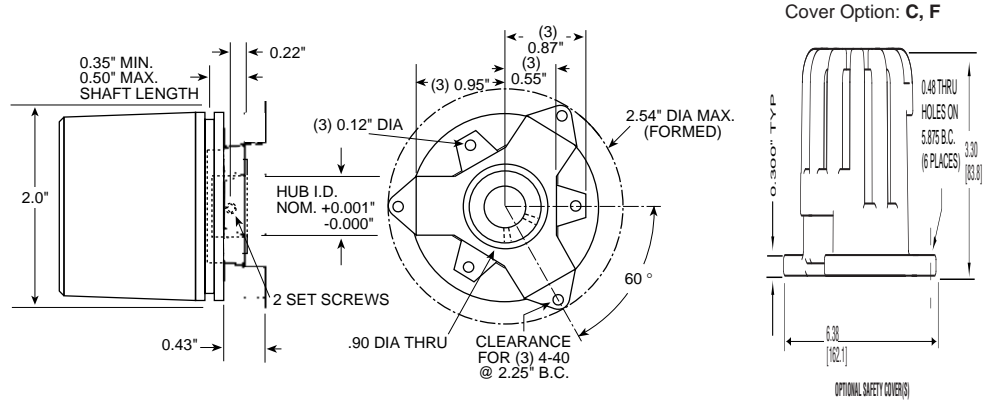
\* Index not provided on all models. See ordering information

**Cable Configuration:** PVC jacket, 105 °C rated, overall foil shield; 24 AWG conductors, minimum

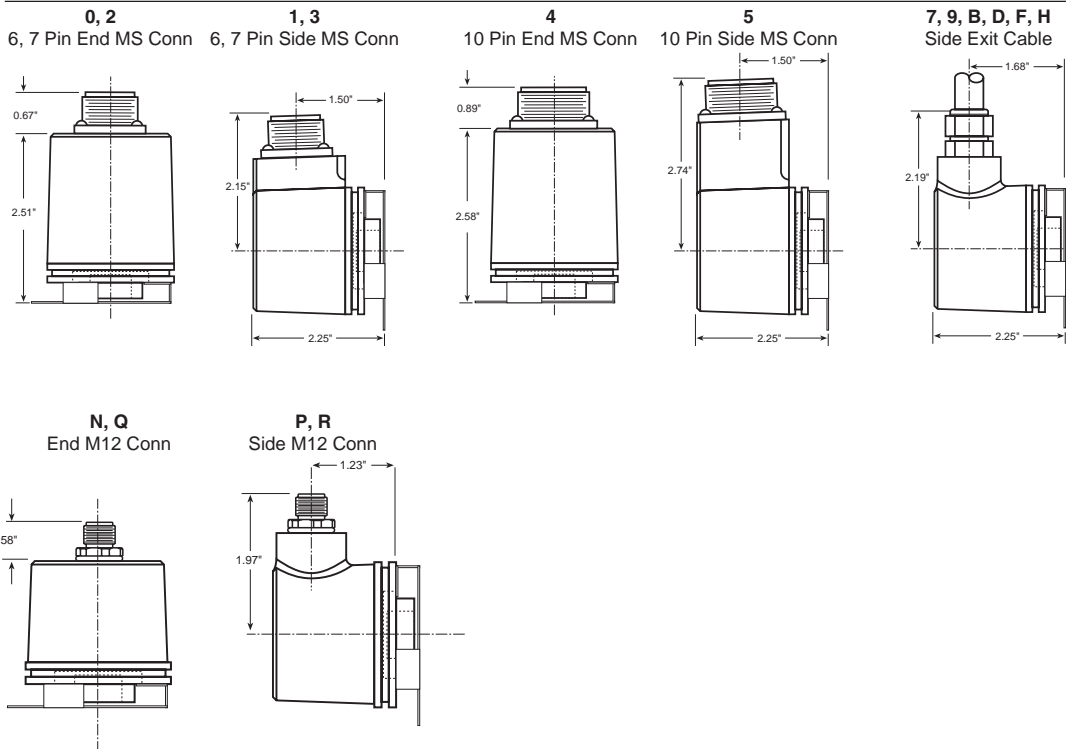
See “Accessories” Section for Connectors and Cable Assemblies Ordering Information

## DIMENSIONS

Codes 3-5: Housing, Shafts, Face Mount



Code 8: Terminations



# SERIES HS20

# Dynapar™ brand

## Sealed Hollowshaft Encoder

### Key Features

- Hollowshaft Design Eliminates Brackets and Couplings
- Electrically Isolated Shaft Design
- Compact Size for Tight Mounting Constraints

CE



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental

**Resolution:** 1 to 2540 PPR (pulses/revolution)

**Accuracy:** (worst case any edge to any other edge)  $\leq 1024$  PPR (metal disk):  $\pm 7.5$  arc-min.

$> 1024$  PPR (glass disk):  $\pm 2.5$  arc-min.

**Format:** Two channel quadrature (AB) with optional Index (Z) and complementary outputs

**Phase Sense:** A leads B for CCW shaft rotation viewing the hub clamp end of the encoder

**Quadrature Phasing:**  $90^\circ \pm 22.5^\circ$  electrical

**Symmetry:**  $180^\circ \pm 18^\circ$  electrical

**Index:**  $180^\circ + 18^\circ / -135^\circ$  electrical (gated with B low)

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

### ELECTRICAL

#### Input Power:

4.5 min. to 26 VDC max. at 100 mA max., not including output loads

#### Outputs:

7273 Open Collector: 30 VDC max., 40 mA sink max.

7272 Push-Pull and Differential Line Driver: 40 mA sink or source

**Frequency Response:** 100 kHz min.

**Electrical Protection:** Overvoltage, reverse voltage and output short circuit protected

**Noise Immunity:** Tested to EN61326 (Industrial) for Electro Static Discharge, Radio Frequency Interference, Electrical Fast Transients, Conducted and Magnetic Interference

#### 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);

5 pin, style M12: Cable with connector available

8 pin, style M12: Cable with connector available

### MECHANICAL

**Bearing Life:** (at maximum tether loading)

Standard tether:  $5 \times 10^9$  revolutions

Slotted tether:  $8 \times 10^9$  revolutions

**Shaft Speed:** 6000 RPM max.

**Shaft Bore Tolerance:** Nominal  $+0.0002$ "  $+0.0008$ " ( $+0.005/+0.020$  mm)

#### Mating Shaft Requirements:

Runout:  $\pm 0.005$ " ( $\pm 0.13$ mm) radial, max.

Endplay:  $\pm 0.050$ " ( $\pm 1.27$  mm) axial, max.

Length:  $0.80$ " (20 mm), minimum

**Starting Torque:** 3.0 oz-in max.

**Moment of Inertia:**  $5.1 \times 10^{-4}$  oz-in-sec<sup>2</sup>

**Weight:** 10 oz. max.

### ENVIRONMENTAL

Operating Temperature:

Standard: 0 to  $+70^\circ$  C

Extended:  $-40$  to  $+85^\circ$  C

**Storage Temperature:**  $-40$  to  $+85^\circ$  C

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

**Vibration:** 5 to 2000 Hz at 2.5 G's

**Humidity:** to 98% without condensation

**Enclosure Rating:** NEMA4/IP65 (dust proof, washdown)



# SERIES HS20

## 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: Fixing	Code 5: Format	Code 6: Output	Code 7: Termination	Code 8: Options	
<b>HS20</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"/> <input type="checkbox"/>	
Ordering Information								
<b>HS20</b>	Size 20 heavy-duty, sealed hollowshaft encoder	Metal Disk: 0001 0300 0005 0360 0010 0400 0012 0500 0050 0512 0060 0600 0100 0720 0120 0768 0180 0800 0200 0900 0240 1000 0250 1024 0256	0 6 mm 1 1/4" 2 5/16" 3 8 mm 4 3/8" 5 10 mm 6 12 mm 7 1/2" 8 5/8" 9 15 mm A 16 mm	0 None - customer supplied 1 Clearance hole for 3/8" bolt on 5.88" dia. bolt circle (to fit 4-1/2" NEMA C-face) 3 Slotted hole for bolt on 1.87" to 2.95" radius 4 Same as '1', w/ protective cover kit 5 Same as '3', w/ Protective cover kit	0 single ended, unidirectional (A) 1 single ended, bidirectional (AB) 2 single ended, bidirectional with index (ABZ) available when Code 6 is 3, 4, A or B: 3 differential, bidirectional (AĀ BB) available when Code 6 is 3, 4, A or B and code 7 is 2, or 7 thru G: 4 differential, bidirectional with index (AĀ BB ZZ)	0 5-26V in, 5-26V open collector out 1 5-26V in, 5-26V open collector out w/ 2.2kΩ pullups 2 5-26V in, 5-26V push-pull out available when Code 5 is 3 or 4: 3 5-26V in, 5V line driver out 4 5-26V in, 5-26V line driver out A same as '3' with extended temp. -40° to 85°C B same as '4' with extended temp. -40° to 85°C	0 6 pin connector 1 7 pin connector 2 10 pin connector 5 6 pin connector, plus mating connector 6 7 pin connector, plus mating connector 7 10 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 thru 2 H 5 Pin M12 Connector	available when Code 7 is 0 or 5 and Code 5 is 0-2, or Code 7 is 1, 2, 6, 7: <b>PS</b> LED Output Indicator
		Glass Disk: 1200 1968 1250 2000 1270 2048 1500 2400 1600 2500 1800 2540						
112096-0001 Tether Kit (clearance hole for 3/8" bolt on 5.88" diameter bolt-circle)								
112096-0002 Tether Kit (slotted hole for bolt on 1.87" to 2.75" radius)								
112105-0001 Protective Cover Accessory								

### 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
- 1400635-0010 10 Pin MS, Cable Assy. For Use with Differential Line Driver with Index Outputs

### 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)

## ELECTRICAL CONNECTIONS

## 6, 7 &amp; 10 Pin MS Connectors and Cables - Code 7= 0 to 7, A to G

Connector & mate/accessory cable assembly pin numbers and wire color information is provided here for reference. HS20 models with direct cable exit carry the same color coding as shown for each output configuration.

Encoder Function	Cable #108594-* 6 Pin Single Ended		Cable #112123-* 6 Pin Dif Line Drv w/o Idx		Cable #108596-* 7 Pin Dif Line Drv w/o Idx		Cable #108595-* 7 Pin (If Used)		Cable #1400635-* 10 Pin (If Used)	
	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color
Sig. A	E	BRN	E	BRN	A	BRN	A	BRN	A	BRN
Sig. B	D	ORN	D	ORN	B	ORN	B	ORN	B	ORN
Sig. Z	C	YEL	—	—	—	—	C	YEL	C	YEL
Power +V	B	RED	B	RED	D	RED	D	RED	D	RED
N/C	F	—	—	—	—	—	E	—	E	—
Com	A	BLK	A	BLK	F	BLK	F	BLK	F	BLK
Case	—	—	—	—	G	GRN	G	GRN	G	GRN
Sig. $\bar{A}$	—	—	C	BRN/WHT	C	BRN/WHT	—	—	H	BRN/WHT
Sig. $\bar{B}$	—	—	F	ORN/WHT	E	ORN/WHT	—	—	I	ORN/WHT
Sig. $\bar{Z}$	—	—	—	—	—	—	—	—	J	YEL/WHT

**Cable Configuration:** PVC jacket, 105 °C rated, overall foil shield; 3 twisted pairs 26 AWG (output signals), plus 2 twisted pairs 24 AWG (input power)

## 5 &amp; 8 Pin M12 Accessory Cables when Code 7= 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. $\bar{A}$	—	—	—	—	3	BRN/WHT
Sig. $\bar{B}$	—	—	—	—	5	ORG/WHT
†Sig. $\bar{Z}$	—	—	—	—	8	YEL/WHT

**Cable Configuration:** PVC jacket, 105 °C rated, overall foil shield; 24 AWG conductors, minimum

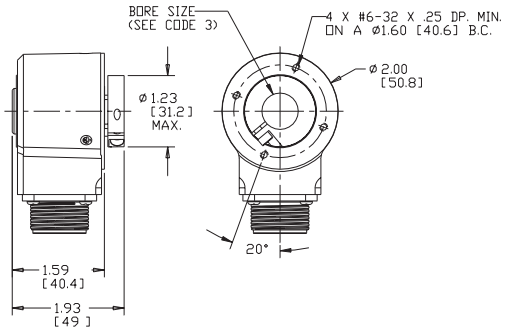
\*Note: Standard cable length is 10 feet but may be ordered in any length in 5 foot increment. For example, -0020 is a 20 foot cable.

†Note: Index not provided on all models. See ordering information

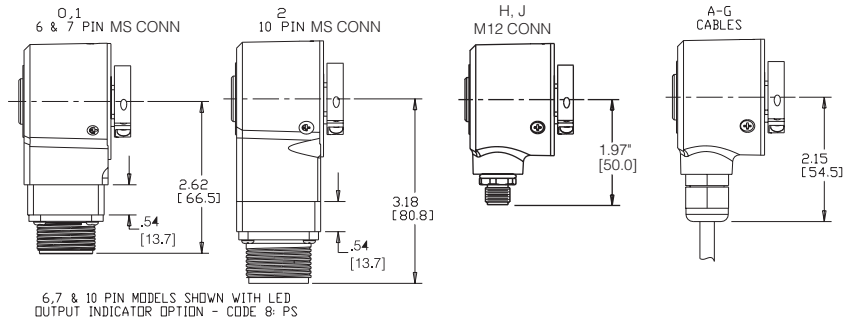
See "Accessories" Section for Connectors and Cable Assemblies Ordering Information

## DIMENSIONS

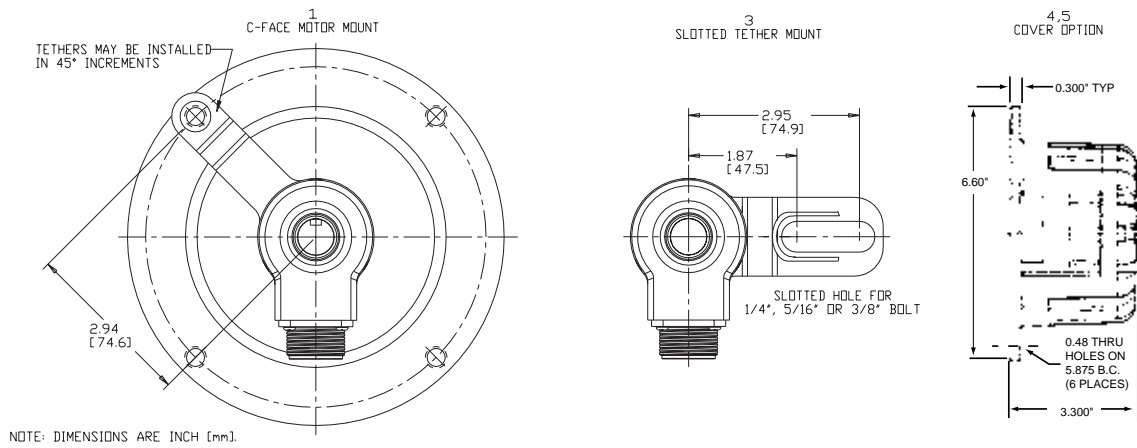
### DIMENSIONS



### CODE 7: TERMINATION



### CODE 4: FIXING



# SERIES HS35

**Dynapar™ brand**

## Sealed Hollowshaft Encoder

### Key Features

- The Original Vector-Duty Hollowshaft Size 35 Encoder
- Electrically Isolated Shaft Sizes up to 1.25"
- Multitude of Configurations and Accessories Available
- Hazardous Location Certification Available



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental

**Resolution:** 1 to 2500 PPR (pulses/revolution)

**Accuracy:** (worst case any edge to any other edge)  $\pm 7.5$  arc-min.

**Format:** Two channel quadrature (AB) with optional Index (Z) and complementary outputs

**Phase Sense:** A leads B for CW shaft rotation

**Quadrature Phasing:**  $90^\circ \pm 22.5^\circ$  electrical

**Symmetry:**  $180^\circ \pm 18^\circ$  electrical

**Index:**  $180^\circ \pm 18^\circ$  electrical (gated with B low)

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

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

### ELECTRICAL

**Input Power:** (each output)  
4.5 min. to 26 VDC max. at 100 mA max., not including output loads

#### Outputs:

7273 Open Collector: 30 VDC max., 40 mA sink max.

7272 Push-Pull and Differential Line Driver: 40 mA sink or source

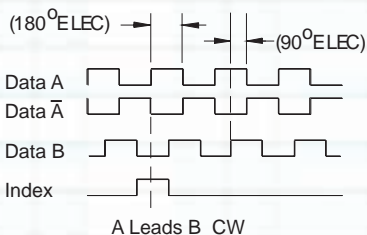
4469 Differential Line Driver: 100 mA sink or source

**Frequency Response:** 100 kHz min.

**Electrical Protection:** Overvoltage, reverse voltage and output short circuit protected

**Noise Immunity:** Tested to EN61326 (Industrial) for Electro Static Discharge, Radio Frequency Interference, Electrical Fast Transients, Conducted and Magnetic Interference

**DATA AND INDEX**  
Not all complements shown.  
A shown for reference



#### 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)
- 5 pin, style M12: Cable with connector available
- 8 pin, style M12: Cable with connector available

#### MECHANICAL

**Bearing Life:** 80,000 hours at 3600 RPM; 128,000 hours at 1800 RPM

**Shaft Loading:** 40 lbs. radial, 30 lbs. axial

**Shaft Speed:** 3600 RPM max. (Important: see Operating Temperature derating for >1800 RPM)

**Shaft Bore Tolerance:** Nominal +0.0003" +0.0005" (+0.008/+0.013 mm)

#### Mating Shaft Requirements:

- Runout:  $\pm 0.025"$  (0.63 mm) radial typical ;
- Endplay:  $\pm 0.050"$  (1.27 mm) axial typical ;
- Minimum: 1.25" (32 mm) recommended;
- Maximum: 2.0" (51 mm) to fit inside cover;
- Solid shaft recommended; keyway allowed; flatted shaft should not be used

**Starting Torque:** 5.0 oz-in max.

**Running Torque:** 4.5 oz-in max.

#### Moment of Inertia:

$\leq 5/8"$  bore:  $7.9 \times 10^{-4}$  oz-in-sec<sup>2</sup>

$> 5/8"$  bore:  $25.6 \times 10^{-4}$  oz-in-sec<sup>2</sup>

**Weight:** 16 oz. max.

### ENVIRONMENTAL

#### Operating Temperature:

**Standard:** -40 to +70 °C;

**Extended:** -40 to +100 °C;

$\leq 5/8"$  bore: Derate 5 °C per 1000 RPM above 1800 RPM;

$> 5/8"$  bore: Derate 10 °C per 1000 RPM above 1800 RPM.

**Storage Temperature:** -40 to +90 °C

**Shock:** 50 Gs for 11 milliseconds duration

**Vibration:** 5 to 2000 Hz at 20 Gs

**Humidity:** to 98% without condensation

**Enclosure Rating:** NEMA4/IP67

#### Hazardous Location Certification:

Available as Optional Feature. Class I, Division 2, Group A, B, C & D. CSA File No. LR86404





# SERIES HS35

## 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: Fixing	Code 5: Format	Code 6: Output	Code 7: Termination	Code 8: Options
<b>HS35</b>	□□□□	□	□	□	□	□	□□

Ordering Information							
<b>HS35</b> Size 35 heavy-duty, sealed hollowshaft encoder	<b>0001 0500</b>	<b>0</b> 6 mm	<b>0</b> None - customer supplied	<b>0</b> single ended, unidirectional (A)	<b>0</b> 5-26V in, 5-26V open collector out	<b>0</b> 6 pin connector	<b>D2</b> Hazardous Location Certified  available when Code 7 is 2 <b>D3</b> Same as D2 including adapter for CSA Div. 2, Group F & G Certification (see specifications)  <i>Note: Requires use of Mating Cable Assembly 114074-XXXX</i>  available when Code 7 is 0 or 5 and Code 5 is 0-2, or Code 7 is 1, 2, 6, 7: <b>PS</b> LED Output Indicator  <i>Not provided with "Hazardous Location Certified" Option</i>  <b>Leave Blank</b> : No Option
	<b>0003 0512</b>	<b>1</b> 1/4"	<b>1</b> Clearance hole for 3/8" bolt on 5.88" dia. bolt circle (to fit 4-1/2" NEMA C-face)	<b>1</b> single ended, bidirectional (AB)	<b>1</b> 5-26V in, 5-26V open collector out w/ 2.2kΩ pullups	<b>1</b> 7 pin connector	
	<b>0010 0600</b>	<b>2</b> 5/16"	<b>2</b> Clearance hole for 1/2" bolt on 7.25" dia. bolt circle (to fit 8-1/2" NEMA C-face)	available when Code 6 is 3, 4, 5, 6, A or B:	available when Code 5 is 3, 4 or 5:	<b>2</b> 10 pin connector	
	<b>0012 0900</b>	<b>3</b> 8 mm	<b>3</b> Slotted hole for bolt on 2.5" to 4.0" radius (to fit standard AC motor fan cover slots)	<b>3</b> differential, bidirectional (AĀ BB̄)	<b>3</b> 5-26V in, 5V line driver out (7272)	<b>3</b> 12 pin connector	
	<b>0050 1000</b>	<b>4</b> 3/8"	Available when Code 5 is 0-4:	available when Code 6 is 3, 4, 5, 6, A or B and Code 7 is 2, 3, or 7 thru G, J:	<b>4</b> 5-26V in, 5-26V line driver out (7272)	<b>5</b> 6 pin connector, plus mating connector	
	<b>0060 1024</b>	<b>5</b> 10 mm	<b>4</b> Same as '1', w/ cover kit	<b>4</b> differential, bidirectional with index (AĀ BB̄ Z̄Z̄)	<b>5</b> 5-26V in, 5V Differential Line Driver out (4469)	<b>6</b> 7 pin connector, plus mating connector	
	<b>0064 1200</b>	<b>6</b> 12 mm	<b>5</b> Same as '3', w/ cover kit	available when Code 6 is 3, 4, 5, 6, A thru G, J:	<b>6</b> 5-15V in, 5-15 V Differential Line Driver out (4469)	<b>7</b> 10 pin connector, plus mating connector	
	<b>0100 1270</b>	<b>7</b> 1/2"	Available when Code 5 is 5:	<b>5</b> Dual isolated differential, bi-directional w/index (AĀBBZ̄Z̄)	<b>A</b> same as '3' with extended temp. to 100°C	<b>8</b> 12 pin connector, plus mating connector	
	<b>0120 1500</b>	<b>8</b> 5/8"	<b>6</b> Same as '1' w/ dual cover kit		<b>B</b> same as '4' with extended temp. to 100°C	<b>A</b> 18" (.5m) cable	
	<b>0240 1800</b>	<b>9</b> 15 mm	<b>7</b> Same as '3' w/ dual cover kit			<b>B</b> 36" (1m) cable	
<b>0250 2000</b>	<b>A</b> 16 mm				<b>C</b> 72" (2m) cable		
<b>0300 2048</b>	<b>B</b> 19 mm				<b>D</b> 10' (3m) cable		
<b>0360 2400</b>	<b>C</b> 3/4"				<b>F</b> 13" (.3m) cable with 10 pin connector plus mating connector		
<b>2500</b>	<b>D</b> 20 mm				<b>G</b> 13" (.3m) cable		
	<b>E</b> 7/8"				<b>J</b> 8 Pin M12 Connector		
	<b>F</b> 24 mm				available when Code 5 is 0 thru 2		
	<b>G</b> 1"				<b>H</b> 5 Pin M12 Connector		
	<b>H</b> 1-1/8"						
	<b>P</b> 1-1/4"						

- 109473-0001 Tether kit (clearance hole for 3/8" bolt on 5.88" dia. bolt circle)
- 109473-0002 Tether kit (clearance hole for 1/2" bolt on 7.25" dia. bolt circle)
- 109473-0003 Tether kit (slotted hole for bolt on 2.5" to 4.0" radius)
- 112121-0001 Spare Hub Clamp (Bore size Code 3: 0 - 9)
- 112121-0002 Spare Hub Clamp (Bore size Code 3: A - H)
- 110533-0001 Cover Kit, 56C face

- 110533-0002 Cover Kit, fan cover
- 110533-0003 Dual Cover Kit, 56C face
- 110533-0004 Dual Cover Kit, fan cover
- 114064-0001 Adapter Kit, CSA Division 2, Group F & G, Cert.
- 114074-XXXX D3 Mating Cable Assembly. "XXXX" denotes length in feet; example -0010 equals 10 feet.

### 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
- 1400635-0010** 10 Pin MS, Cable Assy. For Use with Differential Line Driver with Index Outputs
- 112123-0010** 6 Pin MS, Cable Assy. For Use with Differential Line Driver without Index Outputs
- 108615-0010** 12 Pin CCW MS, Cable Assy.

### 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)

# SERIES HS35

**Dynapar™ brand**

## ELECTRICAL CONNECTIONS

### 6, 7 & 10 Pin MS Connectors and Cables - Code 7= 0 to 8, A to G

Connector & mate/accessory cable assembly pin numbers and wire color information is provided here for reference. HS35 models with direct cable exit carry the same color coding as shown for each output configuration.

Encoder Function	Cable #108594-* 6 Pin Single Ended		Cable #112123-* 6 Pin Dif Line Drv w/o Id x		Cable #108596-* 7 Pin Dif Line Drv w/o Id x		Cable #108595-* 7 Pin (If Used)		Cable #1400635-* 10 Pin (If Used)		Cable #108615-* 12 Pin CCW (If Used)	
	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color
Sig. A	E	BRN	E	BRN	A	BRN	A	BRN	A	BRN	5	BRN
Sig. B	D	ORN	D	ORN	B	ORN	B	ORN	B	ORN	8	ORN
Sig. Z	C	YEL	—	—	—	—	C	YEL	C	YEL	3	YEL
Power +V	B	RED	B	RED	D	RED	D	RED	D	RED	12	RED
N/C	F	—	—	—	—	—	E	—	E	—	7	—
Com	A	BLK	A	BLK	F	BLK	F	BLK	F	BLK	10	BLK
Case	—	—	—	—	G	GRN	G	GRN	G	GRN	9	—
Sig. $\bar{A}$	—	—	C	BRN/WHT	C	BRN/WHT	—	—	H	BRN/WHT	6	BRN/WHT
Sig. $\bar{B}$	—	—	F	ORN/WHT	E	ORN/WHT	—	—	I	ORN/WHT	1	ORN/WHT
Sig. $\bar{Z}$	—	—	—	—	—	—	—	—	J	YEL/WHT	4	YEL/WHT
0V Sense	—	—	—	—	—	—	—	—	—	—	2	GRN
5V Sense	—	—	—	—	—	—	—	—	—	—	11	BLK/WHT

### 5 & 8 Pin M12 Accessory Cables when Code 7= 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-* 8Pin 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. $\bar{A}$	—	—	—	—	3	BRN/WHT
Sig. $\bar{B}$	—	—	—	—	5	ORG/WHT
†Sig. $\bar{Z}$	—	—	—	—	8	YEL/WHT

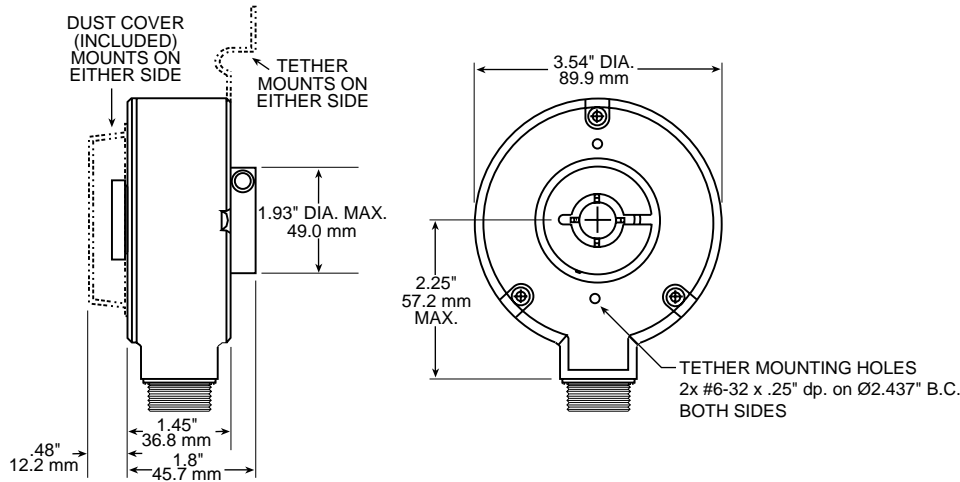
**Cable Configuration:** PVC jacket, 105 °C rated, overall foil shield; 24 AWG conductors, minimum

\*Note: 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.

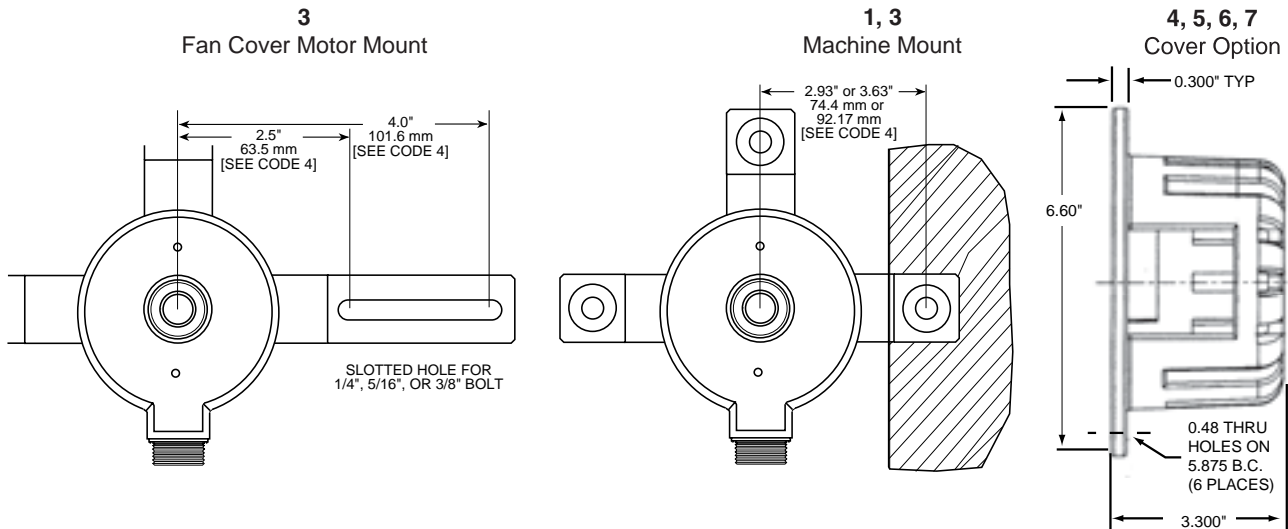
†Note: Index not provided on all models. See ordering information

See “Accessories” Section for Connectors and Cable Assemblies Ordering Information

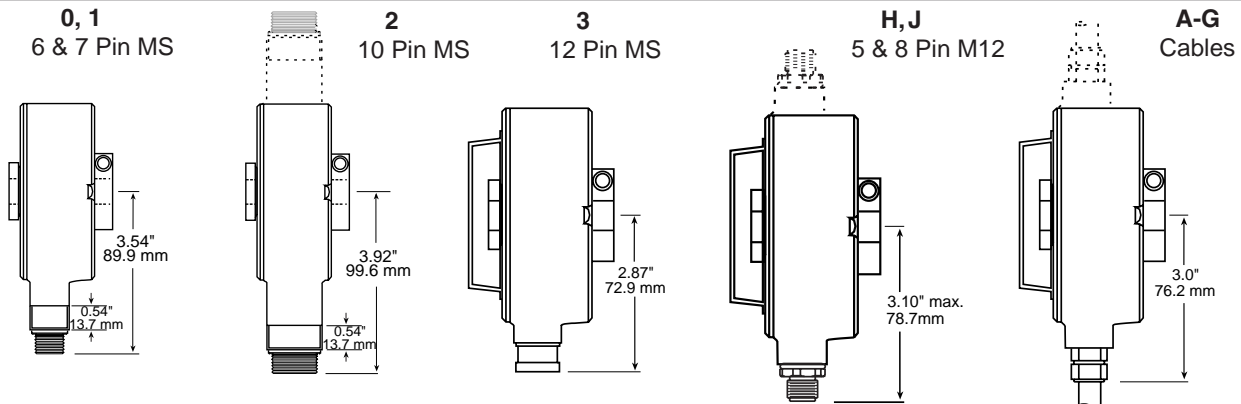
**DIMENSIONS**



**Code 4: Fixing**



**Code 7: Termination**



6 & 7 Pin and 10 Pin shown with LED Output Indicator Option - Code 8: PS

# SERIES HS35R

# Dynapar™ brand

## Sealed Hollowshaft Encoder

### Key Features

- Phased Array Sensor for Reliable Signal Output
- Rugged Design Withstands up to 400g Shock
- Unbreakable Code Disc up to 5000PPR
- Improved Seal Design for Increased Moisture Resistance



### 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 CW 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, 5-15VDC. 50 mA max., not including output loads.

**Outputs:** ET7272, ET7273, 4469

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

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

**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)

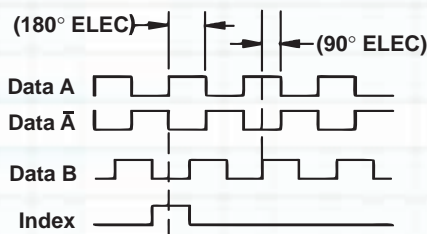
Cable w/ 5 pin M12 connector, p/n 112859-xxx

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

### DATA AND INDEX

Not all complements shown

$\bar{A}$  shown for reference



A leads B, CW (from clamp end)

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

### MECHANICAL

**Shaft Material:** 6061-T6 Aluminum

**Bore Diameter:** 6mm to 28mm, 1.4" to 1.25", electrically isolated

**Mating Shaft Length:** 1.25", Minimum, 1.60", Recommended

**Shaft Speed:** 6000 RPM, Maximum (Enclosure Rating is IP64 at speed over 5000 RPM)

**Starting torque:** 8.0 in-oz. maximum (at 25°C)

**Running torque:** 5.0 in-oz. maximum (at ambient)

**Bearings:** ABEC 1

**Housing and cover:** Hard Anodized and Powder Coated Aluminum

**Disc material:** Plastic or metal (unbreakable)

**Weight:** 1.76lb (28 Oz) Typical

### ENVIRONMENTAL

**Standard Operating Temperature:** -40 to +85°C (0 to +70°C with 4469 line driver, see "Ordering Information"). At shaft speed above 3000 RPM, derate 10°C per 1000 RPM

**Extended Temperature Range:** -40 to +100°C (See ordering information)

**Storage temperature:** -40 to +100°C

**Shock:** 400g, 6mSec

**Vibration:** 5 to 3000 Hz, 20g

**Humidity:** 100%

**Enclosure Rating:** IP67 (IP64 at shaft speed above 5000 RPM)

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



# SERIES HS35R

## 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: Fixing	Code 5: Output Format	Code 6: Termination	Code 7: Options
<b>HS35R</b>	□□□□	□	□	□	□	□□
<b>Ordering Information</b>						
<b>HS35R</b> Industrial-duty, hollowshaft encoder	<b>0001 0500</b> <b>0003 0512</b> <b>0010 0600</b> <b>0012 0900</b> <b>0015 1000</b> <b>0032 1024</b> <b>0050 1200</b> <b>0060 1500</b> <b>0100 2000</b> <b>0120 2048</b> <b>0200 2400</b> <b>0240 2500</b> <b>0250 3072</b> <b>0300 4000</b> <b>0360 4096</b> <b>5000</b>	<b>0</b> 6mm <b>1</b> 1/4" <b>2</b> 5/16" <b>3</b> 8mm <b>4</b> 3/8" <b>5</b> 10mm <b>6</b> 12mm <b>7</b> 1/2" <b>8</b> 5/8" <b>9</b> 15mm <b>A</b> 16mm <b>C</b> 19mm <b>D</b> 3/4" <b>E</b> 20mm <b>F</b> 7/8" <b>G</b> 24mm <b>H</b> 1" <b>J</b> 1-1/8" <b>K</b> 1-1/4" <b>M</b> 14mm <b>N</b> 18mm <b>P</b> 25mm <b>R</b> 28mm	<b>0</b> None <b>1</b> 4.5" C-face tether <b>2</b> 8.5" C-face tether <b>3</b> Slotted tether (to fit standard AC motor fan cover)  Not available when Code 5 is D,E,F,G, Q, R <b>4</b> Same as 1 w/cover <b>5</b> Same as 3 w/cover  Not available when Code 5 is 0 through C or H through P <b>6</b> Same as 1 w/dual cover <b>7</b> Same as 3 w/dual cover	<b>0</b> ABZ, 5-26VDC push-pull <b>1</b> ABZ, 5-26VDC O/C <b>2</b> ABZ, 5-26VDC O/C w2.2kOhm <b>H</b> Same as "0" with Extended temp range <b>J</b> Same as "1" with Extended temp range <b>K</b> Same as "2" with Extended temp range  Not available when Code 6 is H <b>4</b> Differential AB only, 5-26VDC, 5-26VDC out (7272) <b>5</b> Differential AB only, 5-26VDC in, 5VDC out (7272) <b>A</b> Differential AB only, 5-26VDC in, 5VDC out (4469) <b>C</b> Differential AB only, 5-15VDC in, 5-15VDC out (4469) <b>L</b> Same as "4" with Extended temp range <b>M</b> Same as "5" with Extended temp range  Not available when Code 6 is 0, 1, 5, 6, or H <b>6</b> Differential ABZ, 5-26VDC in, 5VDC out (7272) <b>7</b> Differential ABZ, 5-26VDC in, 5-26VDC out (7272) <b>8</b> Differential ABZ, 5-26VDC in, 5VDC out (4469) <b>9</b> Differential ABZ, 5-15VDC in, 5-15VDC out (4469) <b>D</b> Dual isolated outputs, same as "6" <b>E</b> Dual isolated outputs, same as "7" <b>F</b> Dual isolated outputs, same as "8" <b>G</b> Dual isolated outputs, same as "9" <b>N</b> Same as "6" with Extended temp range <b>P</b> Same as "7" with Extended temp range <b>Q</b> Same as "D" with Extended temp range <b>R</b> Same as "E" with Extended temp range	<b>0</b> 6 pin <b>1</b> 7 pin <b>2</b> 10 pin <b>3</b> 12 pin <b>4</b> 10 pin bayonet <b>5</b> 6 pin+mating <b>6</b> 7 pin+mating <b>7</b> 10 pin+mating <b>8</b> 12 pin+mating <b>9</b> 10pin bayonet+mating <b>A</b> 0.5m (18") cable <b>C</b> 1m (36") cable <b>D</b> 2m (72") cable <b>E</b> 3m (120") cable <b>F</b> 0.3m (13") cable with 10 pin connector and mate <b>G</b> 0.3m (13") cable <b>H</b> 5 pin M12 <b>J</b> 8 pin M12	<b>01</b> Reverse Phasing (A leads B, CCW)  Not available when Code 6 is 3, 8, A through J or when Code 5 is 4, 5, 6, 7, 8, 9, A, C, D, E, F, G, L, M, N, P, Q, R and Code 6 is 0 or 5 <b>PS</b> LED Output

**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 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)

**Accessory Kits:**

- 114573-0001** Tether Kit, 4.5" C-face single point with 3/8" bolt
- 114574-0001** Tether Kit, Slotted with T-bolts for standard AC motor fan covers
- 114575-0001** 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

# SERIES HS35R

**Dynapar™ brand**

## ELECTRICAL CONNECTIONS

### 6, 7 & 10 Pin MS Connectors and Cables - Code 6 = 0 to 9, A to G

Connector & mate/accessory cable assembly pin numbers and wire color information is provided here for reference. Models with direct cable exit carry the same color coding as shown for each output configuration.

Encoder Function	Cable #108594-* 6 Pin Single Ended		Cable #112123-* 6 Pin Dif Line Drv w/o ldx		Cable #108596-* 7 Pin Dif Line Drv w/o ldx		Cable #108595-* 7 Pin (If Used)		Cable #1400635- or 109209- (NEMA4) 10 Pin Dif Line Drv w/ldx (If Used)		Cable #108615-* 12 Pin CCW (If Used)		Cable #114448-* 10Pin Bayonet	
	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color
	Sig. A	E	BRN	E	BRN	A	BRN	A	BRN	A	BRN	5	BRN	A
Sig. B	D	ORN	D	ORN	B	ORN	B	ORN	B	ORN	8	ORN	B	ORN
Sig. Z	C	YEL	—	—	—	—	C	YEL	C	YEL	3	YEL	C	YEL
Power +V	B	RED	B	RED	D	RED	D	RED	D	RED	12	RED	D	RED
N/C	F	—	—	—	—	—	E	—	E	—	7	—	E	—
Com	A	BLK	A	BLK	F	BLK	F	BLK	F	BLK	10	BLK	F	BLK
Case	—	—	—	—	G	GRN	G	GRN	G	GRN	9	—	G	GRN
Sig. A	—	—	C	BRN/WHT	C	BRN/WHT	—	H	BRN/WHT	6	BRN/WHT	H	BRN/WHT	
Sig. B	—	—	F	ORN/WHT	E	ORN/WHT	—	I	ORN/WHT	1	ORN/WHT	J	ORN/WHT	
Sig. Z	—	—	—	—	—	—	—	J	YEL/WHT	4	YEL/WHT	K	YEL/WHT	
0V Sense	—	—	—	—	—	—	—	—	—	2	GRN	—	—	
5V 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.

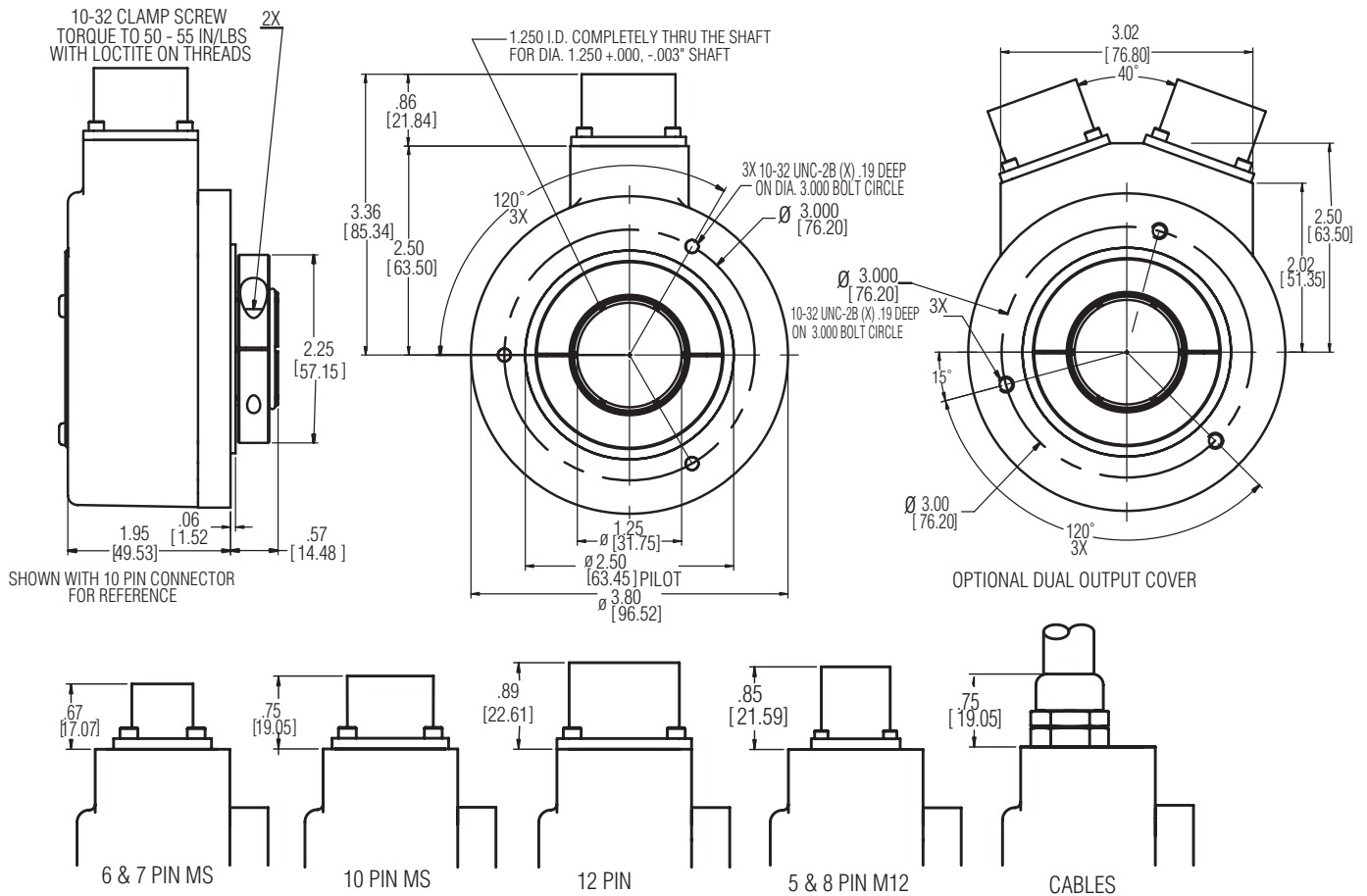
Encoder Function	Cable # 112859- 5 Pin Single Ended		Cable # 112860- 8 Pin Single Ended		Cable # 112860- 8Pin Differential	
	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color
Sig. A	4	BLK	1	BRN	1	BRN
Sig. B	2	WHT	4	ORG	4	ORG
†Sig. Z	5	GRY	6	YEL	6	YEL
Power +V	1	BRN	2	RED	2	RED
Com	3	BLU	7	BLK	7	BLK
Sig. A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

† Index not provided on all models. See ordering information

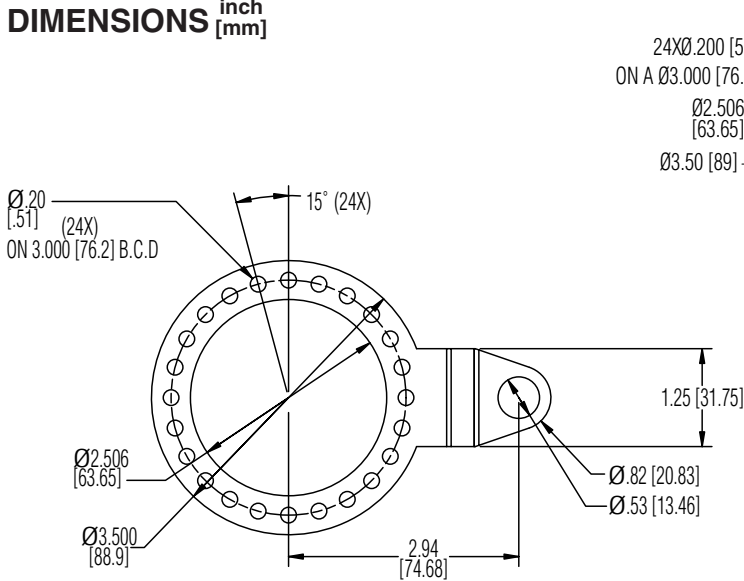
Cable Configuration: PVC jacket, 105 °C rated, overall foil shield; 24 AWG conductors, minimum

- \* 1) Note: 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.

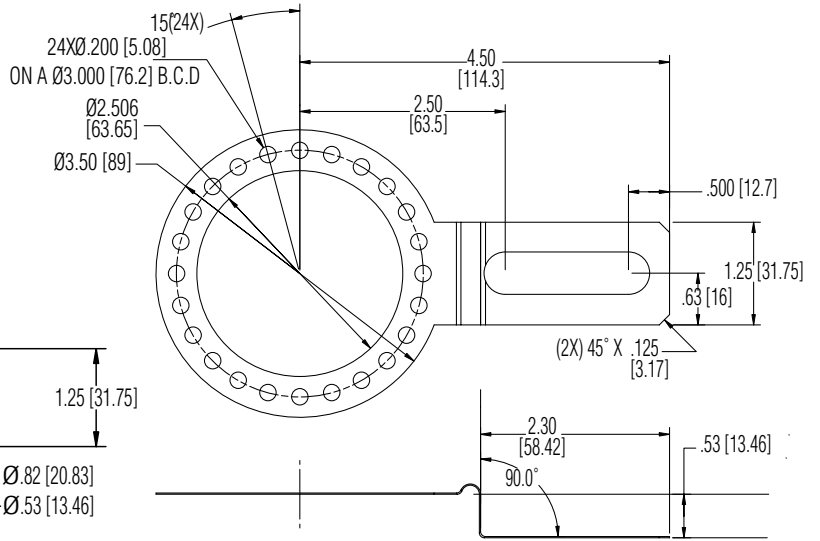
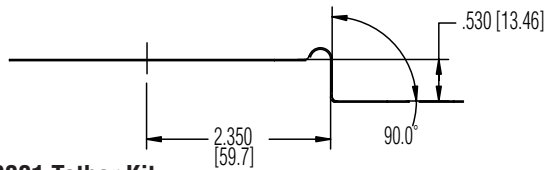
## DIMENSIONS inch [mm]



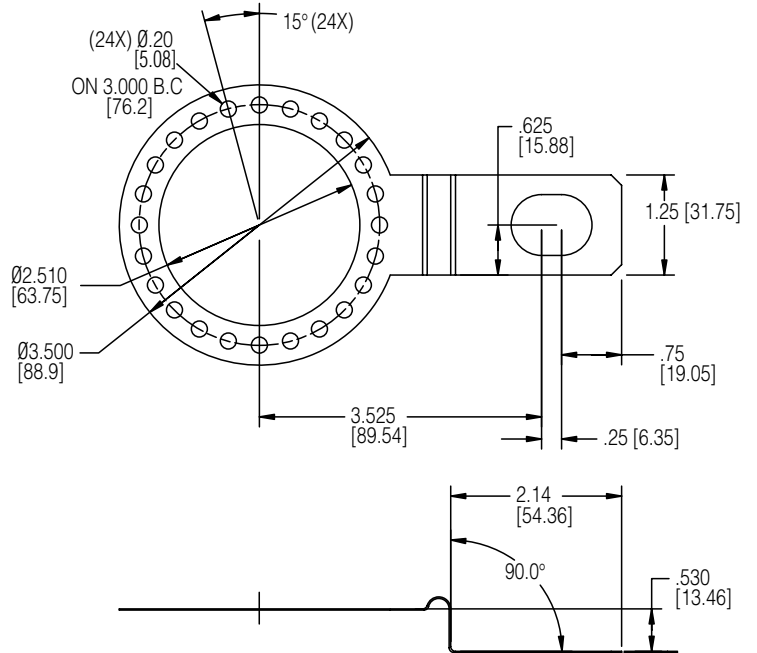
**DIMENSIONS** <sup>inch</sup>  
[mm]



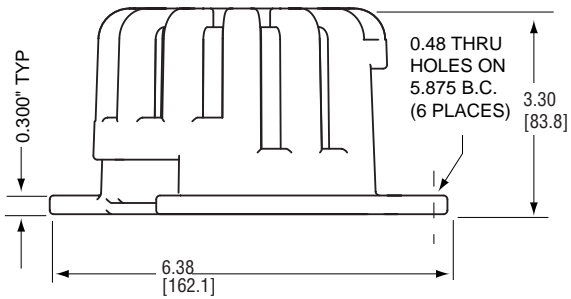
**114573-0001 Tether Kit**



**114574-0001 Slotted Tether Kit**



**114575-0001 Tether Kit**



OPTIONAL SAFETY COVER(S)

# SERIES RI80E

**Hengstler™ brand**

## Hollowshaft Encoder

### Key Features

- **Advanced Opto-ASIC Provides Fault Detection**
- **Oversized Bearings for Long Life**
- **Unbreakable Code Disc**
- **Specifically Designed for Elevator Geared Traction Drives**



## SPECIFICATIONS

### MECHANICAL

**Shaft fixation:** Keyway, set screw  
**Coupling:** Spring tether (single, double)  
**Protection:** IP50, IP64  
**Max. Speed:** 3600 min<sup>-1</sup> (IP50); 1500 min<sup>-1</sup> (IP64)  
**Moment of inertia:** 240 kgmm<sup>2</sup>  
**Max. parallel shaft misalignment:**  
 Axial: ± 0.5 mm  
 Radial: ± 0.05 mm  
**Operating temperature:** -20 ... +70 °C  
**Storage temperature:** -40 ... +70 °C  
**Housing Material:** Glass fiber-reinforced plastic/  
 aluminum  
**Weight:** 1000 g

### ELECTRICAL

**General design:** As per DIN EN 61010, protection class III, Contamination level 2, over voltage class II  
**Supply voltage:** DC 5V ±10% or DC 5-30V<sup>1</sup>  
**Max. current:** w/o load max 60mA (DC 5V), 60mA (DC 10V), 35mA (DC 24V)  
**Standard output versions:**  
 With RS 422 (R): A, B, N,  $\bar{A}$ ,  $\bar{B}$ ,  $\bar{N}$ , Alarm, Sense  
 With push-pull (K): A, B, N, Alarm  
 With push-pull (I): A, B, N,  $\bar{A}$ ,  $\bar{B}$ ,  $\bar{N}$ , Alarm, Sense  
**Connection:** Sub-D 15-pole, cable radial

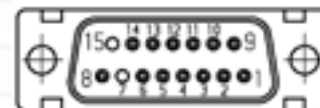
<sup>1</sup> Pole protection with supply voltage DC 5 ... 30 V

### ELECTRICAL CONNECTIONS

Pin	Signal 15 pole	Signal 9 pole
1	$\bar{B}$	GND
2	B	+Ub
3	$\bar{A}$	A
4	A	B
5	GND	N
6	+Ub	$\bar{A}$
7	n.c.	$\bar{B}$
8	screen	$\bar{N}$
9	$\bar{N}$	
10	N	
11	n.c.	
12	n.c.	
13	n.c.	
14	n.c.	
15	n.c.	

Color	RS 422 + Alarm + Sense (R)	Push-pull (K)	Push-pull Complement. (I)
brown	Channel A	Channel A	Channel A
green	Channel $\bar{A}$ Channel		$\bar{A}$
grey	Channel B	Channel B	Channel B
pink	Channel $\bar{B}$ Channel		$\bar{B}$
red	Channel N	Channel N	Channel N
black	Channel $\bar{N}$ Channel		$\bar{N}$
violet	Alarm	Alarm	Alarm
white	Sense GND		Sense GND
blue	Sense V <sub>CC</sub>		Sense V <sub>CC</sub>
brown/green	DC 5 - 30 V	DC 5 - 30 V	DC 5 - 30 V
white/green	GND	GND	GND
screen <sup>1</sup>	screen <sup>1</sup>	screen <sup>1</sup>	screen <sup>1</sup>

<sup>1</sup> connected with encoder housing





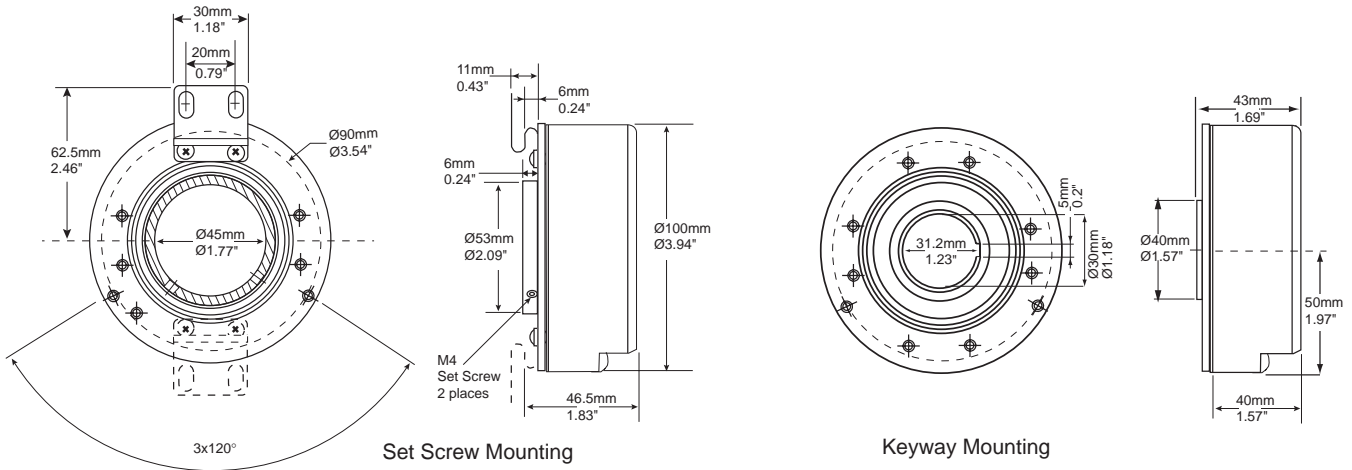
**Ordering Information**

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

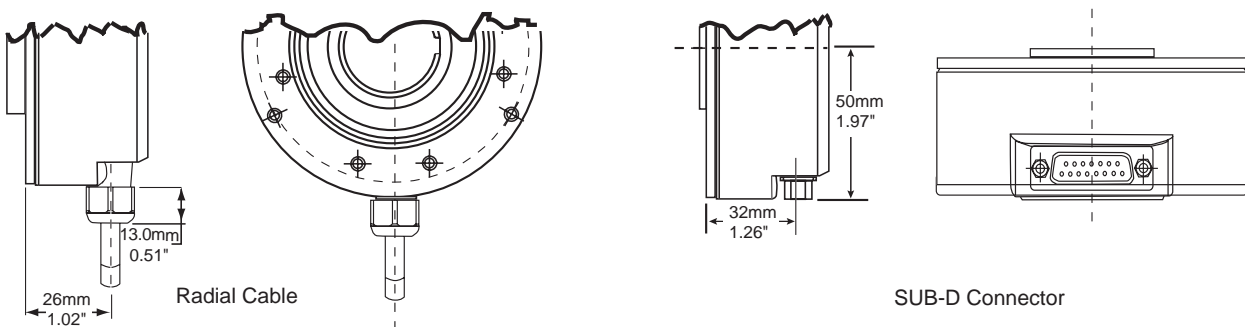
Code 1: Model	Code 2: Resolution	Code 3: Voltage	Code 4: Mounting	Code 5: Protection	Code 6: Shaft Fixing	Code 7: Shaft Size	Code 8: Output	Code 9: Connection	Code 10: Cable Length
Ordering Information									
RI80E	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
RI80E	1024 2048 4096 5000	A 5 VDC B 5-30VDC	O No Tether A Single Tether B Dual Tether	0 IP40 1 IP50 4 IP64	K Keyway G Setscrew	30 30mm 32 32mm 38 38mm 45 45mm	I Push-Pull, Diff+Alarm with Voltage B K Push-Pull + Alarm with Voltage B R RS422 + Alarm with Voltage A or B	F Radial Cable 3 9 pin d-Sub Connector 4 15 pin d-Sub Connector	Blank 1.5m (standard) DO 3m FO 5m KO 10m PO 15m UO 20m VO 25m

**DIMENSIONS**

**Codes 4, 6: Tether, Mounting/Shaft**



**Code 8: Connections**



# SERIES HA26

# Dynapar™ brand

## Integral Coupling Encoder

### Key Features

- Industry Standard 2.5" Rugged Encoder Size
- Integral Coupling and Flange Provide Thermal and Electrical Isolation
- Field Replaceable Coupling



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental

**Resolution:** 1 to 2540 PPR (pulses/revolution)

**Accuracy:** (worst case any edge to any other edge)  $\pm 2.5$  arc-min.

**Format:** Two channel quadrature (AB) with optional Index (Z) and complementary outputs

**Phase Sense:** A leads B for CW or CCW shaft rotation as viewed from the shaft end of the encoder; see Ordering Information

**Quadrature Phasing:**  $90^\circ \pm 22.5^\circ$  electrical

**Symmetry:**  $180^\circ \pm 18^\circ$  electrical

**Index:**  $180^\circ \pm 18^\circ$  electrical (gated with B low)

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

### ELECTRICAL

**Input Power:**

4.5 min. to 26 VDC max. at 80 mA max., not including output loads

**Outputs:**

7273 Open Collector: 30 VDC max., 40 mA sink max.

7272 Push-Pull and Differential Line Driver: 40 mA sink or source

4469 Differential Line Driver: 100 mA sink or source

**Frequency Response:** 100 kHz min.

**Electrical Protection:** Overvoltage, reverse voltage and output short circuit protected

**Noise Immunity:** Tested to EN61326 (Industrial) for Electro Static Discharge, Radio Frequency Interference, Electrical Fast Transients, Conducted and Magnetic Interference

**Mating Connector:**

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

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

5 pin, style M12: Cable with connector available

8 pin, style M12: Cable with connector available

### MECHANICAL

**Shafts coupling:** accepts 1/4", 3/8" and 1/2" motor or machinery shafts

**Shafts alignment:** 0.002" max. TIR runout; 0.005" max. radial offset;  $3^\circ$  max. angular

**Shaft Speed:** 5,000 RPM max.

**Starting Torque:** (max at 25 °C) 1.0 oz-in;

**Moment of Inertia:**  $4.3 \times 10^{-4}$  oz-in-sec<sup>2</sup>

### ENVIRONMENTAL

**Operating Temperature:**

Standard: 0 to +70 °C;

Extended: -40 to +85 °C

**Storage Temperature:** -40 to +90 °C

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

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

**Humidity:** to 98% without condensation

**Enclosure Rating:** NEMA12/IP54 (dirt tight, splashproof)



# SERIES HA26

## Ordering Information

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

Code 1: Model	Code 2: PPR	Code 3: Mechanical	Code 4: Output	Code 5: Electrical	Code 6: Termination	Code 7: Options
<b>HA526</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>HA526</b> Size 25 with Integral Coupling and Flange Adapter, Glass Code Disk	<b>0001 0600</b> <b>0005 0625</b> <b>0010 0635</b> <b>0012 0720</b> <b>0050 0800</b> <b>0060 0900</b> <b>0100 1000</b> <b>0120 1024</b> <b>0150 1200</b> <b>0180 1250</b> <b>0200 1270</b> <b>0240 1500</b> <b>0250 1600</b> <b>0256 1800</b> <b>0300 1968</b> <b>0360 2000</b> <b>0400 2048</b> <b>0500 2400</b> <b>0512 2500</b> <b>2540</b>	<b>A</b> Flange Adapter with Pilot <b>B</b> Flange Adapter without Pilot <b>C</b> Flange Adapter for NEMA Size 42 Motors	<b>7 Pin Connector or Cable</b> <b>0</b> Single Ended, no Index, Format A, Table 1 <b>1</b> Single Ended, with Index, Format A, Table 1 <b>4</b> Single Ended, with Index, Format B, Table 1 <b>A</b> Single Ended, with Index, Format C, Table 1 <b>C</b> Single Ended, no Index, Format C, Table 1 <b>G</b> Single Ended, with Index, Format D, Table 1	<b>0</b> 5-26V in; 5-26V Open Collector with 2.2kΩ Pullup out <b>1</b> 5-26V in; 5-26V Open Collector out <b>2</b> 5-26V in; 5V Totem Pole out <b>3</b> 5-26V in; 5V Differential Line Driver out (7272) <b>4</b> 5-26V in; 5-26V Differential Line Driver out (7272) <b>5</b> 5-26V in, 5 V Differential Line Driver out (4469) <b>6</b> 5-15V in, 5-15 V Differential Line Driver out (4469)	<b>0</b> End Mount Connector <b>1</b> Side Mount Connector <b>2</b> 18" Cable, Side <b>3</b> 3' Cable, Side <b>4</b> 6' Cable, Side <b>5</b> 10' Cable, Side <b>6</b> 15' Cable, Side	available when Code 4 is 0 thru G, and Code 6 is 0 or 1:  <b>PS</b> LED Output Indicator
			<b>10 Pin Connector or Cable</b> <b>2</b> Differential, no Index, Format A, Table 2 <b>3</b> Differential, with Index, Format A, Table 2 <b>5</b> Differential, with Index, Format B, Table 2 <b>B</b> Differential, with Index Format C, Table 2 <b>D</b> Differential, no Index, Format C, Table 2			
			<b>5 Pin M12 Connector</b> <b>H</b> Single ended, no index, Format A, Table 4 <b>J</b> Single ended, with index, Format A, Table 4 <b>K</b> Single ended, with index, Format B, Table 4 <b>L</b> Single ended, with index, Format C, Table 4 <b>M</b> Single ended, no index, Format C, Table 4 <b>N</b> Single ended, with index, Format D, Table 4			
			<b>8 Pin M12 Connector</b> <b>P</b> Single ended, no index, Format A, Table 5 <b>Q</b> Single ended, with index, Format A, Table 5 <b>R</b> Single ended, with index, Format B, Table 5 <b>S</b> Single ended, with index, Format C, Table 5 <b>T</b> Single ended, no index, Format C, Table 5 <b>U</b> Single ended, with index, Format D, Table 5 <b>V</b> Differential, no index, Format A, Table 6 <b>W</b> Differential, with index, Format A, Table 6 <b>X</b> Differential, with index, Format B, Table 6 <b>Y</b> Differential, with index, Format C, Table 6 <b>Z</b> Differential, no index, Format C, Table 6	<b>A</b> Same as "0" with extend. temp range <b>B</b> Same as "1" with extend. temp range <b>C</b> Same as "2" with extend. temp range <b>D</b> Same as "3" with extend. temp range <b>E</b> Same as "4" with extend. temp range		
605512-0020 Flexible Coupling 3/8"; 1/4", 3/8", 1/2"						

#### 10 foot Cable Assemblies with MS Connector

**1400431-0010** 7 Pin MS, Cable Assy. For Use with Single Ended w/Index Outputs

**1400635-0010** 10 Pin MS, Cable Assy. For Use with Differential Line Driver with Index Outputs

#### 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)

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

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

## ELECTRICAL CONNECTIONS

### Prewired Cable or Accessory Cables with 7 or 10 Pin MS Connector - when Code 4= 0 to 5, or A, B, C, D or G

Note: Wire color codes are referenced here for models that are specified with pre-wired cable. Connector/cables are described in the Encoder Accessories section of this catalog and color-coding information is provided here for reference.

Pin	Function (If Used)	Wire Color Code	Cable* Accessory Color Code
A	Signal A	BRN	RED
B	Signal B	ORN	BLUE
C	Signal Z	YEL	YEL
D	Power Source	RED	WHT
E	No Connection	—	GRN
F	Common	BLK	BLK
G	Case	GRN	SHIELD

\*Cable Accessory: P/N 14004310010

Pin	Function (If Used)	Wire Color Code	Cable* Accessory Color Code
A	Signal A	BRN	BRN
B	Signal B	ORN	ORN
C	Signal Z	YEL	YEL
D	Power Source	RED	RED
E	No Connection	—	—
F	Common	BLK	BLK
G	Case	GRN	GRN
H	Signal $\bar{A}$	BRN/WH	BRN/WH
I	Signal $\bar{B}$	ORN/WH	ORN/WH
J	Signal $\bar{Z}$	YEL/WH	YEL/WH

\*Cable Accessory: P/N 14006350010

**Cable Configuration:** PVC jacket, 105 °C rated, overall foil shield; 3 twisted pairs 26 AWG (output signals), plus 2 twisted pairs 24 AWG (input power)

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

Encoder Function	Table 4 5 Pin Single Ended		Table 5 8 Pin Single Ended		Table 6 8 Pin Differential	
	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color
<b>Sig. A</b>	4	BLK	1	BRN	1	BRN
<b>Sig. B</b>	2	WHT	4	ORG	4	ORG
<b>*Sig. Z</b>	5	GRY	6	YEL	6	YEL
<b>Power +V</b>	1	BRN	2	RED	2	RED
<b>Com</b>	3	BLU	7	BLK	7	BLK
<b>Sig. <math>\bar{A}</math></b>	—	—	—	—	3	BRN/WHT
<b>Sig. <math>\bar{B}</math></b>	—	—	—	—	5	ORG/WHT
<b>*Sig. <math>\bar{Z}</math></b>	—	—	—	—	8	YEL/WHT

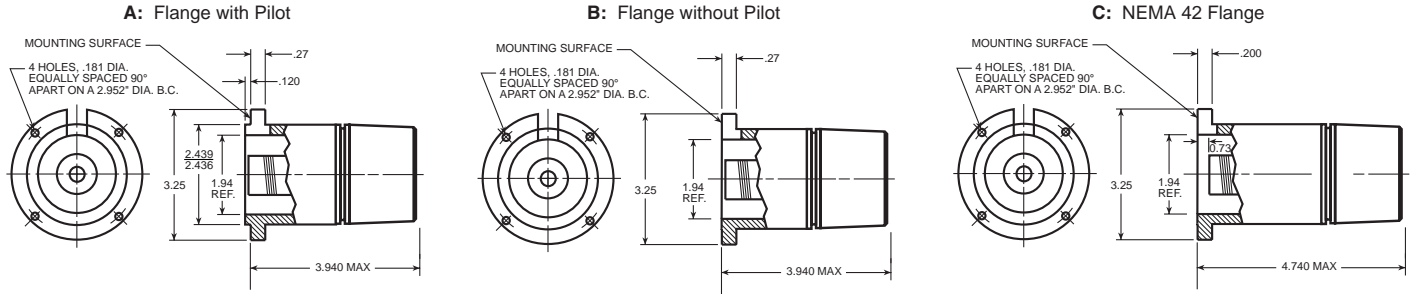
\* Index not provided on all models. See ordering information

**Cable Configuration:** PVC jacket, 105 °C rated, overall foil shield; 24 AWG conductors, minimum

See “Accessories” Section for Connectors and Cable Assemblies Ordering Information

**DIMENSIONS**

**Code 3: Mechanical**



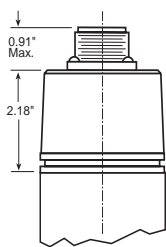
**Mating shaft lengths:** Typically: 0.5" max. available into the coupling as measured from the A/B mounting surface.  
1.3" max. available into the coupling as measured from the C mounting surface.

**Code 4: Output**

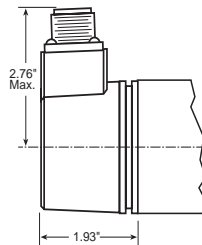


**Code 6: Termination**

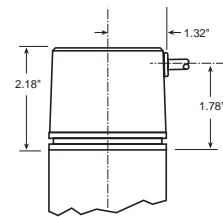
**0: End MS Connector**  
When Code 5 is 0 to 5 or A to G



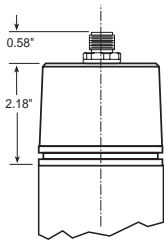
**1: Side MS Connector**  
When Code 5 is 0 to 5 or A to G



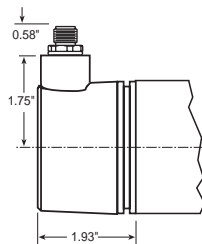
**2 - A: Side Cable**



**0: End M12 Connector**  
When Code 5 is H to Z



**1: Side M12 Connector**  
When Code 5 is H to Z



# SERIES HR26

# Dynapar™ brand

## Integral Coupling Encoder

### Key Features

- **Unbreakable Code Disc with Rugged Dual Row Bearings**
- **Integral Coupling and Flange Provide Thermal and Electrical Isolation**
- **Field Replaceable Coupling**



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental

**Resolution:** 1 to 1024 PPR (pulses/revolution)

**Accuracy:** (worst case any edge to any other edge)  $\pm 7.5$  arc-min.

**Format:** Two channel quadrature (AB) with optional Index (Z) and complementary outputs

**Phase Sense:** A leads B for CW or CCW shaft rotation as viewed from the shaft end of the encoder; see Ordering Information

**Quadrature Phasing:**  $90^\circ \pm 22.5^\circ$  electrical

**Symmetry:**  $180^\circ \pm 18^\circ$  electrical

**Index:**  $180^\circ \pm 18^\circ$  electrical (gated with B low)

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

### ELECTRICAL

**Input Power:**

4.5 min. to 26 VDC max. at 80 mA max., not including output loads

**Outputs:**

7273 Open Collector: 30 VDC max., 40 mA sink max.

7272 Push-Pull and Differential Line Driver: 40 mA sink or source

4469 Differential Line Driver: 100 mA sink or source

**Frequency Response:** 100 kHz min.

**Electrical Protection:** Overvoltage, reverse voltage and output short circuit protected

**Noise Immunity:** Tested to EN61326 (Industrial) for Electro Static Discharge, Radio Frequency Interference, Electrical Fast Transients, Conducted and Magnetic Interference

**Mating Connector:**

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

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

5 pin, style M12: Cable with connector available

8 pin, style M12: Cable with connector available

### MECHANICAL

**Shaft coupling:** accepts 1/4", 3/8" and 1/2" motor or machinery shafts

**Shafts alignment:** 0.002" max. TIR runout; 0.005" max. radial offset;  $3^\circ$  max. angular

**Shaft Speed:** 10,000 RPM max.

**Starting Torque:** (max at 25 °C) 1.0 oz-in

**Moment of Inertia:**  $4.3 \times 10^{-4}$  oz-in-sec<sup>2</sup>

### ENVIRONMENTAL

**Operating Temperature:**

Standard: 0 to +70 °C;

Extended: -40 to +85 °C

**Storage Temperature:** -40 to +90 °C

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

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

**Humidity:** to 98% without condensation

**Enclosure Rating:** NEMA12/IP54 (dirt tight, splashproof)



# SERIES HR26

## Ordering Information

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

Code 1: Model	Code 2: PPR	Code 3: Mechanical	Code 4: Output	Code 5: Electrical	Code 6: Termination	Code 7: Options
<b>HR526</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>HR526</b> Size 25 with Integral Coupling and Flange Adapter	<b>0001 0250</b> <b>0005 0256</b> <b>0010 0300</b> <b>0012 0360</b> <b>0050 0400</b> <b>0060 0500</b> <b>0086 0512</b> <b>0100 0600</b> <b>0120 0635</b> <b>0125 0800</b> <b>0180 0900</b> <b>0200 1000</b> <b>0240 1024</b>	<b>A</b> Flange Adapter with Pilot <b>B</b> Flange Adapter without Pilot <b>C</b> Flange Adapter for NEMA Size 42 Motors	<b>7 Pin Connector or Cable</b> <b>0</b> Single Ended, no Index, Format A, Table 1 <b>1</b> Single Ended, with Index, Format A, Table 1 <b>4</b> Single Ended, with Index, Format B, Table 1 <b>A</b> Single Ended, with Index, Format C, Table 1 <b>C</b> Single Ended, no Index, Format C, Table 1 <b>G</b> Single Ended, with Index, Format D, Table 1	<b>0</b> 5-26V in; 5-26V Open Collector with 2.2kΩ Pullup out <b>1</b> 5-26V in; 5-26V Open Collector out <b>2</b> 5-26V in; 5V Totem Pole out <b>3</b> 5-26V in; 5V Differential Line Driver out (7272) <b>4</b> 5-26V in; 5-26V Differential Line Driver out (7272) <b>5</b> 5-26V in, 5 V Differential Line Driver out (4469) <b>6</b> 5-15V in, 5-15 V Differential Line Driver out (4469)	<b>0</b> End Mount Connector <b>1</b> Side Mount Connector <b>2</b> 18" Cable, Side <b>3</b> 3' Cable, Side <b>4</b> 6' Cable, Side <b>5</b> 10' Cable, Side <b>6</b> 15' Cable, Side	available when Code 4 is 0 thru G, and Code 6 is 0 or 1:  <b>PS</b> LED Output Indicator
			<b>10 Pin Connector or Cable</b> <b>2</b> Differential, no Index, Format A, Table 2 <b>3</b> Differential, with Index, Format A, Table 2 <b>5</b> Differential, with Index, Format B, Table 2 <b>B</b> Differential, with Index Format C, Table 2 <b>D</b> Differential, no Index, Format C, Table 2			
			<b>5 Pin M12 Connector</b> <b>H</b> Single ended, no index, Format A, Table 4 <b>J</b> Single ended, with index, Format A, Table 4 <b>K</b> Single ended, with index, Format B, Table 4 <b>L</b> Single ended, with index, Format C, Table 4 <b>M</b> Single ended, no index, Format C, Table 4 <b>N</b> Single ended, with index, Format D, Table 4			
			<b>8 Pin M12 Connector</b> <b>P</b> Single ended, no index, Format A, Table 5 <b>Q</b> Single ended, with index, Format A, Table 5 <b>R</b> Single ended, with index, Format B, Table 5 <b>S</b> Single ended, with index, Format C, Table 5 <b>T</b> Single ended, no index, Format C, Table 5 <b>U</b> Single ended, with index, Format D, Table 5 <b>V</b> Differential, no index, Format A, Table 6 <b>W</b> Differential, with index, Format A, Table 6 <b>X</b> Differential, with index, Format B, Table 6 <b>Y</b> Differential, with index, Format C, Table 6 <b>Z</b> Differential, no index, Format C, Table 6			
			<b>A</b> Same as "0" with extend. temp range <b>B</b> Same as "1" with extend. temp range <b>C</b> Same as "2" with extend. temp range <b>D</b> Same as "3" with extend. temp range <b>E</b> Same as "4" with extend. temp range			
605512-0020	Flexible Coupling 3/8"; 1/4", 3/8", 1/2"					

**10 foot Cable Assemblies with MS Connector**

- 1400431-0010** 7 Pin MS, Cable Assy. For Use with Single Ended w/Index Outputs
- 1400635-0010** 10 Pin MS, Cable Assy. For Use with Differential Line Driver with Index Outputs

**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)**

- 7 pin, style MS3106A-16S-1S (MCN-N5)
- 10 pin, style MS3106A-18-1S (MCN-N6)

## ELECTRICAL CONNECTIONS

### Prewired Cable or Accessory Cables with 7 or 10 Pin MS Connector - when Code 4= 0 to 5, or A, B, C, D or G

Note: Wire color codes are referenced here for models that are specified with pre-wired cable. Connector/cables are described in the Encoder Accessories section of this catalog and color-coding information is provided here for reference.

Table 1 – Single Ended			
Pin	Function (If Used)	Wire Color Code	Cable Accessory Color Code
A	Signal A	BRN	RED
B	Signal B	ORN	BLUE
C	Signal Z	YEL	YEL
D	Power Source	RED	WHT
E	No Connection	—	GRN
F	Common	BLK	BLK
G	Case	GRN	SHIELD

Cable Accessory: P/N 14004310010

Table 2 – Differential			
Pin	Function (If Used)	Wire Color Code	Cable Accessory Color Code
A	Signal A	BRN	BRN
B	Signal B	ORN	ORN
C	Signal Z	YEL	YEL
D	Power Source	RED	RED
E	No Connection	—	—
F	Common	BLK	BLK
G	Case	GRN	GRN
H	Signal $\bar{A}$	BRN/WH	BRN/WH
I	Signal $\bar{B}$	ORN/WH	ORN/WH
J	Signal $\bar{Z}$	YEL/WH	YEL/WH

Cable Accessory: P/N 14006350010

**Cable Configuration:** PVC jacket, 105 °C rated, overall foil shield; 3 twisted pairs 26 AWG (output signals), plus 2 twisted pairs 24 AWG (input power)

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

Encoder Function	Table 4 5 Pin Single Ended		Table 5 8 Pin Single Ended		Table 6 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. $\bar{A}$	—	—	—	—	3	BRN/WHT
Sig. $\bar{B}$	—	—	—	—	5	ORG/WHT
†Sig. $\bar{Z}$	—	—	—	—	8	YEL/WHT

**Cable Configuration:** PVC jacket, 105 °C rated, overall foil shield; 24 AWG conductors, minimum

\*Note: 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.

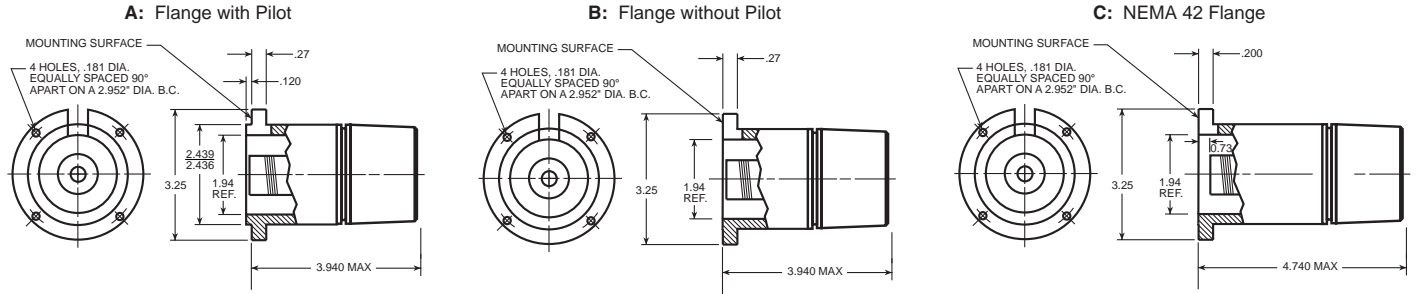
†Note: Index not provided on all models. See ordering information

See “Accessories” Section for Connectors and Cable Assemblies Ordering Information



**DIMENSIONS**

**Code 3: Mechanical**



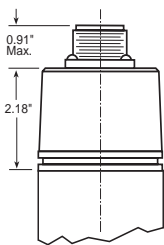
**Mating shaft lengths:** Typically: 0.5" max. available into the coupling as measured from the A/B mounting surface.  
1.3" max. available into the coupling as measured from the C mounting surface.

**Code 4: Output**

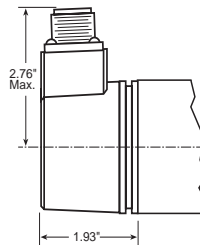


**Code 6: Termination**

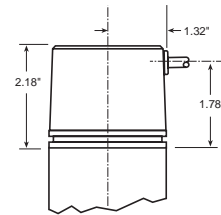
**0: End MS Connector**  
When Code 5 is 0 to 5 or A to G



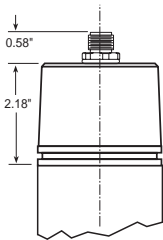
**1: Side MS Connector**  
When Code 5 is 0 to 5 or A to G



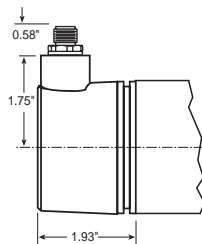
**2 - A: Side Cable**



**0: End M12 Connector**  
When Code 5 is H to Z



**1: Side M12 Connector**  
When Code 5 is H to Z



# SERIES HC26

# Dynapar™ brand

## Integral Coupling Encoder

### Key Features

- High 5000PPR Resolution Available
- Integral Coupling and Flange Provide Thermal and Electrical Isolation
- Field Replaceable Coupling

CE



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental

**Resolution:** 3000 to 5000 PPR (pulses/revolution)

**Accuracy:** (worst case any edge to any other edge)  $\pm 10.8^\circ/\text{PPR}$

**Format:** Two channel quadrature (AB) with optional Index (Z) and complementary outputs  
**Phase Sense:** A leads B for CW or CCW shaft rotation as viewed from the shaft end of the encoder; see Ordering Information

**Quadrature Phasing:**  $90^\circ \pm 25^\circ$  electrical

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

**Index:**  $90^\circ \pm 25^\circ$  electrical (gated with B low)

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

### ELECTRICAL

**Input Power:**

4.5 min. to 26 VDC max. at 80 mA max., not including output loads

**Outputs:**

7273 Open Collector: 30 VDC max., 40 mA sink max.

7272 Push-Pull and Differential Line Driver: 40 mA sink or source

**Frequency Response:** 250 kHz min.

**Electrical Protection:** Overvoltage, reverse voltage and output short circuit protected

**Noise Immunity:** Tested to EN61326 (Industrial) for Electro Static Discharge, Radio Frequency Interference, Electrical Fast Transients, Conducted and Magnetic Interference

**Mating Connector:**

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

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

5 pin, style M12: Cable with connector available

8 pin, style M12: Cable with connector available

### MECHANICAL

**Shafts coupling:** accepts 1/4", 3/8" and 1/2" motor or machinery shafts

**Shafts alignment:** 0.002" max. TIR runout; 0.005" max. radial offset; 3° max. angular

**Shaft Speed:** 10,000 RPM max.

**Starting Torque:** (max at 25 °C) 1.0 oz-in

**Moment of Inertia:**  $4.3 \times 10^{-4}$  oz-in-sec<sup>2</sup>

### ENVIRONMENTAL

**Operating Temperature:**

Standard: 0 to +70 °C;

Extended: -40 to +85 °C

**Storage Temperature:** -40 to +90 °C

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

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

**Humidity:** to 98% without condensation

**Enclosure Rating:** NEMA12/IP54 (dirt tight, splashproof)



# SERIES HC26

## Ordering Information

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

Code 1: Model	Code 2: PPR	Code 3: Mechanical	Code 4: Output	Code 5: Electrical	Code 6: Termination	Code 7: Options
<b>HC526</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>HC526</b> Size 25 Enclosed with Integral Coupling and Flange Adapter	<b>3000</b> 3,000 <b>3600</b> 3,600 <b>4096</b> 4,096 <b>5000</b> 5,000	<b>A</b> Flange Adapter with Pilot <b>B</b> Flange Adapter without Pilot <b>C</b> Flange Adapter for NEMA Size 42 Motors	<b>7 Pin Connector or Cable</b> <b>0</b> Single Ended, no Index, Format A, Table 1 <b>1</b> Single Ended, with Index, Format A, Table 1 <b>4</b> Single Ended, with Index, Format B, Table 1 <b>A</b> Single Ended, with Index, Format C, Table 1 <b>C</b> Single Ended, no Index, Format C, Table 1 <b>G</b> Single Ended, with Index, Format D, Table 1  <b>10 Pin Connector or Cable</b> <b>2</b> Differential, no Index, Format A, Table 2 <b>3</b> Differential, with Index, Format A, Table 2 <b>5</b> Differential, with Index, Format B, Table 2 <b>B</b> Differential, with Index Format C, Table 2 <b>D</b> Differential, no Index, Format C, Table 2  <b>5 Pin M12 Connector</b> <b>H</b> Single ended, no index, Format A, Table 4 <b>J</b> Single ended, with index, Format A, Table 4 <b>K</b> Single ended, with index, Format B, Table 4 <b>L</b> Single ended, with index, Format C, Table 4 <b>M</b> Single ended, no index, Format C, Table 4 <b>N</b> Single ended, with index, Format D, Table 4  <b>8 Pin M12 Connector</b> <b>P</b> Single ended, no index, Format A, Table 5 <b>Q</b> Single ended, with index, Format A, Table 5 <b>R</b> Single ended, with index, Format B, Table 5 <b>S</b> Single ended, with index, Format C, Table 5 <b>T</b> Single ended, no index, Format C, Table 5 <b>U</b> Single ended, with index, Format D, Table 5 <b>V</b> Differential, no index, Format A, Table 6 <b>W</b> Differential, with index, Format A, Table 6 <b>X</b> Differential, with index, Format B, Table 6 <b>Y</b> Differential, with index, Format C, Table 6 <b>Z</b> Differential, no index, Format C, Table 6	<b>0</b> 5-26V in; 5-26V Open Collector with 2.2kΩ Pullup out <b>1</b> 5-26V in; 5-26V Open Collector out <b>2</b> 5-26V in; 5V Totem Pole out <b>3</b> 5-26V in; 5V Differential Line Driver out (7272) <b>4</b> 5-26V in; 5-26V Differential Line Driver out (7272)  <b>A</b> Same as "0" with extend. temp range <b>B</b> Same as "1" with extend. temp range <b>C</b> Same as "2" with extend. temp range <b>D</b> Same as "3" with extend. temp range <b>E</b> Same as "4" with extend. temp range	<b>0</b> End Mount Connector <b>1</b> Side Mount Connector <b>2</b> 18" Cable, Side <b>3</b> 3' Cable, Side <b>4</b> 6' Cable, Side <b>5</b> 10' Cable, Side <b>6</b> 15' Cable, Side	available when Code 4 is 0 thru G, and Code 6 is 0 or 1:  <b>PS</b> LED Output Indicator
	CPLX1250375	Flexible Coupling 3/8" to 1/4", 3/8" or 1/2"				

**10 foot Cable Assemblies with MS Connector**

- 1400431-0010** 7 Pin MS, Cable Assy. For Use with Single Ended w/Index Outputs
- 1400635-0010** 10 Pin MS, Cable Assy. For Use with Differential Line Driver with Index Outputs

**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)**

- 7 pin, style MS3106A-16S-1S (MCN-N5)
- 10 pin, style MS3106A-18-1S (MCN-N6)

## ELECTRICAL CONNECTIONS

### Prewired Cable or Accessory Cables with 7 or 10 Pin MS Connector - when Code 4= 0 to 5, or A, B, C, D or G

Note: Wire color codes are referenced here for models that are specified with pre-wired cable. Connector/cables are described in the Encoder Accessories section of this catalog and color-coding information is provided here for reference.

Pin	Function (If Used)	Wire Color Code	Cable* Accessory Color Code
A	Signal A	BRN	RED
B	Signal B	ORN	BLUE
C	Signal Z	YEL	YEL
D	Power Source	RED	WHT
E	No Connection	—	GRN
F	Common	BLK	BLK
G	Case	GRN	SHIELD

\*Cable Accessory: P/N 14004310010

Pin	Function (If Used)	Wire Color Code	Cable* Accessory Color Code
A	Signal A	BRN	BRN
B	Signal B	ORN	ORN
C	Signal Z	YEL	YEL
D	Power Source	RED	RED
E	No Connection	—	—
F	Common	BLK	BLK
G	Case	GRN	GRN
H	Signal $\bar{A}$	BRN/WH	BRN/WH
I	Signal $\bar{B}$	ORN/WH	ORN/WH
J	Signal $\bar{Z}$	YEL/WH	YEL/WH

\*Cable Accessory: P/N 14006350010

**Cable Configuration:** PVC jacket, 105 °C rated, overall foil shield; 3 twisted pairs 26 AWG (output signals), plus 2 twisted pairs 24 AWG (input power)

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

Encoder Function	Table 4 5 Pin Single Ended		Table 5 8 Pin Single Ended		Table 6 8 Pin Differential	
	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color
<b>Sig. A</b>	4	BLK	1	BRN	1	BRN
<b>Sig. B</b>	2	WHT	4	ORG	4	ORG
<b>†Sig. Z</b>	5	GRY	6	YEL	6	YEL
<b>Power +V</b>	1	BRN	2	RED	2	RED
<b>Com</b>	3	BLU	7	BLK	7	BLK
<b>Sig. <math>\bar{A}</math></b>	—	—	—	—	3	BRN/WHT
<b>Sig. <math>\bar{B}</math></b>	—	—	—	—	5	ORG/WHT
<b>†Sig. <math>\bar{Z}</math></b>	—	—	—	—	8	YEL/WHT

**Cable Configuration:** PVC jacket, 105 °C rated, overall foil shield; 24 AWG conductors, minimum

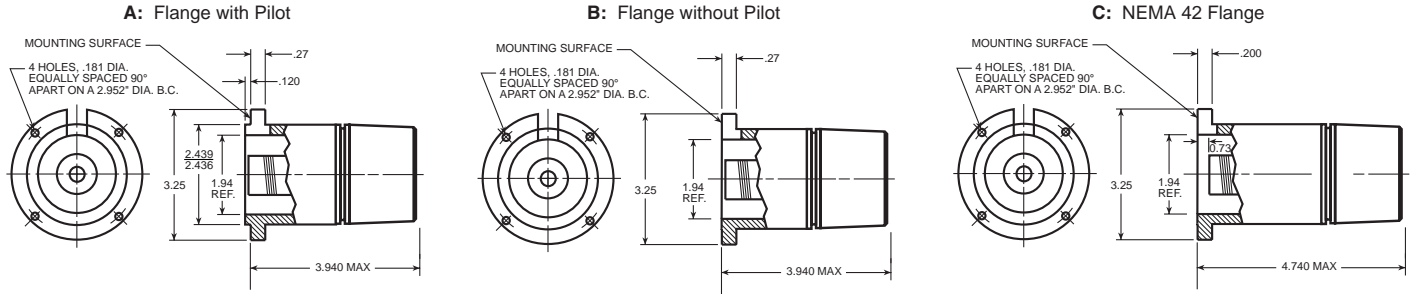
\*Note: Standard cable length is 10 feet but may be ordered in any length in 5 foot increment. For example, -0020 is a 20 foot cable.

†Note: Index not provided on all models. See ordering information

See “Accessories” Section for Connectors and Cable Assemblies Ordering Information

**DIMENSIONS**

**Code 3: Mechanical**



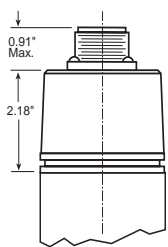
**Mating shaft lengths:** Typically: 0.5" max. available into the coupling as measured from the A/B mounting surface.  
1.3" max. available into the coupling as measured from the C mounting surface.

**Code 4: Output**

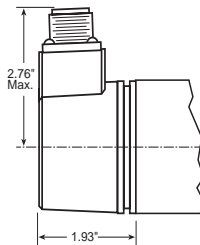


**Code 6: Termination**

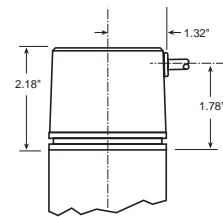
**0: End MS Connector**  
When Code 5 is 0 to 5 or A to G



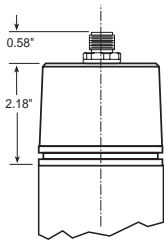
**1: Side MS Connector**  
When Code 5 is 0 to 5 or A to G



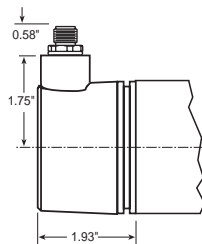
**2 - A: Side Cable**



**0: End M12 Connector**  
When Code 5 is H to Z



**1: Side M12 Connector**  
When Code 5 is H to Z



# SERIES AC36

# ACURO

## Absolute Encoder

### Key Features

- Up to 22 bit Singleturn and 12 bit multiturn true absolute positioning
- Small 38mm diameter housing
- Wide -15 to +100C temperature range



## SPECIFICATIONS

### ELECTRICAL

**Supply Voltage:** -5%/ 10% DC 5 V; DC 7-30 V  
**Max. Current:** w/o load 50 mA (ST), 100 mA (MT)  
**Resolution:** singleturn 12 -17 Bit; multiturn 12 Bit  
**Output Code:** Gray, Binary  
**Drives:** Clock and Data / RS422  
**Incremental signals:** Optional Sine-Cosine 1 Vpp  
**Number of Pulses:** 2048  
**3dB Limiting Frequency:** 500 kHz  
**Alarm Output:** Alarm bit (SSI Option), warning and alarm bit (BiSS)

### MECHANICAL

**Housing Diameter:** 37.5 mm  
**Shaft Diameter:** 6 mm (Solid shaft)  
**Flange (Mounting of housing):** Pilot flange  
**Protection Class Shaft Input (EN 60529):** IP64  
**Protection Class Housing (EN 60529):** IP64  
**Max. Shaft Speed:** 10 000 rpm (continuous), 12 000 rpm (short term)  
**Torque:** 0.01 Nm  
**Moment of Inertia:** ca.  $2.5 \times 10^{-6}$  kgm<sup>2</sup>

### ENVIRONMENTAL

**Vibration Resistance (DIN EN 60068-2-6):** 100 m/s<sup>2</sup> (10 to 2000 Hz)  
**Shock resistance (DIN EN 60068-2-27):** 1000 m/s<sup>2</sup> (6 ms)  
**Operating Temperature:** -40°C to +100°C  
**Storage Temperature:** -15°C to +85°C  
**Weight:** approx. 80 g (ST) / 130 g (MT)  
**Connection:** Cable, axial or radial

### ELECTRICAL CONNECTIONS

SIGNAL	CABLE COLOR
5 / 7-30 V (U <sub>B</sub> )	White
0 V (U <sub>N</sub> )	Brown
Clock	Yellow
Clock	Green
Data	Pink
Data	Grey
A	White/Green <sup>1</sup>
$\bar{A}$	Brown/Green <sup>1</sup>
B	Red/Blue <sup>1</sup>
$\bar{B}$	Grey/Pink <sup>1</sup>
5V Sensor	Violet <sup>1</sup>
0V Sensor	Black <sup>1</sup>

<sup>1</sup>only with "SC"

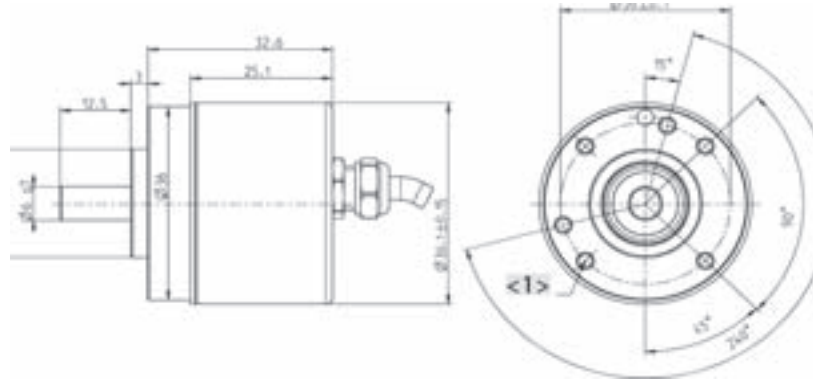
### Ordering Information

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

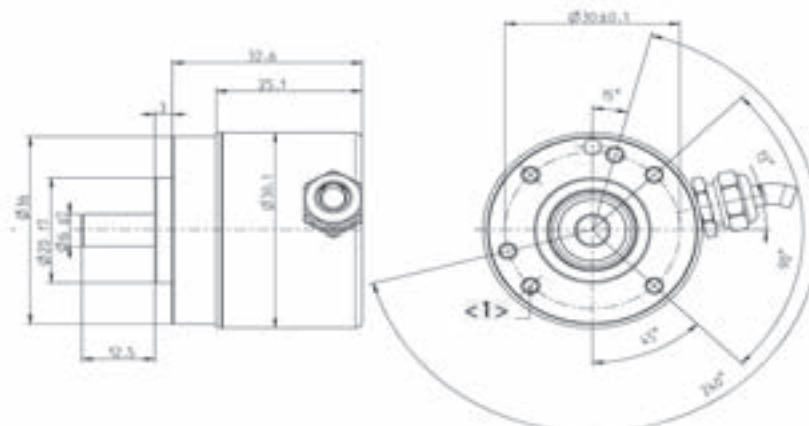
Code 1: Model	Code 2: Resolution	Code 3: Supply Voltage	Code 4: Mounting	Code 5: Protection Class	Code 6: Shaft Size	Code 7: Interface	Code 8: Connection
<b>AC36/</b> □ □ □ □	□ □ □ □	□	□	□	□	□ □	□
Ordering Information							
ACURO Series AC36 Absolute Encoder	<u>Single Turn</u> <b>0012</b> <b>0013</b> <b>0014</b> <b>0017</b> Available when Code 7 is BI <b>0019</b> <b>0022</b> <u>Multiturn</u> <b>1212</b> <b>1213</b> <b>1214</b> <b>1217</b> Available when Code 7 is BI <b>1219</b> <b>1222</b>	<b>A</b> 5 VDC <b>E</b> 7-30 VDC	<b>R</b> Round Flange	<b>4</b> IP 64	<b>1</b> 6mm	<b>BI</b> BISS <b>SB</b> SSI Binary <b>SC</b> SSI Gray + sin/cos 1Vpp <b>SG</b> SSI Gray	<b>A</b> Cable, axial, 1.5m, 12 pole <b>B</b> Cable, radial, 1.5m, 12 pole

### DIMENSIONS

#### Axial



#### Radial



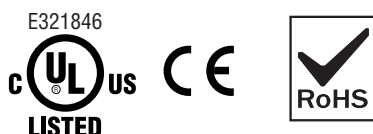
# SERIES AI25 DeviceNet



## Absolute Encoder

### Key Features

- Up to 14 Bit of Singleturn and 12 Bits of True Multiturn Absolute Positioning
- Onboard Diagnostics
- DeviceNet Interface



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Single-turn Resolution:** 10, 12, 13, 14 Bit

**Multi-turn Resolution:** 12 bit

**Linearity:** +/- 1/2 LSB

**Absolute Accuracy:**  $\pm 0.01^\circ$  mechanical (36 arc-sec.)

**Repeatability:**  $\pm 0.002^\circ$  mechanical (7.2 arc-sec.)

**Code format:** Binary  
Electrical

**Connection:** Bus Cover with spring terminal clamps

**Supply voltage:** 10-30 VDC

**Intrinsic current consumption:** 200 mA (ST), 220 mA (MT)

**Baud Rate:** 125, 250, 500 kBaud

**Interface:** CAN Highspeed according to ISO/DIS 11898, CAN Specification 2.0 B (11 and 29 bit identifier)

**Protocol:** According to DeviceNet V2.0

**Transfer mode:**

Poll mode

Bit strobe (time-synchronous for all devices)

Change of State (automatic after change of values) Cyclic, with adjustable cycle timer

### MECHANICAL

**Shaft diameter:**

Shaft: 6 mm (Servo Mount), 10 mm (Clamping

Mount), 3/8" (Square Flange Mount)

Hubshaft: 10mm, 12 mm, 3/8", 1/2"

**Maximum shaft load:**

6 mm shaft: 13 lb axial, 24 lb radial

10 mm shaft: 24 lb axial, 35 lb radial

**Maximum shaft speed:** 10,000 RPM (continuous), 12,000 RPM (peak)

**Starting torque:** < 1.4 in-oz

**Body Diameter:** 58 mm, nominal

**Weight (approx.):** 350 g ST, 400 g MT

**Shaft tolerance (hubshaft only):** +/- 1.5 mm axial, +/- 0.2 mm radial

**Flange configurations:** Square, Clamp, Servo, Hubshaft with flexible tether

**Bearing life:**

1 x 10<sup>10</sup> revolutions at 35% full rated shaft load

1 x 10<sup>9</sup> revolutions at 75% full rated shaft load

1 x 10<sup>8</sup> revolutions at 100% full rated shaft load

### ENVIRONMENTAL

**Operating Temperature:** -40 to 85° C

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

**Enclosure Rating:** IP64 or IP67

**Shock:** 1,000 m/s<sup>2</sup> (6 ms)

**Vibration:** 100 m/s<sup>2</sup> (10 to 2,000 Hz)



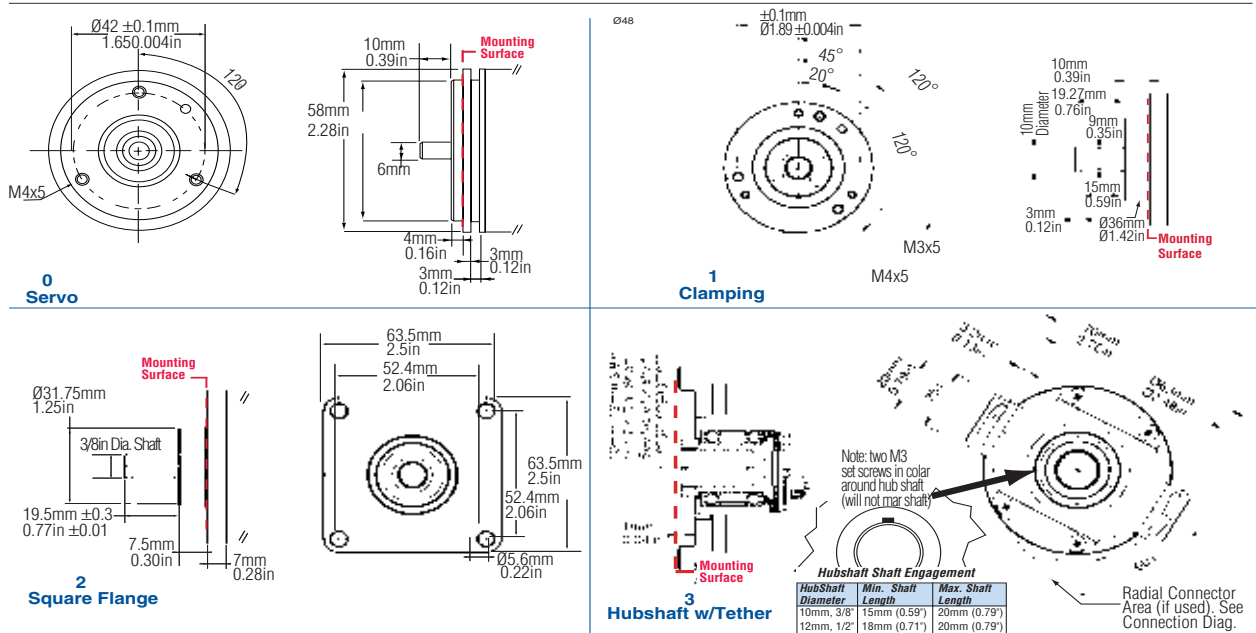
### Ordering Information

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

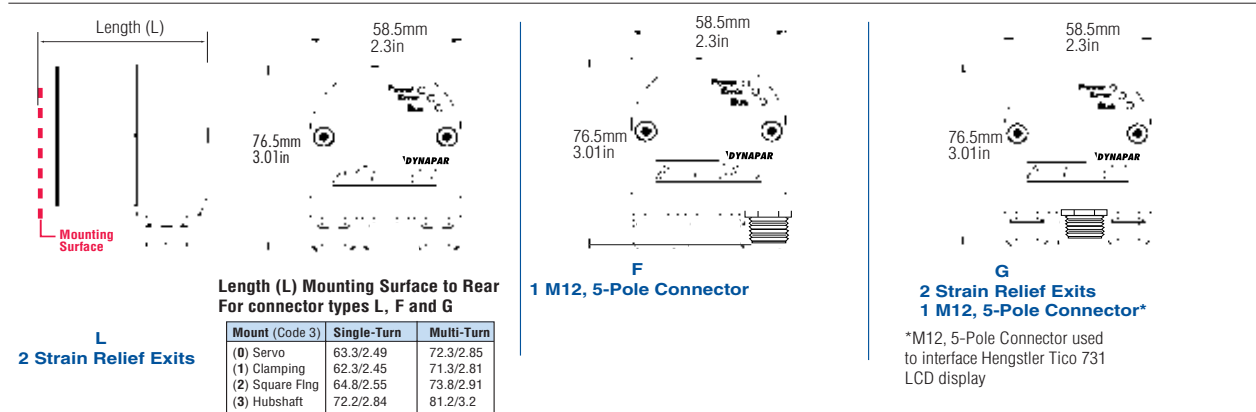
Code 1: Model	Code 2: Bits	Code 3: Mounting	Code 4: Shaft Size	Code 5: Protocol	Code 6: Electrical	Code 7: Connector
<b>AI25</b>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>AI25</b> Size25 Acuro Absolute Encoder	<b>Single-Turn</b> <b>0010</b> 10 Bit <b>0012</b> 12 Bit <b>0013</b> 13 Bit <b>0014</b> 14 Bit  <b>Multi-Turn</b> <b>1212</b> 12 Bit Multi-Turn, 12 Bit Single-Turn <b>1213</b> 12 Bit Multi-Turn, 13 Bit Single-Turn <b>1214</b> 12 Bit Multi-Turn, 14 Bit Single-Turn	Available when Code 4 is 0 or A <b>0</b> Servo*  Available when Code 4 is 2 or C <b>1</b> Clamping*  Available when Code 4 is 1 or B <b>2</b> Square flange**  Available when Code 4 is 3, 4, 5 or 6 <b>3</b> Hubshaft w/tether†	<b>w/o shaft seal (IP64)</b> <b>0</b> 6 mm <b>1</b> 3/8" <b>2</b> 10 mm <b>3</b> 3/8" Hub Shaft <b>4</b> 12 mm Hubshaft <b>5</b> 1/2" Hubshaft <b>6</b> 10 mm Hub Shaft <b>w/ shaft seal (IP67)</b> <b>A</b> 6 mm <b>B</b> 3/8" <b>C</b> 10 mm	<b>9</b> Devicenet	<b>2</b> 10-30 VDC	<b>F</b> Bus Cover 1 M12, 5-Pole Connector  <b>G</b> Bus Cover 2 Strain Relief Exits and 1 M12, 5-Pole Connector (for Tico display). Internal T-coupler included  <b>L</b> Bus Cover 2 Strain Relief Exits. Internal T-coupler included

### DIMENSIONS

Code 3: Mounting



Code 7: Connector



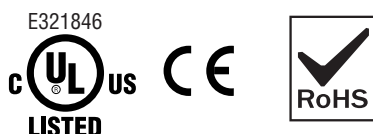
# SERIES AI25 CAN Open

# ACURO

## Absolute Encoder

### Key Features

- Up to 14 Bit of Singleturn and 12 Bits of True Multiturn Absolute Positioning
- Onboard Diagnostics
- CAN Open Interface



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Single-turn Resolution:** 10, 12, 13, 14 Bit

**Multi-turn Resolution:** 12 bit

**Linearity:** +/- 1/2 LSB

**Absolute Accuracy:**  $\pm 0.01^\circ$  mechanical (36 arc-sec.)

**Repeatability:**  $\pm 0.002^\circ$  mechanical (7.2 arc-sec.)

**Code format:** Binary  
Electrical

**Connection:** Bus Cover with spring terminal clamps; 12 pin Conin CW; Cable with Pigtail

**Supply voltage:** 10-30 VDC

**Intrinsic current consumption:** 200 mA (ST), 220 mA (MT)

**Baud Rate:** 125, 250, 500 kBaud

**Interface:** CAN High-Speed according to ISO/DIS 11898.

**Protocol:** CANopen according to DS 301 with profile DSP 406, programmable encoder according to C2

**Transfer mode:**

Poll mode

Bit strobe (time-synchronous for all devices)

Change of State (automatic after change of values) Cyclic, with adjustable cycle timer

### MECHANICAL

**Shaft diameter:**

Shaft: 6 mm (Servo Mount), 10 mm (Clamping

Mount), 3/8" (Square Flange Mount)

Hubshaft: 10mm, 12 mm, 3/8", 1/2"

**Maximum shaft load:**

6 mm shaft: 13 lb axial, 24 lb radial

10 mm shaft: 24 lb axial, 35 lb radial

**Maximum shaft speed:** 10,000 RPM (continuous), 12,000 RPM (peak)

**Starting torque:** < 1.4 in-oz

**Body Diameter:** 58 mm, nominal

**Weight (approx.):** 350 g ST, 400 g MT

**Shaft tolerance (hubshaft only):** +/- 1.5 mm axial, +/- 0.2 mm radial

**Flange configurations:** Square, Clamp, Servo,

Hubshaft with flexible tether

**Bearing life:**

1 x 10<sup>10</sup> revolutions at 35% full rated shaft load

1 x 10<sup>9</sup> revolutions at 75% full rated shaft load

1 x 10<sup>8</sup> revolutions at 100% full rated shaft load

### ENVIRONMENTAL

**Operating Temperature:** -40 to 85° C

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

**Enclosure Rating:** IP64 or IP67

**Shock:** 1,000 m/s<sup>2</sup> (6 ms)

**Vibration:** 100 m/s<sup>2</sup> (10 to 2,000 Hz)

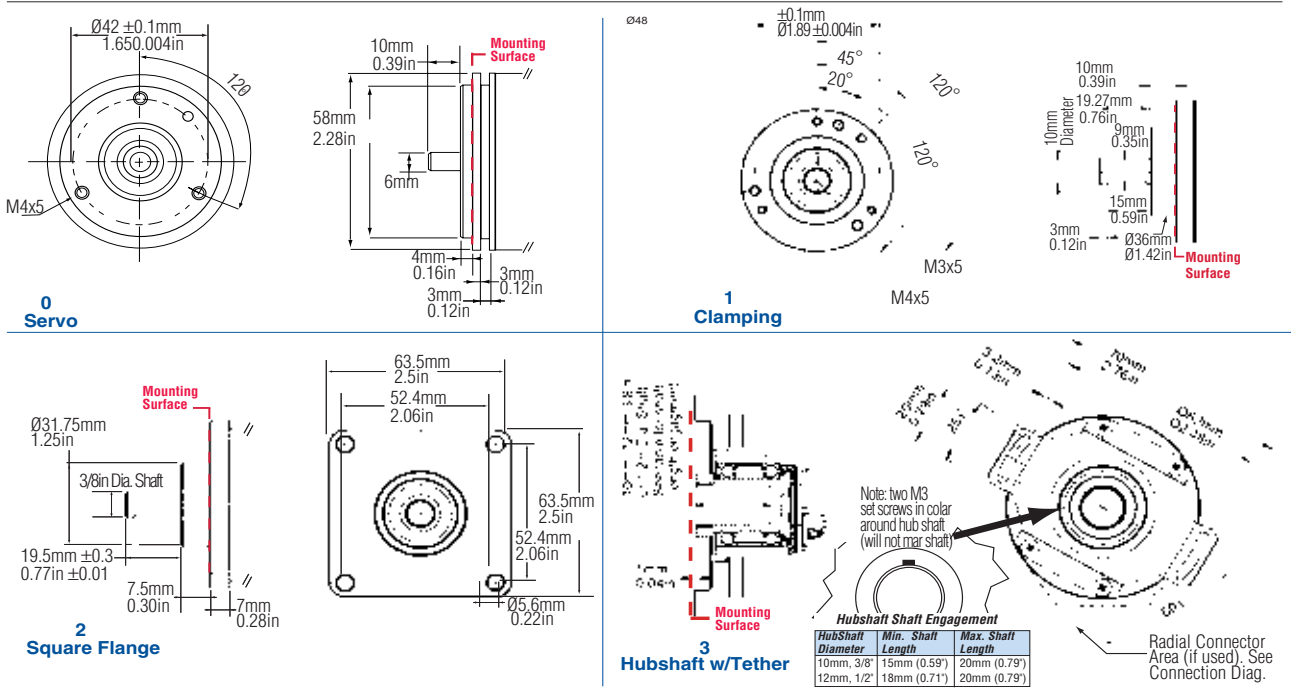
**Ordering Information**

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

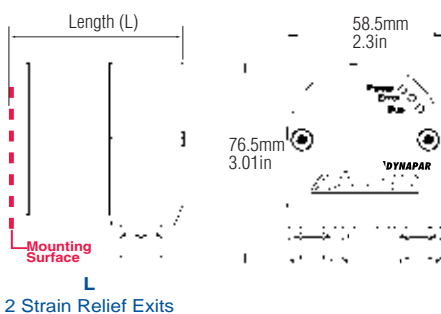
Code 1: Model	Code 2: Bits	Code 3: Mounting	Code 4: Shaft Size	Code 5: Protocol	Code 6: Electrical	Code 7: Connector
<b>AI25</b>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>AI25</b> Size25 Acuro Absolute Encoder	<b>Single-Turn</b> <b>0010</b> 10 Bit <b>0012</b> 12 Bit <b>0013</b> 13 Bit <b>0014</b> 14 Bit  <b>Multi-Turn</b> <b>1212</b> 12 Bit Multi-Turn, 12 Bit Single-Turn <b>1213</b> 12 Bit Multi-Turn, 13 Bit Single-Turn <b>1214</b> 12 Bit Multi-Turn, 14 Bit Single-Turn	Available when Code 4 is 0 or A <b>0</b> Servo*  Available when Code 4 is 2 or C <b>1</b> Clamping*  Available when Code 4 is 1 or B <b>2</b> Square flange**  Available when Code 4 is 3, 4, 5 or 6 <b>3</b> Hubshaft w/tether†	<b>w/o shaft seal (IP64)</b> <b>0</b> 6 mm <b>1</b> 3/8" <b>2</b> 10 mm <b>3</b> 3/8" Hub Shaft <b>4</b> 12 mm Hubshaft <b>5</b> 1/2" Hubshaft <b>6</b> 10 mm Hub Shaft  <b>w/ shaft seal (IP67)</b> <b>A</b> 6 mm <b>B</b> 3/8" <b>C</b> 10 mm	<b>8</b> CANopen	<b>2</b> 10-30 VDC	<b>0</b> 1.5m Axial Cable <b>1</b> 1.5m Radial Cable <b>2</b> M23 Conin 12 pin Axial CW <b>3</b> M23 Conin 12 pin Radial CW  <b>F</b> Bus Cover 1 M12, 5-Pole Connector  <b>L</b> Bus Cover 2 Strain Relief Exits. Internal T-coupler included

**DIMENSIONS**

Code 3: Mounting



Code 7: Connector



Length (L) Mounting Surface to Rear For connector types L, and F

Mount (Code 3)	Single-Turn	Multi-Turn
(0) Servo	63.3/2.49	72.3/2.85
(1) Clamping	62.3/2.45	71.3/2.81
(2) Square Flange	64.8/2.55	73.8/2.91
(3) Hubshaft	72.2/2.84	81.2/3.2

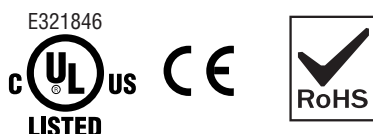
# SERIES AI25 CANLayer 2

# ACURO

## Absolute Encoder

### Key Features

- Up to 14 Bit of Singleturn and 12 Bits of True Multiturn Absolute Positioning
- Onboard Diagnostics
- CANbus CAN Layer 2 Interface



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Single-turn Resolution:** 10, 12, 13, 14 Bit

**Multi-turn Resolution:** 12 bit

**Linearity:** +/- 1/2 LSB

**Absolute Accuracy:**  $\pm 0.01^\circ$  mechanical (36 arc-sec.)

**Repeatability:**  $\pm 0.002^\circ$  mechanical (7.2 arc-sec.)

**Code format:** Binary  
Electrical

**Connection:** Bus Cover with spring terminal clamps; 12 pin Conin CW; Cable with Pigtail

**Supply voltage:** 10-30 VDC

**Intrinsic current consumption:** 220 mA (ST), 250 mA (MT)

**Baud Rate:** Range of 10 through 1000 Kbits/s

**Interface:** CAN High-Speed according to ISO/DIS 11898

**Protocol:** CAN 2.0A

### MECHANICAL

**Shaft diameter:**

Shaft: 6 mm (Servo Mount), 10 mm (Clamping

Mount), 3/8" (Square Flange Mount)

Hubshaft: 10mm, 12 mm, 3/8", 1/2"

**Maximum shaft load:**

6 mm shaft: 13 lb axial, 24 lb radial

10 mm shaft: 24 lb axial, 35 lb radial

**Maximum shaft speed:** 10,000 RPM (continuous), 12,000 RPM (peak)

**Starting torque:** < 1.4 in-oz

**Body Diameter:** 58 mm, nominal

**Weight (approx.):** 350 g ST, 400 g MT

**Shaft tolerance (hubshaft only):** +/- 1.5 mm axial, +/- 0.2 mm radial

**Flange configurations:** Square, Clamp, Servo,

Hubshaft with flexible tether

**Bearing life:**

1 x 10<sup>10</sup> revolutions at 35% full rated shaft load

1 x 10<sup>9</sup> revolutions at 75% full rated shaft load

1 x 10<sup>8</sup> revolutions at 100% full rated shaft load

### ENVIRONMENTAL

**Operating Temperature:** -40 to 85° C

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

**Enclosure Rating:** IP64 or IP67

**Shock:** 1,000 m/s<sup>2</sup> (6 ms)

**Vibration:** 100 m/s<sup>2</sup> (10 to 2,000 Hz)

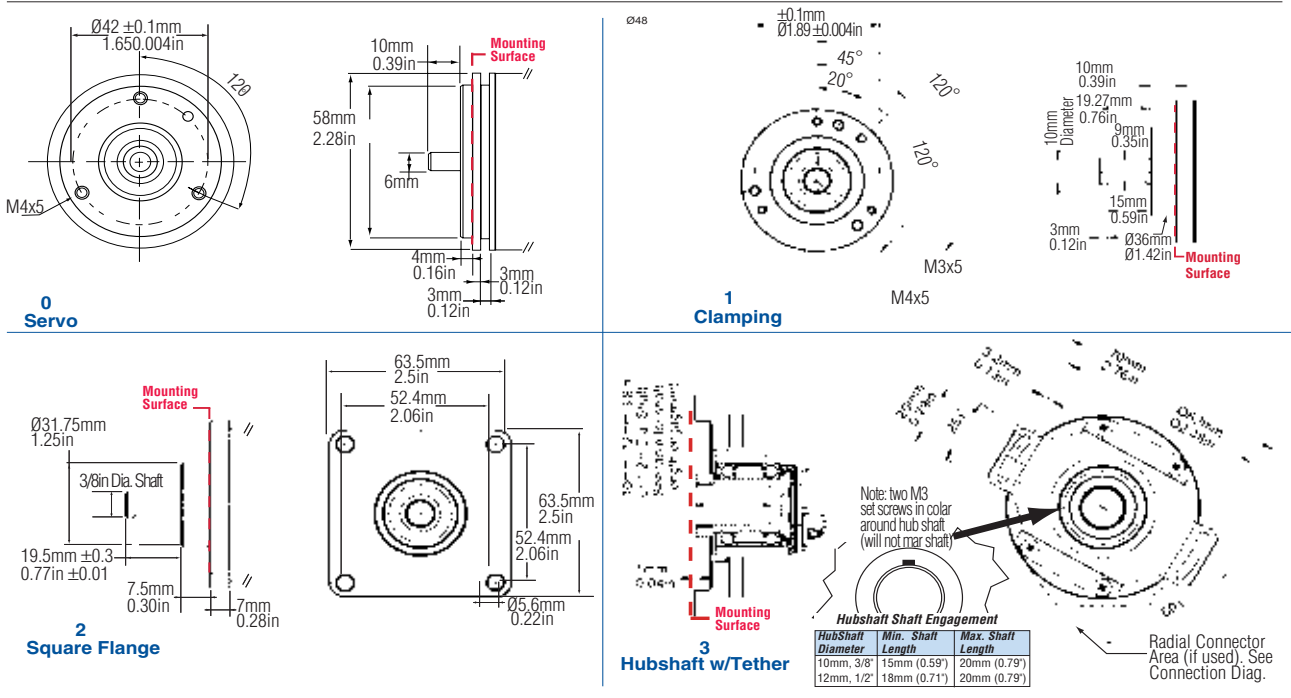
**Ordering Information**

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

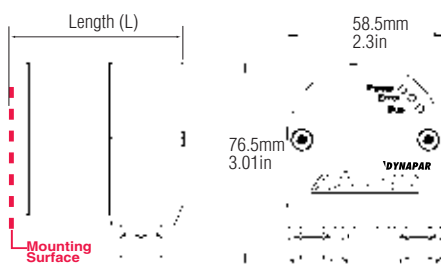
Code 1: Model	Code 2: Bits	Code 3: Mounting	Code 4: Shaft Size	Code 5: Protocol	Code 6: Electrical	Code 7: Connector
<b>AI25</b>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>AI25</b> Size25 Acuro Absolute Encoder	<b>Single-Turn</b> <b>0010</b> 10 Bit <b>0012</b> 12 Bit <b>0013</b> 13 Bit <b>0014</b> 14 Bit  <b>Multi-Turn</b> <b>1212</b> 12 Bit Multi-Turn, 12 Bit Single-Turn <b>1213</b> 12 Bit Multi-Turn, 13 Bit Single-Turn <b>1214</b> 12 Bit Multi-Turn, 14 Bit Single-Turn	Available when Code 4 is 0 or A <b>0</b> Servo*  Available when Code 4 is 2 or C <b>1</b> Clamping*  Available when Code 4 is 1 or B <b>2</b> Square flange**  Available when Code 4 is 3, 4, 5 or 6 <b>3</b> Hubshaft w/tether†	<b>w/o shaft seal (IP64)</b> <b>0</b> 6 mm <b>1</b> 3/8" <b>2</b> 10 mm <b>3</b> 3/8" Hub Shaft <b>4</b> 12 mm Hubshaft <b>5</b> 1/2" Hubshaft <b>6</b> 10 mm Hub Shaft  <b>w/ shaft seal (IP67)</b> <b>A</b> 6 mm <b>B</b> 3/8" <b>C</b> 10 mm	<b>7</b> CAN L2	<b>2</b> 10-30 VDC	<b>0</b> 1.5m Axial Cable <b>1</b> 1.5m Radial Cable <b>2</b> M23 Conin 12 pin Axial CW <b>3</b> M23 Conin 12 pin Radial CW  <b>F</b> Bus Cover 1 M12, 5-Pole Connector  <b>L</b> Bus Cover 2 Strain Relief Exits. Internal T-coupler included

**DIMENSIONS**

Code 3: Mounting



Code 7: Connector



Length (L) Mounting Surface to Rear For connector types L, and F

Mount (Code 3)	Single-Turn	Multi-Turn
(0) Servo	63.3/2.49	72.3/2.85
(1) Clamping	62.3/2.45	71.3/2.81
(2) Square Flange	64.8/2.55	73.8/2.91
(3) Hubshaft	72.2/2.84	81.2/3.2

L  
 2 Strain Relief Exits

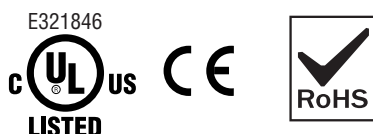
# SERIES AI25 Profibus

# ACURO

## Absolute Encoder

### Key Features

- Up to 14 Bit of Singleturn and 12 Bits of True Multiturn Absolute Positioning
- Onboard Diagnostics
- Profibus Interface



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Single-turn Resolution:** 10, 12, 13, 14 Bit  
**Multi-turn Resolution:** 12 bit  
**Linearity:** +/- 1/2 LSB  
**Absolute Accuracy:**  $\pm 0.01^\circ$  mechanical (36 arc-sec.)  
**Repeatability:**  $\pm 0.002^\circ$  mechanical (7.2 arc-sec.)  
**Code format:** Binary  
 Electrical  
**Connection:** Bus Cover with spring terminal clamps  
**Supply voltage:** 10-30 VDC  
**Intrinsic current consumption:** 200 mA (ST), 220 mA (MT)  
**Baud Rate:** 12 Mbaud  
**Interface:** Profibus-DP, Encoder Profile  
**Programmable:** According to Class 2  
**Special Functions:** Speed, Acceleration

### MECHANICAL

**Shaft diameter:**  
 Shaft: 6 mm (Servo Mount), 10 mm (Clamping Mount), 3/8" (Square Flange Mount)  
 Hubshaft: 10mm, 12 mm, 3/8", 1/2"  
**Maximum shaft load:**  
 6 mm shaft: 13 lb axial, 24 lb radial  
 10 mm shaft: 24 lb axial, 35 lb radial  
**Maximum shaft speed:** 10,000 RPM (continuous), 12,000 RPM (peak)  
**Starting torque:** < 1.4 in-oz  
**Weight (approx.):** 350 g ST, 400 g MT  
**Shaft tolerance (hubshaft only):** +/- 1.5 mm axial, +/- 0.2 mm radial  
**Flange configurations:** Square, Clamp, Servo, Hubshaft with flexible tether  
**Bearing life:**  
 1 x  $10^{10}$  revolutions at 35% full rated shaft load  
 1 x  $10^9$  revolutions at 75% full rated shaft load  
 1 x  $10^8$  revolutions at 100% full rated shaft load

### ENVIRONMENTAL

**Operating Temperature:** -40 to 85° C  
**Storage Temperature:** -40 to 100° C  
**Enclosure Rating:** IP64 or IP67  
**Shock:** 1,000 m/s<sup>2</sup> (6 ms)  
**Vibration:** 100 m/s<sup>2</sup> (10 to 2,000 Hz)

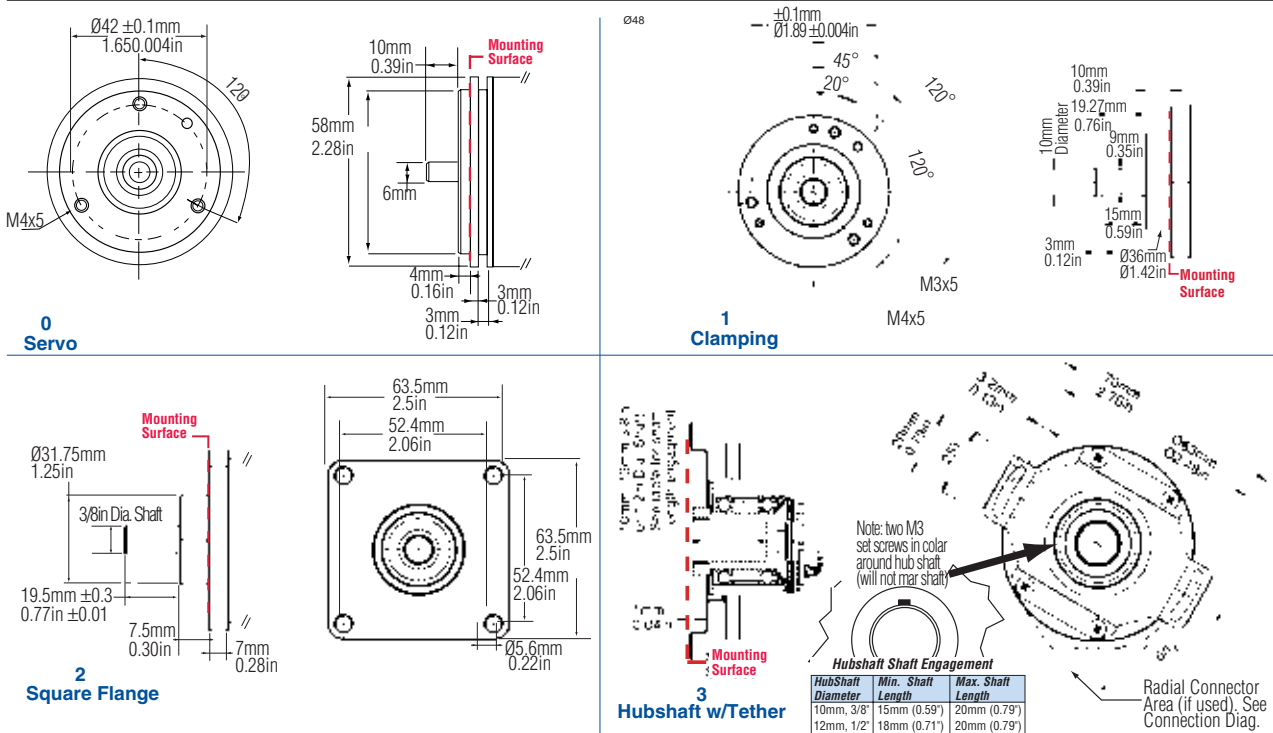
**Ordering Information**

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

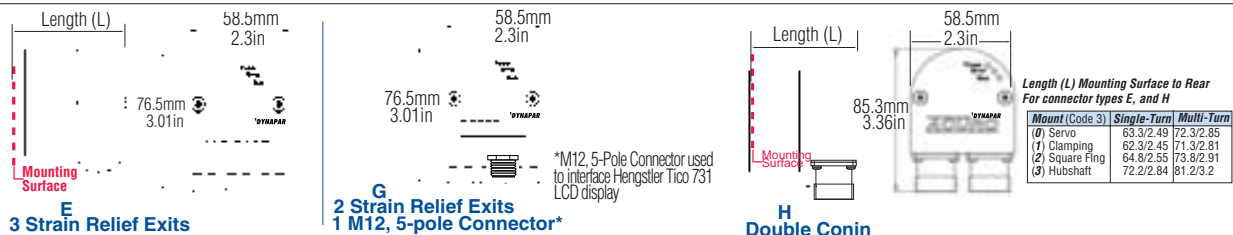
Code 1: Model	Code 2: Bits	Code 3: Mounting	Code 4: Shaft Size	Code 5: Protocol	Code 6: Electrical	Code 7: Connector
<b>AI25</b>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>AI25</b> Size25 Acuro Absolute Encoder	<b>Single-Turn</b> <b>0010</b> 10 Bit <b>0012</b> 12 Bit <b>0013</b> 13 Bit <b>0014</b> 14 Bit <b>Multi-Turn</b> <b>1212</b> 12 Bit Multi-Turn, 12 Bit Single-Turn <b>1213</b> 12 Bit Multi-Turn, 13 Bit Single-Turn <b>1214</b> 12 Bit Multi-Turn, 14 Bit Single-Turn	Available when Code 4 is 0 or A <b>0</b> Servo* Available when Code 4 is 2 or C <b>1</b> Clamping* Available when Code 4 is 1 or B <b>2</b> Square flange** Available when Code 4 is 3, 4, 5 or 6 <b>3</b> Hubshaft w/tether† * 58mm Dia. ** 2.5" Square † 63mm BC	<b>w/o shaft seal (IP64)</b> <b>0</b> 6 mm <b>1</b> 3/8" <b>2</b> 10 mm <b>3</b> 3/8" Hub Shaft <b>4</b> 12 mm Hubshaft <b>5</b> 1/2" Hubshaft <b>6</b> 10 mm Hub Shaft <b>w/ shaft seal (IP67)</b> <b>A</b> 6 mm <b>B</b> 3/8" <b>C</b> 10 mm	<b>6</b> Profibus	<b>2</b> 10-30 VDC	<b>E</b> Bus Cover 3 Strain Relief Exits. Internal T-coupler included <b>G</b> Bus Cover 2 Strain Relief Exits and 1 M12, 5-Pole Connector (for Tico display). Internal T-coupler included <b>H</b> Bus Cover Double Conin. Internal T-coupler included

**DIMENSIONS**

**Code 3: Mounting**



**Code 7: Connector**



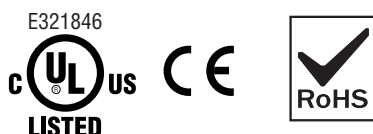
# SERIES AI25 Interbus

# ACURO

## Absolute Encoder

### Key Features

- Up to 14 Bit of Singleturn and 12 Bits of True Multiturn Absolute Positioning
- Onboard Diagnostics
- Interbus Interface



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Single-turn Resolution:** 10, 12 Bit

**Multi-turn Resolution:** 12 bit (only available with 12 bit ST resolution)

**Linearity:** +/- 1/2 LSB

**Absolute Accuracy:** ± 0.01° mechanical (36 arc-sec.)

**Repeatability:** ± 0.002° mechanical (7.2 arc-sec.)

**Code format:** 32 Bit Binary  
Electrical

**Connection:** Bus Cover with spring terminal clamps; cable with connector

**Supply voltage:** 10-30 VDC

**Intrinsic current consumption:** 220 mA (ST), 250 mA (MT)

**Baud Rate:** 500 kBaud according to ENCOM

**Interface:** Interbus, ENCOM Profile K3 (parameterizable)

**Programmable:** Direction, scaling factor, preset, offset

### MECHANICAL

#### Shaft diameter:

Shaft: 6 mm (Servo Mount), 10 mm (Clamping Mount), 3/8" (Square Flange Mount)

Hubshaft: 10mm, 12 mm, 3/8", 1/2"

#### Maximum shaft load:

6 mm shaft: 13 lb axial, 24 lb radial

10 mm shaft: 24 lb axial, 35 lb radial

**Maximum shaft speed:** 10,000 RPM (continuous), 12,000 RPM (peak)

**Starting torque:** < 1.4 in-oz

**Weight (approx.):** 350 g ST, 400 g MT

**Shaft tolerance (hubshaft only):** +/- 1.5 mm axial, +/- 0.2 mm radial

**Flange configurations:** Square, Clamp, Servo, Hubshaft with flexible tether

#### Bearing life:

1 x 10<sup>10</sup> revolutions at 35% full rated shaft load

1 x 10<sup>9</sup> revolutions at 75% full rated shaft load

1 x 10<sup>8</sup> revolutions at 100% full rated shaft load

### ENVIRONMENTAL

**Operating Temperature:** -40 to 85° C

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

**Enclosure Rating:** IP64 or IP67

**Shock:** 1,000 m/s<sup>2</sup> (6 ms)

**Vibration:** 100 m/s<sup>2</sup> (10 to 2,000 Hz)





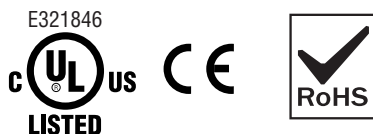
# SERIES AI25 BiSS

# ACURO

## Absolute Encoder

### Key Features

- Up to 22 Bit True Singleturn Positioning
- Onboard Diagnostics
- BiSS Interface



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Single-turn Resolution:** 10, 12, 13, 14, 17 Bit  
**Multi-turn Resolution:** 12 bit (only available with 12, 13, 14 or 17 bit ST resolution)  
**Linearity:** +/- 1/2 LSB  
**Absolute Accuracy:**  $\pm 0.01^\circ$  mechanical (36 arc-sec.)  
**Repeatability:**  $\pm 0.002^\circ$  mechanical (7.2 arc-sec.)  
**Code format:** Binary, Gray, Gray Excess, parameterization through *AcuroSoft*  
**Parameterization:** Resolution code type, sense of rotation, warning, alarm  
 Electrical  
**Connection:** Cable, M23 - 12 pole Conin connector, M12 - 8-pole connector  
**Supply voltage:** 5 VDC -5%/+10% or 10-30 VDC  
**Intrinsic current consumption:** 50 mA (ST), 100 mA (MT) not including output current  
**Output current:** 60 mA per bit, short circuit protected  
**Frequency response:** 500 kHz  
**Maximum cable length:** 400 m  
**Control Inputs:** Direction  
**Alarm output:** Warning and Alarm bits  
**Status LED:** Green = OK, Red = Alarm (IP64 only)  
**Preset Switch:** Sets encoder to zero output at present mechanical position (IP64 only)

### MECHANICAL

**Shaft diameter:**  
 Shaft: 6 mm (Servo Mount), 10 mm (Clamping Mount), 3/8" (Square Flange Mount)  
 Hubshaft: 10mm, 12 mm, 3/8", 1/2"  
**Maximum shaft load:**  
 6 mm shaft: 13 lb axial, 24 lb radial  
 10 mm shaft: 24 lb axial, 35 lb radial  
**Maximum shaft speed:** 10,000 RPM (continuous), 12,000 RPM (peak)  
**Starting torque:** < 1.4 in-oz  
**Weight (approx.):** 350 g ST, 400 g MT  
**Shaft tolerance (hubshaft only):** +/- 1.5 mm axial, +/- 0.2 mm radial  
**Flange configurations:** Square, Clamp, Servo, Hubshaft with flexible tether  
**Bearing life:**  
 1 x 10<sup>10</sup> revolutions at 35% full rated shaft load  
 1 x 10<sup>9</sup> revolutions at 75% full rated shaft load  
 1 x 10<sup>8</sup> revolutions at 100% full rated shaft load

### ENVIRONMENTAL

**Operating Temperature:** -40 to 100° C  
**Storage Temperature:** -40 to 100° C  
**Enclosure Rating:** IP64 or IP67  
**Shock:** 1,000 m/s<sup>2</sup> (6 ms)  
**Vibration:** 100 m/s<sup>2</sup> (10 to 2,000 Hz)

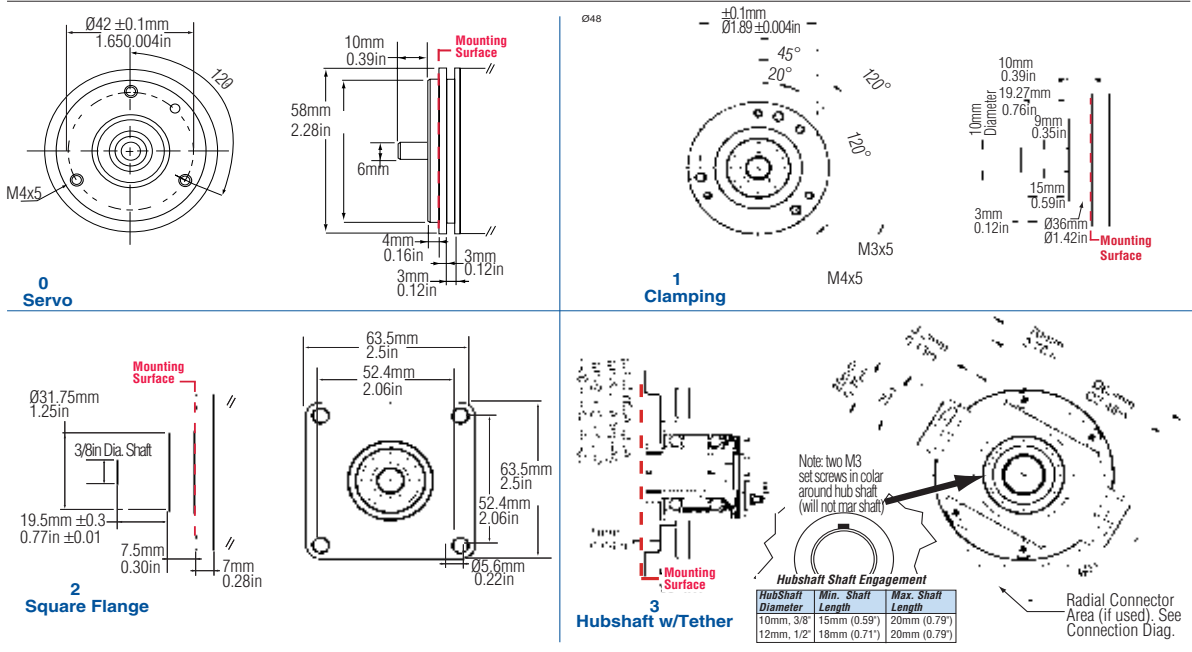
**Ordering Information**

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

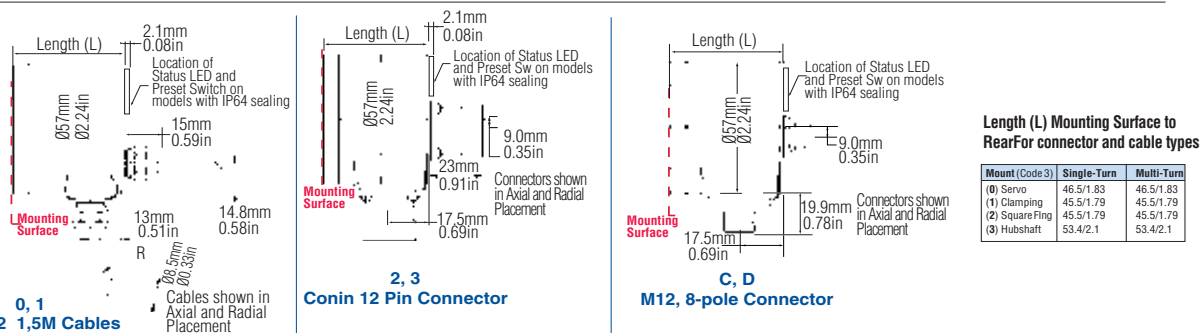
Code 1: Model	Code 2: Bits	Code 3: Mounting	Code 4: Shaft Size	Code 5: Protocol	Code 6: Electrical	Code 7: Connector
<b>AI25</b>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>AI25</b> Size25 Acuro Absolute Encoder	<b>Single-Turn</b> <b>0010</b> 10 Bit <b>0012</b> 12 Bit <b>0013</b> 13 Bit <b>0014</b> 14 Bit <b>0017</b> 17 Bit  <b>Multi-Turn</b> <b>1212</b> 12 Bit Multi-Turn, 12 Bit Single-Turn <b>1213</b> 12 Bit Multi-Turn, 13 Bit Single-Turn <b>1214</b> 12 Bit Multi-Turn, 14 Bit Single-Turn <b>1217</b> 12 Bit Multi-Turn, 17 Bit Single-Turn	Available when Code 4 is 0 or A <b>0</b> Servo*  Available when Code 4 is 2 or C <b>1</b> Clamping*  Available when Code 4 is 1 or B <b>2</b> Square flange**  Available when Code 4 is 3, 4, 5 or 6 <b>3</b> Hubshaft w/tether† * 58mm Dia. ** 2.5" Square † 63mm BC	<b>w/o shaft seal (IP64)</b> <b>0</b> 6 mm <b>1</b> 3/8" <b>2</b> 10 mm <b>3</b> 3/8" Hub Shaft <b>4</b> 12 mm Hubshaft <b>5</b> 1/2" Hubshaft <b>6</b> 10 mm Hub Shaft  <b>w/ shaft seal (IP67)</b> <b>A</b> 6 mm <b>B</b> 3/8" <b>C</b> 10 mm	<b>A</b> BiSS	<b>0</b> 5 VDC <b>2</b> 10-30 VDC	<b>0</b> 1.5m axial cable <b>1</b> 1.5m radial cable <b>2</b> M23 Conin 12 pin axial CW <b>3</b> M23 Conin 12 pin radial CW <b>C</b> M12, 8-pole connector axial <b>D</b> M12, 8-pole connector radial

**DIMENSIONS**

Code 3: Mounting



Code 7: Connector



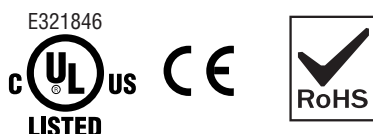
# SERIES AI25 SSI

# ACURO

## Absolute Encoder

### Key Features

- Up to 17 Bit True Singleturn Positioning
- Onboard Diagnostics
- SSI Interface



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Single-turn Resolution:** 10, 12, 13, 14, 17 Bit

**Multi-turn Resolution:** 12 bit (only available with 12 or 13 bit ST resolution)

**Linearity:** +/- 1/2 LSB

**Absolute Accuracy:**  $\pm 0.01^\circ$  mechanical (36 arc-sec.)

**Repeatability:**  $\pm 0.002^\circ$  mechanical (7.2 arc-sec.)

**Code format:** Binary, Gray, Gray Excess, parameterization through *AcuroSoft*

**Parameterization:** Resolution code type, sense of rotation, warning, alarm

Electrical

**Connection:** Cable, M23 - 12 pole Conin connector, M12 - 8-pole connector

**Supply voltage:** 5 VDC -5%/+10% or 10-30 VDC

**Intrinsic current consumption:** 50 mA (ST),

100 mA (MT) not including output current

**Output current:** 60 mA per bit, short circuit protected

**Frequency response:** 500 kHz

**Maximum cable length:** 400 m

**Control Inputs:** Direction

**Alarm output:** Alarm bit

**Status LED:** Green = OK, Red = Alarm (IP64 only)

**Preset Switch:** Sets encoder to zero output at present mechanical position (IP64 only)

### MECHANICAL

**Shaft diameter:**

Shaft: 6 mm (Servo Mount), 10 mm (Clamping

Mount), 3/8" (Square Flange Mount)

Hubshaft: 10mm, 12 mm, 3/8", 1/2"

**Maximum shaft load:**

6 mm shaft: 13 lb axial, 24 lb radial

10 mm shaft: 24 lb axial, 35 lb radial

**Maximum shaft speed:** 10,000 RPM (continuous), 12,000 RPM (peak)

**Starting torque:** < 1.4 in-oz

**Weight (approx.):** 350 g ST, 400 g MT

**Shaft tolerance (hubshaft only):** +/- 1.5 mm axial, +/- 0.2 mm radial

**Flange configurations:** Square, Clamp, Servo, Hubshaft with flexible tether

**Bearing life:**

1 x 10<sup>10</sup> revolutions at 35% full rated shaft load

1 x 10<sup>9</sup> revolutions at 75% full rated shaft load

1 x 10<sup>8</sup> revolutions at 100% full rated shaft load

### ENVIRONMENTAL

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

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

**Enclosure Rating:** IP64 or IP67

**Shock:** 1,000 m/s<sup>2</sup> (6 ms)

**Vibration:** 100 m/s<sup>2</sup> (10 to 2,000 Hz)

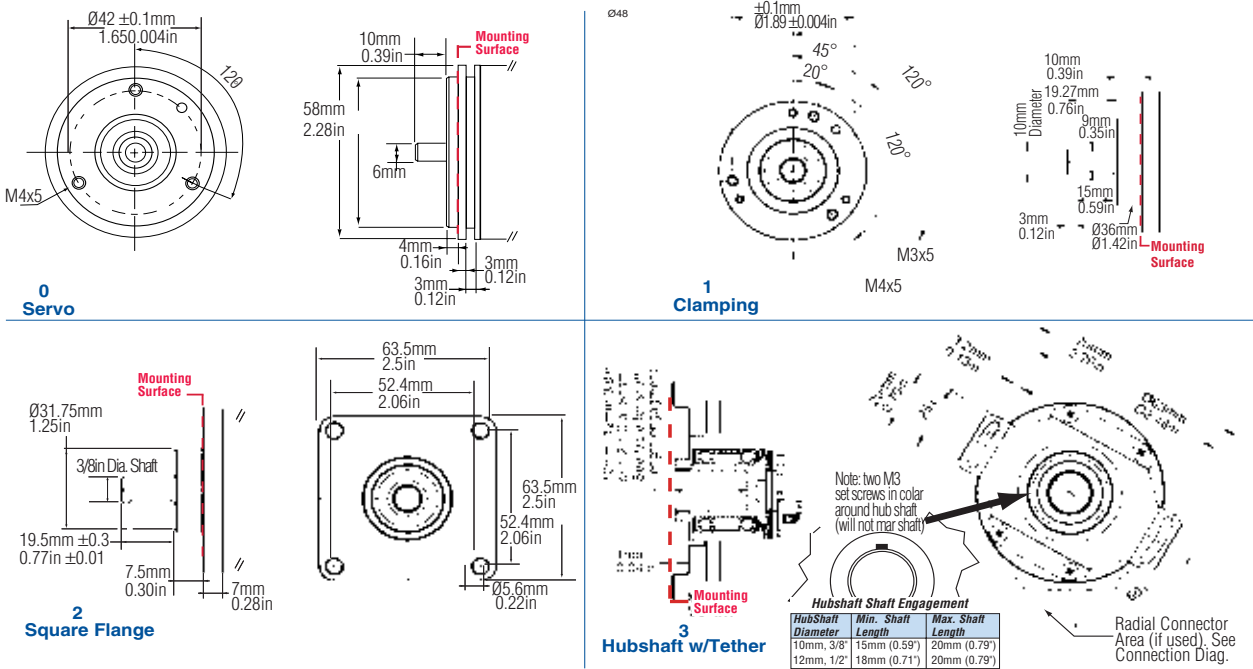
**Ordering Information**

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

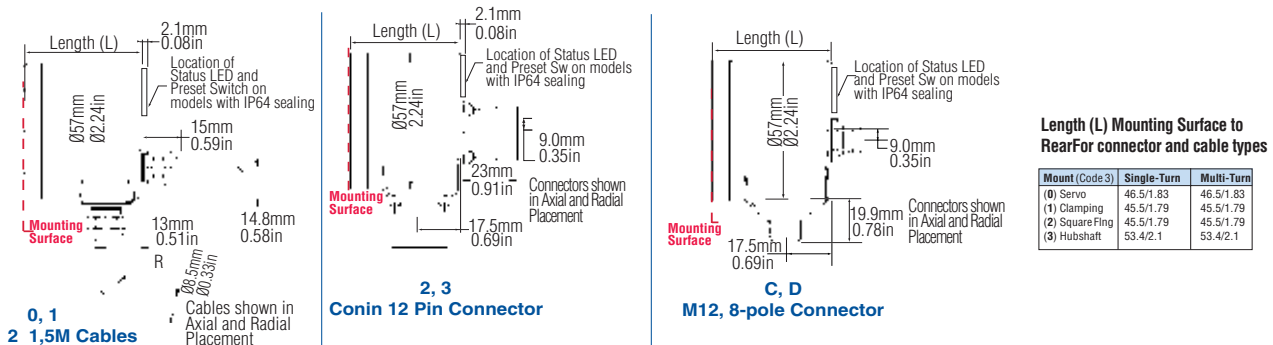
Code 1: Model	Code 2: Bits	Code 3: Mounting	Code 4: Shaft Size	Code 5: Protocol	Code 6: Electrical	Code 7: Connector
<b>AI25</b>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>AI25</b> Size25 Acuro Absolute Encoder	<b>Single-Turn</b> <b>0010</b> 10 Bit <b>0012</b> 12 Bit <b>0013</b> 13 Bit <b>0014</b> 14 Bit <b>0017</b> 17 Bit  <b>Multi-Turn</b> <b>1212</b> 12 Bit Multi-Turn, 12 Bit Single-Turn <b>1213</b> 12 Bit Multi-Turn, 13 Bit Single-Turn	Available when Code 4 is 0 or A <b>0</b> Servo* Available when Code 4 is 2 or C <b>1</b> Clamping* Available when Code 4 is 1 or B <b>2</b> Square flange** Available when Code 4 is 3, 4, 5 or 6 <b>3</b> Hubshaft w/tether† * 58mm Dia. ** 2.5" Square † 63mm BC	<b>w/o shaft seal (IP64)</b> <b>0</b> 6 mm <b>1</b> 3/8" <b>2</b> 10 mm <b>3</b> 3/8" Hub Shaft <b>4</b> 12 mm Hubshaft <b>5</b> 1/2" Hubshaft <b>6</b> 10 mm Hub Shaft  <b>w/ shaft seal (IP67)</b> <b>A</b> 6 mm <b>B</b> 3/8" <b>C</b> 10 mm	<b>2</b> SSI Gray <b>3</b> SSI Binary	<b>0</b> 5 VDC <b>2</b> 10-30 VDC	<b>0</b> 1.5m axial cable <b>1</b> 1.5m radial cable <b>2</b> M23 Conin 12 pin axial CW <b>3</b> M23 Conin 12 pin radial CW <b>4</b> M23 CCW axial <b>5</b> M23 CCW Radial <b>C</b> M12, 8-pole connector axial <b>D</b> M12, 8-pole connector radial

**DIMENSIONS**

Code 3: Mounting



Code 7: Connector



# SERIES AI25 SSI



## SSI Data Format

Bits	T1 - T10	T11	T12	T13	T14	T15	T16	T17	T18	T19
10	S9 - S0	0	0	0	0	S9	S8	S7	S6	S5
12	S11 - S2	S1	S0	0	0	S11	S10	S9	S8	S7
13	S12 - S3	S2	S1	S0	0	S12	S11	S10	S9	S8
14	S13 - S4	S3	S2	S1	S0	0	S13	S12	S11	S10
17	S16 - S7	S6	S5	S4	S3	S2	S1	S0	0	S16

Bits	T1 - T12	T13 - T21	T22	T23	T24	T25	T26	T27	T28	T29
1212	M11 - M0	S11 - S3	S2	S1	S0	0	0	M11	M10	M9
1213	M11 - M0	S12 - S4	S3	S2	S1	S0	0	M11	M10	M9

S9, S8 Data Bits for resolution per turn.

S9 - S0 Data Bits S9, S8, S7, S6, S5, S4, S3 Etc.

M11, M10 Data Bits for number of turns.

M11- M0 Turn Data Bits M11, M10, M9, M8, Etc.

T1, T2 SSI Clock number

## ELECTRICAL CONNECTIONS

### Electrical Connections 12 pin CONIN

Wire Color	Pin	Function
Brown	1	0V
Pink	2	Data
Yellow	3	Clock
—	4	N.C.
Blue	5	Direction
Red	6	N.C.
Violet	7	N.C.
White	8	5V/10-30V
—	9	N.C.
Gray	10	Data
Green	11	Clock
Black	12	0 V Data

12 pin CONIN Connector **Part Number: G3 539 202**

Bulk Cable (sold by the meter) **Part Number: 113101-0001**

Cable Assembly (with Connector)

3 meters **Part Number: G1 542 003**

5 meters **Part Number: G1 542 004**

10 meters **Part Number: G1 542 005**

### Electrical Connections 8 pin M12

Wire Color	Pin	Function
White	1	5/10-30 Volt
Brown	2	0 Volt
—	3	N.C.
Green	4	Clock
Pink	5	Data
Yellow	6	Clock
Blue	7	Direction
Gray	8	Data

8 pin M12 Connector **Part Number: G3 539 597**

Bulk Cable (sold by the meter) **Part Number: G3 280 220**

Cable Assembly (with Connector)

3 meters **Part Number: G1 565 329**

5 meters **Part Number: G1 565 330**

10 meters **Part Number: G1 565 331**



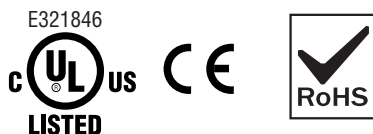
# SERIES AI25 Parallel



## Absolute Encoder

### Key Features

- Up to 14 Bit of Singleturn and 12 Bits of True Multiturn Absolute Positioning
- Onboard Diagnostics
- Parallel Interface



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Single-turn Resolution:** 10, 12, 13, 14 Bit, 360 PPR, 720 PPR  
**Multi-turn Resolution:** 12 bit (only available with 12 bit ST resolution)  
**Absolute Accuracy:**  $\pm 0.01^\circ$  mechanical (36 arc-sec.)  
**Repeatability:**  $\pm 0.002^\circ$  mechanical (7.2 arc-sec.)  
**Code format:** Binary, Gray, Gray Excess  
**Electrical**  
**Connection:** Cable, Conin Connector, MS Connector, Cable with Sub-D Connector (MT only)  
**Supply voltage:** 5 VDC -5%/+10%, or 10-30 VDC  
**Intrinsic current consumption:** 200 mA (ST), 300 mA (MT)  
**Output current:** 30 mA per bit, short circuit protected  
**Frequency response:** 500 kHz on single-turn, 1.5m cable.  
**Update Rate:** 1mHz for Single-turn; 100kHz for Multi-turn  
**Latch Delay:** 20 $\mu$ Sec.  
**Alarm output:** NPN open collector max 5 mA  
**Maximum cable length:** 100 m  
**Status LED:** Green = OK, Red = Alarm (IP64 only, not available on connector type J)  
**Preset Switch:** Sets encoder to zero output at present mechanical position (Multi-turn IP64

Control Inputs		
Input	Logic Level	Function
Direction	1	Ascending code values when turning clockwise
	0	Descending code values when turning clockwise
Latch	1	Encoder data continuously changing at output
	0	Encoder data stored and constant at output
Tristate (ST)	1	Outputs active
	0	Outputs at high impedance (Tristate mode)
Tristate (MT)	1	Outputs at high impedance (Tristate mode)
	0	Outputs active

only, not available on connector type J)  
**Control Inputs:** Latch, Direction, Tri-state (see table below)

### MECHANICAL

**Shaft diameter:**  
 Shaft: 6 mm (Servo Mount), 10 mm (Clamping Mount), 3/8" (Square Flange Mount)  
 Hubshaft: 10mm, 12 mm, 3/8", 1/2"  
**Maximum shaft load:**  
 6 mm shaft: 13 lb axial, 24 lb radial  
 10 mm shaft: 24 lb axial, 35 lb radial  
**Maximum shaft speed:** 10,000 RPM (continuous), 12,000 RPM (peak)  
**Starting torque:** < 1.4 in-oz  
**Weight (approx.):** 350 g ST, 400 g MT  
**Shaft tolerance (hubshaft only):** +/- 1.5 mm axial, +/- 0.2 mm radial  
**Flange configurations:** Square, Clamp, Servo, Hubshaft with flexible tether  
**Bearing life:**

1 x 10<sup>10</sup> revolutions at 35% full rated shaft load  
 1 x 10<sup>9</sup> revolutions at 75% full rated shaft load  
 1 x 10<sup>8</sup> revolutions at 100% full rated shaft load

### ENVIRONMENTAL

**Operating Temperature:** -40 to 100° C  
**Storage Temperature:** -40 to 100° C  
**Enclosure Rating:** IP64 or IP67  
**Shock:** 1,000 m/s<sup>2</sup> (6 ms)  
**Vibration:** 100 m/s<sup>2</sup> (10 to 2,000 Hz)



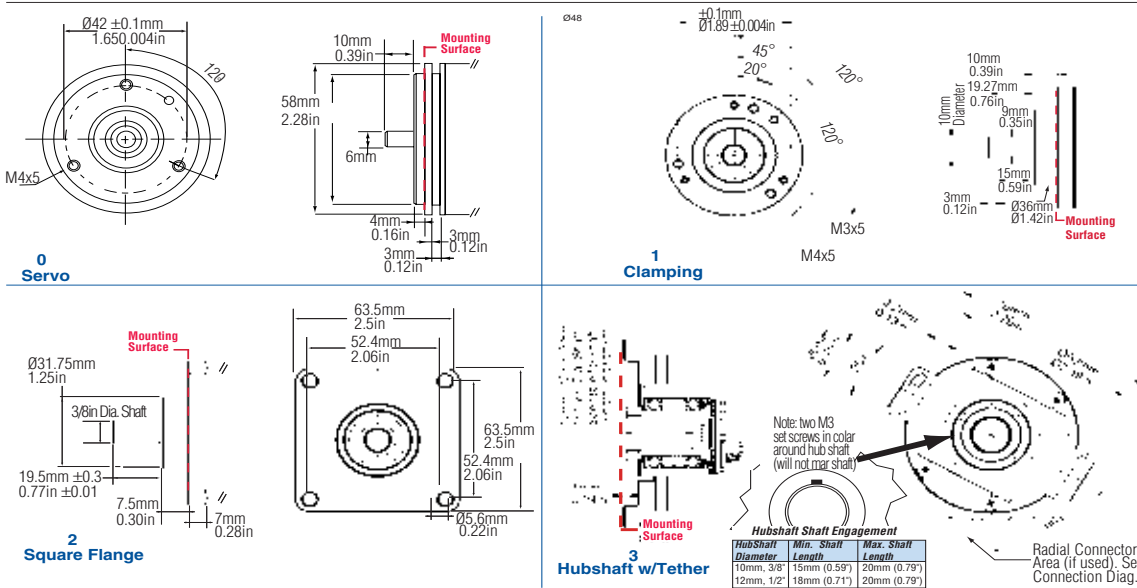
**Ordering Information**

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

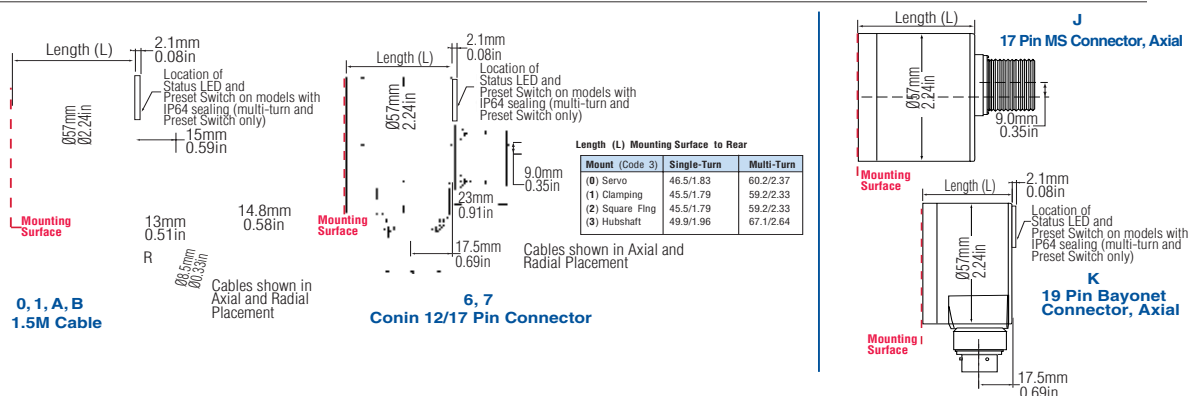
Code 1: Model	Code 2: Bits	Code 3 :Mounting	Code 4: Shaft Size	Code 5: Protocol	Code 6: Electrical	Code 7: Connector
<b>AI25</b>	□□□□	□	□	□	□	□
<b>AI25</b> Size25 Acuro Absolute Encoder	<b>Single-Turn</b>	Available when Code 4 is 0 or A	<b>w/o shaft seal (IP64)</b>	<b>0</b> Parallel Binary <b>1</b> Parallel Gray	<b>0</b> 5 VDC <b>2</b> 10-30 VDC	<b>0</b> 1.5m axial cable <b>1</b> 1.5m radial cable Available when Code 2 is 00XX, 0360 or 0720 <b>6</b> M23 Conin 17 pin axial CW <b>7</b> M23 Conin 17 pin radial CW <b>8</b> 17 pin Conin axial CCW <b>9</b> 17 pin Conin radial <b>J</b> 17 pin MS axial * <b>K</b> 19 pin Bayonet radial
	<b>0010</b> 10 Bit <b>0012</b> 12 Bit <b>0013</b> 13 Bit <b>0014</b> 14 Bit <b>0360</b> 360 PPR (Gray excess) <b>0720</b> 720 PPR (Gray excess)	Available when Code 4 is 2 or C	<b>0</b> 6 mm <b>1</b> 3/8" <b>2</b> 10 mm <b>3</b> 3/8" Hub Shaft <b>4</b> 12 mm Hubshaft <b>5</b> 1/2" Hubshaft <b>6</b> 10 mm Hub Shaft			
	Available when Code 6 is 2	Available when Code 4 is 1 or B	<b>w/ shaft seal (IP67)</b>			Available when Code 2 is 1212
	<b>Multi-Turn</b> <b>1212</b> 12 Bit Multi-Turn, 12 Bit Single-Turn	Available when Code 4 is 3, 4, 5 or 6	<b>A</b> 6 mm <b>B</b> 3/8" <b>C</b> 10 mm			<b>A</b> Cable 1.5m radial w/ 37 pin sub-D <b>B</b> Cable 1.5m axial w/37 pin sub-D * Status LED and Preset Switch features not available with "J"

**DIMENSIONS**

Code 3: Mounting



Code 7: Connector



# SERIES AI25 Parallel



## CONNECTOR WIRING

Explanation of Terms	
Tristate	+UB = Outputs at high impedance (Tristate mode) 0 V <sup>2)</sup> = Outputs active
Tristate	+UB <sup>2)</sup> = Outputs active 0 V = Outputs at high impedance (Tristate-Mode)
Latch	+UB <sup>2)</sup> = Encoder data continuously changing at output 0 V = Encoder data stored and constant at output
Direction	+UB <sup>2)</sup> = Ascending code value when turning cw 0 V = Descending code value when turning cw
N.C.	= Not Connected
LSB	= Least Significant Bit
MSB	= Most Significant Bit
S0, S1, ...	= Data bits for resolution per turn
M0, M1, ... (Multiturn)	= Data bits for number of turns

2) Or unattached (floating)

PVC-cable (Singleturn) 9-12 Bit			
Color	9 Bit / 360 <sup>3)</sup>	10 Bit/720 <sup>3)</sup>	12 Bit
brn/gry	N.C.	N.C.	S0 (LSB)
red/blu	N.C.	N.C.	S1
vio	N.C.	S0 (LSB)	S2
wht/brn	S0 (LSB)	S1	S3
wht/grn	S1	S2	S4
wht/yel	S2	S3	S5
wht/gry	S3	S4	S6
wht/pnk	S4	S5	S7
wht/blu	S5	S6	S8
wht/red	S6	S7	S9
wht/blk	S7	S8	S10
brn/grn	S8 (MSB)	S9 (MSB)	S11 (MSB)
yel	Tristate D0...D8	Tristate D0...D9	Tristate D0.. D11
pnk	Latch <sup>4)</sup>	Latch <sup>4)</sup>	Latch <sup>4)</sup>
grn	Direction	Direction	Direction
blk	0 V	0 V	0 V
red	5/10...30VDC	5/10...30VDC	5/10...30VDC
brn	Alarm	Alarm	Alarm

3) Increments 4) Binary Only

Connector 17pol. (CONIN) 9-12 Bit			
Pin	9 Bit / 360 <sup>3)</sup>	10 Bit / 720 <sup>3)</sup>	12 Bit
1	S0 (LSB)	S0 (LSB)	S0 (LSB)
2	S1	S1	S1
3	S2	S2	S2
4	S3	S3	S3
5	S4	S4	S4
6	S5	S5	S5
7	S6	S6	S6
8	S7	S7	S7
9	S8 (MSB)	S8	S8
10	N.C.	S9 (MSB)	S9
11	N.C.	N.C.	S10
12	Tristate S0...S8	Tristate S0...S9	S11 (MSB)
13	Latch <sup>4)</sup>	Latch <sup>4)</sup>	Latch <sup>4)</sup>
14	Direction	Direction	Direction
15	0 V	0 V	0 V
16	5/10...30VDC	5/10...30VDC	5/10...30VDC
17	Alarm	Alarm	Alarm

3) Increments 4) Binary Only

Connector 17pol. (CONIN) 13-14 Bit		
Pin	13 Bit	14 Bit
1	S12 (MSB)	S13 (MSB)
2	S11	S12
3	S10	S11
4	S9	S10
5	S8	S9
6	S7	S8
7	S6	S7
8	S5	S6
9	S4	S5
10	S3	S4
11	S2	S3
12	S1	S2
13	S0 (LSB)	S1
14	Direction	S0 (LSB)
15	0 V	0 V
16	5/10...30VDC	5/10...30VDC
17	Latch (Binarycode) Alarm (Graycode)	Latch (Binarycode) Alarm (Graycode)

TPE-cable (Multiturn 13-14 Bit) 37 pol. Sub-D		
Color	Pin	
brn	2	S0
grn	21	S1
yel	3	S2
gry	22	S3
pnk	4	S4
vio	23	S5
gry/pnk	5	S6
red/blu	24	S7
wht/grn	6	S8
brn/grn	25	S9
wht/yel	7	S10
yel/brn	26	S11
wht/gry	8	M0
gry/brn	27	M1
wht/pnk	9	M2
pnk/brn	28	M3
wht/blu	14	M4
brn/blu	33	M5
wht/red	15	M6
brn/red	34	M7
wht/blk	16	M8
brn/blk	35	M9
gry/grn	17	M10
yel/gry	36	M11
pnk/grn	18	Alarm
yel/pnk	10	Direction
grn/blu	30	Latch
yel/blu	12	Tristate
red	13	10...30 VDC
wht	31	10...30 VDC
blu	1	0 V
blk	20	0 V



# SERIES AI25

## CONNECTOR WIRING

MS style 17 pin connectors					
Pin	Function		107865 Cable Accessory* Color Code	14 BIT	13 BIT
	12 Bit 4096 CPR	10 Bit 1024 CPR			
A	Vin		Red	D13 (MSB)	D12 (MSB)
B	N.C.		Violet	D12	D11
C	Latch (binary only)		Green	D11	D10
D	Direction		Orange	D10	D9
E	S1	N.C.	White	D9	D8
F	S3	S1	White/Brown	D8	D7
G	S5	S3	White/Orange	D7	D6
H	S7	S5	White/Green	D6	D5
J	S8	S6	White/Blue	D5	D4
K	S9	S7	White/Violet	D4	D3
L	S11 (MSB)	S9 (MSB)	White/Black/Brown	D3	D2
M	GND		Black	D2	D1
N	S4	S2	White/Red	D1	D0 (LSB)
P	S0 (LSB)	N.C.	Gray	D0 (LSB)	Direction
R	S2	S0 (LSB)	White/Black	GND	GND
S	S6	S4	White/Yellow	Latch	Latch
T	S10	S8	White/Grey	Vin	Vin
10ft Cable # 107865-0010			NA		
Mating Connector: MS 17 pin style MS3106A-20-29S part # MCN-N8					
*This is a mating connector/cable assembly. Color coding information is provided here for reference					

PVC-cable (Singleturn 13-14 Bit)		
Color	13 Bit	14 Bit
gry/pnk	N.C	S0 (LSB)
brn/yel	S0 (LSB)	S1
brn/gry	S1	S2
red/blu	S2	S3
vio	S3	S4
wht/brn	S4	S5
wht/grn	S5	S6
wht/yel	S6	S7
wht/gry	S7	S8
wht/pnk	S8	S9
wht/blu	S9	S10
wht/red	S10	S11
wht/blk	S11	S12
brn/grn	S12 (MSB)	S13 (MSB)
yel	Tristate S0...S12	Tristate S0...S13
pnk	Latch <sup>4)</sup>	Latch <sup>4)</sup>
grn	Direction	Direction
blk	0 V	0 V
red	5/10...30VDC	5/10...30VDC
brn	Alarm	Alarm

4) Binary Only

Bayonet style 19 pin connectors							
Pin	Function 14 Bit	112077 Cable Accessory* Color Code	Function 13 bit	112076 Cable Accessory* Color Code	Function		110158 Cable Accessory* Color Code
	16384 CPR				8192 CPR	12 Bit 4096 CPR	
A	S13 (MSB)	White/Black/Brown	S12	White/Black/Brown	S11 (MSB)	S9 (MSB)	White/Black/Brown
B	S12	White/Grey	S11	White/Grey	S10	S8	White/Grey
C	S11	White/Violet	S10	White/Violet	S9	S7	White/Violet
D	S10	White/Blue	S9	White/Blue	S8	S6	White/Blue
E	S9	White/Green	S8	White/Green	S7	S5	White/Green
F	S8	White/Orange	S7	White/Orange	S6	S4	White/Orange
G	S7	White/Yellow	S6	White/Yellow	S5	S3	White/Yellow
H	S6	White/Red	S5	White/Red	S4	S2	White/Red
J	S5	White/Brown	S4	White/Brown	S3	S1	White/Brown
K	S4	White/Black	S3	White/Black	S2	S0 (LSB)	White/Black
L	S3	Brown	S2	Blue	S1	N.C.	White
M	S2	Blue	S1	White	S0 (LSB)	N.C.	Grey
N	S1	White	S0 (LSB)	Grey	N.C	N.C.	
P	S0 (LSB)	Grey	GND	Black	GND		Black
R	Direction	Orange	Direction	Orange	Direction		Orange
S	Case	Violet	Case	Violet	Case		Violet
T	GND	Black	GND	Yellow	GND		Yellow
U	Latch	Green	Latch	Green	Latch (binary only)		Green
V	Vin	Red	Vin	Red	Vin		Red
10ft Cable # 112077-0010			10ft Cable # 112076-0010		10ft Cable # 110158-0010		
Mating Connector: 19 pin Bayonet style PT06E-14-19S part # 606219-0001							

\*This is a mating connector/cable assembly. Color coding information is provided here for reference

# SERIES AC110



## Absolute Encoder

### Key Features

- Large 50mm Hollowshaft Available
- Integrated Diagnostic System
- Up to 22 bits of True Singleturn Absolute Positioning



## SPECIFICATIONS

### ELECTRICAL

**Supply Voltage:** -5%/ +10% DC 5 V; DC 10-30 V  
**Max. Current w/o Load:** 120 mA  
**EMC:** EN 61326 Class A  
**Resolution:** Singleturn 11 - 19 Bit (22 Bit on request); Multiturn: 16 Bit  
**Output Code:** Binary, Gray  
**Drives:** Clock and Data / RS422  
**Incremental Signals:** Optional Sine-Cosine 1 Vpp  
**Number of Pulses:** 4096  
**3dB Limiting Frequency:** 500 kHz  
**Alarm Output:** Alarm bit (SSI Option), Warning and Alarm bit (BiSS)

### ELECTRICAL CONNECTIONS

Cable Color	Cable Connector	Signal
brown <sup>4</sup>	1	0 V (supply voltage)
pink	2	Data
yellow	3	Clock
—	4	N.C.
blue	5	Direction <sup>1</sup>
—	6	N.C.
—	7	N.C.
white <sup>4</sup>	8	DC 5 V <sup>3</sup> / DC 10 - 30 V
—	9	N.C.
grey	10	Data
green	11	Clock
black	12	0 V-signal output <sup>2</sup>
Screen		Shielded with housing

<sup>1</sup> Direction: + UB or unconnected = ascending code values with rotation cw  
 0 V = descending code values with rotation cw  
<sup>2</sup> Connected with 0 V in the encoder. Use this output to lay Direction on logical "0" if required.  
<sup>3</sup> Notice: when supply voltage = 5VDC or more, max. cable length is 10 m  
<sup>4</sup> Use only thin wires 0.14mm<sup>2</sup>

### MECHANICAL

**Housing Diameter:** 110 mm  
**Shaft Diameter:** 50 mm (Hub shaft)  
**Mounting of Shaft:** Keyway, Rear clamping ring  
**Hubshaft Axial Endplay:** ± 0.5 mm  
**Hubshaft Radial Runout:** ± 0.05 mm  
**Max. Speed:** IP40: 3600 rpm; IP50: 2000 rpm; IP64: 1500 rpm  
**Torque:** 15 Ncm  
**Shaft Material:** Stainless Steel / Aluminum, ceramic coated  
**Housing Material:** Aluminum  
**Weight approx.:** 1000g (2.2lbs.)  
**Connection:** Cable, radial; Cable 1.5 m with M23 connector (Conin), 12 pole, axial or radial

### Recommended Data Transfer Rate bei SSI

Cable Length	Frequency
< 50 m	< 400 kHz
< 100 m	< 300 kHz
< 200 m	< 200 kHz
< 400 m	< 100 kHz

Maximum data transfer rate depends on cable length. For Clock /  $\overline{\text{Clock}}$  and Data /  $\overline{\text{Data}}$ . Use cable with twisted pairs in shield.

### ENVIRONMENTAL

**Operating Temperature:** -20°C to +100°C (-20°F to 212°F)  
**Storage Temperature:** -50°C to +80°C (-58°F to 176°F)  
**Vibration (DIN EN 60068-2-6):** 100 m/s<sup>2</sup> (10 to 500 Hz)  
**Shock (DIN EN 60068-2-27):** 1000 m/s<sup>2</sup> (6 ms)  
**Enclosure Rating:** (EN 60529) IP40 or IP64  
**Shaft Rating:** (EN 60529) IP50 or IP64



# SERIES AC110

### Ordering Information

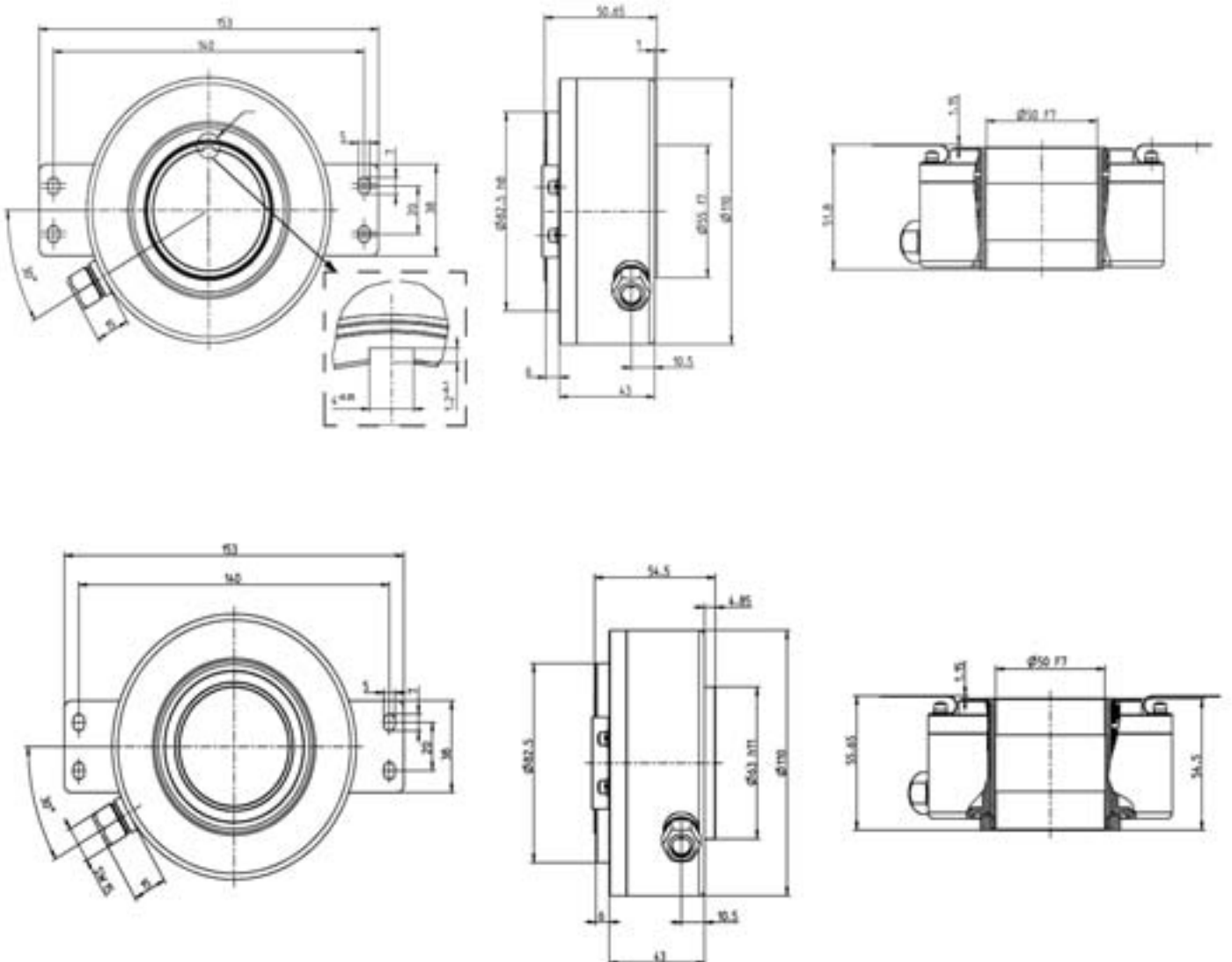
To order, complete the model number with code numbers from the table below:

Code 1: Model	Code 2: Resolution	Code 3: Supply Voltage	Code 4: Spring Tether	Code 5: Protection Class	Code 6: Shaft Mounting	Code 7: Shaft Size	Code 8: Interface	Code 9: Connection	Code 10: Cable Length
<b>AC110/</b>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

#### Ordering Information

ACURO Series AC110 Absolute Encoder	<b>0011</b>	<b>A</b> 5 VDC	<b>0</b> None	<b>0</b> IP 40	<b>K</b> Keyway 4 x 1.2	<b>50</b> 50mm	<b>SB</b> SSI Binary	<b>B</b> Cable, radial, 1.5m	<b>B5</b> 1.5m <b>DO</b> 3m <b>FO</b> 5m <b>KO</b> 10m
	<b>0012</b>	<b>E</b> 10-30 VDC	<b>B</b> With Spring Tether	<b>1</b> IP 50	<b>H</b> Clamping Ring		<b>SG</b> SSI Gray		
	<b>0013</b>			<b>4</b> IP 64			<b>BI</b> BISS		
	<b>0014</b>								
	<b>0017</b>								
	<b>0019</b>								
	<b>0022</b>								

### DIMENSIONS





# SERVO DUTY FEEDBACK GUIDE

## DYNAPAR 2010

Rotary encoders designed for servomotor duty face special challenges such as high temperatures, high peak speeds, and commutation chores. Ease of installation is equally important, so Dynapar offers “One Size Fits All” mounting— Our size 15 frameless resolvers, absolute encoders, and commutation encoders are physically interchangeable. This gives the brushless motor customer unlimited flexibility in feedback options, while using the same motor shaft and endbell.

Dynapar’s Servo Motor Duty encoders offer:

- High 120°C operating temperatures that won’t downgrade motor ratings
- Up to 10,000PPR and commutation tracks up to 32 pole at 12,000 rpm
- Drop-in replacement for all mounting configurations

To meet the lightning-quick communication response brushless servomotors require, Dynapar offers the Acuro™ absolute encoder family designed especially for high-performance servo feedback. These encoders provide features such as:

- Fast response with either SSI or BiSS communication protocol
- High 22 bit resolution for the ultimate in low-speed smoothness
- Integrated diagnostics that monitor temperature and other safety parameters to monitor system performance

Dynapar also provides Harowe™ brand ultra-performance resolvers, long recognized as the benchmark in the brushless motor industry. Harowe resolvers provide reliable analog output in some of the harshest conditions where shock, vibration, temperature extremes, and even radiation are present. The new HaroMax line of frameless resolvers combine traditional resolver reliability with:

- Machine-wound stators for unparalleled accuracy
- Tough anodized aluminum housings with low mass for weight savings
- Ultra-high 155°C temperature rating for the toughest servo applications

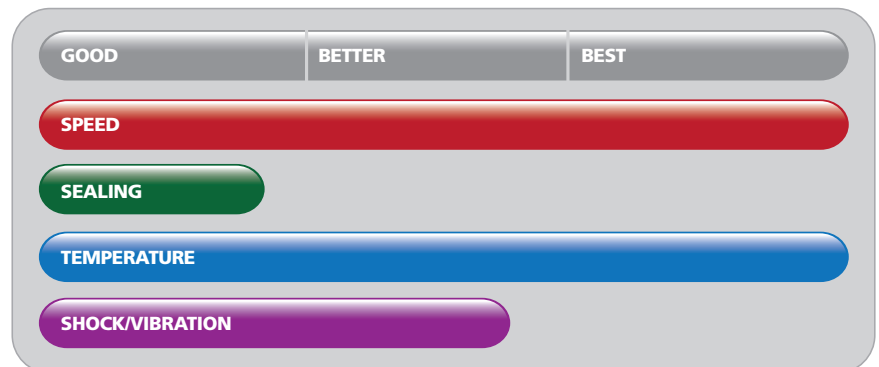
For those OEM customers with special requirements, Dynapar has an engineering team ready to tackle custom modifications whether electrical, mechanical, or environmental. With these custom products manufactured across the globe, Dynapar supports today’s servomotor manufacturer by combining high performance with fast delivery.



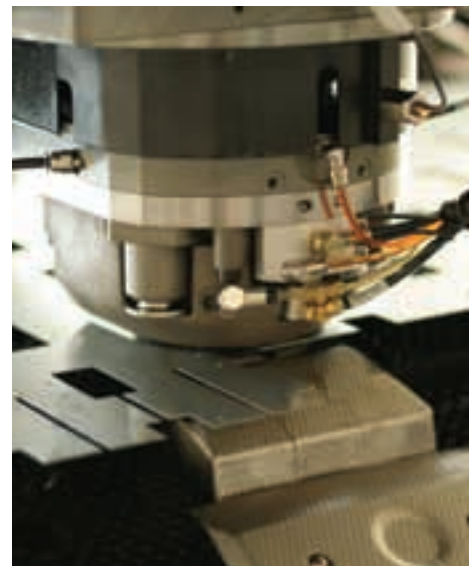
This class of encoders and resolvers is specifically suited to use on small-to mid-size stepper and servo motors. They typically have limited sealing due to their use inside motor housings, but are capable of very high speeds and high temperatures, a benefit due to being in such close proximity to motor windings. These encoders typically come from the factory ready to mount to common motor back shafts.



#### SERVO DUTY ENCODER GENERAL PERFORMANCE DATA







AD35 Pictured.













## OPTICAL - ABSOLUTE

				
Product	AD34	AD35	AD36	AD25
Shaft/Bore Sizes	6mm	8mm	8mm	10mm
Available Resolutions (Bits)	Up to 19 bit Singleturn	Up to 22 bit Singleturn	Up to 22 bit Singleturn, 12 bit multiturn	Up to 22 bit Singleturn, 12 bit multiturn
Input Voltage (VDC)	5 or 7 to 30	5 or 7 to 30	5 or 7 to 30	5
Operating Temperature (°C)	-15 to +120	-15 to +120	-15 to +120	-15 to +120
Enclosure Rating	IP40	IP40	IP40	IP40
Key Features	Unique one-step notched shaft mounting	Short mounting depth	Up to 22 bit singleturn resolution	Unique conical shaft for concentric motor mounting
Page Number	3.04	3.06	3.08	3.10

## INDUCTIVE - RESOLVER

		
11	R11	
0.120" (3.05mm)	0.120" (3.05mm)	
+/- 3 arcmin	+/- 6 arcmin	
2 to 26	2 to 6	
Up to 155	Up to 155	
N/A	N/A	
Brushless construction	Brushless construction	
3.40	3.40	

## OPTICAL - INCREMENTAL

							
Product	M602/M832 Module	LM/LAM	E9	M9	M14	M15	
Shaft/Bore Sizes	1/4" to 10mm	N/A	1.5 to 4mm, .125", .156"	1.5 to 4mm, .125", .156"	3 to 8mm, .1248", .375"	1/8" or 3/8" 6 to 10mm	
Available Resolutions (PPR)	1 to 5000 (M832) 1 to 3600 (M602)	Up to 720 CPI/500 CPI	100 to 512	100 to 512	200 to 1024	200 to 1024	
Input Voltage (VDC)	5	5	5	5	5	5 or 12	
Operating Temperature (°C)	-40 to +100	-40 to +100	-20 to +100	-20 to +100	-20 to +100	-20 to +120	
Enclosure Rating	IP00	IP00	N/A	N/A	N/A	NEMA 1/ IP50 (w/cover)	
Key Features	Tool-less gapping	Choice of Digital or Analog Output	Super-compact size for small motors	Up to 512 PPR resolution	Short mounting depth	Easy installation without special tools	
Page Number	3.12	3.15	3.18	3.20	3.22	3.24	





INDUCTIVE - RESOLVER

Frameless 10	Frameless 15	Frameless 21	Frameless 31	Frameless 55	HaroMax® 15	HaroMax® 21	Product
0.25" (6mm)	0.472" (12mm)	0.800" (20mm)	1.576" (40mm)	3.651" (93mm)	0.472" (12mm)	0.800" (20mm)	Shaft size/ Max bore size
+/- 15 arcmin	+/- 10 arcmin	+/- 7 arcmin	+/- 20 arcmin	+/- 30 arcmin	+/- 5 arcmin	+/- 5 arcmin	Accuracy (Single Speed Only)
2 to 12	2 to 12	2 to 12	2 to 12	2 to 12	2 to 12	2 to 12	Input Voltage (Vrms)
Up to 200	Up to 200	Up to 200	Up to 200	Up to 200	Up to 200	Up to 200	Operating Temperature (°C)
N/A	N/A	N/A	N/A	N/A	N/A	N/A	Enclosure Rating
Compact mounting depth	Compact mounting depth	Compact mounting depth	Compact mounting depth	Compact mounting depth	Machine wound stator for high accuracy	Machine wound stator for high accuracy	Key Features
3.41	3.41	3.41	3.41	3.41	3.42	3.43	Page Number

OPTICAL - INCREMENTAL

M53	F10	F14	F15	F18	F21	HC20	Product
1/4" to 1/2" 6 to 12mm	6mm	1/4", 6mm, 8mm	3/8"	1/4" to 1/2" 6 to 12mm	1/2"	6mm, 8mm hub or hollow, 9mm tapered	Shaft/Bore Sizes
500 to 2500	1024 to 2048	200 to 5000	1024 to 2048	500 to 1000	1024 to 2048	500 to 2500	Available Resolutions (PPR)
5 or 12	5	5	5	5	5	5 or 5 to 26	Input Voltage (VDC)
0 to +120	0 to +120	0 to +120	0 to +120	0 to +120	0 to +120	0 to +120	Operating Temperature (°C)
NEMA 1/ IP50 (w/cover)	N/A	NEMA 1/ IP40 (w/cover)	N/A	NEMA 1/ IP40 (w/cover)	N/A	IP51	Enclosure Rating
Up to 2500PPR with commutation tracks	Compact 1.0" diameter servo ring mount	Non-marring hollow shaft	Industry standard size 15 servo mounting	Under 2.0" dia package with high 10,000PPR capability	Industry standard size 21 servo mounting	Economical servomotor feedback	Key Features
3.26	3.28	3.30	3.32	3.34	3.36	3.38	Page Number

# SERIES AD34

# ACURO™ brand

## Single Turn Absolute Encoder

### Key Features

- **Special Notched Shaft Installs Easily in One Step and Eliminates Coupling Issues**
- **Up to 19 bits of Singleturn Absolute Positioning**
- **Wide -15° to +120°C Operating Temperature Covers Majority of Servomotor Applications**



**NEW!**



## SPECIFICATIONS

### ELECTRICAL

**Supply Voltage:** 5 VDC -5 %/+10 % or 7 - 30 VDC  
**Max. Current w/o Load:** 50 mA  
**Resolution Singleturn:** 12 -17 Bit  
**Output Code:** Gray  
**Drives:** Clock and Data / RS422  
**Incremental signals:** Optional Sinus-Cosinus 1 Vpp  
**Number of Pulses:** 2,048  
**3dB Limiting Frequency:** 500 kHz  
**Absolute Accuracy:** ±35°  
**Repeatability:** ±7°  
**Alarm Output:** Alarm bit (SSI-Option), warning bit and alarm bit (BiSS)

### MECHANICAL

**Housing Diameter:** 37.5 mm (1.48")  
**Shaft Diameter:** 6 mm (Notched Shaft)  
**Mounting:** Spring Tether  
**Protection Class (EN 60529):** IP40 Housing & Shaft  
**Shaft Speed (maximum):** 10,000 RPM (continuous), 12,000 RPM (peak)  
**Torque:** 0.01 Ncm  
**Moment of Inertia:** approx.  $2.5 \times 10^{-6}$  kgm<sup>2</sup>  
**Weight:** approx. 80g (2.8 oz.)  
**Connections:** Cable, radial; PCB connector, 12 pole

### ENVIRONMENTAL

**Vibration:** 100 m/s<sup>2</sup> (10 to 2,000 Hz) (DIN EN 60068-2-6)  
**Shock:** 1,000 m/s<sup>2</sup> for 6 msec duration (DIN EN 60068-2-27)  
**Operating Temperature:** -15°C to +120°C  
**Storage temperature:** -15°C to +85°C (due to packaging)

## CONNECTIONS

PIN	1b	2b	3b	4b	5b	6b
Function	DC 5V / 7-30V (U <sub>p</sub> )	Clock	B -	0 V (U <sub>n</sub> )	A -	Data
Color	White	Yellow	Gray/Pink	Brown	Brown/Green	Pink
PIN	1a	2a	3a	4a	5a	6a
Function	Data	A +	0 V -Sen	B +	Clock	5V Sensor
Color	Gray	White/Green	Black	Red/Blue	Green	Violet

U<sub>p</sub> = power Supply

Sensor is connected to Power Supply and 0 V (U<sub>n</sub>)

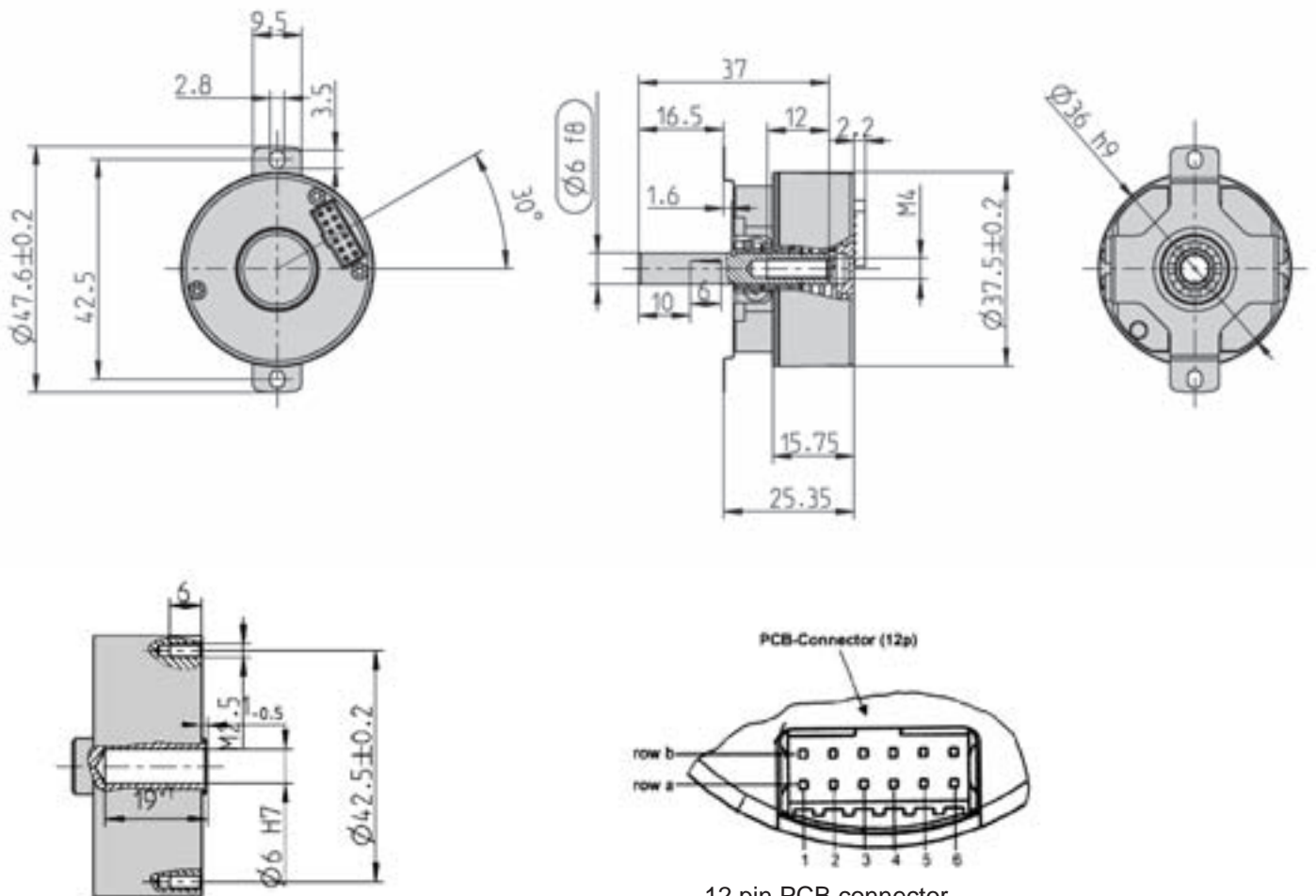
Shield connected to case

### Ordering Information

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

Code 1: Model	Code 2: Resolution	Code 3: Voltage	Code 4: Flange/Protection/Shaft	Code 5: Output	Code 6: Connection
<b>AD34</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"/>	<input type="checkbox"/>
<b>AD34</b> ACURO Absolute Encoder	<b>0012</b> 12 Bit ST <b>0013</b> 13 Bit ST <b>0014</b> 14 Bit ST <b>0017</b> 17 Bit ST <b>0019</b> 19 Bit ST	<b>A</b> 5 VDC* <b>E</b> 7-30 VDC  <b>*Note:</b> No inverse polarity protection	<b>U.0N</b> Spring Tether, IP40, 8mm Notched Shaft	<b>BI</b> BiSS <b>SG</b> SSI Gray <b>SC</b> SSI Gray (+SinCos 1Vpp)	<b>0</b> PCB Connector, axial, 12 pole <b>2</b> PCB Connector, radial, 12 pole <b>A</b> PCB Connector, axial, 12 pole, with mating connector and 0.5 m cable <b>B</b> PCB Connector, radial, 12 pole, with mating connector and 0.5 m cable

### Dimensions (mm)



12 pin PCB connector  
manufacture Berg, type Minitek

# SERIES AD35

# ACURO™ brand

## Single Turn Absolute Encoder

### Key Features

- Short Mounting Depth Allows Installation in Tight Motor Endbells
- Up to 10,000RPM Speed Capability for Majority of Servomotor Applications
- 8mm Hubshaft Mount for Easy Installation



**NEW!**



## SPECIFICATIONS

### ELECTRICAL

**Supply Voltage:** 5 VDC -5 %/+10 % or 10 - 30 VDC

**Max. Current w/o Load:** 50 mA

**Resolution Singleturn:** 17 Bit

**Output Code:** Gray

**Lines/Drives:** Clock and Data / RS422

**Incremental signals:** Sine-Cosine 1 Vpp

**Number of Increments:** 2,048

**3dB Limiting Frequency:** 500 kHz

**Absolute Accuracy:**  $\pm 35^\circ$

**Repeatability:**  $\pm 7^\circ$

**Alarm Output:** Alarm bit (SSI); Warning bit and alarm bit (BiSS)

### MECHANICAL

**Housing Diameter:** 37.5 mm (1.48")

**Material Shaft/ Flange/ Housing:** Stainless steel/ aluminum/ plastic

**Shaft Diameter:** 6 mm solid shaft (8 mm hub shaft optional)

**Mounting:** Spring Tether (Hub Shaft)

**Protection Class:** IP40 Housing & Shaft

**Shaft Speed (maximum):** 10,000 RPM (continuous), 12,000 RPM (peak)

**Torque:**  $\leq 1$  Ncm

**Moment of Inertia:** approx. 25 gcm<sup>2</sup>

**Shaft Load (solid-shaft):** Axial  $\leq 5$  N; Radial  $\leq 10$  N

**Shaft Load (hubshaft):** Spring Tether Tolerance: Axial  $\pm 0.5$ mm; Radial  $\pm 0.05$ mm

**Weight:** Approx. 80g (2.8 oz.)

**Connections:** Cable, PCB connector, 12 pole

### ENVIRONMENTAL

**Vibration:** 100 m/s<sup>2</sup> (10 to 500 Hz) (IEC 68-2-6)

**Shock:** 1,000 m/s<sup>2</sup> for 6 msec duration (IEC 68-2-27)

**Operating Temperature:** -15°C to +100°C

**Storage temperature:** -15°C to +85°C (due to packaging)

## CONNECTIONS

PIN	1b	2b	3b	4b	5b	6b
Function	DC 5V / 7-30V (U <sub>p</sub> )	Clock	B -	0 V (U <sub>n</sub> )	A -	Data
Color	Yellow/Black	White	Red	White/Green	Yellow	Black
PIN	1a	2a	3a	4a	5a	6a
Function	Data	A +	0 V - Sen	B +	Clock	5V Sensor
Color	Violet	Green	Brown/Green	Blue	Brown	Red/Black

U<sub>p</sub> = power Supply

Sensor is connected to Power Supply and 0 V (U<sub>n</sub>)

Shield connected to case

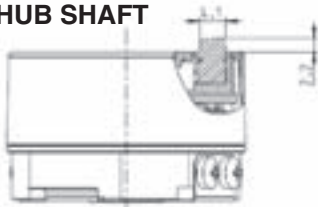
### Ordering Information

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

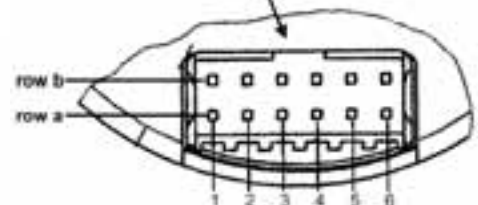
Code 1: Model	Code 2: Resolution	Code 3: Voltage	Code 4: Flange/Protection/Shaft	Code 5: Output	Code 6: Connection
<b>AD35</b>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> . <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>
<b>AD35</b> ACURO Absolute Encoder	<b>0012</b> 12 Bit ST <b>0013</b> 13 Bit ST <b>0014</b> 14 Bit ST <b>0017</b> 17 Bit ST <b>0019</b> 19 Bit ST <b>0022</b> 22 Bit ST	<b>A</b> 5 VDC* <b>E</b> 7-30 VDC  * No Inverse polarity protection	<b>F.O.C</b> Optional, Spring Tether, IP40, 8mm Hub Shaft	<b>BI</b> BiSS <b>SC</b> SSI Gray +1Vpp	<b>O</b> PCB Connector, 12 pole <b>B</b> Cable Radial, 0.5 m

### Dimensions (mm)

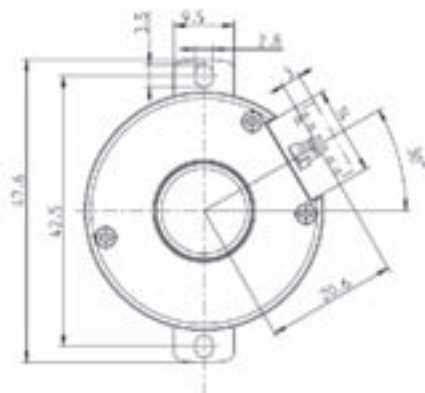
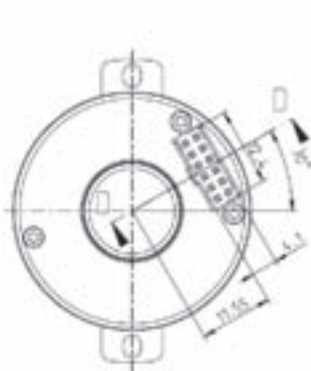
#### HUB SHAFT



PCB-Connector (12p)



12 pin PCB connector  
manufacture Berg, type Minitek



# SERIES AD36

# ACURO™ brand

## Single- / Multi- Turn Absolute Encoder **NEW!**

### Key Features

- **Compact Dimensions Compatible with Size 15 Resolvers**
- **Up to 22 Bit Singleturn and 12 Bit True Multiturn Absolute Positioning**
- **Optional Sinewave 1Vp-p Output for Easy Integration Into Older Controls**



## SPECIFICATIONS

### ELECTRICAL

**Supply Voltage:** 5 VDC -5 %/+10 % or 10 - 30 VDC  
**Max. Current w/o Load:** Single-Turn: 50 mA;  
 Multi-Turn: 100 mA  
**Resolution Singleturn:** SSI: 13 Bit; Biss: 19 Bit  
**Output Code:** Gray  
**Lines/Drives:** Clock and Data / RS422  
**Incremental Signals:** Sine-Cosine 1 Vpp  
**Number of Increments:** 2,048  
**3dB Limiting Frequency:** 500 kHz  
**Absolute Accuracy:**  $\pm 35''$   
**Repeatability:**  $\pm 7''$   
**Alarm Output:** Alarm bit (SSI); Warning bit and alarm bit (BiSS)

### MECHANICAL

**Housing Diameter:** 37.5 mm (1.48")  
**Material Shaft/ Flange/ Housing:** Stainless steel/ aluminum/ plastic  
**Shaft Diameter:** 8 mm solid shaft  
**Mounting:** Spring Tether (Hollow Shaft)  
**Protection Class:** IP40 Housing & Shaft  
**Shaft Speed (maximum):** 10,000 RPM (continuous), 12,000 RPM (peak)  
**Torque:** 0.01 Ncm  
**Moment of Inertia:** approx. 25 gcm<sup>2</sup>  
**Shaft Load (solid-shaft):** Axial  $\leq 5$  N; Radial  $\leq 10$  N  
**Shaft Load (hollowshaft):** Spring Tether Tolerance: Axial  $\pm 0.5$ mm; Radial  $\pm 0.05$ mm  
**Weight ST/MT:** 80g (2.8 oz.) / 130g (4.6 oz.)  
**Connections:** Cable, PCB connector, 12 pole

### ENVIRONMENTAL

**Vibration:** 100 m/s<sup>2</sup> (10 to 500 Hz) (IEC 68-2-6)  
**Shock:** 1,000 m/s<sup>2</sup> for 6 msec duration (IEC 68-2-27)  
**Operating Temperature:** -15°C to +120°C  
**Storage temperature:** -15°C to +85°C (due to packaging)

## CONNECTIONS

PIN	1b	2b	3b	4b	5b	6b
Function	DC 5V / 7-30V (U <sub>p</sub> )	Clock	B -	0 V (U <sub>n</sub> )	A -	Data
Color	Yellow/Black	White	Red	White/Green	Yellow	Black
PIN	1a	2a	3a	4a	5a	6a
Function	Data	A +	0 V - Sen	B +	Clock	5V Sensor
Color	Violet	Green	Brown/Green	Blue	Brown	Red/Black

U<sub>p</sub> = power Supply

Sensor is connected to Power Supply and 0 V (U<sub>n</sub>)

Shield connected to case

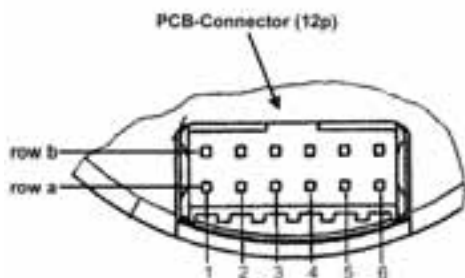
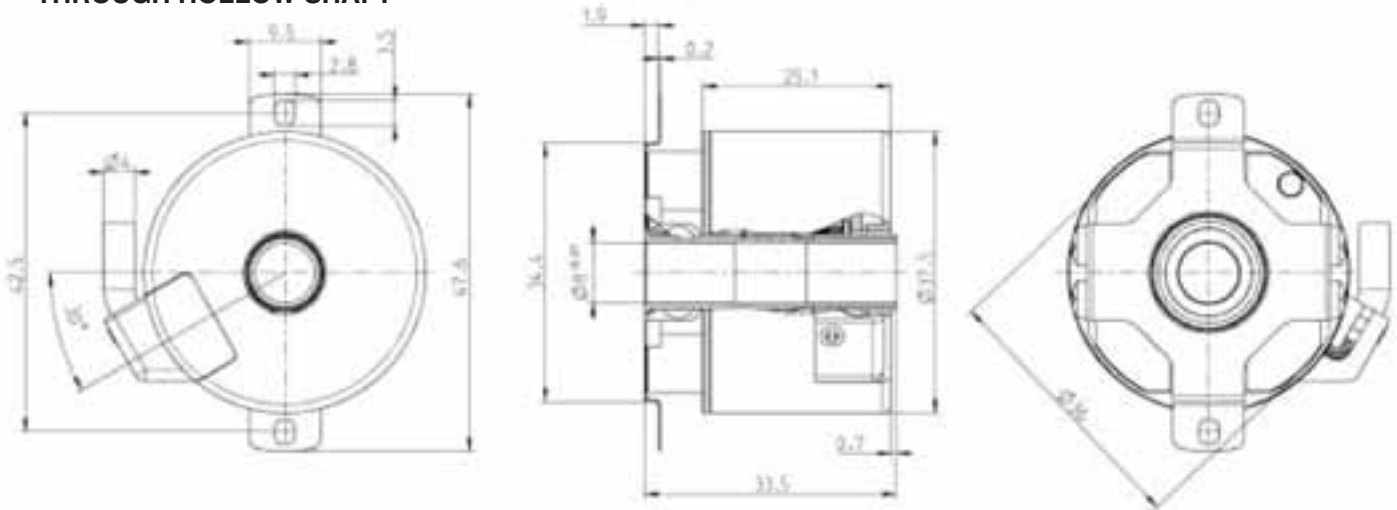
### Ordering Information

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

Code 1: Model	Code 2: Resolution	Code 3: Voltage	Code 4: Flange/Protection/Shaft	Code 5: Output	Code 6: Connection
<b>AD36</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"/>	<input type="checkbox"/>
<b>AD36</b> ACURO Absolute Encoder	<b>0012</b> 12 Bit ST <b>0013</b> 13 Bit ST <b>0014</b> 14 Bit ST <b>0017</b> 17 Bit ST <b>0019</b> 19 Bit ST (Biss) <b>0022</b> 22 Bit ST <b>1213</b> 12 Bit MT+13 Bit ST <b>1217</b> 12 Bit MT+17 Bit ST <b>1219</b> 12 Bit MT+19 Bit ST (Biss) <b>1222</b> 12 Bit MT+22 Bit ST	<b>A</b> 5 VDC* <b>E</b> 7-30 VDC  * No Inverse polarity protection	<b>F.O.C</b> Optional, Spring Tether, IP40, 8mm Through Hollow Shaft  <b>F.OR</b> Spring Tether, IP40, 8mm Hub Shaft	<b>BI</b> BiSS (1 Vss redundant, optional)  <b>SC</b> SSI Gray +1Vpp	<b>0</b> PCB Connector, 12 pole <b>B</b> Cable Radial, 0.5 m

### Dimensions (mm)

#### THROUGH HOLLOW SHAFT



12 pin PCB connector  
manufacture Berg, type Minitex

# SERIES AD25

# ACURO™ brand

## Single- / Multi- Turn Absolute Encoder

### Key Features

- **Special Conical Shaft for Concentric Motor Mounting**
- **Up to 22 Bits of Singleturn Absolute Positioning for Smooth Low Speed Motor Performance**
- **Integrated On-Board Diagnostics to Monitor Encoder Health**



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Supply Voltage:** 5 VDC, +10% / -5%

**Current Consumption (w/o output current):**

*Single-turn:* £ 45 mA (at 5V)

*Multi-turn:* £ 85 mA (at 5V)

**Absolute Accuracy:** ± 0.01° mechanical (36 arc-sec.)

**Repeatability:** ± 0.002° mechanical (7.2 arc-sec.)

**Connection:** 1 ft. Cable (30 cm)

**Incremental Signals (SSI models only)**

**Resolution:** 2048

**Format:** A, B Quadrature, 1 Vpp Sine wave

**SSI Interface**

**Resolution:**

**Single-turn:** 13 Bits

**Multi-turn resolution:** 12 Bits

**Interface:**

**Number of lines:** 4 unidirectional (2 for clock; 2 for data)

**Electrical Interface:** RS 422

**Transmission speed:** 70 kHz to 2 MHz per SSI definition

**BiSS Interface**

**Resolution:**

**Single-turn resolution:** 22 Bits

**Multi-turn resolution:** 12 Bits

**Interface:**

**Signals:** Clock unidirectional (from master to encoder);  
Data unidirectional (from encoder to master)

**Electrical Interface:** RS 422

**Number of lines:** 4 unidirectional (2 for clock and 2 for data)

**Transmission speed:** 70 kHz – 10 MHz

**Transmission security:** 1 start bit, 1 stop bit, 6 Bit CRC

**Diagnostic functions:** possible failure modes are constantly checked with the following functions

**LED current sensing:** Pollution, condensation, over-temperature

**Single-step check:** Disk pollution or damage, condensation, mechanical overload

**Temperature monitoring:** Warning message if the user-defined limits have been reached/exceeded

*For further information on the BiSS interface please consult: <http://www.biss-ic.de/>*

### MECHANICAL

**Shaft Size:**

**Tapered solid shaft:** 10 mm diameter;  
Cone 1:10

**Tapered hub shaft:** 10 mm diameter;  
Cone 1:10

**Shaft Loading:** 5 lb axial, 20 lb radial

**Shaft Speed:** 10,000 RPM (continuous), 12,000 RPM (peak-ST only)

**Starting Torque:** < 1.4 in-oz

**Weight:** 6.2 oz.

**Diameter:** 2.28"

**Length:** 1.85"

### ENVIRONMENTAL

**Operating Temperature:** -15 to +120° C

**Storage Temperature:** -25 to +85° C (due to packaging)

**Enclosure Rating:** IP40

**Shock:** 100 g's for 6 msec duration

**Vibration:** 10 g's (10 to 2000 Hz)

## CONNECTIONS

PIN	1b	2b	3b	4b	5b	6b
Name	Power Supply (U <sub>p</sub> )	Clock	B -	0 V (U <sub>n</sub> )	A -	Data
Color	Gray/Pink	White	Red	White/Green	Yellow	Black
PIN	1a	2a	3a	4a	5a	6a
Name	Data	A +	0 V -Sen	B +	Clock	U <sub>p</sub> Sensor
Color	Violet	Green	Brown/Green	Blue	Brown	Blue/Red

U<sub>p</sub> = power Supply

Sensor is connected to Power Supply and 0 V (U<sub>n</sub>)

Shield connected to case



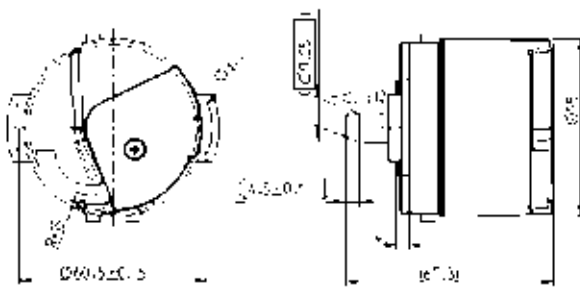
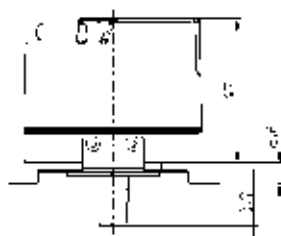
### Ordering Information

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

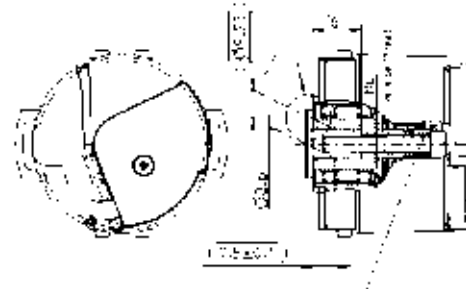
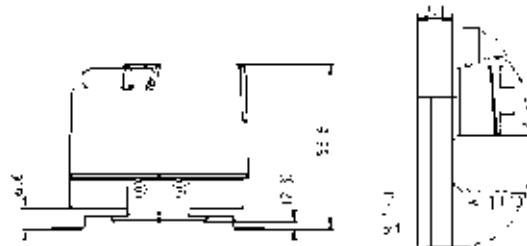
Code 1: Model	Code 2: Bits	Code 3 :Mounting	Code 4: Shaft Size	Code 5: Protocol	Code 6: Electrical	Code 7: Connector
<b>AD25</b>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>AD25</b> Size25 Acuro Absolute Encoder	<b>Single-Turn</b> <b>0013</b> 13 Bit <b>0022</b> 22 Bit	<b>4</b> Spring Tether	<b>Y</b> 10mm Shaft (10:1 Taper) <b>Z</b> 10mm Hub Shaft (10:1 Taper)	Available when Code 2 is 0022 or 1222 <b>A</b> BiSS	<b>0</b> 5 VDC	<b>M</b> Drive cable, 1 foot (30 cm)
	<b>Multi-Turn</b> <b>1213</b> 12 Bit Multi- Turn, 13 Bit Single-Turn <b>1222</b> 12 Bit Multi- Turn, 22 Bit Single-Turn			Available when Code 2 is 0013 or 1213 <b>F</b> SSI-Gray Code, + 1Vpp		

### Dimensions (mm)

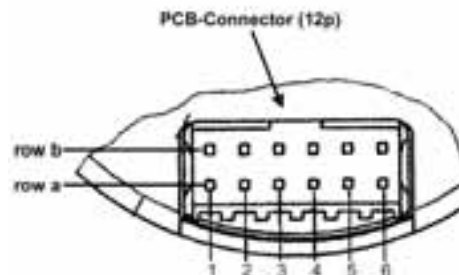
#### Code 4: Shaft Size



**Y**  
10mm (10:1 taper) Shaft



**Z**  
10mm Hub Shaft



12 pin PCB connector  
manufacture Berg, type Minitek

# SERIES M602 & M832

# Dynapar™ brand

## Kit Encoder

### Key Features

- Compact Size for Easy Integration
- Advanced Phased-Array Sensor Technology with Digital or Analog Output
- Available with Unbreakable Plastic or Stainless Code Discs
- Commutation Tracks Available for Brushless Motor Commutation
- Line Driver Output Board Available



## NEW!



## SPECIFICATIONS

### ELECTRICAL

**Code:** Incremental

**Resolution:** See ordering information for standard resolutions

**Supply Voltage:** 5Vdc + 10% at 60mA maximum

**Output Format:** Dual channel quadrature

**Output Format Options:** Index and commutation.

*ComTracks available on Digital version only*

**Output Type – Digital:** Square wave, TTL and CMOS compatible, 10mA sink

**Output Type – Analog:** Current Source

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

### MECHANICAL

**Dimensions:** See module outline dimensions

**Weight:** <0.25 ounces

**Termination:** .025 sq. discrete pins

### Materials

**Module:** Molded PPS 40% glass (R-4)

**Pins:** gold plated

**Disc:** mylar or etched metal

**Hub:** aluminum

### Disc Interface

**Runout:** 0.005 inches TIR

**Endplay:** + 0.010 inches

**Optical Radius (data):** 0.602 or 0.832 inches

### Motor Interface

**Mounting Holes:** See recommended mounting

### Connector Interface

**Molex Connector:** P/N 50-57-9005

**Molex Socket:** P/N 16-02-0069

**AMP Connector:** P/N 87499-9

**AMP Socket:** P/N 87667-3

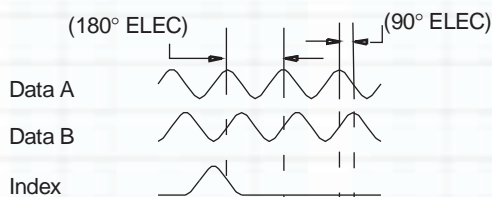
### ENVIRONMENTAL CONDITIONS

**Operating Temperature:** -40° to 100°C (non-condensing)

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

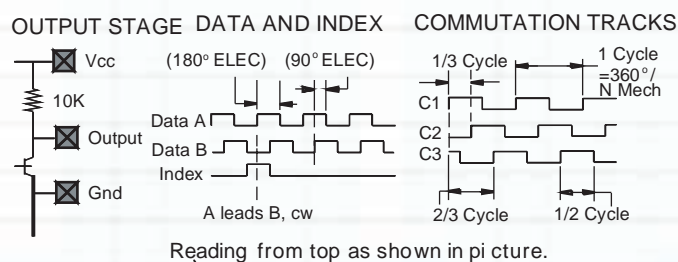
**Enclosure:** Unsealed housing

### Analog Output Wave Forms



Output signal shown after analog signal processing

### Digital Output Format





# SERIES M602 & M832

## ORDERING INFORMATION

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

<b>Encoder Module (Rotary)</b> <b>Digital M</b> <span style="border: 1px solid black; padding: 2px;">602</span> - <span style="border: 1px solid black; padding: 2px;">1000</span> - <span style="border: 1px solid black; padding: 2px;">3T</span> - <span style="border: 1px solid black; padding: 2px;">See Note</span> 1.                   2.                   3.	<b>Code Disc and Hub</b> <b>DH</b> <span style="border: 1px solid black; padding: 2px;">602</span> - <span style="border: 1px solid black; padding: 2px;">1000</span> - <span style="border: 1px solid black; padding: 2px;">0</span> - <span style="border: 1px solid black; padding: 2px;">25</span> 1.                   2.                   3.                   4.																			
<b>Analog AM</b> <span style="border: 1px solid black; padding: 2px;">602</span> - <span style="border: 1px solid black; padding: 2px;">2000</span> - <span style="border: 1px solid black; padding: 2px;">6T</span> 1.                   2.                   3.	<b>Code Disc Only (no Hub)</b> <b>D</b> <span style="border: 1px solid black; padding: 2px;">602</span> - <span style="border: 1px solid black; padding: 2px;">1000</span> - <span style="border: 1px solid black; padding: 2px;">0</span> 1.                   2.                   3.																			
<p>1. Optical Radius</p> <p>0.602 inches ..... 602</p> <p>0.832 inches ..... 832</p> <p>2. Standard Resolutions</p> <p>Digital 602 Module</p> <p>Resolutions from 35 to 3600.</p> <p>See "Current Resolutions" list.</p> <p>Digital 832 Module</p> <p>Resolutions from 360 to 5000</p> <p>See "Current Resolutions" list.</p> <p>Analog 602 Module</p> <p>Available Resolutions: 1000 &amp; 1024</p> <p>Analog 832 Module</p> <p>Available Resolutions: 2000 &amp; 2048</p> <p>3. Lead Positions</p> <p>Digital</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Side Exit</td> <td style="width: 50%;">Top Exit</td> </tr> <tr> <td>A ..... 1S</td> <td>A ..... 1T</td> </tr> <tr> <td>AB ..... 2S</td> <td>AB ..... 2T</td> </tr> <tr> <td>ABZ ..... 3S</td> <td>ABZ ..... 3T</td> </tr> <tr> <td></td> <td>ABZ + COMS ..... 6T</td> </tr> </table> <p>Analog</p> <p>Top Exit</p> <p>ABZ ..... 6T</p>	Side Exit	Top Exit	A ..... 1S	A ..... 1T	AB ..... 2S	AB ..... 2T	ABZ ..... 3S	ABZ ..... 3T		ABZ + COMS ..... 6T	<p>1. Disc Outside Diameter</p> <p>1.30 inches ..... 602</p> <p>1.75 ..... 832</p> <p>2. Standard Resolutions</p> <p>See "Current Resolutions: list.</p> <p>3. Commutation Tracks (Option)</p> <p>(Available on 6T digital module only)</p> <p>Not required ..... 0</p> <p>Specify 2, 3, 4, 6 or 8 motor pole pairs</p> <p>4. Hub Bore Size*</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">1/4 inch ..... 25</td> <td style="width: 33%;">6mm ..... 6M</td> <td style="width: 33%;"></td> </tr> <tr> <td>3/8 inch ..... 38</td> <td>8mm ..... 8M</td> <td></td> </tr> <tr> <td></td> <td>10mm ..... 10M</td> <td></td> </tr> </table> <p>*Consult factory for other sizes</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>NOTE: When ordering Modules with Index add a "G" to the end of the part number for GATED INDEX or "U" for UNGATED INDEX.</b></p> <p><b>When ordering Modules in 1000 or 1024PPR to specify DOUBLER CIRCUIT add a "D" to the last digit. Example: M602-1000-3T-UD</b></p> </div>	1/4 inch ..... 25	6mm ..... 6M		3/8 inch ..... 38	8mm ..... 8M			10mm ..... 10M	
Side Exit	Top Exit																			
A ..... 1S	A ..... 1T																			
AB ..... 2S	AB ..... 2T																			
ABZ ..... 3S	ABZ ..... 3T																			
	ABZ + COMS ..... 6T																			
1/4 inch ..... 25	6mm ..... 6M																			
3/8 inch ..... 38	8mm ..... 8M																			
	10mm ..... 10M																			

## RESOLUTIONS

### M602 Digital Modules

1, 24, 25, 35, 40, 60, 100, 120, 192, 200, 240, 250, 256, 300, 360, 500, 512, 600, 625, 720, 1000\*, 1024\*

\* Available as direct read or doubler

**Doubler:** 1000, 1024, 1200, 1250, 1440, 2000, 2048, 2500, 2540, 2600 3600

With Commutation for Brushless Motors:

CPR	Pole Pairs
500	5 or 6
512	3 or 6

### M832 Digital Modules

**Direct Read:** 360, 1000, 1024

**Doubler:** 2000, 2048, 3600, 4096, 5000

With Commutation for Brushless Motors:

CPR	Pole Pairs
1000	2, 3, 4, 6 or 8
1024	6

### AM602/AM832 Analog Modules

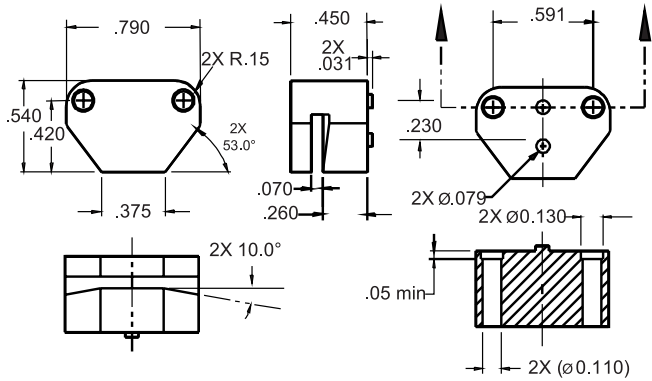
AM602	AM832
1000,	1024 2000, 2048

Analog Modules available in -6T configuration only  
 For new Disc resolutions or radii please consult factory for availability and NRE. We are constantly adding new resolutions so if the one you require is not listed please call the factory for availability

# SERIES M602 & M832



### Module Outline Dimensions



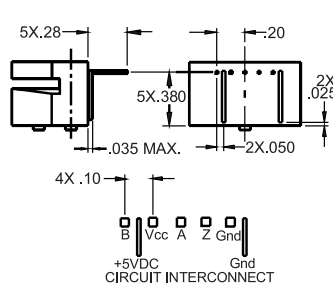
### Pin Layouts

The Optical Encoder Modules come standard in either top mount or side mount with A, B, and Index Channels. Commutation Channels are optionally available for Digital modules in top-mounted configurations only.

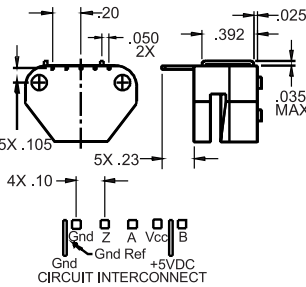
### ABZ CONFIGURATION

5X .025 square pins

#### SIDE MOUNT (-1S, -2S, -3S)

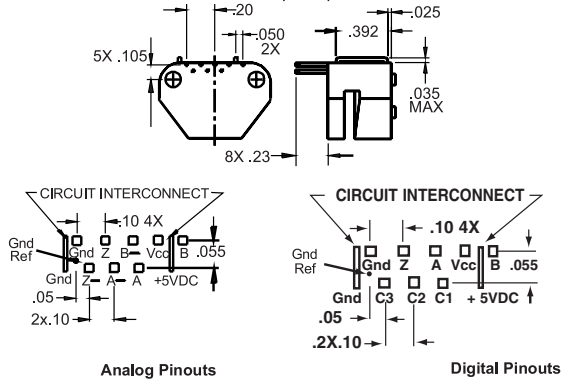


#### TOP MOUNT (-1T, -2T, -3T)



### ANALOG CONFIGURATIONS (-6T)

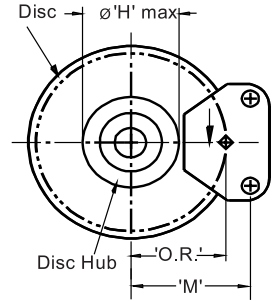
8X .025 square pins



### Module Interface

#### Module 602

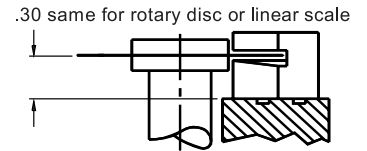
‘O.R.’ – Optical Radius .....0.602 in.  
 ‘M’ – Mounting dimension ..0.756 in.  
 ∅ ‘H’ – Hub Maximum O.D. ...0.61 in.



#### Module 832

‘O.R.’ – Optical Radius ..... 0.832. in.  
 ‘M’ – Mounting dimension...0.986 in.  
 ∅ ‘H’ – Hub maximum O.D...1.07 in.

### DISC MOUNTING



### Disc and Hub Dimensions

#### Module 602 Disc and Hub

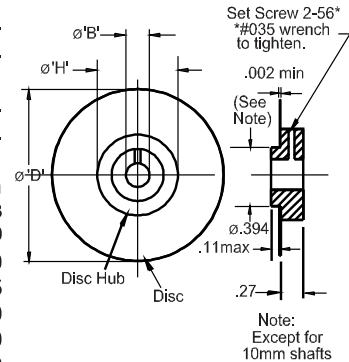
∅ ‘D’ – Disc O.D. .... 1.30 in.  
 ∅ ‘H’ – Hub O.D. .... 0.61 in.

#### Module 832 Disc and Hub

∅ ‘D’ – Disc O.D. .... 1.75 in.  
 ∅ ‘H’ – Hub O.D. .... 1.00 in.

#### Shaft Size Hub Bore Sizes

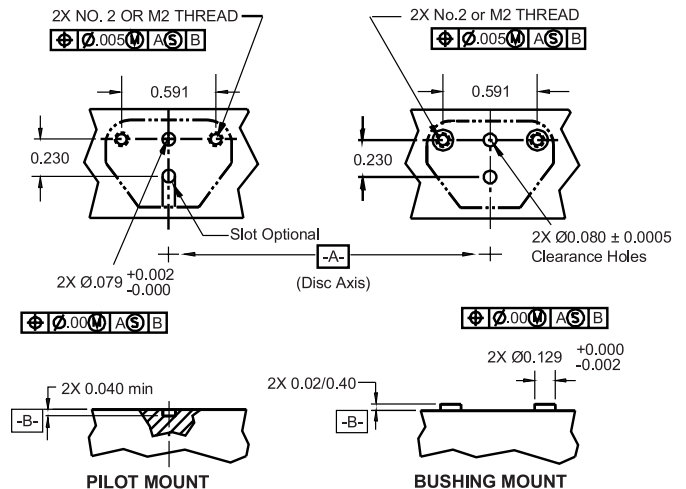
Shaft Size	Hub Bore Size (in.)	Hub Bore Size (mm)
	∅ ‘B’ in.	∅ ‘B’ mm
	+0.0005	+0.013
	+0.0000	-0.000
1/4 in.	.2500	6.350
3/8 in.	.3750	9.525
6 mm	.2362	6.000
8 mm	.3150	8.000
10 mm	.3937	10.000



#### Disc only

.3942 I.D. x .002 min. thick

### Recommended Mounting Configurations



# SERIES LM & LAM

# Dynapar™ brand

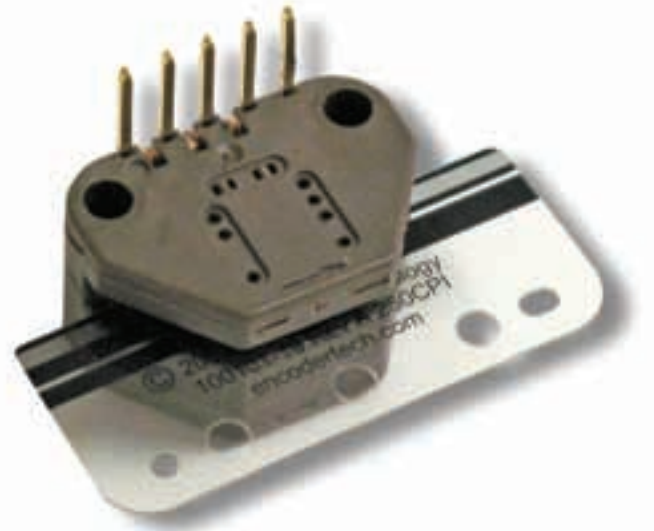
## Kit Encoder

### Key Features

- Compact Size for Easy Integration
- Advanced Phased-Array Sensor Technology with Digital or Analog Output
- Rugged Plastic or Metal Scale Material



## NEW!



## SPECIFICATIONS

### ELECTRICAL

**Code:** Incremental

**Resolution:** See ordering information for standard resolutions

**Supply Voltage:** 5Vdc + 10% at 60mA maximum

**Output Format:** Dual channel quadrature

**Output Format Options:** Index

**Output Type – Digital:** Square wave, TTL and CMOS compatible, 10mA sink

**Output Type – Analog:** Output from diode array

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

### MECHANICAL

**Dimensions:** See module outline dimensions

**Weight:** <0.25 ounces

**Termination:** .025 sq. discrete pins

### Materials

**Module:** Molded PPS 40% glass (R-4)

**Pins:** gold plated

**Scale:** Mylar or etched metal

### ENVIRONMENTAL CONDITIONS

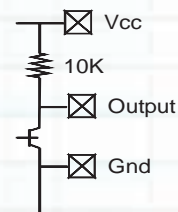
**Operating Temperature:** -40° to 100°C (non-condensing)

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

**Enclosure:** Unsealed housing

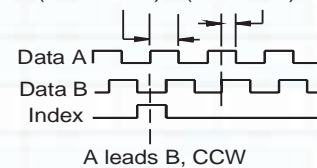
### Digital Output

#### Output Stage



#### Data and Index

(180° ELEC) (90° ELEC)



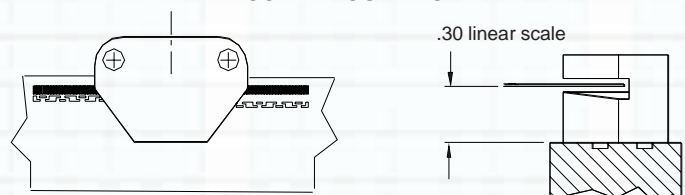
### Analog Output Wave Forms

(180° ELEC) (90° ELEC)



Output signal shown after analog signal processing

### SCALE MOUNTING



Linear Module Scale made to order: contact factory

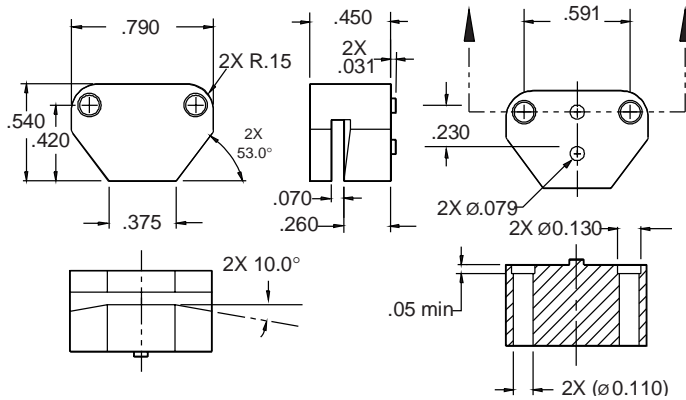
# SERIES LM & LAM

## ORDERING INFORMATION

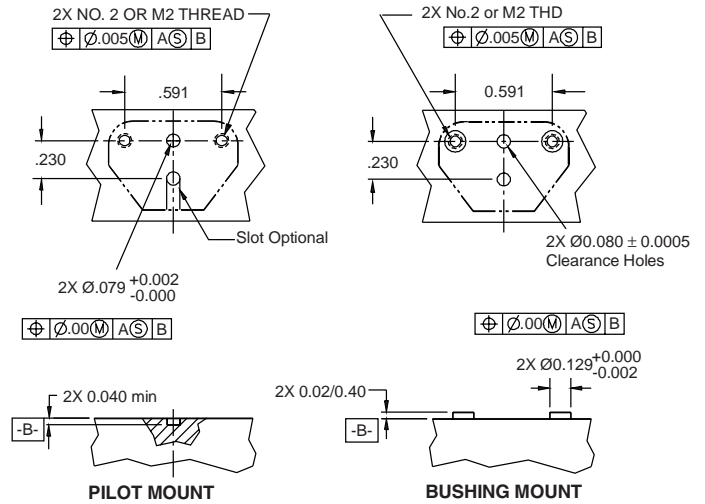
To order, complete the model number with code numbers from the table below:

Encoder Module (Linear)	Scale Characteristics												
<p><b>Digital LM</b>    <span style="border: 1px solid black; padding: 2px;">720CPI</span> – <span style="border: 1px solid black; padding: 2px;">3T</span> – <span style="border: 1px solid black; padding: 2px;">See Note</span></p> <p style="margin-left: 40px;">1.                      3.</p> <p><b>Analog LAM</b>    <span style="border: 1px solid black; padding: 2px;">500CPI</span>    <span style="border: 1px solid black; padding: 2px;">6T</span></p> <p style="margin-left: 40px;">2.                      3.</p>	<p><b>Standard Resolution - Digital</b> after 4x edge multiplication.</p> <p><i>12 cycles/mm = 0.0008 Inch</i> Available Scale Length: 1.5 inches</p> <p><i>25 cycles/mm = 0.01mm</i> Available Scale Length: Up to 600mm</p> <p><i>720 cycles per inch = 0.00035 inch</i> Available Scale Length: 0.75, 1.0, 1.26, 1.70, 2.03, 3.255 or 4.8 inches</p>												
<p><b>1.Linear Digital Module (LM)</b> 12CPMM.....12 cycles/mm 25CPMM.....25 cycles/mm 720CPI.....720 cycles/inch See "Current Resolutions List" for Scale Lengths.</p> <p><b>2. Linear Analog Module (LAM)</b> 250CPI.....250 cycles /inch 500 cycles/inch.....500CPI See "Current Resolutions List" for Scale Lengths.</p> <p><b>3.Lead Positions</b></p> <p><b>Digital</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Side Exit</td> <td style="width: 50%;">Top Exit</td> </tr> <tr> <td>A.....1S</td> <td>A.....1T</td> </tr> <tr> <td>AB.....2S</td> <td>AB.....2T</td> </tr> <tr> <td>ABZ.....3S</td> <td>ABZ.....3T</td> </tr> </table> <p><b>Analog</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Top Exit</td> <td style="width: 50%;"></td> </tr> <tr> <td>ABZ.....</td> <td>6T</td> </tr> </table> <p style="text-align: center;"><b>Note: When ordering Modules with a Gated Index, add a "G". For Ungated Index, add a "U".</b></p>	Side Exit	Top Exit	A.....1S	A.....1T	AB.....2S	AB.....2T	ABZ.....3S	ABZ.....3T	Top Exit		ABZ.....	6T	<p><b>Standard Resolution – Analog</b> Available in custom lengths to 6 feet. Consult factory.</p> <p><i>250 cycles per inch = 1.6 microns</i> after16x interpolate and 4x edge multiplication.</p> <p><i>500 cycles per inch = .8 microns</i> after16X interpolate and 4x edge multiplication.</p> <p><b>Length &amp; Index Positioning</b> Per customer requirement Consult factory for availability, part numbers and pricing.</p>
Side Exit	Top Exit												
A.....1S	A.....1T												
AB.....2S	AB.....2T												
ABZ.....3S	ABZ.....3T												
Top Exit													
ABZ.....	6T												

### Module Outline Dimensions



### Recommended Mounting Configurations

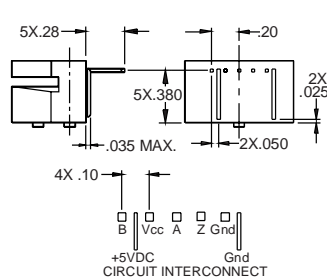


### Pin Layouts

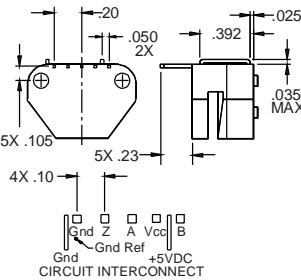
The Optical Encoder Modules come standard in either top mount or side mount with A, B, and Index Channels.

#### ABZ CONFIGURATION 5X .025 square pins

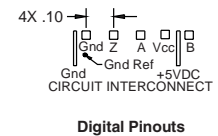
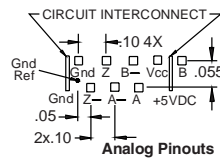
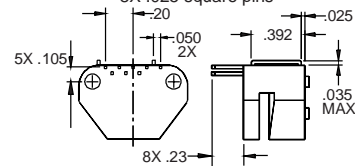
SIDE MOUNT (-1S, -2S, -3S)



TOP MOUNT (-1T, -2T, -3T)



#### ANALOG CONFIGURATIONS (-6T) 8X .025 square pins



# SERIES E9

**Dynapar™ brand**

## Miniature Encoder

### Key Features

- Super-Compact Modular Encoder for Small Servo and Stepper Motor Feedback
- Differential Outputs Available
- Low-Power Standby Mode is Ideal for Battery Powered Applications



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental, Optical  
**Resolution:** Incremental pulses per revolution; 100 to 512  
**Phasing:** 90° ±18° electrical degrees  
**Symmetry:** 180° ±18° electrical  
**Index Pulse Width:** 90° ±36° electrical

### ELECTRICAL

**Supply Voltage:** 5 VDC ±10%  
**Supply Current:** 10 mA, typ.  
**Standby Current:** 50 µA, max.

**Output Signals:** 2.5 V min. high ( $V_{OH}$ ); 0.5 V max. low ( $V_{OL}$ ). 3 mA sink/source (25°C), 2 mA (100°C)  
**Frequency Response:** 200 kHz  
**Termination:** 10 pin header (accessory connector/ 12" ribbon cable, part no. CA0040012)  
**Recommended Mating Connector:** Thomas & Betts part number 622-1030

### MECHANICAL

**Weight:** 0.18 oz (5.07 g)  
**Moment of Inertia:** 0.28 x 10<sup>-5</sup> oz-in-sec<sup>2</sup> (0.20 gm-cm<sup>2</sup>)  
**Hub Bore:** 1.5, 2.0, 2.5, 3.0, 4.0 mm; 0.125, 0.156 inch

**Hub Dia. Tolerance:** +0.0004"/-0.0000" (+0.010 mm/-0.000 mm)  
**Mating Shaft Length:** See table  
**Mating Shaft Runout:** 0.001 TIR  
**Mating Shaft Endplay:** >256 ppr: ±0.003" (±0.076mm); 250, 256 ppr: +0.005/-0.003" (+0.127/-0.076mm); <250 ppr: +0.007/-0.003" (+0.178/-0.076mm)

### ENVIRONMENTAL

**Operating Temperature:** -20° to 100°C  
**Storage Temperature:** -50° to 125°C  
**Relative Humidity:** 90% non-condensing

### OUTPUT WAVEFORMS & CONNECTIONS (direction viewing encoder cover)

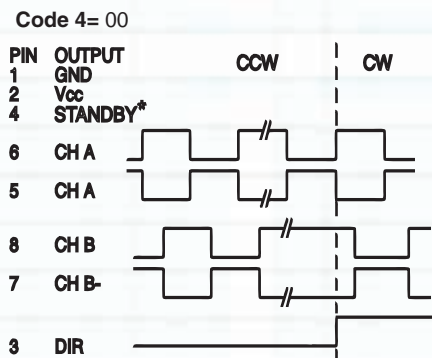


Figure 1

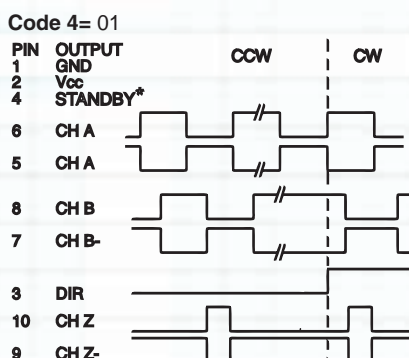


Figure 2

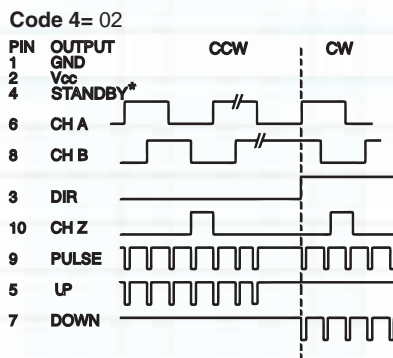


Figure 3

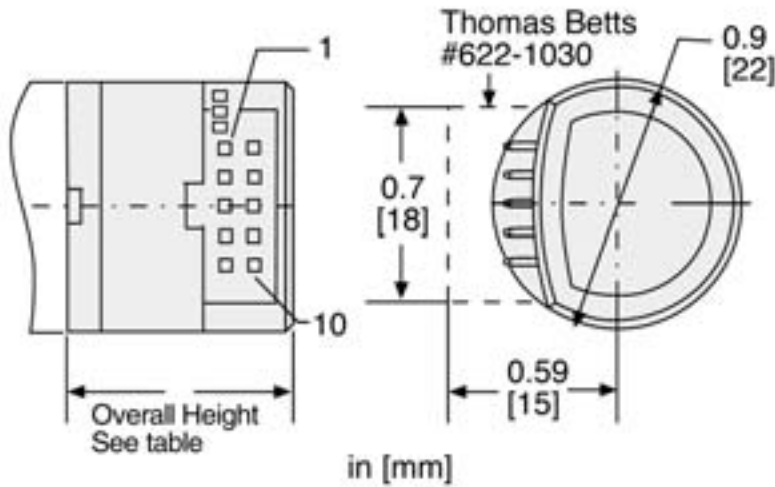
\* For operation, connect STANDBY (4) to Vcc (2)





# SERIES E9

## DIMENSIONS/INSTALLATION



Base (Code 3)	Overall Height inch (MM)	Motor Shaft Length inch (MM)	
		Max.	Min
A	0.795 (20.20)	0.479 (12.16)	0.467 (11.86)
C, D, E	0.929 (23.60)	0.613 (15.56)	0.581 (14.76)

Bases C and D provide clearance for motor-bosses with maximum dimensions of 0.5 in, Dia. x 0.15 in. high. Base E provides clearance for motor-bosses with maximum dimensions of 1.0 in. x 0.15 in. high

## ORDERING INFORMATION

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

Code 1: Model	Code 2: PPR	Code 3: Hub Bore	Description	Code 4: Output	Description	Code 5: Mounting	Description
<b>E9</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>E9</b>	0.9" Diameter Incremental Modular Encoder	<b>0100</b> <b>0144</b> <b>0200</b> <b>0256</b> <b>0300</b> <b>0360</b> <b>0500</b> <b>0512</b>	<b>1.5</b> <b>2.0</b> <b>2.5</b> <b>3.0</b> <b>4.0</b> <b>125</b> <b>156</b>	1.5 mm 2.0 mm 2.5 mm 3.0 mm 4.0 mm 0.125 in 0.156 in	<b>00</b> See Figure 1 <b>01</b> See Figure 2 <b>02</b> See Figure 3	<b>0</b> <b>A</b> <b>C</b> <b>D</b> <b>E</b>	No mounting base 4x M1.6 on 0.728" BC 2x #2-56 on 0.75" BC 3x #0-80 on 0.823" BC 2x #2-56 on 1.812" BC

**IMPORTANT:** To properly install Series E9, a specialized mounting kit must be purchased. Only one kit is required to install any number of encoders with the same hub bore size.

Kit Part Number: MK E9  Code 3 (from Models Table, above) designating Hub Bore requirement.

Example: Kit for installing encoders with 3.0 mm hub Bore= **MK E9 3.0**

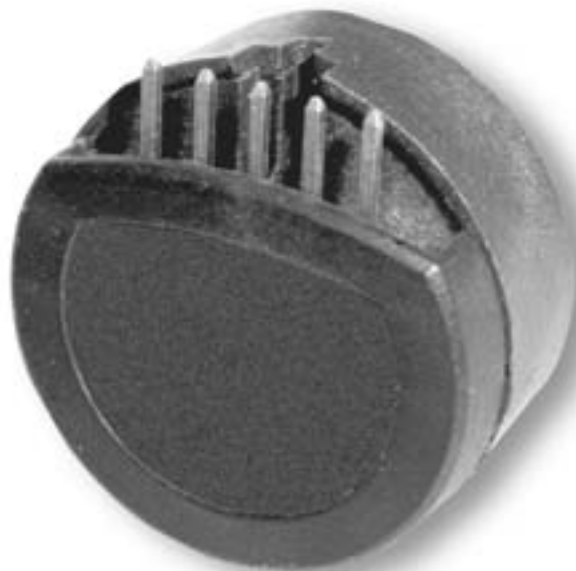
# SERIES M9

# Dynapar™ brand

## Miniature Encoder

### Key Features

- Super-Compact Modular Encoder for Small Servo and Stepper Motor Feedback
- Integrated ASIC for Enhanced Reliability and Accuracy
- Up to 512 PPR Resolution



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental, Optical

**Resolution:** Incremental pulses per revolution; 100 to 512

**Phasing:** 90° ±18° electrical

**Symmetry:** 180° ±18° electrical

**Index Pulse Width:** 90° ±36° electrical

### ELECTRICAL

**Supply Voltage:** 5 VDC ±10%

**Supply Current:** 10 mA, typ.

**Output Signals:** 2.5 V min. high ( $V_{OH}$ ); 0.5 V max. low ( $V_{OL}$ ), 6 mA sink/source (25°C), 4 mA (100°C)

**Frequency Response:** 200 kHz

**Termination:** 5 pin header (accessory 12" wires w/connector, part no. CA0050012) or flying leads

**Recommended Mating Connector:** AMP part number 103675-4

### MECHANICAL

**Weight:** 0.15 oz (4.14 g)

**Moment of Inertia:** 0.15 x 10<sup>-5</sup> oz-in-sec<sup>2</sup> (0.11 gm-cm<sup>2</sup>)

**Hub Bore:** 1.5, 2.0, 2.5, 3.0, 4.0 mm; 0.125, 0.156 inch

**Hub Dia. Tolerance:** +0.0004"/-0.0000" (+0.010 mm/-0.000 mm)

**Mating Shaft Length:** See table

**Mating Shaft Runout:** 0.001 TIR

**Mating Shaft Endplay:** >256 ppr: ±0.003" (±0.076mm); 250, 256 ppr: +0.005/-0.003" (+0.127/-0.076mm); <250 ppr: +0.007/-0.003" (+0.178/-0.076mm)

### ENVIRONMENTAL

**Operating Temperature:** -20° to 100°C

**Storage Temperature:** -50° to 125°C

**Relative Humidity:** 90% non-condensing

## OUTPUT WAVEFORMS & CONNECTIONS

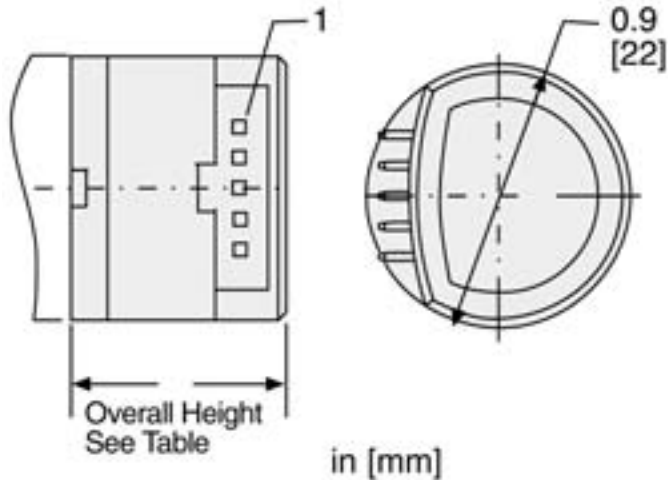
PIN	FUNCTION	CABLE WIRE
1	GND	BLACK
2	CH Z	BLUE
3	CH A	WHITE
4	Vcc	RED
5	CH B	BROWN

(Direction CCW viewing encoder cover)



# SERIES M9

## DIMENSIONS/INSTALLATION



Base (Code 3)	Overall Height inch (MM)	Motor Shaft Length inch (MM)	
		Max.	Min
A	0.583 (14.80)	0.437 (11.10)	0.377 (9.57)
C, D, E	0.717 (18.20)	0.571 (14.50)	0.511 (12.97)

Bases C and D provide clearance for motor-bosses with maximum dimensions of 0.5 in. Dia. x 0.15 in. high. Base E provides clearance for motor-bosses with maximum dimensions of 1.0 in. x 0.15 in. high

## ORDERING INFORMATION

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

Code 1: Model	Code 2: PPR	Code 3: Mounting	Description	Code 4: Hub Bore	Description	Code 5: Termination	Description
<b>M9</b>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> /0	<input type="checkbox"/>		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		<input type="checkbox"/>	
Ordering Information							
<b>M9</b>	0.9" Diameter Incremental Modular Encoder	<b>0100/0</b> <b>0144/0</b> <b>0200/0</b> <b>0256/0</b> <b>0300/0</b> <b>0360/0</b> <b>0500/0</b> <b>0512/0</b>	<b>0</b> No mounting base <b>A</b> 4x M1.6 on 0.728" BC, <b>C</b> 2x #2-56 on 0.75" BC <b>D</b> 3x #0-80 on 0.823" BC <b>E</b> 2x #2-56 on 1.812" BC	<b>1.5</b> 1.5 mm <b>2.0</b> 2.0 mm <b>2.5</b> 2.5 mm <b>3.0</b> 3.0 mm <b>4.0</b> 4.0 mm <b>125</b> 0.125 in <b>156</b> 0.156 in		<b>1</b> 5 pin header <b>2</b> flying leads	

**IMPORTANT:** To properly install Series M9, a specialized mounting kit must be purchased. Only one kit is required to install any number of encoders with the same hub bore size.

Kit Part Number: MK M9    Code 4 (from Models Table, above) designating Hub Bore requirement.

Example: Kit for installing encoders with 3.0 mm hub Bore= **MK M9 3.0**

# SERIES M14

# Dynapar™ brand

## Miniature Encoder

### Key Features

- Ideal Economical Choice for Stepper and Servo Motor Feedback
- Short .678" Mounting Depth and 1.5" Diameter
- Up to 1024PPR Resolution with Index



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental, Optical

**Resolution:** Incremental pulses per revolution; 200 to 1024

**Phasing:** 90° ±18° electrical

**Symmetry:** 180° ±18° electrical

**Index Pulse Width:** 90° ±36° electrical

### ELECTRICAL

**Supply Voltage:** 5 VDC ±10%

**Supply Current:** 10 mA, typ.

**Output Signals:** 2.5 V min. high ( $V_{OH}$ ); 0.5 V max. low ( $V_{OL}$ ), 6 mA sink/source (25°C), 4 mA (100°C)

**Frequency Response:** 200 kHz

**Termination:** 5 pin connector (accessory connector w/12" wires, part no. CA0060012)

**Recommended Mating Connector:** Amp Part Number 103969-4

### MECHANICAL

**Weight:** 0.22 oz (6.2 g)

**Moment of Inertia:** 0.16 x 10<sup>-5</sup> oz-in-sec<sup>2</sup> (0.13 gm-cm<sup>2</sup>)

**Hub Bore:** 3.0, to 8.0 mm; 0.125, to 0.375 inch

**Hub Dia. Tolerance:** +0.0004"/-0.0000" (+0.010 mm/-0.000 mm)

**Mating Shaft Length:** 0.525" (13.3 mm) max.; 0.436" (11.07 mm) min.

**Mating Shaft Runout:** 0.001 TIR

**Mating Shaft Endplay:** >512 ppr: ±0.003" (±0.076mm); 500, 512 ppr: +0.005/-0.003" (+0.127/-0.076mm); <500 ppr: +0.007/-0.003" (+0.178/-0.076mm)




### ENVIRONMENTAL

**Operating Temperature:** -20° to 100°C

**Storage Temperature:** -50° to 125°C

**Relative Humidity:** 90% non-condensing

### OUTPUT WAVEFORM AND CONNECTIONS

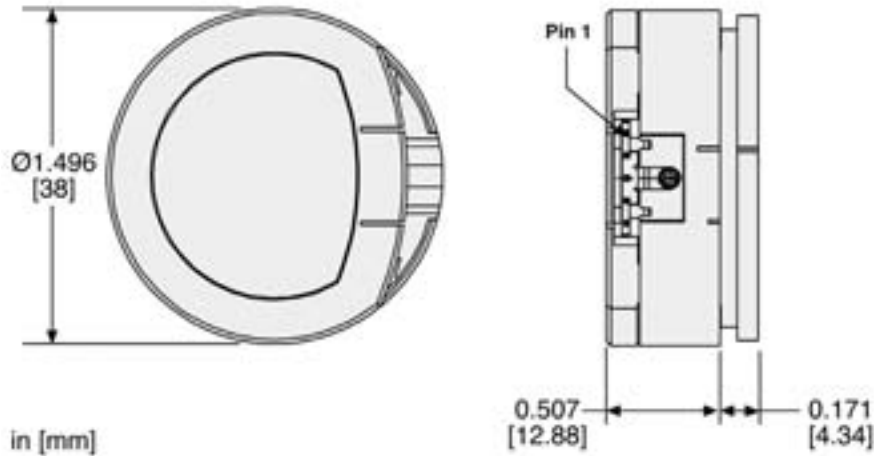
PIN	FUNCTION	CABLE WIRE
5	GND	BLACK
4	CH Z 	BLUE
3	CH A 	WHITE
2	Vcc	RED
1	CH B 	BROWN

Direction: CCW viewing encoder cover



# SERIES M14

## Dimensions/Installation



### Ordering Information

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

Code 1: Model	Code 2: PPR	Code 3: Mounting	Description	Code 4: Hub Bore	Description
<b>M14</b>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> /0	<input type="text"/>		<input type="text"/> <input type="text"/> <input type="text"/>	
Ordering Information					
<b>M14</b> 1.5" Diameter Incremental Modular Encoder	<b>0200/0</b>	<b>0</b>	No mounting base	<b>3.0</b>	3.0 mm
	<b>0400/0</b>	<b>A</b>	2x #2-56 on 1.28" BC	<b>4.0</b>	4.0 mm
	<b>0500/0</b>	<b>B</b>	3x #0-80 on 0.823" BC	<b>5.0</b>	5.0 mm
	<b>0512/0</b>	<b>C</b>	2x #2-56 on 0.75" BC	<b>6.0</b>	6.0 mm
	<b>1000/0</b>			<b>8.0</b>	8.0 mm
	<b>1024/0</b>			<b>125</b>	0.1248 in
				<b>187</b>	0.1873 in
			<b>249</b>	0.2498 in	
			<b>250</b>	0.2501 in	
			<b>312</b>	0.3123 in	
			<b>374</b>	0.3748 in	
			<b>375</b>	0.3750 in	

**IMPORTANT:** To properly install Series M14, a specialized mounting kit must be purchased. Only one kit is required to install any number of encoders with the same hub bore size.

Kit Part Number: MK M14   Code 4 (from Models Table, above) designating Hub Bore requirement.

Example: Kit for installing encoders with 0.1248" hub Bore= **MK M14 125**

# SERIES M15

**Dynapar™ brand**

## For Stepper & Small Servo Motors

### Key Features

- **Modular Encoder with Easy Installation Requiring No Special Gapping Tools or Parts**
- **Phased Array Sensor Technology Allowing .030" Axial Shaft Play**
- **Wide -20 to 120C Operating Temperature Range**



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental

**Resolution:** (pulses/revolution)  
Incremental: 200 to 1024 PPR;  
Commutation: 4, 6, or 8 pole

**Accuracy:**  
Incremental:  $\pm 5$  arc-mins. max. edge to edge;  
Commutation:  $\pm 6$  arc-mins. max.

**Sense:** (viewing encoder mounting surface)  
Incremental: A leads B by  $90^\circ$  for CCW rotation of motor shaft;  
Commutation: U leads V, V leads W by  $120^\circ$  for CW rotation of motor shaft

**Phasing:**  
Incremental:  $90^\circ \pm 18^\circ$  electrical  
Commutation: 8 Pole:  $30^\circ$ ; 6 Pole:  $40^\circ$ ; 4 Pole:  $60^\circ$  mechanical  
Index to U Channel:  $\pm 1^\circ$  mechanical - Index center to U channel edge

**Symmetry:**  
Incremental:  $180^\circ \pm 18^\circ$  electrical  
Commutation: 8 Pole:  $45^\circ$ ; 6 Pole:  $60^\circ$ ; 4 Pole:  $90^\circ$  mechanical

**Index Pulse Width:**  $180^\circ \pm 36^\circ$  electrical (Gated with B low) standard

### ELECTRICAL

#### Input Power Requirements:

Incremental: 5 or 12 VDC  $\pm 10\%$  at 100 mA max. (excluding output load);  
Incremental w/Commutation: 5 or 12 VDC  $\pm 10\%$  at 120 mA max. (excluding output load)

#### Output Signals:

7272 Line Driver: 40 mA sink/source max.;  
Open Collector w/2.0 k $\Omega$  pull-ups: 16 mA sink max.

**Frequency Response:** 200 kHz min.

#### Termination:

Connector: PCB mounted dual row head with 0.1" x 0.1" pin spacing, 10 pins (incremental only), 14 pins (w/commutation);  
Cable: conductors - 28 AWG, stranded (7/36), insulation - black, PVC; Shield: aluminum/polyester foil plus tinned, copper drain wire (28 AWG, 7/36)

**Noise Immunity:** Conforms to EN50082-1 Light Industrial for Electro-Static Discharge, Radio Frequency Interference, Electrical Fast Transients, and Magnetic Fields (for models or applications with shielded cable)

### MECHANICAL

#### Weight:

Connector: 0.8 oz. (23 gm) typ.  
Connector w/cover: 1.0 oz. (28 gm) typ.  
Cable: 1.3 oz (37 gm) typ.  
Cable w/cover: 1.5 oz. (43 gm) typ.

#### Dimensions:

Outside Diameter: 1.60" (40.7 mm) max. w/cover, 1.50" (38.2 mm) max. without cover;  
Height: 1.27" (32.3 mm) max. (w/cover, excluding connector);  
Emitter to Detector Gap: 0.070" (1.8 mm) min.

#### Material:

Base, Housing, & Cover: high temperature, glass filled polymer;  
Hub: Aluminum; Disk: 0.030" thick glass

#### Finish:

Base & Housing: black;  
Cover: RAL 7010 (dark grey)

**Moment of Inertia:**  $3.40 \times 10^{-6}$  in-oz sec.<sup>2</sup> (2.4 gm-cm<sup>2</sup>)

**Hub Diameters:** 1/8", 1/4", 3/8", 3/16", 6 mm, 8 mm, 10 mm nominal

**Hub Dia. Tolerance:**  $+0.001"/-0.000"$  ( $+0.026$  mm/ $-0.000$  mm)

**Mating Shaft Length:** 0.45" (12 mm) min.; 0.85" (22 mm) max. inside cover

**Mating Shaft Runout:** 0.002" (0.05 mm) max. (Includes shaft perpendicularity to mounting surface)

**Mating Shaft Endplay:**  $+0.015"/-0.015"$  ( $+0.38$  mm/ $-0.38$  mm) nominal ("+" indicates away from mounting face)

#### Mounting:

Base: (2) #4-40 (M2.5) #1 Phillips fillister head cap screw on 1.812" (46 mm) B.C., or (2) #2-56 (M2.0) hex socket cap screw on 1.28" (32.5 mm) B.C.; 0.01" (0.254 mm) true position to shaft.  
Shaft: split hub w/collar clamp, #2-56 hex socket cap screw (5/64" hex wrench included)

**Electrical/Mechanical Alignment Range:**  $\pm 15^\circ$  mechanical

**Acceleration:** 100,000 rad/sec.<sup>2</sup> max.

**Velocity:** 12,000 RPM max.

### ENVIRONMENTAL

**Operating Temperature:**  $0^\circ$  to  $120^\circ\text{C}$

**Storage Temperature:**  $-40^\circ$  to  $85^\circ\text{C}$

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

**Vibration:** 2.5 G's at 5 to 2000 Hz

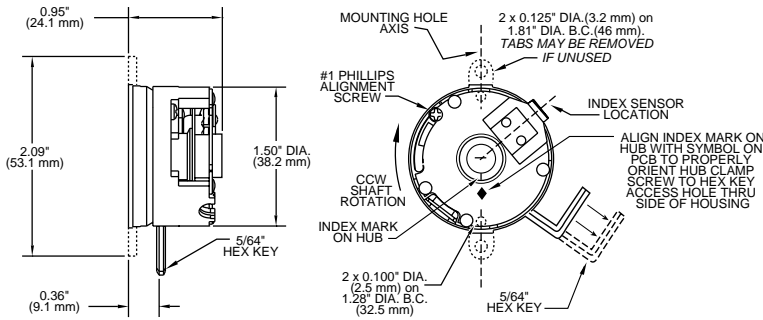
**Relative Humidity:** 90% non-condensing

**Enclosure Rating:** NEMA 1 / IP40 dirt-tight (for models with cover)

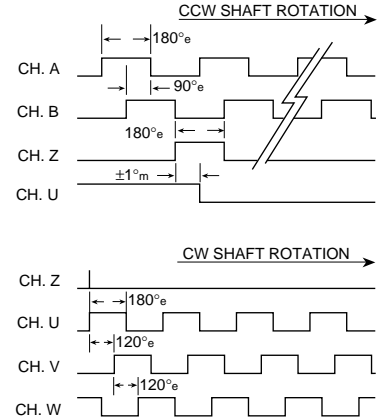


# SERIES M15

### Dimensions/Installation



### Output Waveforms (For clarity, compliments are not shown.)



### Installation Instructions:

Incremental only models: Drawing #200638-0001  
Commutation models: Drawing #200638-0002

### Code 6: Terminations (Not all signals present on all models)

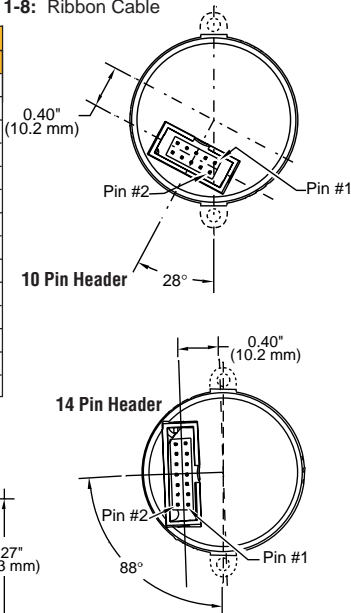
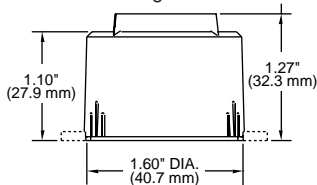
0: Pin Header

1-8: Ribbon Cable

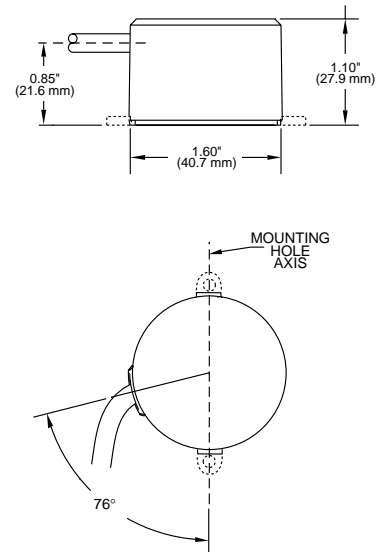
A-H: Shielded Cable

Pin	10 Pin		14 Pin
	O.C.	L.D.	
1	A	—	Vcc
2	Vcc	Vcc	U
3	GND	GND	U'
4	—	—	V
5	—	A'	V'
6	—	A	W
7	—	B'	W'
8	B	B	A'
9	—	Z'	A
10	Z	Z	B
11	—	—	B'
12	—	—	Z
13	—	—	GND
14	—	—	Z'

Mating Cable Assembly:  
10 pin, 109524-000x  
14 pin, 110527-000x  
x= length in feet



Function	Wire Color	
	Incr. Only	Incr. & Comm.
Vcc com	—	RED/WHT
Vcc Inc	RED	RED
GND Inc	BLK	BLK
GND com	—	BLK/WHT
A'	RED/BLK	BLU/BLK
A	GRN	BLU
B'	WHT/BLK	GRN/BLK
B	ORN	GRN
Z'	BLU	VIO/BLK
Z	WHT	VIO
U'	—	BRN/BLK
U	—	BRN
V'	—	GRY/BLK
V	—	GRY
W'	—	WHT/BLK
W	—	WHT



### Ordering Information

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

Code 1: Model	Code 2: PPR, Poles	Code 3: Cover	Code 4: Electrical	Code 5: Hub	Code 6: Termination
<b>M15</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"/>

Ordering Information							
<b>M15</b>	Size 15 Commutating Modular	Incremental channels only		<b>0</b> No cover <b>1</b> Enclosed, end-of-shaft mount <b>2</b> Through shaft	<b>0</b> 5V in, open collector out incremental only <b>1</b> 12V in, open collector out incremental only <b>3</b> 5V in, line driver out incremental only  Available when Code 2 is XXXX/4, XXXX/6, or XXXX/8 <b>6</b> 5V in, line driver out incr.; 5V in, open collector out comm. <b>7</b> 5V in, line driver out incr.; 12V in, open collector out comm. <b>9</b> 5V in, line driver out incr.; 5V in, line driver out comm.	<b>0</b> 1/4 in. <b>1</b> 3/8 in. <b>4</b> 6 mm <b>5</b> 8 mm <b>6</b> 10 mm <b>8</b> 3/16 in. <b>9</b> 1/8 in.	Available when Code 4= 0,1,3,6 or 9 <b>0</b> Pin Header <b>1-8</b> Mating ribbon cable included; 1=1 ft., 2=2 ft., etc.  Available when Code 4= 0-9 <b>A-H</b> Shielded cable; A=1 ft., B=2 ft., etc.
		Incremental plus Commutation channels					
		<b>0200/0</b>	<b>1000/0</b>				
		<b>0400/0</b>	<b>1024/0</b>				
		<b>0500/0</b>					
		<b>0500/6</b>	<b>1024/4</b>				
		<b>1000/4</b>	<b>1024/6</b>				
		<b>1000/6</b>	<b>1024/8</b>				
		<b>1000/8</b>					

# SERIES M53

# Dynapar™ brand

## For Stepper & Small Servo Motors

### Key Features

- **2.0" Diameter Modular Encoder with Easy Installation Requiring No Special Gapping Tools or Parts**
- **Phased Array Sensor Technology Allowing .020" Axial Shaft Play**
- **Up to 2048 PPR with Commutation Tracks**



## NEW!



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental

**Resolution:** (pulses/revolution)

Incremental: 500 to 2048 PPR

Commutation: 4, 6 or 8 pole

**Accuracy:**

Incremental:  $\pm 5$  arc-mins. max. edge to edge;

**Sense:** (viewing encoder mounting surface)

Incremental: A leads B by  $90^\circ$  for CCW rotation of motor shaft;

Commutation: U leads V, V leads W by  $120^\circ$  for CW rotation of motor shaft

**Phasing:**

Incremental:  $90^\circ \pm 18^\circ$  electrical

Commutation: 8 Pole:  $30^\circ$ ; 6 Pole:  $40^\circ$ ; 4 Pole:

$60^\circ$  mechanical

Index to U Channel:  $\pm 1^\circ$  mechanical - Index

center to U channel edge

**Symmetry:**

Incremental:  $180^\circ \pm 18^\circ$  electrical

Commutation: 8 Pole:  $45^\circ$ ;

6 Pole:  $60^\circ$ ; 4 Pole:  $90^\circ$  mechanical

**Index Pulse Width:**  $90^\circ \pm 36^\circ$  electrical (Gated with A and B high)

### ELECTRICAL

**Input Power Requirements:**

Incremental: 5 VDC or 12 VDC  $\pm 10\%$  at

100 mA max. (excluding output load);

Commutation: 5 VDC or 12 VDC  $\pm 10\%$  at 75 mA max. (excluding output load)

**Output Signals:**

7272 Line Driver: 40 mA sink/source max.;

Open Collector w/2.0 k $\Omega$  pull-ups: 16 mA sink max.

**Frequency Response:** 200 kHz min.

**Termination:**

Connector: PCB mounted dual row head with 0.1" x 0.1" pin spacing, 10 pins (incremental only), 16 pins (w/commutation); Cable: conductors - 28

AWG, stranded (7/36), insulation - black, PVC;

Shield: aluminum/polyester foil plus tinned, copper drain wire (28 AWG, 7/36)

**Noise Immunity:** Conforms to EN50082-1 Light Industrial for Electro-Static Discharge, Radio Frequency Interference, Electrical Fast Transients, Conducted Interference, and Magnetic Fields (for models or applications with shielded cable)

### MECHANICAL

**Weight:**

Connector: 1 oz. (28 gm) typ.

Connector w/cover: 1.5 oz. (43 gm) typ.

Cable: 2.5 oz (71 gm) typ.

Cable w/cover: 3 oz. (85 gm) typ.

**Dimensions:**

Outside Diameter: 2.1" (53 mm) max. w/cover, 2.0"

(51 mm) max. without cover; Height: 0.8" (20.3

mm) (w/cover, excluding connector);

Emitter to Detector Gap: 0.070" (1.8 mm) min.

**Material:**

Base, Housing, & Cover: high temperature, glass filled polymer;

Hub: Aluminum; Disk: 0.030" thick glass

**Finish:**

Base & Housing: black;

Cover: RAL 7010 (dark grey)

**Moment of Inertia:**  $6.64 \times 10^{-5}$  in-oz sec.<sup>2</sup> (4.7 gm-cm<sup>2</sup>)

**Hub Diameters:** 1/4", 3/8", 7/16", 1/2", 6 mm, 8 mm, 10 mm, 12 mm nominal

**Hub Dia. Tolerance:**  $+0.001"/-0.000"$  ( $+0.026$  mm/ $-0.000$  mm)

**Mating Shaft Length:** 0.45" (12 mm) min. blind hub clamp screw, 0.65" (16.5 mm) exposed hub clamp screw; 0.75" (19 mm) max. inside cover

**Mating Shaft Runout:** 0.002" (0.05 mm) max. (Includes shaft perpendicularity to mounting surface)

**Mating Shaft Endplay:**  $+0.011"/-0.008"$  ( $+0.30$  mm/ $-0.21$  mm) nominal ("+" indicates away from mounting face)

**Mounting:**

Base: (2) #4-40 (M2.5) #1 Phillips fillister head cap screw on 1.812" (46 mm) B.C., 0.01" (0.254 mm) true position to shaft; Shaft: split hub w/ collar clamp, #2-56 hex socket cap screw (5/64" hex wrench included)

**Electrical/Mechanical Alignment Range:**  $\pm 15^\circ$  mechanical

**Acceleration:** 100,000 rad/sec.<sup>2</sup> max.

**Velocity:** 12,000 RPM max.

### ENVIRONMENTAL

**Operating Temperature:**  $0^\circ$  to  $120^\circ\text{C}$

**Storage Temperature:**  $-40^\circ$  to  $85^\circ\text{C}$

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

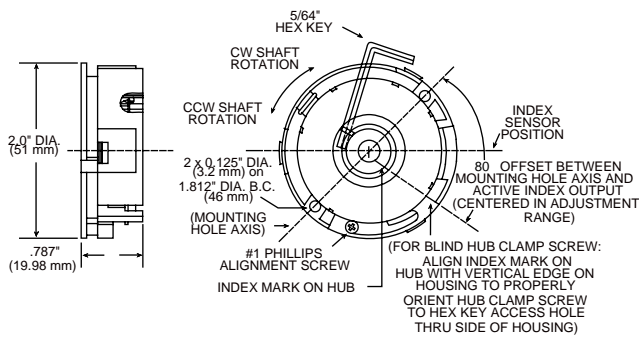
**Vibration:** 2.5 G's at 5 to 2000 Hz

**Relative Humidity:** 90% non-condensing

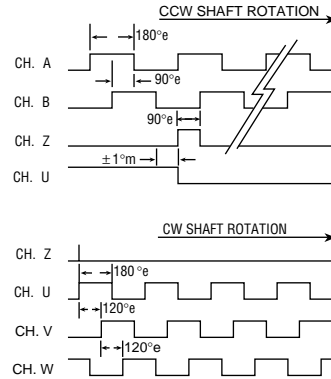
**Enclosure Rating:** NEMA 1 / IP50 dirt-tight (for models with cover)



Dimensions/Installation



Output Waveforms (For clarity, compliments are not shown.)

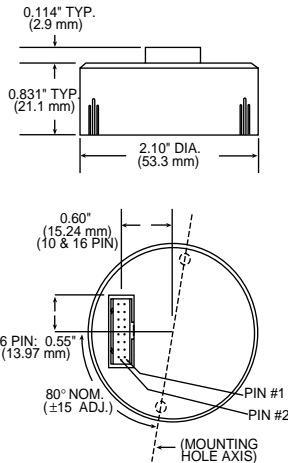


Code 6: Terminations (Not all signals present on all models)

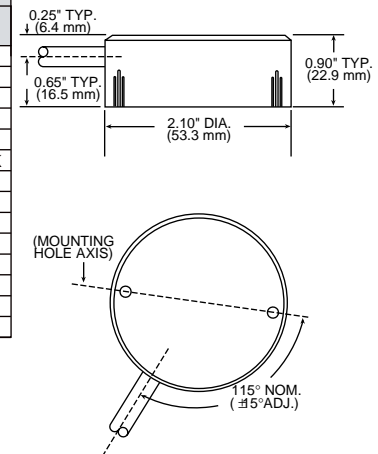
0: 16 Pin JST connector 1-8: Shielded Cable with JST connector

A-H: Shielded Cable

Pin	16 Pin
1	Vcc
2	U
3	GND
4	V
5	A
6	W
7	A'
8	NC
9	B
10	U'
11	B'
12	V'
13	Z
14	W'
15	Z'
16	NC



Function	Wire Color	
	Incr. Only	Incr. & Comm.
Vcc	RED	RED
GND	BLK	BLK
A	GRN	BLU
A'	RED/BLK	BLU/BLK
B	ORN	GRN
B'	WHT/BLK	GRN/BLK
Z	WHT	VIO
Z'	BLU	VIO/BLK
U	-	BRN
U'	-	BRN/BLK
V	-	GRY
V'	-	GRY/BLK
W	-	WHT
W'	-	WHT/BLK



### Ordering Information

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

Code 1: Model	Code 2: PPR, Poles	Code 3: Cover	Code 4: Electrical	Code 5: Hub	Code 6: Termination
<b>M53</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"/>

#### Ordering Information

M53 Size 20 Commutating Modular	Incremental channels only	0 No cover	0 5V in, open collector out incremental only	Exposed hub clamp screw: A 1/4 in. B 3/8 in. C 7/16 in. D 1/2 in. E 6 mm F 8 mm G 10 mm H 12 mm	0 JST connector
	Incremental plus Commutation channels	1 Radial exit cover (for shielded cable)	1 12V in, open collector out incremental only 3 5V in, line driver out incremental only A 12V in, 5V line driver out incremental only B 12V in, 12V line driver out incremental only		1-8 Shielded cable with connector; 1=1 ft., 2=2 ft., etc.
		2 Axial exit (for shielded cable with JST connector)	Available when Code 2 is XXXX/4, XXXX/6, or XXXX/8 6 5V in, line driver out incremental open collector out Comm 9 5V in, line driver out incremental line driver out Comm C 12V in, 5V line driver out incremental, open collector D 12V in, 12V line driver out incremental, open collector E 12V in, 5V line driver out incremental, 5V line driver out Comm out Comm out Comm F 12V in, 12V line driver out incremental, 12V line driver out Comm	Available when Code 4 is 3 or higher: A-H Shielded cable; A=1 ft., B=2 ft., etc.	

# SERIES F10

**Dynapar™ brand**

## For Stepper & Small Servo Motors

### Key Features

- Digital Encoder Replaces size 10 Pancake Resolver
- Up to 2048PPR with Commutation Tracks
- Up to 120C Temperature Range Doesn't Limit Motor Performance



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental with commutation option, Optical

**Resolution:** 1024 or 2048 PPR incremental with 6 pole commutation channels

**Accuracy:** Incremental:  $\pm 2.5$  arc-mins. max. edge to any edge; Commutation:  $\pm 6$  arc-mins. max.

**Phasing for CCW rotation of motor shaft :**

A leads B by  $90^\circ$  and U leads V leads W by  $120^\circ$ .

**Minimum edge separation A to B is  $45^\circ$ .**

**Index to U channel:**  $\pm 1^\circ$  mech. index pulse center to U channel edge.

**Index Pulse Width:**  $90^\circ$  gated A and B high

### ELECTRICAL

**Input Power Requirements:**  $5 \pm 10\%$  VDC at 100 mA max (incremental and commutation), excluding output load

**Output Signals:**

**Incremental:** 26LS31 Differential Line Driver, sink / source 40 mA max.

**Commutation:** Open Collector w/2.0 k $\Omega$  pull-ups, 8 mA sink max.; or 26LS31 Differential Line Driver, sink / source 40 mA max.

**Frequency Response:** 300 kHz, max.

**Termination:** Flying leads, stranded 26 AWG, twisted pair, PVC insulation, 6.5" length  $\pm 0.5$ "

### MECHANICAL

**Weight:** 1.6 oz. (45 gm) typ.

**Dimensions:** Outside Diameter : 1.25" (31.7mm), max.; Height: 0.89" (24.1mm), max.

**Material:** Housing: cast-aluminum; Servo Ring: glass reinforced engineering resin; Hub: Brass; Disk: 0.030" (0.76mm) thick glass

**Moment of Inertia:**  $2.22 \times 10^{-5}$  in-oz-sec.<sup>2</sup> (1.6 gm-cm<sup>2</sup>)

**Bore Diameter:** 6mm

**Bore Dia. Tolerance:**  $+0.001"/-0.000"$  (+0.025 mm/-0.000 mm)

**Mating Shaft Runout:** 0.002" (0.05 mm) max. (Includes shaft perpendicularity to mounting surface)

**Mating Shaft Axial movement:**  $\pm 0.010"$  ( $\pm 0.25$  mm)

**Mounting:** 1.030" (26.16mm) servo ring with integral flexure (size 10 pancake resolver equivalent)

**Acceleration:** 100,000 rad/sec.<sup>2</sup> max.

**Velocity:** 5,000 RPM continuous; 12,000 RPM peak

**Bearing Life:**  $[(3.6 \times 10^9) / \text{RPM}]$  Hours ; e.g. 605,000 hours @6,000 RPM

### ENVIRONMENTAL

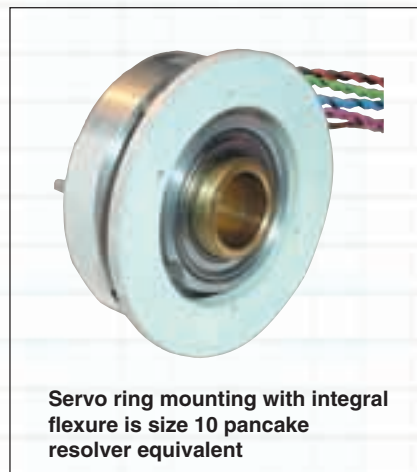
**Operating Temperature:**  $0^\circ$  to  $+120^\circ\text{C}$

**Storage Temperature:**  $0^\circ$  to  $+120^\circ\text{C}$

**Shock:** 50 Gs for 6 msec duration

**Vibration:** 2.5 Gs at 5 to 2000 Hz

**Relative Humidity:** 90% non-condensing

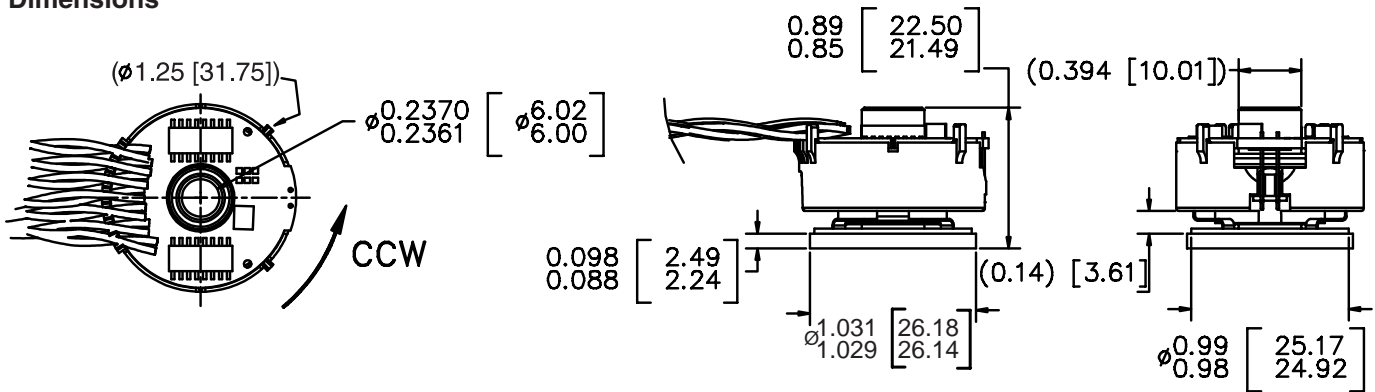


Servo ring mounting with integral flexure is size 10 pancake resolver equivalent



# SERIES F10

## Dimensions

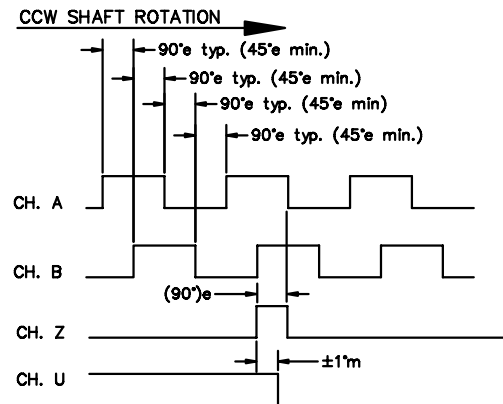


## Connections

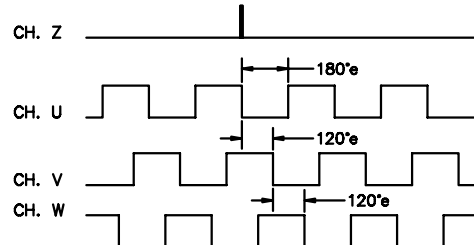
Function*	Cable Wire Color
VCC	RED
GND	BLACK
A <sup>-</sup>	BLUE/BLACK
A	BLUE
B <sup>-</sup>	GREEN/BLACK
B	GREEN
Z <sup>-</sup>	VIOLET/BLACK
Z	VIOLET
U <sup>-</sup>	BROWN/BLACK
U	BROWN
V <sup>-</sup>	GRAY/BLACK
V	GRAY
W <sup>-</sup>	WHITE/BLACK
W	WHITE

\* Function availability dependant on Model

## Waveforms



Waveforms below show relationship between CH. Z, U, V & W (scale differs from above)



## Ordering Information

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

Code 1: Model	Code 2: PPR, Poles	Code 3: Mount	Code 4: Electrical	Code 5: Shaft/Bore	Code 6: Termination
<b>F10</b>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> / <input type="checkbox"/>	<b>0</b>	<input type="checkbox"/>	<b>4</b>	<b>0</b>
Ordering Information					
<b>F10</b> Size 10 Commutating Encoder	Incremental channels only <b>1024/0</b> <b>2048/0</b>	<b>0</b> Servo mount 1.030 Diameter x .095 thick	Available when Code 2 is XXXX/0 <b>3</b> 5V in, line driver out incremental only	<b>4</b> 6mm thru bore	<b>0</b> 6.5" ±0.5" Twisted Pair Flying Leads
	Incremental plus Commutation channels <b>1024/6</b> <b>2048/6</b>		Available when Code 2 is XXXX/6 <b>6</b> 5V in, line driver out for incremental; 5V in, open collector out for commutation <b>9</b> 5V in, line driver out for incremental; 5V in, line driver out for commutation		

# SERIES F14

# Dynapar™ brand

## For Stepper & Small Servo Motors

### Key Features

- Easy to install non-marring hollowshaft design with flex tether
- Up to 5000PPR for smooth low-speed motor control
- Up to 120C temperature range doesn't limit motor performance



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental with commutation option, Optical

**Resolution:** 200, 400, 500, 1000, 1024, 2000, 2048, 2500, 4096, 5000 PPR incremental with 4, 6 and 8 pole commutation channels

**Accuracy:** Incremental:  $\pm 2.5$  arc-mins. max. edge to any edge; Commutation:  $\pm 6$  arc-mins. max.

**Phasing for CCW rotation of motor shaft** (viewing encoder cover): A leads B by  $90^\circ$  and U leads V leads W by  $120^\circ$ .

**Minimum edge separation** A to B is  $45^\circ$ .

**Index to U channel:**  $\pm 1^\circ$  mech. index pulse center to U channel edge.

**Index Pulse Width:**  $90^\circ$  gated A and B high; ( $180^\circ$  gated B high gating options available - consult factory)

### ELECTRICAL

**Input Power Requirements:**  $5 \pm 10\%$  VDC at 150 mA max (incremental only); 175 mA max. (incremental and commutation), excluding output load

#### Output Signals:

Line Driver: sink / source 40 mA max.,  
Open Collector Incremental ( $\leq 1024$  PPR): 16 mA sink max.  
Open Collector Commutation: 30 mA sink max. (2.0 k $\Omega$  pull-ups in encoder)

### Frequency Response:

PPR  $\leq 1024$ : 250 kHz; PPR  $> 1024$ : 500 kHz

**Termination:** 16 pin, fully shielded, 2mm pitch, double row header. Accessory mating cable assembly available: 26 AWG twisted pair, jacketed and shielded with copper drain wire

### MECHANICAL

**Weight:** 1.6 oz. (45gm) typ.

**Dimensions:** Outside Diameter with cover: 1.55" (39.8mm), without cover 1.45" (36.8mm); Outside collar height 1.36" (34.6mm), inside collar height 1.28" (32.4mm)

**Material:** Bearing housing: aluminum; Cover: high temperature, glass filled polymer; Hub: Brass; Disk: 0.030" thick glass

**Finish:** Cover: RAL 7010 (dark grey)

**Moment of Inertia:**  $8.2 \times 10^{-5}$  in-oz sec.<sup>2</sup> (5.8 gm-cm<sup>2</sup>)

**Hub Diameters:** 1/4", 6mm, 8mm standard

**Bore Dia. Tolerance:**  $+0.001"/-0.000"$  ( $+0.025$  mm/ $-0.000$  mm)

**Mating Shaft Length:** 1.35" (34.3 mm) minimum for outside shaft collar. 0.50 inch minimum for inside shaft collar

**Mating Shaft Runout:** 0.002" (0.05 mm) max. (Includes shaft perpendicularity to mounting surface)

**Mating Shaft Axial movement:**  $\pm 0.060"$  ( $\pm 1.52$  mm)

**Mounting:** Two standard configurations are available for tethers. A choice of U.S. or Metric screws are included. Mounting holes should be 0.01" (0.254 mm) true position to shaft for best encoder operation.

**Shaft clamp:** 2 #6-32 set screws in collar around hub shaft (will not mar shaft)

Electrical/Mechanical Alignment Range:  $\pm 15^\circ$  mechanical typical (see tether options)

**Acceleration:** 100,000 rad/sec.<sup>2</sup> max.

**Max. Velocity:** RPM = (Frequency / PPR) x 60; or 12,000 RPM, whichever is less;

**Bearing Life:**  $[(1.4 \times 10^9) / \text{RPM}]$  Hours; e.g. 230,000 hours @ 6,000 RPM

*(Based on bearing manufacturer's suggested calculation for 6801ZZ with 44N equivalent dynamic load - including preload and tether reaction loads - at 6000 RPM continuous with adequate lubrication)*

### ENVIRONMENTAL

**Operating Temperature:**  $0^\circ$  to  $+120^\circ\text{C}$

**Storage Temperature:**  $-40^\circ$  to  $+120^\circ\text{C}$

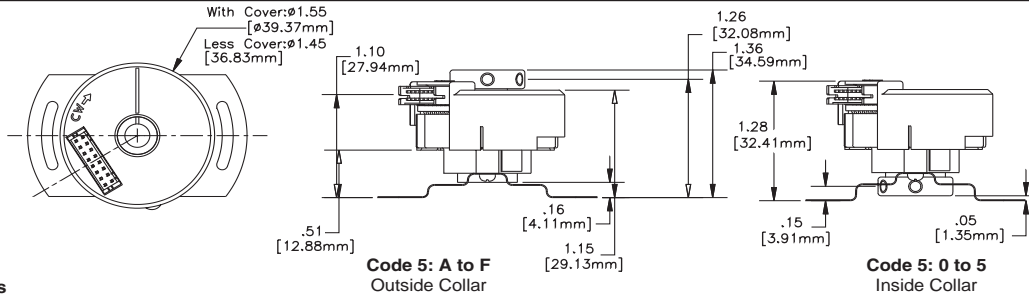
**Shock:** 100 Gs for 6 msec duration

**Vibration:** 2.5 Gs at 5 to 2000 Hz

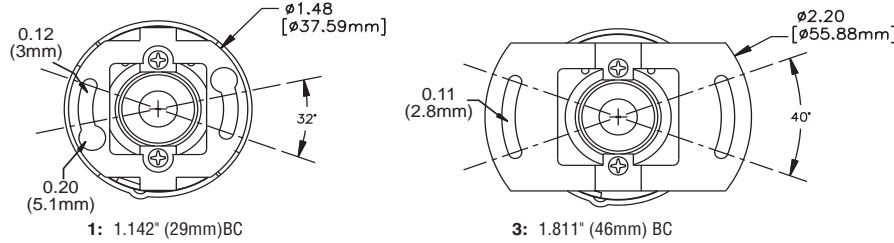
**Relative Humidity:** 90% non-condensing

**Enclosure Rating:** NEMA 1 / IP40 (for models with cover)

**Dimensions**



**Code 3: Tethers**



**Electrical Connections**

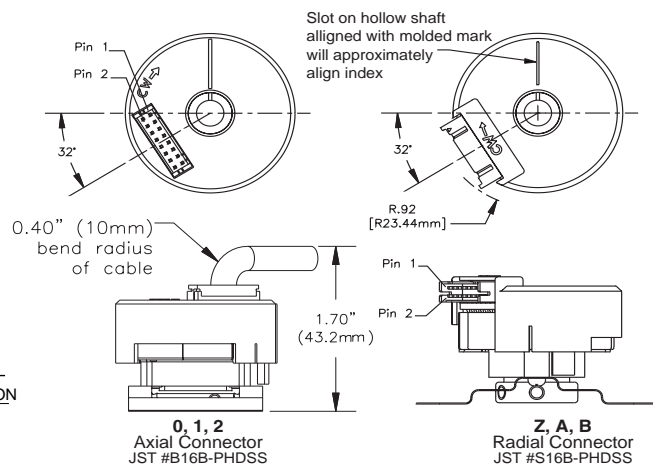
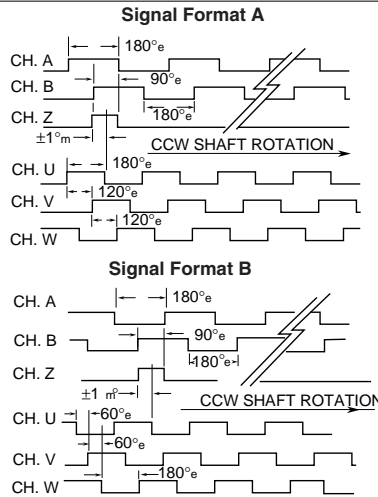
Pin	Function*	Cable Wire Color
1	VCC	RED
2	U	Brown
3	GND	BLACK
4	V	GRAY
5	A	BLUE
6	W	WHITE
7	A̅	BLUE/BLACK
8	NONE	NONE
9	B	GREEN
10	U̅	BROWN/BLACK
11	B̅	GREEN/BLACK
12	V̅	GRAY/BLACK
13	Z	VIOLET
14	W̅	WHITE/BLACK
15	Z̅	VIOLET/BLACK
16	NONE	NONE

\* Function availability dependent on Model

**Mating Cable Assembly:**

Incremental only, 111752-000x  
 Incremental + Comm., 111753-000x  
 x= length in feet

**Output Waveforms**



**Ordering Information**

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

Code 1: Model	Code 2: PPR, Poles	Code 3: Tether	Code 4: Electrical	Code 5: Shaft/Bore	Code 6: Termination
<b>F14</b>	□□□□/□	□	□	□	□

Ordering Information									
F14	Size 14 Commutating Encoder	Incremental channels only	0 No Tether	Available when Code 2 is ≤ 1024/0	Inside Collar:	Code			Length
						Connector/Cable	Wire	Pigtail	
		0200/0	1 2 #2 on 1.181" Diameter	0 5V in, open collector out incremental only - Format A	0 1/4 in.	0	Z	N/A	None
		0400/0		C 5V in, open collector out incremental only - Format B	4 6 mm	1	A	J	1 Ft.
		0500/0	3 2 #4 on 1.811" Diameter	Available when Code 2 is XXXX/0	5 8 mm	2	B	K	2 Ft.
		1000/0		3 5V in, line driver out incremental only - Format A		3	C	L	3 Ft.
		1024/0	6 2 M2.5 on 30 mm Diameter	Available when Code 2 is XXXX/4, XXXX/6, or XXXX/8		4	D	M	4 Ft.
		2000/0	8 2 M3 on 46 mm Diameter	6 5V in, line driver out incr.; 5V in, open collector out comm. Format A	Outside Collar:	5	E	N	5 Ft.
				E 5V in, line driver out incr.; 5V in, open collector out comm. - Format B	A 1/4 in.	6	F	P	6 Ft.
				9 5V in, line driver out incr.; 5V in, line driver out comm. Format A	E 6 mm	7	G	Q	7 Ft.
				F 5V in, line driver out incr.; 5V in, line driver out comm. - Format B	F 8 mm	8	H	R	8 Ft.
						<b>CONNECTION OPTIONS</b> You may choose an integral connector mounted in axial or radial position. Available with or without mating connector/cable. Alternatively, a direct-solder pigtail cable is offered.			

† Available with 4, 6 or 8 pole.  
 e.g. 1000/6 is 1000PPR with 6 poles

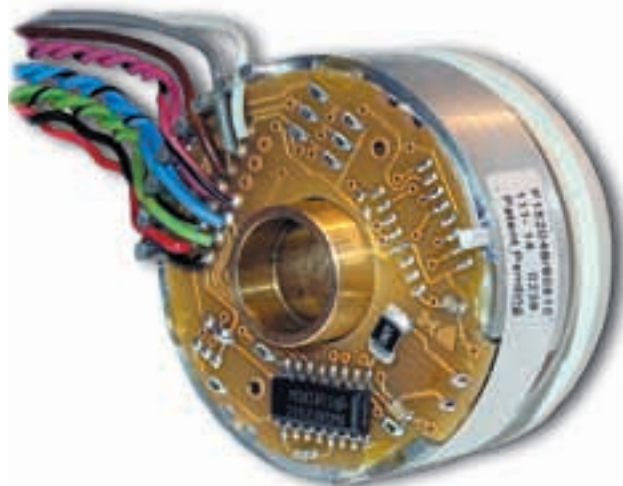
# SERIES F15

**Dynapar™ brand**

## For Stepper & Small Servo Motors

### Key Features

- **Digital Encoder with Flex Servo Ring Easily Replaces Size 15 Resolver**
- **Short 0.88" Mounting Depth with Jam Nut Shaft Fixing Makes Installation Easy**
- **Superior +/-2.5° Arc-Min Accuracy**



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental with commutation option, Optical

**Resolution:** 1024 or 2048 PPR incremental with 6 or 8 pole commutation channels

**Accuracy:** Incremental:  $\pm 2.5$  arc-mins. max. edge to any edge; Commutation:  $\pm 6$  arc-mins. max.

**Phasing for CCW rotation of motor shaft :**

A leads B by  $90^\circ$  and U leads V leads W by  $120^\circ$ .

**Minimum edge separation A to B is  $45^\circ$ .**

**Index to U channel:** +/-  $1^\circ$  mech. index pulse center to U channel edge.

**Index Pulse Width:**  $90^\circ$  gated A and B high

### ELECTRICAL

**Input Power Requirements:**  $5 \pm 10\%$  VDC at 100 mA max (incremental and commutation), excluding output load

**Output Signals:**

**Incremental:** 26LS31 Differential Line Driver, sink / source 40 mA max.

**Commutation:** Open Collector w/2.0 k $\Omega$  pull-ups, 8 mA sink max.; or 26LS31 Differential Line Driver, sink / source 40 mA max.

**Frequency Response:** 300 kHz, max.

**Termination:** Flying leads, stranded 26 AWG, twisted pair, PVC insulation, 6.5" length  $\pm 0.5$ "

### MECHANICAL

**Weight:** 1.6 oz. (45 gm) typ.

**Dimensions:** Outside Diameter : 1.45" (36.8mm), max.; Height: 0.87" (22.1mm), max.

**Material:** Housing: cast-aluminum; Servo Ring: glass reinforced engineering resin; Hub: Brass; Disk: 0.030" (0.76mm) thick glass

**Moment of Inertia:**  $3.59 \times 10^{-5}$  in-oz-sec.<sup>2</sup> (2.5 gm-cm<sup>2</sup>)

**Bore Diameter:** 0.375" (9.53mm)

**Bore Dia. Tolerance:** +0.001"/-0.000" (+0.025 mm/-0.000 mm)

**Mating Shaft Runout:** 0.002" (0.05 mm) max. (Includes shaft perpendicularity to mounting surface)

**Mating Shaft Axial movement:**  $\pm 0.010$ " ( $\pm 0.25$  mm), max.

**Mounting:** 1.435" (36.45mm) servo ring with integral flexure (size 15 pancake resolver equivalent)

**Acceleration:** 100,000 rad/sec.<sup>2</sup> max.

**Velocity:** 5,000 RPM continuous; 12,000 RPM peak

**Bearing Life:**  $[(3.6 \times 10^9) / \text{RPM}]$  Hours ; e.g. 605,000 hours @6,000 RPM

### ENVIRONMENTAL

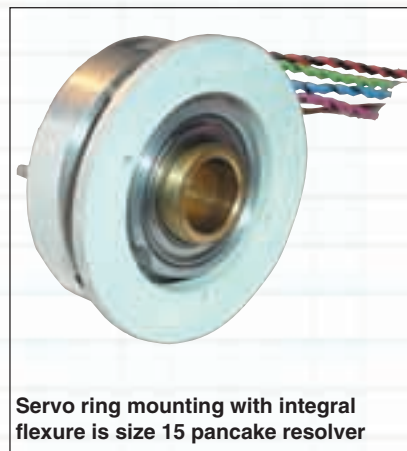
**Operating Temperature:**  $0^\circ$  to  $+120^\circ\text{C}$

**Storage Temperature:**  $0^\circ$  to  $+120^\circ\text{C}$

**Shock:** 50 Gs for 6 msec duration

**Vibration:** 2.5 Gs at 5 to 2000 Hz

**Relative Humidity:** 90% non-condensing

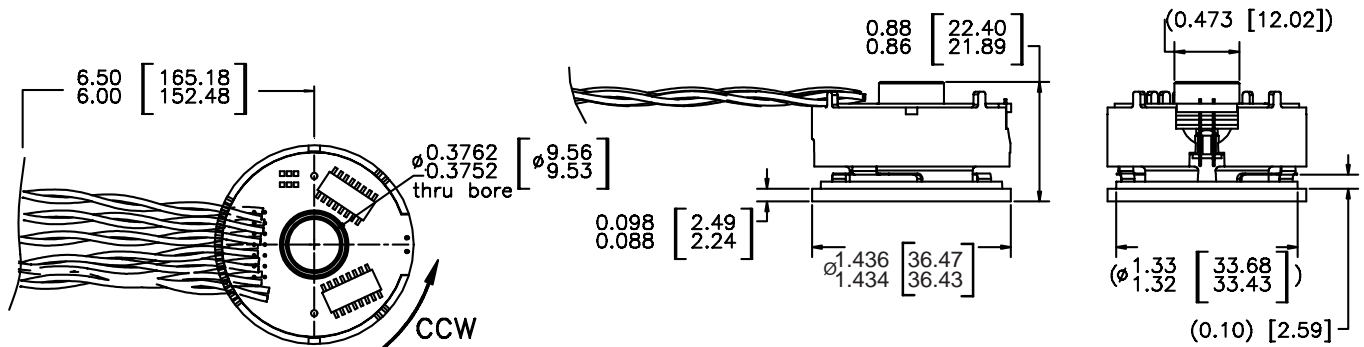


Servo ring mounting with integral flexure is size 15 pancake resolver



# SERIES F15

## Dimensions

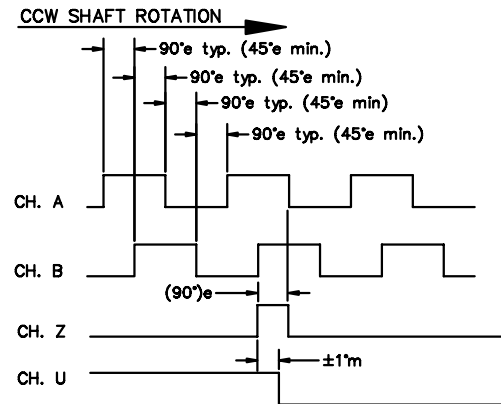


## Connections

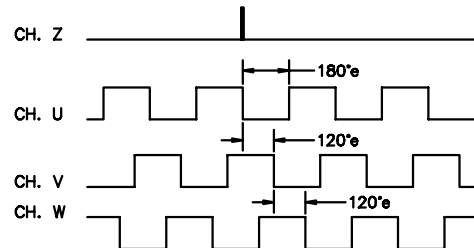
Function*	Cable Wire Color
VCC	RED
GND	BLACK
A <sup>-</sup>	BLUE/BLACK
A	BLUE
B <sup>-</sup>	GREEN/BLACK
B	GREEN
Z <sup>-</sup>	VIOLET/BLACK
Z	VIOLET
U <sup>-</sup>	BROWN/BLACK
U	BROWN
V <sup>-</sup>	GRAY/BLACK
V	GRAY
W <sup>-</sup>	WHITE/BLACK
W	WHITE

\* Function availability dependant on Model

## Waveforms



Waveforms below show relationship between CH. Z, U, V & W (scale differs from above)



## Ordering Information

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

Code 1: Model	Code 2: PPR, Poles	Code 3: Mount	Code 4: Electrical	Code 5: Shaft/Bore	Code 6: Termination
<b>F15</b>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> / <input type="checkbox"/>	<b>0</b>	<input type="checkbox"/>	<b>1</b>	<b>0</b>
Ordering Information					
<b>F15</b> Size 15 Commutating Encoder	Incremental channels only <b>1024/0</b> <b>2048/0</b>	<b>0</b> Servo mount 1.435 Diameter x .095 thick	Available when Code 2 is XXXX/0 <b>3</b> 5V in, line driver out incremental only	<b>1</b> 3/8 in. thru bore	<b>0</b> 6.5" ±0.5" Twisted Pair Flying Leads
	Incremental plus Commutation channels <b>1024/6</b> <b>2048/6</b> <b>1024/8</b> <b>2048/8</b>		Available when Code 2 is XXXX/6 or 8 <b>6</b> 5V in, line driver out for incremental; 5V in, open collector out for commutation <b>9</b> 5V in, line driver out for incremental; 5V in, line driver out for commutation		

# SERIES F18

# Dynapar™ brand

## For Stepper & Small Servo Motors

### Key Features

- **Under 2.0" Diameter Package with High 10,000PPR Capability**
- **Easy to Install Hollowshaft and Spring Tether Design**
- **Up to 120°C Temperature Range Doesn't Limit Motor Performance**



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental with commutation option, Optical

**Resolution:** 500, 512, 1000, 1024, 2000, 2048, 2500, 4096, 5000, 8192, 10,000 PPR incremental with 4, 6, 8 or 12 pole commutation channels

**Accuracy:** Incremental:  $\pm 2.5$  arc-mins. max. edge to any edge; Commutation:  $\pm 6$  arc-mins. max.

**Phasing for CCW rotation of motor shaft** (viewing encoder cover): A leads B by  $90^\circ$  and U leads V leads W by  $120^\circ$ .

**Minimum edge separation A to B** is  $45^\circ$ .

**Index to U channel:**  $\pm 1^\circ$  mech. index pulse center to U channel edge.

**Index Pulse Width:**  $90^\circ$  gated A and B high; ( $180^\circ$  gated B high gating options available - consult factory)

### ELECTRICAL

**Input Power Requirements:**  $5 \pm 10\%$  VDC at 150 mA max (incremental only); 175 mA max. (incremental and commutation), excluding output load

#### Output Signals:

Line Driver: sink / source 40 mA max.,  
Open Collector Incremental ( $\leq 2048$  PPR): 16 mA sink max.  
Open Collector Commutation: 30 mA sink max. (2.0 k $\Omega$  pull-ups in encoder)

#### Frequency Response:

PPR  $\leq 2048$ : 250 kHz; PPR  $> 2048$ : 500 kHz

**Termination:** 16 pin, fully shielded, 2mm pitch, double row header. Accessory mating cable assembly available: 26 AWG twisted pair, jacketed and shielded with copper drain wire

### MECHANICAL

**Weight:** 4 oz. (110 gm) typ.

**Dimensions:** Outside Diameter with cover: 1.96" (49.8mm), without cover 1.85" (47.0mm); Outside collar height 1.71" (43.4mm), inside collar height 1.50" (38.1mm)

**Material:** Bearing housing: aluminum;  
Cover: high temperature, glass filled polymer;

Hub: Brass; Disk: 0.030" thick glass

**Finish:** Cover: RAL 7010 (dark grey)

**Moment of Inertia:**  $5.3 \times 10^{-4}$  in-oz sec.<sup>2</sup> (37.3 gm-cm<sup>2</sup>)

**Hub Diameters:** 1/4", 3/8", 7/16", 1/2", 6mm, 8mm, 10mm, 12mm standard

**Bore Dia. Tolerance:**  $+0.001/-0.000$ " ( $+0.025$  mm/ $-0.000$  mm)

**Mating Shaft Length:** 1.62" (41 mm) minimum for outside shaft collar. 0.50 inch minimum for inside shaft collar

**Mating Shaft Runout:** 0.002" (0.05 mm) max. (Includes shaft perpendicularity to mounting surface)

**Mating Shaft Axial movement:**  $\pm 0.060$ " ( $\pm 1.52$  mm)

**Mounting:** Four standard configurations are available for tethers. A choice of U.S. and Metric screws are included. Mounting holes should be 0.01" (0.254 mm) true position to shaft for best encoder operation.

**Shaft clamp:** 2 #6-32 set screws in collar around hub shaft (will not mar shaft)

Electrical/Mechanical Alignment Range:  $\pm 15^\circ$  mechanical typical (see tether options)

**Acceleration:** 100,000 rad/sec.<sup>2</sup> max.

**Max. Velocity:** RPM = (Frequency / PPR) x 60; or 12,000 RPM, whichever is less;

**Bearing Life:**  $[(3.6 \times 10^9) / \text{RPM}]$  Hours; e.g. 605,000 hours @ 6,000 RPM

*(Based on bearing manufacturer's suggested calculation for 6803ZZ with 37N equivalent dynamic load - including preload and tether reaction loads - at 6000 RPM continuous with adequate lubrication)*

### ENVIRONMENTAL

**Operating Temperature:**  $0^\circ$  to  $+120^\circ\text{C}$

**Storage Temperature:**  $-40^\circ$  to  $+120^\circ\text{C}$

**Shock:** 100 Gs for 6 msec duration

**Vibration:** 2.5 Gs at 5 to 2000 Hz

**Relative Humidity:** 90% non-condensing

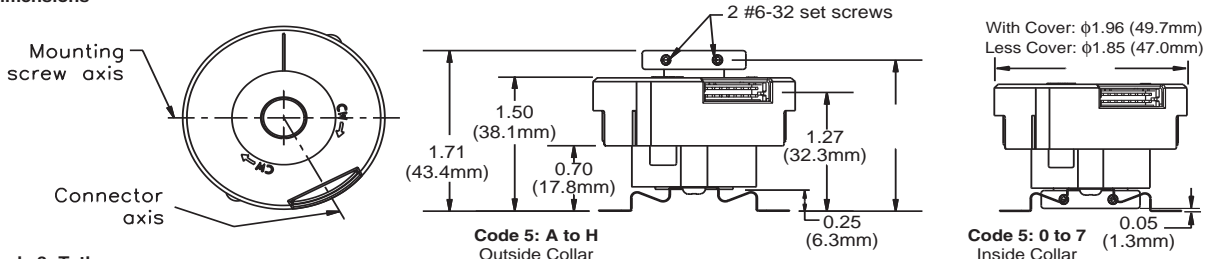
**Enclosure Rating:** NEMA 1 / IP40 (for models with cover)



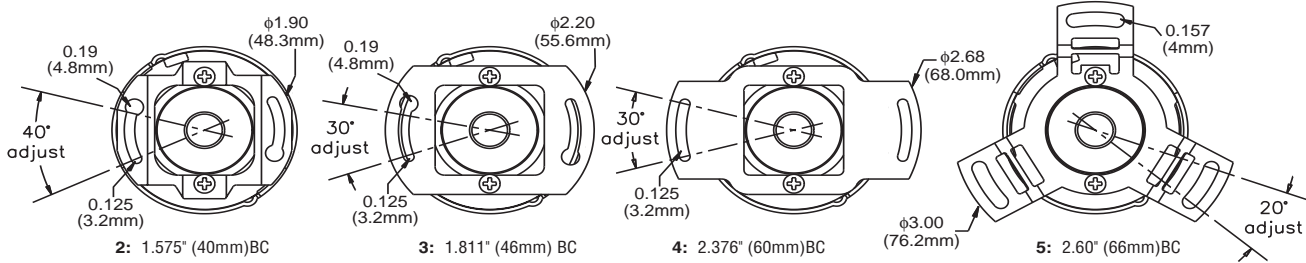


# SERIES F18

**Dimensions**



**Code 3: Tethers**



**Electrical Connections**

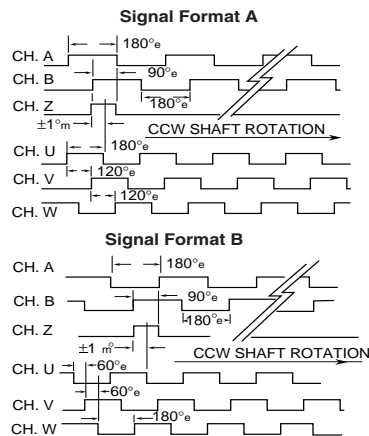
Pin	Function*	Cable Wire Color
1	VCC	RED
2	U	Brown
3	GND	BLACK
4	V	GRAY
5	A	BLUE
6	W	WHITE
7	A	BLUE/BLACK
8	NONE	NONE
9	B	GREEN
10	U	BROWN/BLACK
11	B	GREEN/BLACK
12	V	GRAY/BLACK
13	Z	VIOLET
14	W	WHITE/BLACK
15	Z	VIOLET/BLACK
16	NONE	NONE

\* Function availability dependant on Model

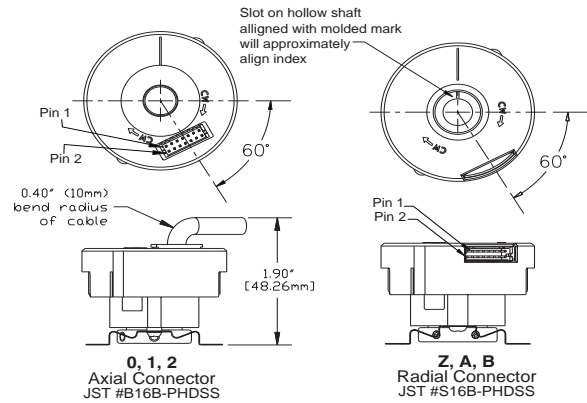
**Mating Cable Assembly:**

Incremental only, 111752-000x  
Incremental + Comm., 111753-000x  
x= length in feet

**Output Waveforms**



**Code 6: Termination**



**Ordering Information**

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

Code 1: Model	Code 2: PPR, Poles	Code 3: Tether	Code 4: Electrical	Code 5: Shaft/Bore	Code 6: Termination
<b>F18</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"/>

**Ordering Information**

F18	Size 18 Commutating Encoder	Incremental channels only		0 No Tether 2 2 #2 on 1.575" Diameter 3 2 #4 on 1.811" Diameter 4 2 #4 on 2.376" Diameter 5 3 #4 on 2.60" Diameter 7 2 M2.5 on 40 mm Diameter 8 2 M3 on 46 mm Diameter 9 2 M3 on 60 mm Diameter A 3 M3 on 66 mm Diameter	Available when Code 2 is $\leq 2048/0$ 0 5V in, open collector out incremental only C 5V in, open collector out incremental only - reverse phase Available when Code 2 is XXXX/0 3 5V in, line driver out incremental only D 5V in, line driver out incremental only - reverse phase Available when Code 2 is XXXX/4, XXXX/6, XXXX/8 or XXXX/C 6 5V in, line driver out for incremental; 5V in, open collector out for commutation E 5V in, line driver out for incremental; 5V in, open collector out for commutation - reverse phase 9 5V in, line driver out for incremental; 5V in, line driver out for commutation F 5V in, line driver out for incremental; 5V in, line driver out for commutation - reverse phase	Inside Collar: 0 1/4 in. 1 3/8 in. 2 7/16 in. 3 1/2 in. 4 6 mm 5 8 mm 6 10 mm 7 12 mm Outside Collar: A 1/4 in. B 3/8 in. C 7/16 in. D 1/2 in. E 6 mm F 8 mm G 10 mm H 12 mm	Code			Length
		Connector/Cable	Wire				Pigtail			
		0500/0	2500/0				0	Z	N/A	None
		0512/0	4096/0				1	A	J	1 Ft.
		1000/0	5000/0				2	B	K	2 Ft.
		1024/0	8192/0				3	C	L	3 Ft.
		2000/0	10E3/0*				4	D	M	4 Ft.
		2048/0	*= 10000/0				5	E	N	5 Ft.
		0500/†	2500/†				6	F	P	6 Ft.
		0512/8	4096/†				7	G	Q	7 Ft.
		1000/†	5000/†				8	H	R	8 Ft.
		1024/†	8192/†				<b>CONNECTION OPTIONS</b> You may choose an integral connector mounted in axial or radial position. Available with or without mating connector/cable. Alternatively, a direct-solder pigtail cable is offered.			
		2000/†	10E3/†*							
		2048/†	*= 10000/†							
		† Available with 4, 6, 8 or 12 pole. (12 pole is designated by character "C")								
		Examples: 1024/8 is 1024PPR, 8 pole; 2000/C is 2000PPR, 12 pole								

# SERIES F21

**Dynapar™ brand**

## For Stepper & Small Servo Motors

### Key Features

- Digital Encoder with Flex Servo Ring easily Replaces Size 21 Resolver
- Short Mounting Depth with Jam Nut Shaft Fixing makes Installation Easy
- Up to 2048PPR with Commutation Channels



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental with commutation option, Optical

**Resolution:** 1024 or 2048 PPR incremental with 8 or 10 pole commutation channels

**Accuracy:** Incremental:  $\pm 2.5$  arc-mins. max. edge to any edge; Commutation:  $\pm 6$  arc-mins. max.

**Phasing for CCW rotation of motor shaft :**  
A leads B by  $90^\circ$  and U leads V leads W by  $120^\circ$ .

**Minimum edge separation** A to B is  $45^\circ$ .

**Index to U channel:** +/-  $1^\circ$  mech. index pulse center to U channel rising edge.

**Index Pulse Width:**  $90^\circ$  gated A and B high

### ELECTRICAL

**Input Power Requirements:**  $5 \pm 10\%$  VDC at 100 mA max (incremental and commutation), excluding output load

**Output Signals:**

**Incremental:** 26LS31 Differential Line Driver, sink / source 40 mA max.

**Commutation:** Open Collector w/2.0 k $\Omega$  pull-ups, 8 mA sink max.; or 26LS31 Differential Line Driver, sink / source 40 mA max.

**Frequency Response:** 300 kHz, max.

**Termination:** Flying leads, stranded 26 AWG, twisted pair, PVC insulation, 6.5" length  $\pm 0.5$ "

### MECHANICAL

**Weight:** 3.5 oz. (90 gm) typ.

**Dimensions:** Outside Diameter : 2.062" (52.4mm), max.; Height: 1.01" (25.65mm), max.

**Material:** Housing: cast-aluminum; Servo Ring: glass reinforced engineering resin; Hub: Brass; Disk: 0.030" (0.76mm) thick glass

**Moment of Inertia:**  $2.66 \times 10^{-4}$  in-oz-sec.<sup>2</sup> (18.8 gm-cm<sup>2</sup>)

**Bore Diameter:** 0.50" (12.7mm)

**Bore Dia. Tolerance:**  $+0.001"/-0.000"$  ( $+0.025$  mm/ $-0.000$  mm)

**Mating Shaft Runout:** 0.002" (0.05 mm) max. (Includes shaft perpendicularity to mounting surface)

**Mating Shaft Axial movement:**  $\pm 0.010"$  ( $\pm 0.25$  mm), max.

**Mounting:** 2.047" (51.99mm) servo ring with integral flexure (size 21 pancake resolver equivalent)

**Acceleration:** 100,000 rad/sec.<sup>2</sup> max.

**Velocity:** 5,000 RPM continuous; 12,000 RPM peak

**Bearing Life:**  $[(3.6 \times 10^9) / \text{RPM}]$  Hours ; e.g. 605,000 hours @6,000 RPM

### ENVIRONMENTAL

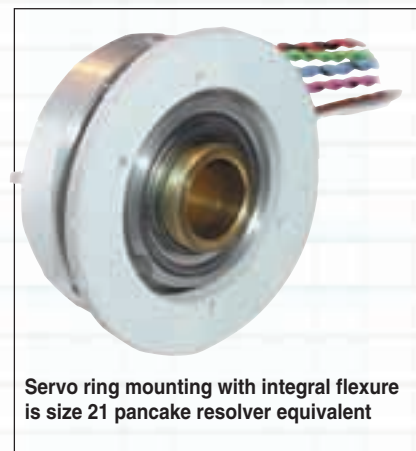
**Operating Temperature:**  $0^\circ$  to  $+120^\circ\text{C}$

**Storage Temperature:**  $0^\circ$  to  $+120^\circ\text{C}$

**Shock:** 50 Gs for 6 msec duration

**Vibration:** 2.5 Gs at 5 to 2000 Hz

**Relative Humidity:** 90% non-condensing

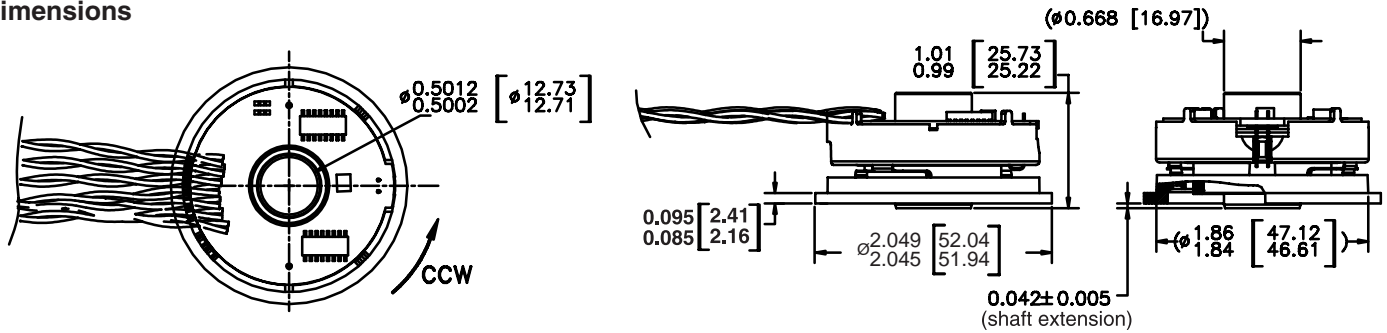


Servo ring mounting with integral flexure is size 21 pancake resolver equivalent



# SERIES F21

## Dimensions

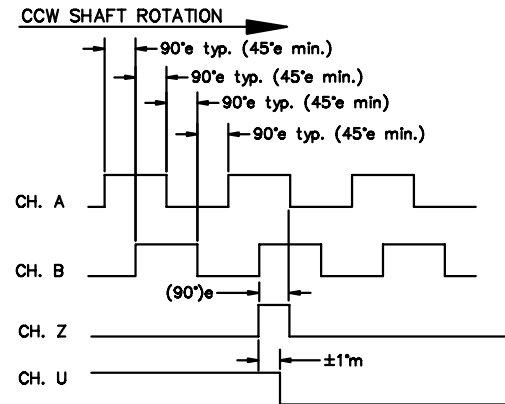


## Connections

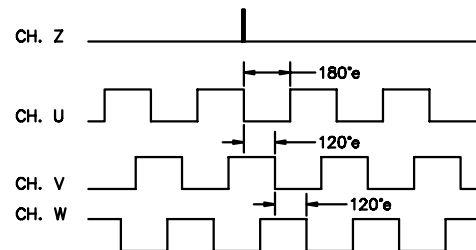
Function*	Cable Wire Color
VCC	RED
GND	BLACK
A	BLUE/BLACK
A	BLUE
B	GREEN/BLACK
B	GREEN
Z	VIOLET/BLACK
Z	VIOLET
U	BROWN/BLACK
U	BROWN
V	GRAY/BLACK
V	GRAY
W	WHITE/BLACK
W	WHITE

\* Function availability dependant on Model

## Waveforms



Waveforms below show relationship between CH. Z, U, V & W (scale differs from above)



## Ordering Information

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

Code 1: Model	Code 2: PPR, Poles	Code 3: Mount	Code 4: Electrical	Code 5: Shaft/Bore	Code 6: Termination
<b>F21</b>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> / <input type="checkbox"/>	<b>0</b>	<input type="checkbox"/>	<b>3</b>	<b>0</b>
Ordering Information					
<b>F21</b> Size 21 Commutating Encoder	Incremental channels only	<b>0</b> Servo mount 2.047 Diameter x.090 thick	Available when Code 2 is XXXX/0	<b>3</b> 1/2 in. thru bore	<b>0</b> 6.5" $\pm$ 0.5" Twisted Pair Flying Leads
	Incremental plus Commutation channels		Available when Code 2 is XXXX/8 or C		
	<b>1024/0</b> <b>2048/0</b>		<b>3</b> 5V in, line driver out incremental only		
	<b>1024/8</b> Note: "C"= 10 poles. Consult factory for other configurations <b>2048/8</b> <b>1024/C</b> <b>2048/C</b>		<b>6</b> 5V in, line driver out for incremental; 5V in, open collector out for commutation <b>9</b> 5V in, line driver out for incremental; 5V in, line driver out for commutation		

# SERIES HC20

# Dynapar™ brand

## For Stepper & Small Servo Motors

### Key Features

- Economical Servomotor Feedback with New Phased Array ASIC
- High 120°C Operating Temperature Won't Limit Motor Performance
- Up to 2500PPR Direct-Read with Commutation Channels



## NEW!



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental

**Resolution:** 500 to 2500 PPR

**Commutation:** 4/6/8 pole

**Format:** Two channel quadrature (AB) with optional Index (Z) and complementary outputs

**Phase Sense:** Phasing for CCW rotation of motor shaft (viewing from encoder cover side): A leads B by  $90^\circ \pm 22.5^\circ$  electrical, and U leads V leads W by  $120^\circ$

**Accuracy:**

- Incremental: 40 arc-sec. max. edge to any edge;
- Commutation:  $\pm 6$  arc minutes max.

**Index:**  $90^\circ$  electrical (gated A and B high)

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

**Connection:**

Pin	Signal	Color
1	Vcc	Red
2	U	Brown
3	GND	Black
4	V	Gray
5	A	Blue
6	W	White
7	$\bar{A}$	Blue/Black
8	N.C.	—
9	B	Green
10	$\bar{U}$	Brown/Black
11	$\bar{B}$	Green/Black
12	$\bar{V}$	Gray/Black
13	Z	Violet
14	$\bar{W}$	White/Black
15	$\bar{Z}$	Violet/Black
16	N.C.	—

### ELECTRICAL

**Supply Voltage:** DC 5V  $\pm 10\%$  (SELV)

**Max. Current (w/o load):**

- Incremental: 150mA
- Incremental + Commutation: 175mA

**Max. Output Frequency:**

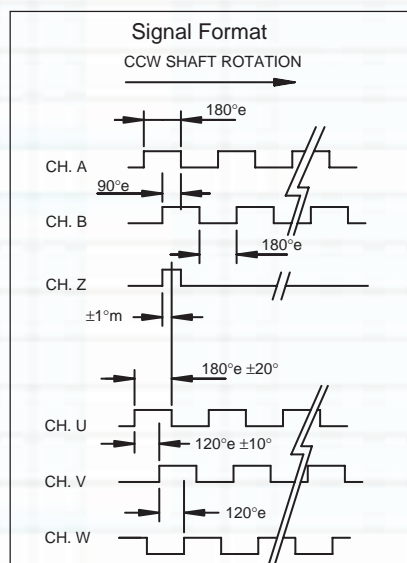
- 250 kHz (up to 1024 ppr)
- 500 kHz (> 1024 ppr)

**Signal Level:**

- NPN: Open Collector
- Differential Line Driver: RS 422

**Output Current:** RS422:  $\pm 40$  mA (26LS31); NPN O.C.: 16mA (2k. int. pull up)

**Connection:** Axial or Raidal cable available



### MECHANICAL

**Weight:** 120g typical

**Dimensions:**

- Outside Diameter with Cover: 50 mm
- Mounting Depth: 36mm

**Material:**

- Bearing Housing: Aluminium;
- Cover: Aluminium;
- Shaft: Brass: 699477-0001

**Shaft Style (dependant on model):**

- Blind Hole Shaft: 8.00mm dia; 20mm depth
- Hollow Shaft: 6.00 or 8.00mm dia
- Taper Shaft: 9.00mm dia. nominal; 2.8624°+0.2289/- 0 Taper

**Mating Shaft Runout:**  $\pm 0.2$ mm max. (Includes shaft perpendicularity to mounting surface)

**Mating Shaft Axial Movement:** max.  $\pm 0.8$ mm.

**Max. Velocity:** RPM= (Frequency/PPR) x 60 or 2000 min<sup>-1</sup>, whichever is less

### ENVIRONMENTAL

**Operating Temperature:** 0...+120°C

**Storage Temperature:** -40...+120°C

**Shock Resistance:** 1000 m/s<sup>2</sup> (6 ms)

**Vibration Resistance:** 25 m/s<sup>2</sup> (5...2000 Hz)

**Protection Class:** IP51 (cable must be oriented downwards)

### Ordering Information

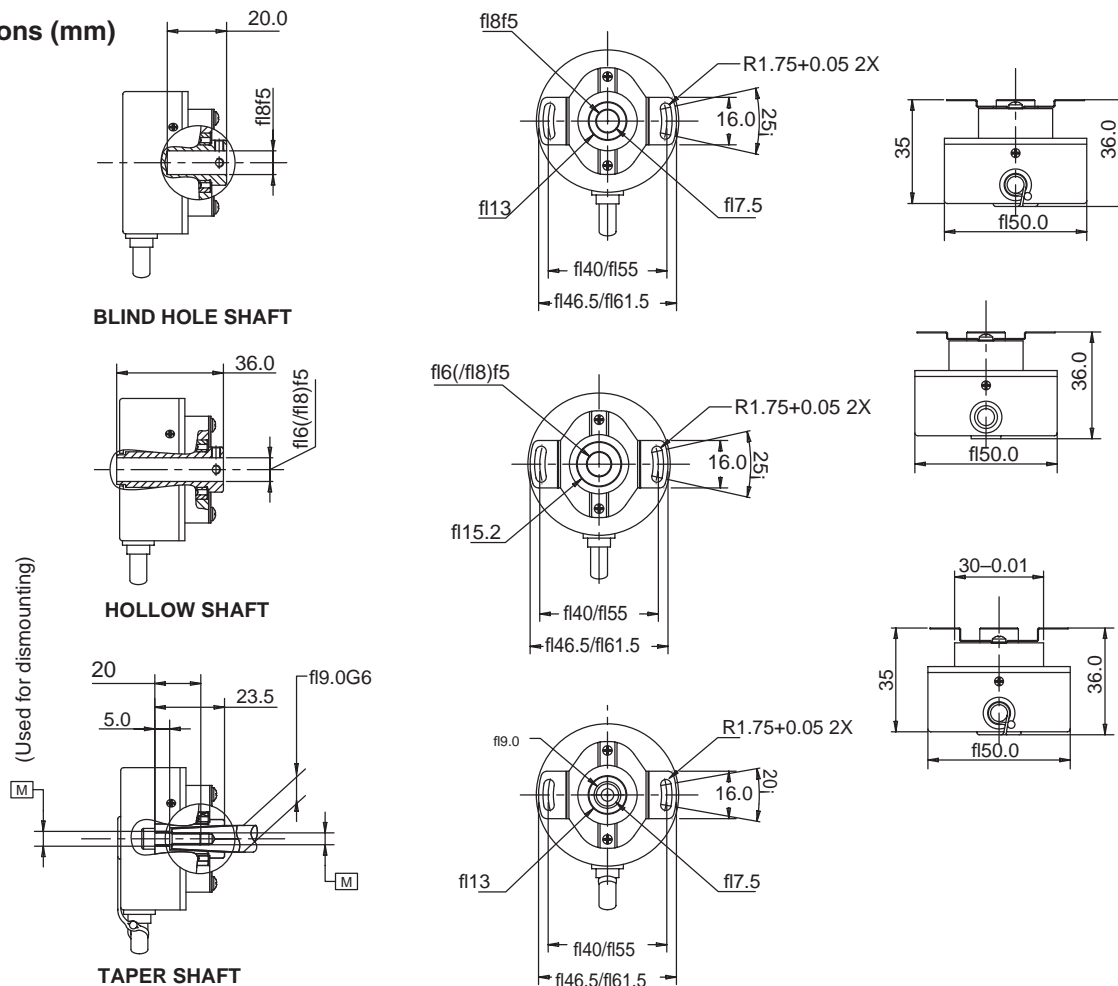
To order, complete the model number with code numbers from the table below:

Code 1: Model	Code 2: PPR Incremental <sup>2</sup>	Code 3: Poles Commutation <sup>2</sup>	Code 4: Mounting	Code 5: Electrical <sup>1</sup>	Code 6: Shaft	Code 7: Connection
<b>HC20</b>	□□□□	□	□	□	□	□

Ordering Information																																																									
<b>HC20</b> Compact Hollowshaft Encoder	<b>0500 2000</b> <b>0512 2048</b> <b>1000 2500</b> <b>1024</b>	<b>0</b> None <b>4</b> 4 Pole <b>6</b> 6 Pole <b>8</b> 8 Pole	<b>0</b> No tether <b>Tether</b> <b>1</b> 1.575" (40mm) TK <b>2</b> 2.166" (55mm) TK	incremental only, <=2048/0 (ppr/poles) <b>0</b> U <sub>inc</sub> = DC 5V; output <sub>inc</sub> = NPN-O.C. incremental only without commutation <b>2</b> U <sub>inc</sub> = DC 5-26V; output <sub>inc</sub> = RS 422 <b>3</b> U <sub>inc</sub> = DC 5V; output <sub>inc</sub> = RS 422 incremental plus commutation signals <b>6</b> U <sub>inc</sub> = DC 5V; output <sub>inc</sub> = RS 422 U <sub>com</sub> = DC 5V; output <sub>com</sub> = NPN-O.C. <b>9</b> U <sub>inc</sub> = DC 5V; output <sub>inc</sub> = RS 422 U <sub>com</sub> = DC 5V; output <sub>com</sub> = RS 422	<b>0</b> Taper shaft(Ø9,1:10) <b>1</b> Blind vertical shaft Ø6 <b>2</b> Blind vertical shaft Ø8 <b>3</b> Hollow shaft Ø6 <b>4</b> Hollow shaft Ø8	<b>Axial plug</b> <b>1</b> 1 Ft. cable <b>2</b> 2 Ft. cable <b>3</b> 3 Ft. cable <b>4</b> 4 Ft. cable <b>5</b> 5 Ft. cable <b>6</b> 6 Ft. cable <b>7</b> 7 Ft. cable <b>8</b> 8 Ft. cable	<b>Radial plug</b> <b>A</b> 1 Ft. cable <b>B</b> 2 Ft. cable <b>C</b> 3 Ft. cable <b>D</b> 4 Ft. cable <b>E</b> 5 Ft. cable <b>F</b> 6 Ft. cable <b>G</b> 7 Ft. cable <b>H</b> 8 Ft. cable																																																		
	<table border="1"> <thead> <tr> <th colspan="5">Available Combinations (PPR/Poles)</th> </tr> <tr> <th></th> <th colspan="4">Number of Poles</th> </tr> <tr> <th>Incremental PPR</th> <th>0</th> <th>4</th> <th>6</th> <th>8</th> </tr> </thead> <tbody> <tr> <td>0500</td> <td>x</td> <td>x</td> <td>x</td> <td>x</td> </tr> <tr> <td>0512</td> <td></td> <td></td> <td></td> <td>x</td> </tr> <tr> <td>1000</td> <td>x</td> <td>x</td> <td>x</td> <td>x</td> </tr> <tr> <td>1024</td> <td>x</td> <td>x</td> <td>x</td> <td>x</td> </tr> <tr> <td>2000</td> <td>x</td> <td>x</td> <td>x</td> <td>x</td> </tr> <tr> <td>2048</td> <td>x</td> <td>x</td> <td>x</td> <td>x</td> </tr> <tr> <td>2500</td> <td>x</td> <td>x</td> <td>x</td> <td>x</td> </tr> </tbody> </table>								Available Combinations (PPR/Poles)						Number of Poles				Incremental PPR	0	4	6	8	0500	x	x	x	x	0512				x	1000	x	x	x	x	1024	x	x	x	x	2000	x	x	x	x	2048	x	x	x	x	2500	x	x	x
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1000	x	x	x	x																																																					
1024	x	x	x	x																																																					
2000	x	x	x	x																																																					
2048	x	x	x	x																																																					
2500	x	x	x	x																																																					

1 U<sub>inc</sub>: Supply voltage incremental, U<sub>com</sub>: Supply voltage commutation (only if commutation is selected); 2 See available combinations (pulses/poles)

### Dimensions (mm)



# SERIES 11/R11

**Harowe™ brand**

## Heavy Duty Brushless Resolvers

### Key Features

- Brushless Construction is Ideal for Brushless Servo Motors
- Shortest Mounting Depth in the Industry for Easy Mounting
- Up to 125°C Temperature Range
- Radiation-Hardened Models Available



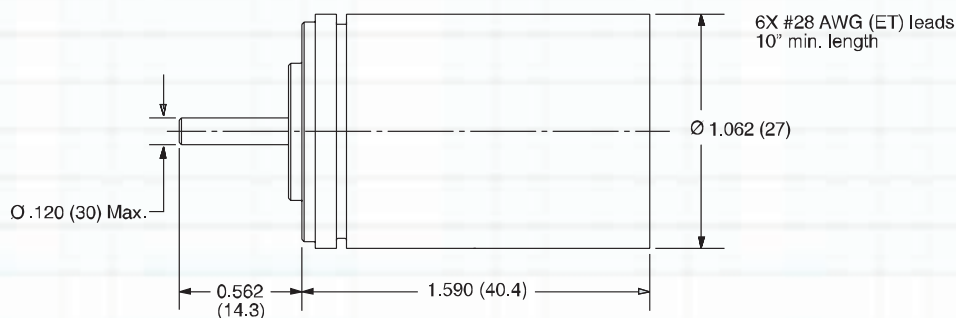
by **DYNAPAR™**



## SPECIFICATIONS

Family Model	Speed*	Primary Winding	Accuracy ± Arc-Min	Input Voltage (Vrms)	Frequency (Hz)	Maximum Input Current (mA)	Transformation Ratio (V out / V in) ± 10%	Phase Shift (degrees)	Total Null Voltage (mV)
11BR W -300-B	1	Stator	10	12.0	400	10.9	1.75	12	30
11BR W -300-F	1	Stator	7	12.0	2,500	3.1	0.50	-2	30
11BR W -300-M	1	Stator	7	10.0	5,000	8.3	0.50	-5	30
11BRCT -300-F	2	Stator	10	12.0	2,500	8.3	0.50	0	15
11BRCT -300-M	2	Stator	10	11.8	2,500	70.0	1.02	-1	30
11BRCT -300-T	4	Stator	5	12.0	2,500	6.0	0.53	-2	15
11BRCT -300-P	5	Stator	4	12.0	2,500	1.4	0.39	-7	15
11BRCX-300-A	1	Rotor	7	7.5	4,000	13.5	0.54	-2	20
11BRCX-300-B	1	Rotor	7	7.5	4,000	40.0	1.07	-2	15
11BRCX-300-C	1	Rotor	7	6.0	1,000	15	0.45	4	15
11BRCX-300-G	1	Rotor	7	26.0	400	40.0	0.45	12	30
11BRCX-300-J	1	Rotor	7	7.0	5,000	10.9	0.95	-6	15
11BRCX-300-N	1	Rotor	7	8.5	1,000	14.0	1.00	3	30
11BRCX-300-M	2	Rotor	7	7.0	5,000	10.9	0.95	-2	30
11BRCX-300-T	4	Rotor	7	7.0	5,000	11.0	0.84	7	20
11BRCX-300-P	5	Rotor	6	10.0	5,000	5.0	0.55	-3	20
R11-S01F-1A	1	Rotor	20	1.88	2,250	21.0	1.40	11	15
R11-S01F-1B	1	Rotor	20	6.00	2,000	12.0	0.454	8.5	15
R11-S01F-1A	1	Rotor	6	1.88	2,250	21.0	1.40	11	15

\*Speeds are defined as follows: 1 = single speed; 2 = 2-speed; etc.



# FRAMELESS SERIES

# Harowe™ brand

## Heavy Duty Brushless Resolvers

### Key Features

- Wide Range of Sizes from 10 to 55
- Multi-Speed Available
- Up to 200°C Temperature Range
- Radiation-Hardened Models Available

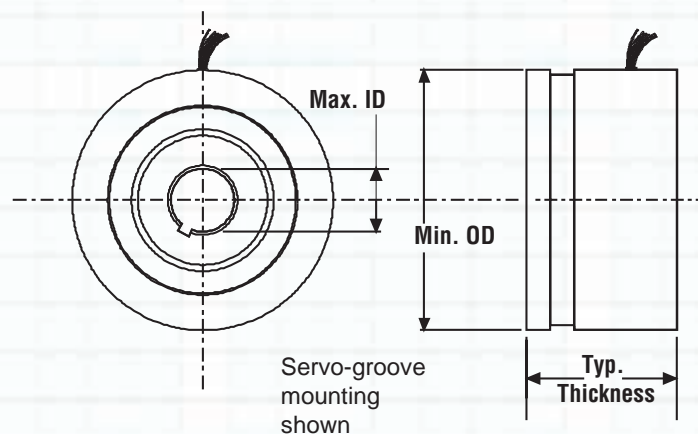
by  **DYNAPAR™**



## SPECIFICATIONS

Model*	Typical Thickness in (mm)	Minimum OD in (mm)	Maximum ID in (mm)
10BRCX	.65 (16.5)	1.05 (26.5)	.237 (6.0)
15BRCX	1.00 (25.4)	1.45 (36.8)	.472 (12.0)
21BRCX	1.25 (31.8)	2.06 (52.4)	.8007 (20.34)
31BRCX	1.25 (31.8)	3.05 (77.5)	1.5763 (40.04)
55BRCX	1.25 (31.8)	5.50 (139.7)	3.6515 (92.75)

\*Available as transmitter and control transformer types.



# HaroMax Series 15

# Harowe™ brand

## Heavy Duty Brushless Resolvers

### Key Features

- Frameless size 15 Servo Mounting
- Anodized Aluminum Housing with Low Mass
- Machine Wound Stator for High Accuracy



by  **DYNAPAR™**



## SPECIFICATIONS

Part Number	Input Volts	Input Khz	Transfer Ratio	Speed	Mounting	Bore	Connections
15BRX700-B04AB	5.0	10.0	0.42	1	Servo	3/8 in	40 in leads
15BRX700-B10AA	2.0	10.0	0.98	1	Servo	3/8 in	2 in leads
15BRX700-B10AA	2.0	6.0	0.90	1	Servo	3/8 in	2 in leads
15BRX700-D10AA	8.0	8.0	0.50	1	Servo	3/8 in	12 in leads
15BRX700-D10AA	4.0	5.0	0.50	1	Servo	3/8 in	12 in leads
15BRX700-D10AA	7.0	10.0	0.48	1	Servo	3/8 in	12 in leads
15BRX700-D10AC	8.0	8.0	0.50	1	Servo	3/8 in	21 in cable
15BRX700-D10AD	8.0	8.0	0.50	1	Servo	3/8 in	4.25 in leads
15BRX700-D10AE	8.0	8.0	0.50	1	Servo	3/8 in	18 in cable
15BRX700-F10AA	4.0	5.0	0.50	1	Servo	3/8 in	12 in leads



# HaroMax Series 21

## Harowe™ brand

### Heavy Duty Brushless Resolvers

#### Key Features

- Frameless size 21 Servo Mounting
- Anodized Aluminum Housing with Low Mass
- Machine Wound Stator for High Accuracy



by  **DYNAPAR™**



### SPECIFICATIONS

Part Number	Input Volts	Input Khz	Transfer Ratio	Speed	Mounting	Bore	Connections
21BRX700-B42AA	2.0	10.0	1.00	1	Servo	1/2 in	6.5 in leads
21BRX700-B42AA	2.0	6.0	1.00	1	Servo	1/2 in	6.5 in leads
21BRX700-B42AA	3.5	10.0	1.03	1	Servo	1/2 in	6.5 in leads
21BRX700-D11AC	11.3	8.0	0.52	1	Servo	17 mm	12 in leads
21BRX700-D42AA	8.0	8.0	0.50	1	Servo	1/2 in	6.5 in leads
21BRX700-D42AA	10.0	10.0	0.50	1	Servo	1/2 in	6.5 in leads
21BRX700-D42AA	4.0	4.0	0.50	1	Servo	1/2 in	6.5 in leads
21BRX708-H06AA	4.0	4.0	0.45	1	Flange	16 mm	12 in leads
21BRX708-H06AA	6.0	6.0	0.45	1	Flange	16 mm	12 in leads
21BRX709-E03AA	6.0	6.0	0.31	1	Flange	8 mm	9 in leads



# LIGHT DUTY ENCODERS GUIDE

## DYNAPAR 2010

Light duty encoders are commonly referred to as “commercial duty” due to their frequent use in commercial or office automation products. Typically these devices reside in fairly benign environments with little temperature variation, are fairly clean, and not generally subjected to high shock loading or moisture.

Dynapar light duty encoders are especially suited for applications using small motors and actuators in relatively clean environments such as office printers, copiers, and laboratory equipment. Although intended for use in commercial applications, these encoders are manufactured with industrial features such as:

- Metal housings
- O-ring seals
- Precision bearings

Their compact dimensions and advanced circuitry make them well-suited for many applications too small to accept “standard” encoders such as desk top and bench top testing equipment and precision actuators.

High performance feedback with some of the shortest lead times in the industry is the benchmark of the Dynapar product line. Most models are manufactured right here in the USA in Gurnee, IL using the advanced cellular manufacturing concept, ensuring Just-In-Time delivery to meet your needs.



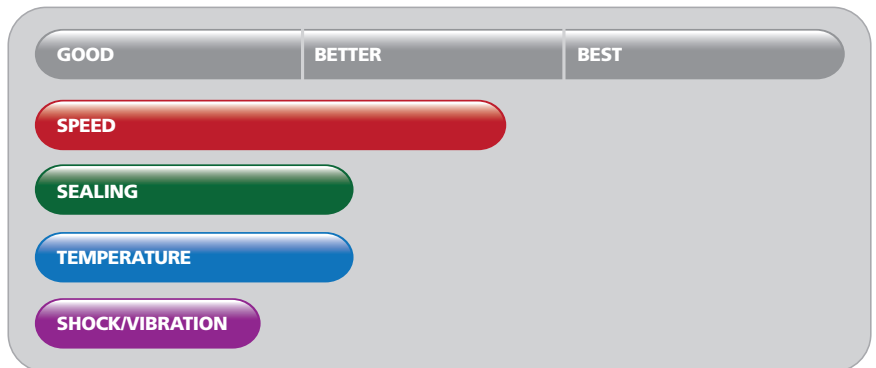


**OPTICAL - INCREMENTAL**

						
Product	E12	E14	E23	EC23	E14H (Hubshaft)	E14IC (Integral Coupling)
Shaft/Bore Sizes	1/8"	1/8" or 1/4"	1/4"	1/4"	1/4" to 5/8", 6mm to 14mm	1/4" or 3/8"
Available Resolutions (PPR)	100 to 1024	100 to 2540	1 to 2540	3000 to 5000	100 to 2540	100 to 2540
Input Voltage (VDC)	5, 12, 15	5, 12, 15	5-26	5-26	5, 12, 15	5, 12, 15
Operating Temperature (°C)	0 to +70	0 to +70	0 to +70	0 to +70	0 to +70	0 to +70
Enclosure Rating	NEMA 12/IP54	NEMA 12/IP54	NEMA 12/IP54	NEMA 12/IP54	NEMA 12/IP54	NEMA 12/IP54
Special Features	Sub-Compact 1.2" diameter	Rugged Metal Housing	Screw terminal connections	High 5000PPR capability	Hubshaft with flex tether	Integrated coupling
Page Number	4.02	4.04	4.06	4.08	4.10	4.12



**LIGHT DUTY ENCODER GENERAL PERFORMANCE DATA**



E14 Pictured

# SERIES E12

**Dynapar™ brand**

## Miniature Encoder

### Key Features

- Rugged Metal Housing
- Sub-Compact 1.2" Diameter
- Up to 1024PPR with Optional Index



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental  
**Resolution:** 100 to 1024 PPR (pulses/ revolution)  
**Format:** Two channel quadrature (AB) with optional Index (Z) outputs  
**Phase Sense:** A leads B for CW shaft rotation as viewed from the shaft end of the encoder  
**Accuracy:**  $\pm 3 \times (360^\circ \div \text{PPR})$  or  $\pm 2.5$  arc-min worst case pulse to any other pulse, whichever is less  
**Quadrature Phasing:**  $90^\circ \pm 36^\circ$  electrical  
**Symmetry:**  $180^\circ \pm 18^\circ$  electrical  
**Index:**  $90^\circ \pm 25^\circ$  (gated with A and B high)  
**Waveforms:** Squarewave with rise and fall times less than 1 microsecond into a load capacitance of 1000 pf

### ELECTRICAL

**Input Power:** 5 VDC  $\pm 5\%$  at 80 mA max.; 12 or 15 VDC  $\pm 10\%$  at 80 mA max.; not including output loads  
**Outputs:** 7272 line driver (or equivalent), 40 mA sink and source  
**Frequency Response:** 100 kHz min.

### ENVIRONMENTAL

**Operating Temperature:** 0 to +70 °C  
**Storage Temperature:** -25 to +70 °C  
**Humidity:** to 98% without condensation  
**Enclosure Rating:** NEMA12/IP54 (dirt tight, splashproof)

### Electrical Connections

Function (If Used)	Wire Color Code
Supply	Red
Common	Black
Signal A	White
Signal B	Green
Signal Z	Orange
Floating	Shield

### MECHANICAL

**Mechanical Bearing Life:**  $16 \times 10^6$  revolutions at max. load  
**Shaft Loading:** 1 lb. radial, 1 lb. axial max.  
**Shaft Speed:** 5,000 RPM max.  
**Starting Torque:**  
 Shielded Bearing: 0.1 oz-in max. at 25 °C  
 Sealed Bearing: 0.3 oz-in max. at 25 °C  
**Running Torque:**  
 Shielded Bearing: 0.08 oz-in max. at 25 °C;  
 Sealed Bearing: 0.2 oz-in max. at 25 °C  
**Moment of Inertia:**  $1.13 \times 10^{-5}$  oz-in-sec<sup>2</sup>  
**Weight:** 3.0 oz. max.



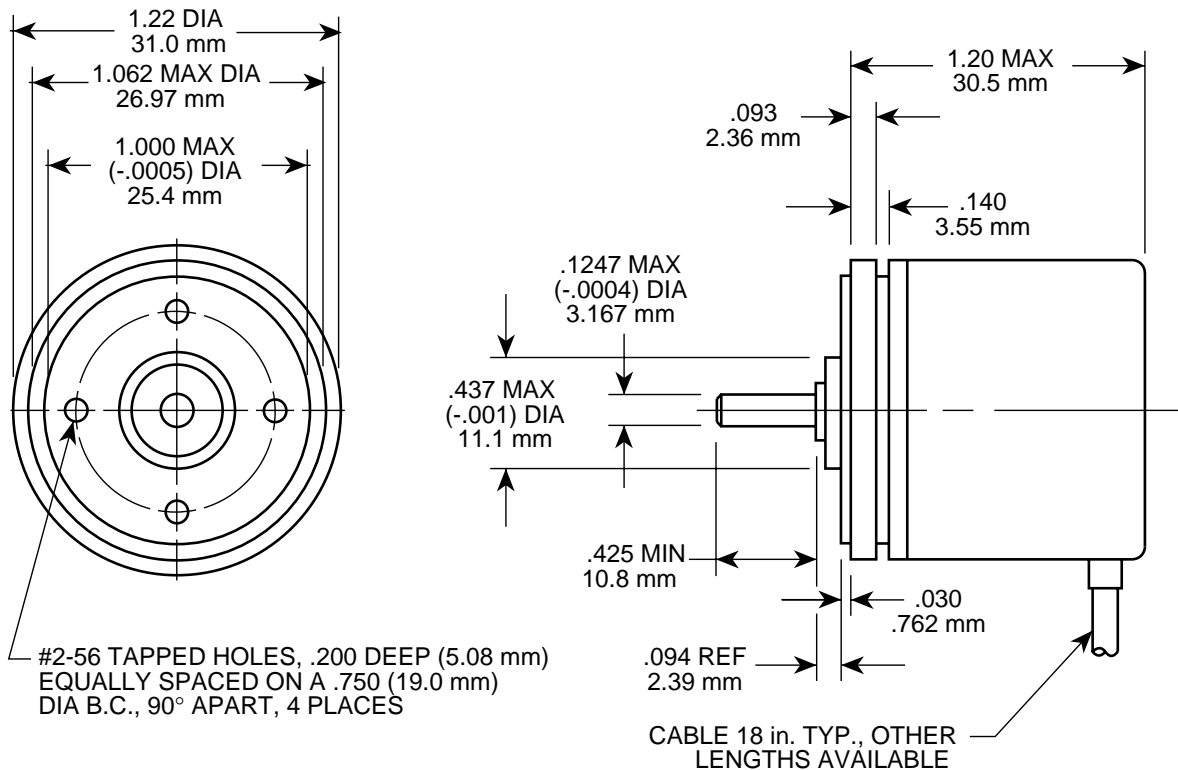
# SERIES E12

### Ordering Information

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

Code 1: Model	Code 2: Pulses/Rev	Code 3: Mechanical	Code 4: Output	Code 5: Voltage	Code 6: Termination
<b>E12</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>E12</b> Size 12, Light Duty Enclosed	<b>0100</b> <b>0250</b> <b>0256</b> <b>0360</b> <b>0500</b> <b>0600</b> <b>1000</b> <b>1024</b>	<b>0</b> Sealed Bearing <b>1</b> Shielded Bearing	<b>0</b> Unidirectional <b>2</b> Bidirectional, no Index <b>3</b> Bidirectional, with Index	<b>0</b> 5 VDC <b>1</b> 12 VDC <b>2</b> 15 VDC	<b>0</b> 18" Cable <b>1</b> 3' Cable <b>2</b> 6' Cable <b>3</b> 10' Cable <b>4</b> 15' Cable

### Dimensions (inches/mm)



# SERIES E14

**Dynapar™ brand**

## Miniature Encoder

### Key Features

- Rugged Metal Housing
- Optional Differential Line Driver Outputs
- Up to 2540PPR with Optional Index



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental  
**Resolution:** 100 to 2540 PPR (pulses/revolution)  
**Format:** Two channel quadrature (AB) with optional Index (Z) outputs  
**Phase Sense:** A leads B for CW shaft rotation as viewed from the shaft end of the encoder  
**Accuracy:**  $\pm 3 \times (360^\circ \div \text{PPR})$  or  $\pm 2.5$  arc-min worst case pulse to any other pulse, whichever is less  
**Quadrature Phasing:**  $90^\circ \pm 36^\circ$  electrical  
**Symmetry:**  $180^\circ \pm 18^\circ$  electrical  
**Index:**  $90^\circ \pm 25^\circ$  (gated with A and B high)  
**Waveforms:** Squarewave with rise and fall times less than 1 microsecond into a load capacitance of 1000 pf

### Electrical Connections

Wire Color Code	Function		
	Standard Outputs 5, 12, or 15 VDC	w/ Line Driver Outputs	
		Unidirectional	Bidirectional
Red	Power Source	Power Source	Power Source
Black	Common	Common	Common
White	Signal A	Signal A	Signal A
Green	Signal B (if used)	Signal $\bar{A}$	Signal B
Orange	Signal Z (if used)	No Connection	Signal $\bar{B}$
Blue	No Connection	No Connection	Signal $\bar{A}$
Shield	Floating	Floating	Floating
White/Black	—	—	Signal Z (if used)
Red/Black	—	—	Signal $\bar{Z}$ (if used)

### ELECTRICAL

**Input Power:** 5 VDC  $\pm 5\%$  at 80 mA max.; 12 or 15 VDC  $\pm 10\%$  at 80 mA max.; not including output loads  
**Outputs:** 7272 (or equivalent) line driver, 40 mA sink and source  
**Frequency Response:** 100 kHz min.

### MECHANICAL

**Bearing Life:**  $(16 \times 10^6 \div \text{RPM})$  hours at max. load  
**Shaft Loading:** 5 lb. radial, 3 lb. axial max.  
**Shaft Speed:** 5,000 RPM max.  
**Starting Torque:**  
 Shielded Bearing: 0.1 oz-in max. at 25 °C  
 Sealed Bearing: 0.43 oz-in max. at 25 °C

### Running Torque:

Shielded Bearing: 0.08 oz-in max. at 25 °C  
 Sealed Bearing: 0.42 oz-in max. at 25 °C

**Moment of Inertia:**  $3.8 \times 10^{-5}$  oz-in-sec<sup>2</sup>

**Weight:** 3.0 oz. max.

### ENVIRONMENTAL

**Operating Temperature:** 0 to +70 °C  
**Storage Temperature:** -25 to +70 °C  
**Humidity:** to 98% without condensation  
**Enclosure Rating:** NEMA12/IP54 (dirt tight, splashproof)



# SERIES E14

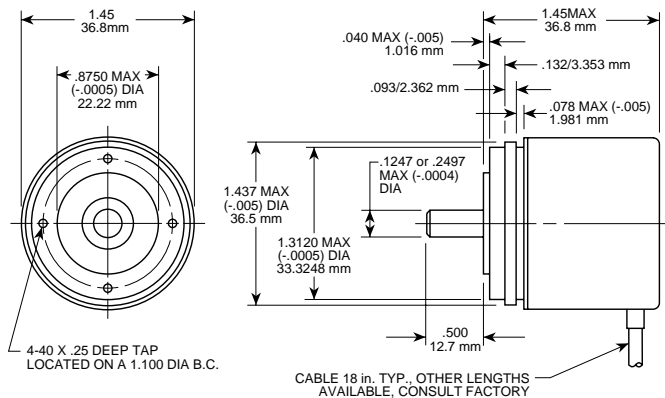
## Ordering Information

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

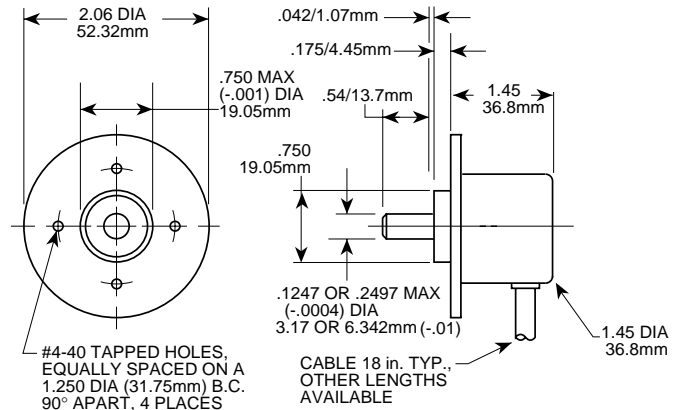
Code 1: Model	Code 2: Pulses/Rev	Code 3: Mounting	Code 4: Mechanical	Code 5: Output	Code 6: Electrical	Code 7: Termination
<b>E14</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>E14</b> Size 14, Light Duty Enclosed	<b>0100</b> <b>1000</b> <b>0200</b> <b>1024</b> <b>0240</b> <b>1250</b> <b>0250</b> <b>1500</b> <b>0256</b> <b>2000</b> <b>0300</b> <b>2048</b> <b>0360</b> <b>2500</b> <b>0400</b> <b>2540</b> <b>0500</b> <b>0600</b> <b>0720</b> <b>0750</b> <b>0900</b>	<b>0</b> Size E14 <b>1</b> Size E20 Servo <b>2</b> Size E20 Flange Available when code 4 is 2 <b>3</b> Size EC80 Flange	<b>0</b> 1/4" Shaft, Sealed Bearing <b>1</b> 1/8" Shaft, Sealed Bearing <b>2</b> 1/4" Shaft, Shielded Bearing <b>3</b> 1/8" Shaft, Shielded Bearing	<b>0</b> Single Ended, Unidirectional <b>2</b> Single Ended, Bidirectional, no Index <b>3</b> Single Ended, Bidirectional, with Index <b>4</b> Differential, Unidirectional <b>6</b> Differential, Bidirectional, no Index <b>7</b> Differential, Bidirectional, with Index	<b>0</b> 5 VDC <b>1</b> 12 VDC <b>2</b> 15 VDC	<b>0</b> 18" Cable <b>1</b> 3' Cable <b>2</b> 6' Cable <b>3</b> 10' Cable <b>4</b> 15' Cable

## Dimensions (inches/mm)

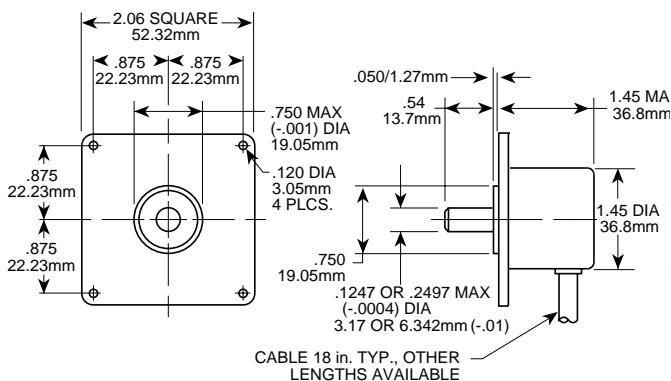
Code 3: 0



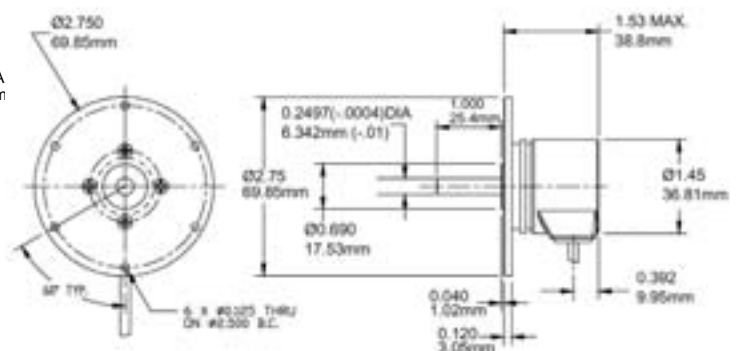
Code 3: 1



Code 3: 2



Code 3: 3



# SERIES E23

**Dynapar™ brand**

## Miniature Encoder

### Key Features

- Up to 2540PPR with Optional Index
- Optional Screw Terminal Connections
- Standard Size 23 (2.3" diameter)



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental

**Resolution:** 1 to 2540 PPR (pulses/revolution)

**Accuracy:** (Worst case any edge to any other edge)  $\pm 2.5$  arc-min.

**Format:** Two channel quadrature (AB) with optional Index (Z) outputs

**Phase Sense:** A leads B for CW or CCW shaft rotation as viewed from the shaft end of the encoder, see Ordering Information

**Quadrature Phasing:**  $90^\circ \pm 18^\circ$  electrical

**Symmetry:**  $180^\circ \pm 9^\circ$  electrical

**Index:**  $180^\circ \pm 9^\circ$  electrical, gated with B

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

### ELECTRICAL

#### Input Power:

Open Collector or Totem Pole outputs: 4.5 VDC min. to 26 VDC max. at 200 mA max.;

Line Driver: 4.5 VDC min. to 26 VDC max. at 80 mA max.

#### Outputs:

Open Collector 7273:

$V_{OH}$ : 30 V max.;  $V_{OL}$ : 0.4 V max. at 20 mA sink

Totem Pole, Line Driver 7272:

40 mA min. sink or source

4469 Differential Line Driver: 100 mA, sink or source

**Frequency Response:** 100 kHz min.

### MECHANICAL

**Shaft Loading:** 5 lbs. max. radial and axial

**Shaft Speed:** 5,000 RPM max.

**Starting Torque:** 0.2 oz-in max. at 25 °C

**Moment of Inertia:**  $3.7 \times 10^{-4}$  oz-in-sec<sup>2</sup>

**Weight:** 13 oz. max.

### ENVIRONMENTAL

**Operating Temperature:** 0 to +70 °C

**Storage Temperature:** -40 to +80 °C

**Humidity:** to 98% without condensation

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

**Vibration:** 5 to 2000 Hz at 2 G's

**Enclosure Rating:** NEMA12/IP54 (dirt tight, splashproof)

### ELECTRICAL CONNECTIONS

Note: Wire color codes are referenced here for models that are specified with pre-wired cable.

Single Ended		
Term.	Function (If Used)	Wire Color Code
A	Signal A	BRN
B	Signal B	ORN
C	Signal Z	YEL
D	Power Source	RED
E	No Connection	—
F	Common	BLK
G	Case	GRN

Differential		
Term.	Function (If Used)	Wire Color Code
A	Signal A	BRN
B	Signal B	ORN
C	Signal Z	YEL
D	Power Source	RED
E	No Connection	—
F	Common	BLK
G	Case	GRN
H	Signal $\bar{A}$	BRN/WH
I	Signal $\bar{B}$	ORN/WH
J	Signal $\bar{Z}$	YEL/WH



### Ordering Information

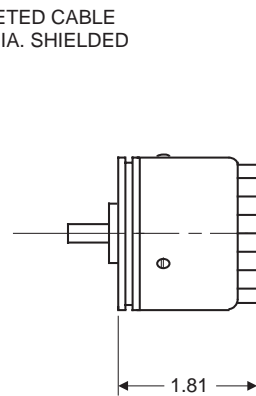
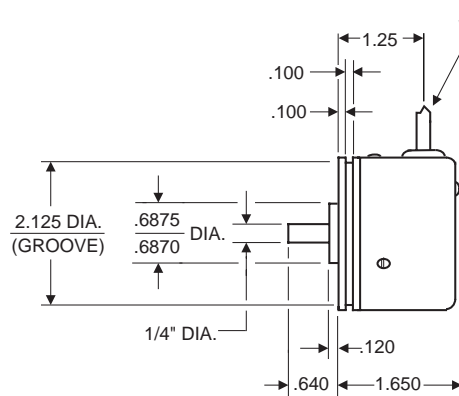
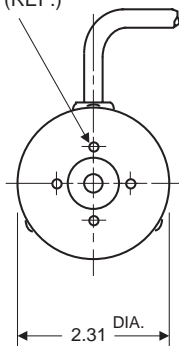
To order, complete the model number with code numbers from the table below:

Code 1: Model	Code 2: Pulses/Rev	Code 3: Mechanical	Code 4: Output	Code 5: Electrical	Code 6: Termination
<b>E23</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"/>
<b>E23</b> Size 23 Enclosed	<b>0001 0300 1024</b> <b>0005 0344 1200</b> <b>0010 0360 1250</b> <b>0012 0400 1270</b> <b>0050 0500 1500</b> <b>0060 0512 1600</b> <b>0100 0600 1800</b> <b>0120 0625 1968</b> <b>0150 0635 2000</b> <b>0180 0720 2048</b> <b>0200 0800 2400</b> <b>0240 0900 2500</b> <b>0250 1000 2540</b> <b>0256</b> For Resolutions above 2540, see Series EC23	<b>0</b> 1/4" Shaft, Shielded Bearings <b>1</b> 1/4" Shaft, Sealed Bearings	<b>4</b> Single Ended, with Index, Format C <b>5</b> Differential, with Index, Format C <b>6</b> Single Ended, with Index, Format D <b>7</b> Differential, with Index, Format D <b>8</b> Single Ended, no Index, Format C <b>9</b> Differential, no Index, Format C	<b>0</b> 5-26V in; 5-26V Open Collector w/2.2kΩ Pullup out <b>1</b> 5-26V in; 5-26V Open Collector out <b>2</b> 5-26V in; 5V TTL Totem Pole out <b>3</b> 5-26V in; 5V Line Driver out (7272) <b>4</b> 5-26V in; 5-26V Line Driver out (7272) <b>5</b> 5-26V in, 5V Differential Line Driver out (4469) <b>6</b> 5-15V in, 5-15V Differential Line Driver out (4469)	<b>0</b> 18" Cable <b>1</b> 3' Cable <b>2</b> 6' Cable <b>3</b> 10' Cable <b>4</b> 15' Cable <b>8</b> Screw Terminals

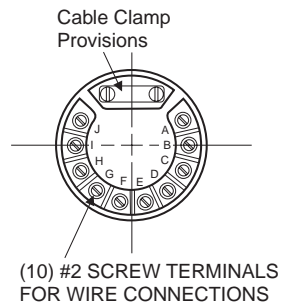
### Dimensions (inches/mm)

### Code 6: Termination

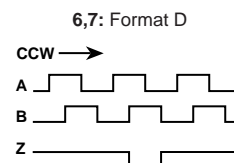
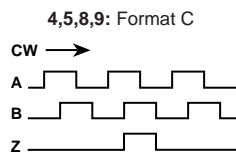
(4) #4-40 UNC-2B THD. 3/16" DP. MIN. EQUALLY SPACED ON A 1.000 DIA. B.C. (REF.)



8: Terminals



### Code 4: Output



# SERIES EC23

**Dynapar™ brand**

## Miniature Encoder

### Key Features

- High 5000PPR Capability
- Optional Screw Terminal Connections
- Standard Size 23 (2.3" diameter)



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental

**Resolution:** 3000 to 5000 PPR (pulses/revolution)

**Accuracy:** (Worst case any edge to any other edge)  $\pm 10.8^\circ$ /PPR

**Format:** Two channel quadrature (AB) with optional Index (Z) and complementary outputs

**Phase Sense:** A leads B for CW or CCW shaft rotation as viewed from the shaft end of the encoder; see Ordering Information

**Quadrature Phasing:**  $90^\circ \pm 25^\circ$  electrical

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

**Index:**  $90^\circ \pm 25^\circ$  electrical, gated with B

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

### ELECTRICAL CONNECTIONS

Note: Wire color codes are referenced here for models that are specified with pre-wired cable.

Single Ended		
Term.	Function (If Used)	Wire Color Code
A	Signal A	BRN
B	Signal B	ORN
C	Signal Z	YEL
D	Power Source	RED
E	No Connection	—
F	Common	BLK
G	Case	GRN

Differential		
Term.	Function (If Used)	Wire Color Code
A	Signal A	BRN
B	Signal B	ORN
C	Signal Z	YEL
D	Power Source	RED
E	No Connection	—
F	Common	BLK
G	Case	GRN
H	Signal $\bar{A}$	BRN/WH
I	Signal $\bar{B}$	ORN/WH
J	Signal $\bar{Z}$	YEL/WH

### ELECTRICAL

**Input Power:** 4.5 min. to 26 VDC max. at 80 mA max., not including output loads

**Outputs:**  
7273 Open Collector: 30 VDC max., 40 mA sink max.  
7272 Push-Pull and Differential Line Driver: 40 mA sink or source

**Frequency Response:** 250 kHz min.

**Electrical Protection:** Overvoltage, reverse voltage and output short circuit protected

**Noise Immunity:** Tested to EN50082-2 (Heavy Industrial) for Electro Static Discharge, Radio Frequency Interference, Electrical Fast Transients, Conducted and Magnetic Interference

**Cable:** PVC jacket, 105 °C rated, overall foil shield; 3 twisted pairs 26 AWG (output signals), plus 2 twisted pairs 24 AWG (input power)

### MECHANICAL

**Bearing Life:**  $1 \times 10^9$  revolutions at max. load

**Shaft Loading:** 5 lbs. max radial and axial

**Shaft Runout:** 0.001" max. TIR

**Shaft Speed:** 10,000 RPM max. mechanical

**Shaft Tolerance:** Nominal  $-0.0004/-0.0007$ "

**Starting Torque:**  
Shielded bearings: 0.1 oz-in max.;  
Sealed bearings: 0.2 oz-in max.

**Moment of Inertia:**  $2.83 \times 10^{-4}$  oz-in-sec<sup>2</sup>

**Weight:** 13 oz. max.

### ENVIRONMENTAL

**Operating Temperature:**  
Standard: 0 to +70 °C

**Storage Temperature:** -40 to +90 °C

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

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

**Humidity:** to 98% without condensation

**Enclosure Rating:** NEMA12/IP54 (dirt tight, splashproof)

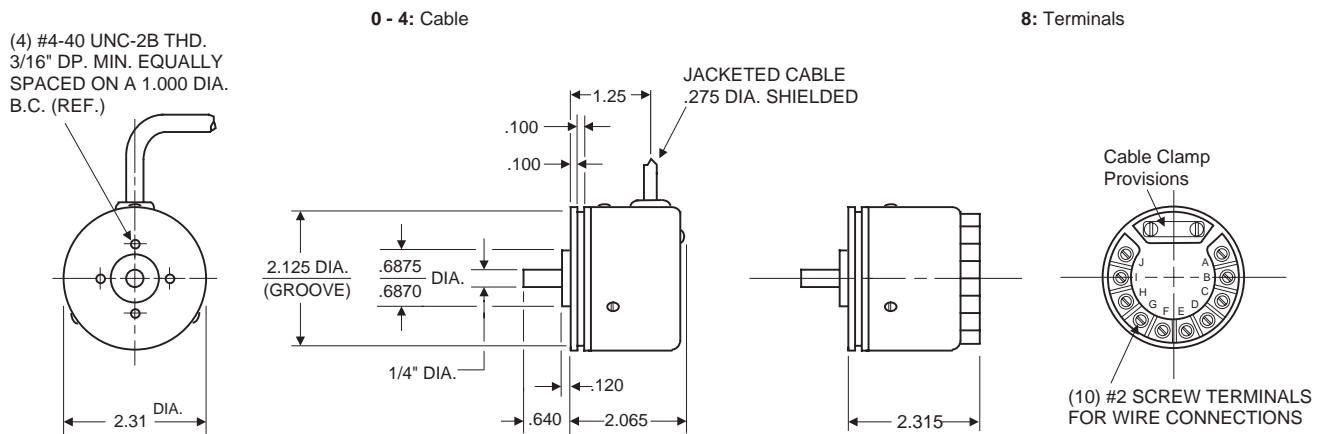
### Ordering Information

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

Code 1: Model	Code 2: Pulses/Rev	Code 3: Mechanical	Code 4: Output	Code 5: Electrical	Code 6: Termination
<b>EC23</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"/>
Ordering Information					
<b>EC23</b> Size 23 Enclosed	<b>3000</b> 3,000 <b>3600</b> 3,600 <b>4096</b> 4,096 <b>5000</b> 5,000	<b>0</b> 1/4" Shaft, Shielded Bearings, 2.31" Dia. Servo Mount w/ 4-Hole Face Mount  <b>1</b> 1/4" Shaft, Sealed Bearings, 2.31" Dia. Servo Mount w/ 4-Hole Face Mount	<b>4</b> Single Ended, with Index, Format C <b>5</b> Differential, with Index, Format C <b>6</b> Single Ended, with Index, Format D <b>7</b> Differential, with Index, Format D <b>8</b> Single Ended, No Index, Format C <b>9</b> Differential, No Index, Format C	<b>0</b> 5-26V in, 5-26V Open Collector w/2.2kΩ Pullups out <b>1</b> 5-26V in, 5-26V Open Collector out <b>2</b> 5-26V in; 5V out, Push-Pull out <b>3</b> 5-26V in; 5V Line Driver out <b>4</b> 5-26V in, 5-26V Line Driver out	<b>0</b> 18" Cable, Side Exit <b>1</b> 3' Cable, Side Exit <b>2</b> 6' Cable, Side Exit <b>3</b> 10' Cable, Side Exit <b>4</b> 15' Cable, Side Exit <b>8</b> Screw Terminals

### Dimensions (inches/mm)

#### Code 6: Termination



#### Code 4: Output



# SERIES E14H

**Dynapar™ brand**

## Miniature Encoder

### Key Features

- Hubshaft with flex tether for simplified installation
- Up to 2540PPR with optional index
- Rugged metal housing



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental

**Resolution:** 100 to 2540 PPR (pulses/revolution)

**Format:** Two channel quadrature (AB) with optional Index (Z) outputs

**Phase Sense:** A leads B for CW shaft rotation as viewed from the shaft end of the encoder

**Accuracy:**  $\pm 3 \times (360^\circ \div \text{PPR})$  or  $\pm 2.5$  arc-min worst case pulse to any other pulse, whichever is less

**Quadrature Phasing:**  $90^\circ \pm 36^\circ$  electrical

**Symmetry:**  $180^\circ \pm 18^\circ$  electrical

**Index:**  $90^\circ \pm 25^\circ$  (gated with A and B high)

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

### ELECTRICAL

**Input Power:**

5 VDC  $\pm 5\%$  at 80 mA max.;  
12 or 15 VDC  $\pm 10\%$  at 80 mA max.; not including output loads

**Outputs:**

7272 line driver (or equivalent), 40 mA sink and source

**Frequency Response:** 100 kHz min.

### MECHANICAL

**Bearing Life:**  $(16 \times 10^6 \div \text{RPM})$  hours at max. load

**Shaft Speed:** 5,000 RPM max.

**Hub Dia. Tolerance:** nominal -0/+0.0005" (0.013mm)

**Mating Shaft Length:** 0.25" (6 mm) min.; 0.50" (12 mm) max.

**Mating Shaft Runout:** 0.008" (0.2 mm) max. TIR

**Mating Shaft Endplay:**  $\pm 0.010$ " (0.25 mm) max.

**Starting Torque:** 0.9 oz-in max. at 25 °C

**Running Torque:** 0.8 oz-in max. at 25 °C

**Moment of Inertia:**

6 to 10 mm hub:  $6.03 \times 10^{-5}$  oz-in-sec<sup>2</sup>  
12 mm to 5/8" hub:  $2.4 \times 10^{-4}$  oz-in-sec<sup>2</sup>

**Weight:**

6 to 10 mm hub: 3.5 oz. max.  
12 mm to 5/8" hub: 4.5 oz. max.

### ENVIRONMENTAL

**Operating Temperature:** 0 to +70 °C

**Storage Temperature:** -25 to +70 °C

**Humidity:** to 98% without condensation

**Enclosure Rating:** NEMA12/IP54 (dirt tight, splashproof)

### Electrical Connections

Wire Color Code	Function		
	Single-Ended Outputs	Differential Outputs	
		Unidirectional	Bidirectional
Red	Power Source	Power Source	Power Source
Black	Common	Common	Common
White	Signal A	Signal A	Signal A
Green	Signal B (if used)	Signal $\bar{A}$	Signal B
Orange	Signal Z (if used)	No Connection	Signal $\bar{B}$
Blue	No Connection	No Connection	Signal $\bar{A}$
Shield	Floating	Floating	Floating
White/Black	—	—	Signal Z (if used)
Red/Black	—	—	Signal $\bar{Z}$ (if used)

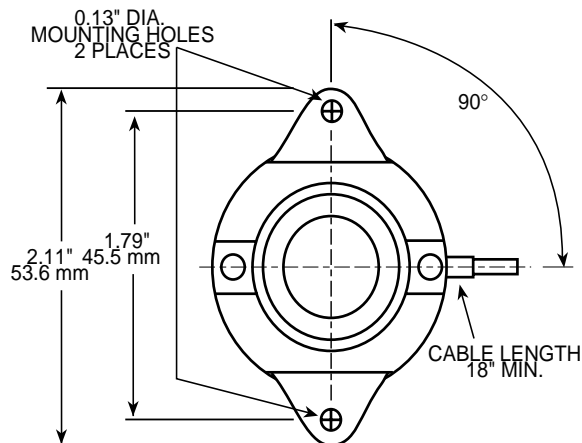
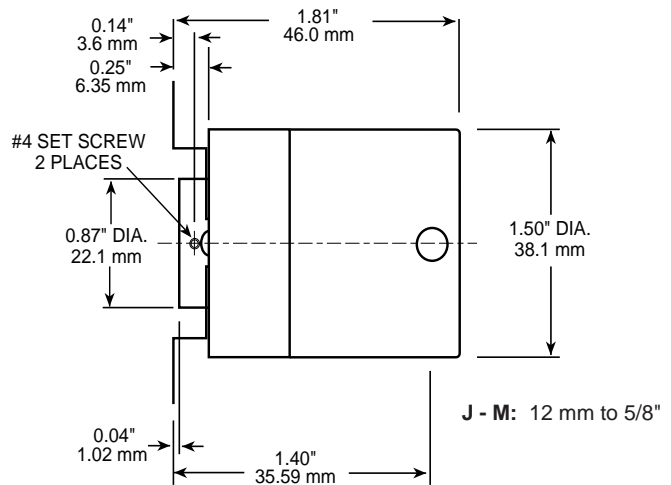
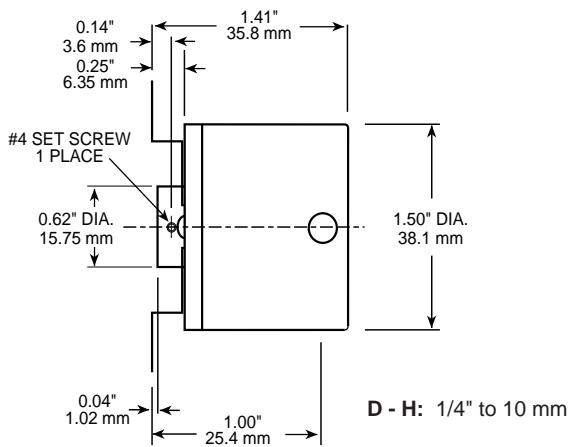
### Ordering Information

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

Code 1: Model	Code 2: Pulses/Rev	Code 3: Mounting	Code 4: Mechanical	Code 5: Output	Code 6: Electrical	Code 7: Termination
<b>E14</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>E14</b> Size 14, Hub Shaft	<b>0100 1000</b> <b>0200 1024</b> <b>0240 1250</b> <b>0250 1500</b> <b>0256 2000</b> <b>0300 2048</b> <b>0360 2500</b> <b>0400 2540</b> <b>0500</b> <b>0600</b> <b>0720</b> <b>0750</b> <b>0900</b>	<b>0</b> Size E14	Hub I.D. <b>D</b> 6 mm <b>E</b> 1/4" <b>F</b> 5/16" <b>G</b> 3/8" <b>H</b> 10 mm <b>J</b> 12 mm <b>K</b> 1/2" <b>L</b> 14 mm <b>M</b> 5/8" <b>N</b> 8 mm	<b>0</b> Single Ended, Unidirectional <b>2</b> Single Ended, Bidirectional, no Index <b>3</b> Single Ended, Bidirectional, with Index <b>4</b> Differential, Unidirectional <b>6</b> Differential, Bidirectional, no Index <b>7</b> Differential, Bidirectional, with Index	<b>0</b> 5 VDC <b>1</b> 12 VDC <b>2</b> 15 VDC	<b>0</b> 18' Cable <b>1</b> 3' Cable <b>2</b> 6' Cable <b>3</b> 10' Cable <b>4</b> 15' Cable

### Dimensions (inches/mm)

### Code 4: Mechanical



# SERIES E14IC

**Dynapar™ brand**

## Miniature Encoder

### Key Features

- Integrated coupling and “top-hat” for simple installation
- Compatible with NEMA size 23 and 24 motors
- Optional differential line driver outputs



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental  
**Resolution:** 100 to 2540 PPR (pulses/revolution)  
**Format:** Two channel quadrature (AB) with optional Index (Z) outputs  
**Phase Sense:** A leads B for CW shaft rotation as viewed from the shaft end of the encoder; Reverse phasing available, see Ordering Information  
**Accuracy:**  $\pm 3 \times (360^\circ \div \text{PPR})$  or  $\pm 2.5$  arc-min worst case pulse to any other pulse, whichever is less  
**Quadrature Phasing:**  $90^\circ \pm 36^\circ$  electrical  
**Symmetry:**  $180^\circ \pm 18^\circ$  electrical  
**Index:**  $90^\circ \pm 25^\circ$  (gated with A and B high)  
**Waveforms:** Squarewave with rise and fall times less than 1 microsecond into a load capacitance of 1000 pf

### ELECTRICAL

**Input Power:** 5 VDC  $\pm 5\%$  at 80 mA max.; 12 or 15 VDC  $\pm 10\%$  at 80 mA max.; not including output loads  
**Outputs:** 7272 line driver (or equivalent), 40 mA sink and source  
**Frequency Response:** 100 kHz min.

### MECHANICAL

**Bearing Life:**  $(16 \times 10^6 \div \text{RPM})$  hours min.  
**Shaft Speed:** 5,000 RPM max.  
**Starting Torque:** 0.1 oz-in max. at 25 °C  
**Running Torque:** 0.08 oz-in max. at 25 °C  
**Moment of Inertia:**  $3.8 \times 10^{-5}$  oz-in-sec<sup>2</sup>  
**Weight:** 7.0 oz. max.

### ENVIRONMENTAL

**Operating Temperature:** 0 to +70 °C  
**Storage Temperature:** -25 to +70 °C  
**Humidity:** to 98% without condensation  
**Enclosure Rating:** NEMA12/IP54 (dirt tight, splashproof)

### Electrical Connections

Wire Color Code	Function			DB 25 Connector Pin Number
	Single Ended Outputs	Differential Outputs		
		Unidirectional	Bidirectional	
Red	Power Source	Power Source	Power Source	23
Black	Common	Common	Common	14
White	Signal A	Signal A	Signal A	1
Green	Signal B (if used)	Signal A	Signal B	3
Orange	Signal Z (if used)	No Connection	Signal B	4
Blue	No Connection	No Connection	Signal A	2
Shield	Floating	Floating	Floating	8
White/Black	—	—	Signal Z (if used)	5
Red/Black	—	—	Signal Z (if used)	6

### Ordering Information

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

Code 1: Model	Code 2: Pulses/Rev	Code 3: Mounting	Code 4: Mechanical	Code 5: Output	Code 6: Electrical	Code 7: Termination
<b>E14</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>E14</b> Size 14, with Integral Shaft Coupling	<b>0100</b> <b>1000</b> <b>0200</b> <b>1024</b> <b>0240</b> <b>1250</b> <b>0250</b> <b>1500</b> <b>0256</b> <b>2000</b> <b>0300</b> <b>2048</b> <b>0360</b> <b>2500</b> <b>0400</b> <b>2540</b> <b>0500</b> <b>0600</b> <b>0720</b> <b>0750</b> <b>0900</b>	<b>0</b> Size E14	<b>A</b> NEMA Size 23 Flange Mount with 1/4" Motor Shaft Coupling <b>B</b> NEMA Size 23 Flange Mount with 3/8" Motor Shaft Coupling <b>C</b> NEMA Size 34 Flange Mount with 3/8" Motor Shaft Coupling	<b>0</b> Single Ended, Unidirectional <b>2</b> Single Ended, Bidirectional, no Index <b>3</b> Single Ended, Bidirectional, with Index <b>4</b> Differential, Unidirectional <b>6</b> Differential, Bidirectional, no Index <b>7</b> Differential, Bidirectional, with Index <b>8</b> Differential, Bidirectional, with Index, Reversed Phasing	<b>0</b> 5 VDC <b>1</b> 12 VDC <b>2</b> 15 VDC	<b>0</b> 18" Cable <b>1</b> 3' Cable <b>2</b> 6' Cable <b>3</b> 10' Cable <b>4</b> 15' Cable  available when Code 5 = 7 or 8: <b>5</b> 10' Cable, DB25 Connector <b>7</b> 25' Cable, DB25 Connector

### Flange Adapter Ordering Codes

Factory Option Code	Motor Frame Size	Motor Shaft Diameter	Model No. of Coupling Only
A	23	1/4"	605106-1
B	23	3/8"	605106-3
C	34	3/8"	605106-3

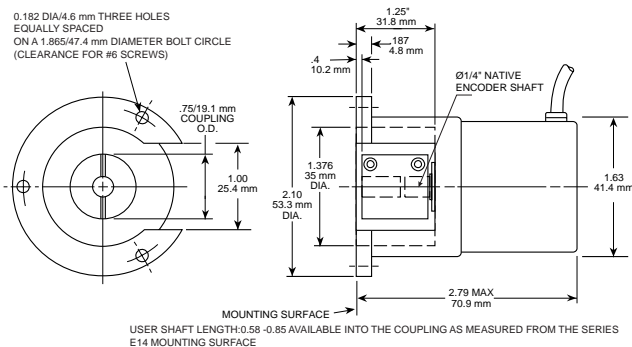
### Field Installed Kit:

Field installed kits are available by ordering either Model No. E14-N1 (integral housing and mounting hardware for NEMA size 23 motors) or Model No. E14-N2 (integral housing & mounting hardware for NEMA size 34 motors), and the appropriate coupling listed in the table left.

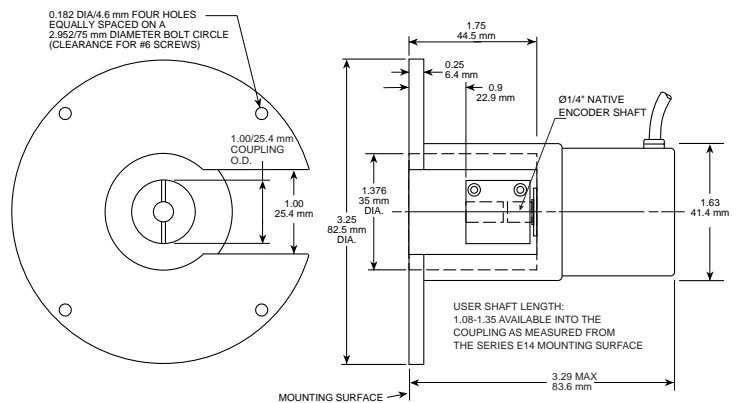
Other couplings available; consult factory.

### Dimensions (inches/mm)

#### E14 for NEMA Size 23 Motors



#### E14 for NEMA Size 34 Motors





## NORTHSTAR REPLACEMENT WHEEL SELECTION GUIDE

NorthStar has several wheel choices. The wheel choices range from "Good" basic wheel designs comparable to competitive choices, to "Better" and "Best" wheel choices that eliminate shaft damage and aid in wheel installation.

NORTHSTAR PULSE WHEEL STYLES				
				
Product	J Wheel	K Wheel	E Wheel	T Wheel
Description	Commonly known as a "Spoke Wheel" configuration. .675" - 1.25" ID	Commonly known as a "Clamp Wheel" configuration. This wheel consists of three components and the assembly is different for RIM style and SLIM style. Refer to next page for more detailed description. 1.375" - 3.25" ID	Commonly known as "End of Shaft" wheel configuration used on GE design motors. 1.125", 2.125", 2.375", 2.875" ID	Commonly known as a "Set Screw Wheel" configuration. Other than for some larger size motor shafts, the T wheel has been replaced by either J and or K Wheel. 3.256" - 4.50" ID

Photographs are representative of each wheel style

### HOW TO SELECT

#### Step 1

Confirm the pulse count being used in your application. Refer to the PPR listed on your RIM Tach housing or SLIM tach products

#### Step 2

Find your encoder resolution in the part number decode table in either columns B, C, D or E

#### Step 3

Then choose your base resolution in column A and order the appropriate size and family of pulse wheel

#### Examples

- If using 1024PPR, order 1024PPR pulse wheel
- If using 600PPR, order 600PPR pulse wheel
- If using 240PPR, order 480PPR pulse wheel

### PART NUMBER DECODE

**N S 0 6 0 0 Z J 0 4**

Code 1	Code 2					Code 3	Code 4	Code 5
Family	Resolution					Index	Wheel Type & Bore Size	For K Wheel Only
NS NorthStar	A	B	C	D	E	Z Differential Index	<b>J04</b> 5/8" bore	<b>R</b> RIM Tach (Pressure plate on outside)
	<b>0480</b> →				0060		<b>J05</b> 7/8" bore	
	<b>0512</b> →			0064	0120		<b>J06</b> 1.00" bore	<b>S</b> SLIM Tach (Pressure plate on inside)
	<b>0600</b> →		0075	0128	0240		<b>J07</b> 1-1/8" bore	
	<b>1024</b> →	1024	0150	0256	0480		<b>K09</b> 1-3/8" bore	
		2048	0300	0512	0960		<b>K10</b> 1-1/2" bore	
			0600	1024			<b>K11</b> 1-5/8" bore	
			1200				<b>K12</b> 1-3/4" bore	
							<b>K13</b> 1-7/8" bore	
							<b>K14</b> 2.00" bore	
							<b>K15</b> 2-1/8" bore	
							<b>K16</b> 2-1/4" bore	
							<b>K17</b> 2-3/8" bore	
							<b>K18</b> 2-1/2" bore	
							<b>K19</b> 2-7/8" bore	
							<b>E01</b> 1-1/8" EOS	
							<b>E06</b> 2-1/8" EOS	
							<b>E08</b> 2-3/8" EOS	
							<b>E10</b> 2-7/8" EOS	

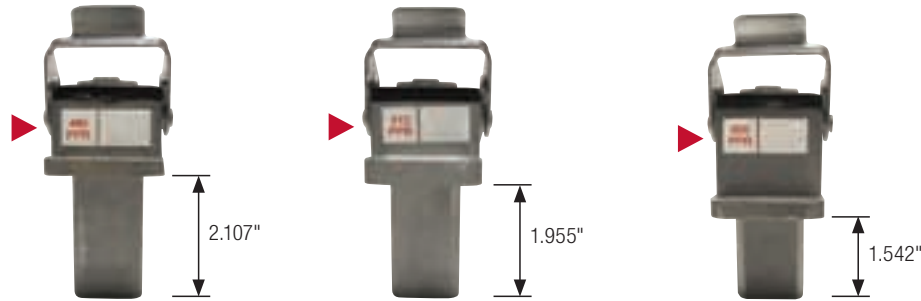
Note: For 2048 consult application engineering





## SENSOR MODULE REPLACEMENT SELECTION GUIDE

Dynapar offers three different sensor modules for both "Z" and "non Z". The difference between the three sensors lies in the length of each sensor nose. They follow in length from largest to smallest, 480, 512, 600.



NORTHSTAR - SENSOR MODULE SERIES					
RIM TACH SENSORS (NON Z)			RIM TACH SENSORS (Z)		
480 PPR Family	512 PPR Family	600 PPR Family	480 PPR Family	512 PPR Family	600 PPR Family
NSRS0060LC	NSRS0064LC	NSRS0075LC	NSRS0060ZLC	NSRS0064ZLC	NSRS0075ZLC
NSRS0120LLC	NSRS0128LLC	NSRS0150LLC	NSRS0120ZLC	NSRS0128ZLC	NSRS0150ZLC
NSRS0240LLC	NSRS0256LLC	NSRS0300LLC	NSRS0240ZLC	NSRS0256ZLC	NSRS0300ZLC
NSRS0480LLC	NSRS0512LLC	NSRS0600LLC	NSRS0480ZLC	NSRS0512ZLC	NSRS0600ZLC
NSRS0960LLC	NSRS1024LLC	NSRS1200LLC	NSRS0960ZLC	NSRS1024ZLC	NSRS1200ZLC

Sensors fit all RIM8500, RIM6200, HS85, and RIM1250 models except large bore

To identify and order replacement sensor modules follow the steps below:

1. Identify the pulse count (which can be found on the label attached to the sensor see ▲ above)
2. Locate whether or not you want Z or Non Z
3. Locate the corresponding PPR in the chart below
4. Order using the complete part number

**PART NUMBER DECODE**

**NSR10480ZLC**

Code 1	Code 2	Code 3	Code 4	Code 5	Code 6
Family	Model	Resolution	Index	Electrical	Termination
NS NorthStar	RS	0480 → 0060	L No Index	L 5-15VDC in, 5-15V Line driver (4428) out	C Latching Industrial Connector
	Covers all previous R1 RIM Tach 1250 R6 RIM Tach 6200 R8 RIM Tach 8500 H8 RIM Tach HS85  Except Large Bore RIM 1250	0512 → 0064 0120	Z Differential Index	R 15-26VDC in, 15V Line driver (4428) out	M 10 Pin MS Connector
		0600 → 0075 0128 0240	G Gated Index	5 5-15VDC in, 5V Line driver (4428) out	P 18" pigtail
		0150 0256 0480		H Same as "L" with extended temperature to 120°C	Q 18" pigtail with latching industrial connector
		0300 0512 0960			
		0600 1024			
		1200			

Note: For 2048 PPR contact application engineering



## MATING CONNECTORS



	Pins	Model #	Encoder Series
Industrial	2	MCN-N1	52BH
	3	MCN-N2	53Z, 53ZK, 71Z
	6	MCN-N4	H20, 21/22, 60 Single ended
	7	MCN-N5	H20, H25, H26, 525, 625, H42, 21/22 Full differential
	10 (MS)	MCN-N6	H20, H25, H26, 525, 526, 60, 60P, 625 Full differential, HS35, HD20, HD25, HSD25, HSD37, HSD38, DWD38, HSD44, H56
	10 (Bayonet)	MCN-B1	Typically a Baldor spec on HS20, HS35, HSD37, HSD38
	12	MCN-C1	H58 (CW)
	12	MCN-C2	H58 (CCW)
	17	MCN-N8	AI25
NEMA 4	19	MCN-N9	AI25
	7	MCN-N5N4	H20, H25, H26, 525, 625, (H42, 21/22 Full differential
	10 (MS)	MCN-N6N4	H20, H25, H26, 525, 526, 60, 60P, 625 Full differential, HS35, HD20, HD25, HSD25, HSD37, HSD38, DWD38, HSD44, H56
	10 (Bayonet)	MCN-B1N4	Typically a Baldor spec on HS20, HS35, HSD37, HSD38

## BULK CABLE



	Model #	Description
Industrial	16002160022	3 wire, 22 gage cable for Model 53Z pickup
	16002160024	6 wire, 22 gage cable for series: X25, HA25, HR25, HA26, HR26, HC25, HC526, 21/22, 60 and H56
	107312 (Special)	10 wire special cable for series: X25, H20, HA25, HR25, HR26, HC25, HC526, H58 with Full differential options
	16002160029	4 pair 24 gage for 60/H56 DIF, H42
Heavy Duty*	RIM Cable DB1X	RIM 5 foot interface cable

\* The final digit is length in 5ft increments

## PATCH CORD ASSEMBLIES

	Model #	Description
Heavy Duty	114414-0001	10 PIN MS to RIM / Electrical Connection Patch Cords
	114413-0001	10 PIN MS to SLIM / Electrical Connection Patch Cords

## CABLE ASSEMBLIES



NEMA 4 Cable Assemblies			
Use with Encoder Series	Cable Part #	Encoder Pins	Output Type
7 Pin MS	Consult Factory	7	Differential
10 Pin Bayonet	Consult Factory	10	Differential
10 Pin Bayonete	Consult Factory	10	Differential
Standard Cable Assemblies			
Use with Encoder Series	Cable Part #	Encoder Pins	Output Type
52 Pick Up	14002030010 14002030020	2	Variable reluctance
53Z Pick Up, 71Z	14003340010	3	Current Sink Open Collector
60, 60P, H56, Armoured Cable	14002090010 14002090025	6	Single Ended
60, 60P, H56, Full Differential	14004190010 14004190025	10	Differential
21/22 without marker	14006070010	6	Single Ended, Current Sink, Open Collector
21/22, 525, 526, 625, HA25, HR25, HC526, H42, HC25, HA26, HR26, without marker	14004310010	7	7 Pin Line Driver Differential
21/22	14006640010	6	6 Pin Line Driver Differential
22 with marker	108241-0010	6	Single Ended, Current Sink, Open Collector
525, 526, 625, HA25, HR25, H26, HC25, HA26, HA725, HR26, HC526, HS35	14006350010	10	Differential
H20, HS35	108594-0010	6	Single Ended, Current Sink, Open Collector
H20, H58, HS35, HA725	108595-0010	7	Open Collector, Push Pull, Single Ended
H20, HA25, HC25, HR25, HS35, 525, 625	108596-0010	7	Differential 7 Pin Line Driver w/out idx
H58, HS35 (CCW)	108615-0010	12	Any Output with 12 Pin CCW Connector
H58 (CW)	108616-0010	12	Any Output with 12 Pin CW Connector
AI25	110158-0010	19	Parallel Push-Pull
AI25	107865-0010 107865-0020	17	Parallel Push-Pull
HS20, HS35	112123-0010	6	Differential 6 Pin Differential line Driver w/ out index
21/22, H20, H58, HA25, HR25, HC25, HA26, HR26, HC26, HS20, HS35, HSD37, HSD38	112859-0015 112859-0030	5 Pin M12	Single Ended
21/22, H20, H58, HA25, HR25, HC25, HA26, HR26, HC26, HS20, HS35, HSD37, HSD38	112860-0015 112860-0030	8 Pin M12	Single Ended or Differential

# CPL COUPLINGS

## Dynapar™ brand

### Flexible Shaft Couplings

#### Key Features

- **Maximum Mechanical, Thermal, and Electrical Protection for Encoder Shaft Connections**
- **Three-Beam Helical Design Restricts Torque "Windup"**
- **Clamp Attachment. No Setscrews to Score or Pit Shafts**
- **Full Range of Models Designed To Match Specific Encoders are Supplied with Shaft Size Adaptors**



### SPECIFICATIONS

#### STANDARD OPERATING CHARACTERISTICS

**Predicted life:** Tested in accordance with MIL-HDBK-5A for infinite life.

**Material:** 2024-T3.5 QQA225/6 aluminum with MIL A8625 Type II black anodize.

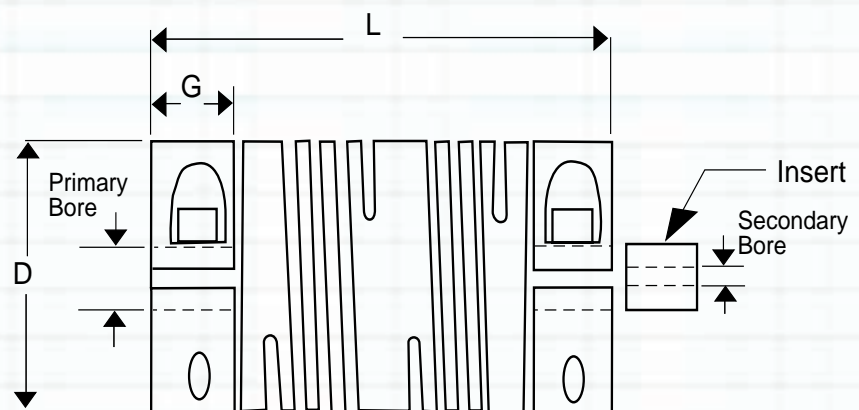
**Insert/insulator:** G10 glass filled phenolic. Sizes provided per *Models table, Secondary Bore*.

**Clamps:** Integral at each end, with black oxide finish hex socket cap screws. Grip is secure to peak torque rating of the coupling per *Models table, Peak Torque*.

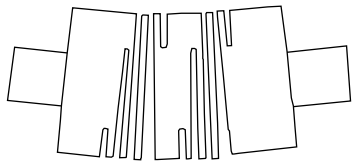
**Peak Torque:** Per *Models table, Peak Torque*. Safety factor should be determined considering acceleration and deceleration loads, etc.

#### APPROXIMATE DIMENSIONS

Refer to Models Table for dimensions of specific models.



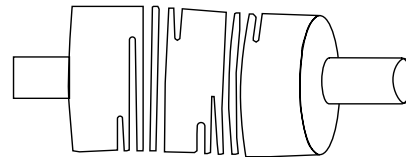
Shafts may extend beyond the clamp-grip-area to within the flexure area, but must not butt.



**Angular Misalignment**

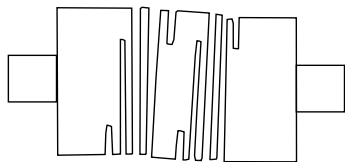
When the center lines of the shafts extend and form an obtuse angle. The intersection of this obtuse angle should be at the center of the flexible beam area.

*Proper shaft coupling protects precision encoders from all of these common hazards. Use of a well engineered coupling can save many times its cost by eliminating failures due to excessive shaft loading, electrical leakage, and thermal stress.*



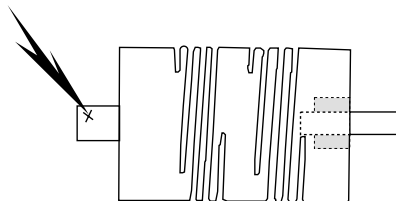
**Skewed Misalignment**

The shafts are not in the same plane. Center line extension is not parallel or intersecting. There can be two obtuse angles of varying degrees. These angles should be centered within the coupling.



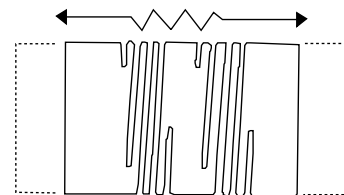
**Parallel Misalignment**

The shaft's center lines are parallel but offset. When the coupling is installed there should be two equal obtuse angles within the coupling.



**Electrical and Thermal Stress**

The supplied insulator insert blocks transfer of static charges, leakage currents, and heat to the encoder. These stresses have been proven to be contributory to bearing damage as well as electrical failures.



**Axial Motion**

Motion in the direction of the center lines of the shafts, such as motor shaft "thrust". Usually created by loose bearings or other elements that do not restrain the motion.

**ORDERING INFORMATION**

Coupling Model Numbers should be selected first by Encoder Application duty, then by specific encoder shaft size and drive shaft size. Most applications will use the Primary Bore as the encoder end, but it is permissible to reverse the coupling to accommodate specific shaft combinations. Each coupling is supplied with Secondary Bore insulator inserts as listed.

Model Number	Primary Bore	Secondary Bore	Dimensions			Maximum Misalignment			Peak Torque (lb. - in.)	Encoder Application (Series)
			D= Dia.	L= Len.	G= Grip	Angular	Parallel	Axial		
CPL00750125	1/8	1/8, 3/16	0.750	0.875	0.230	3°	0.020	0.035	35	Very Light Duty E11, E15,
CPL00750187	3/16	3/16, 1/4								
CPL00750250	1/4	1/8, 1/4								
CPL01000187	3/16	3/16, 1/4	1.000	1.250	0.290	5°	0.025	0.060	45	Light Duty E20, EC80, 523, 42, 525, 21/22, 31/32
CPL01000250	1/4	1/4, 3/8								
CPL01000375	3/8	3/16, 3/8								
CPL01250250	1/4	1/4, 3/8	1.250	1.250	0.348	7°	0.038	0.060	75	Medium Duty 42, 525, 625, 21/22, 60
CPL01250375	3/8	3/8, 1/2								
CPL01250500	1/2	1/4, 1/2								
CPL01500375	3/8	3/8, 1/2	1.500	1.500	0.400	10°	0.035	0.060	100	Heavy Duty 625, EX625, 60, 60P
CPL01500500	1/2	1/2, 5/8								
CPL01500625	5/8	3/8, 5/8								
CPL02000875	7/8	3/8, 5/8	2.000	2.000	0.450	10°	0.040	0.060	300	Extra Heavy Duty 625, 60P
CPL02001000	1	3/8, 5/8								
CPL02001125	1 1/8	3/8, 5/8								
CPLM1000250	1/4	4, 5, 6 mm	1.000	1.250	0.290	5°	0.025	0.060	45	Light Duty E20, EC80, 523, 525, 21/22
CPLM1250375	3/8	6, 8, 10 mm	1.250	1.250	0.348	7°	0.038	0.060	75	Medium Duty 42, 525, 625, 21/22
CPLM1500500	1/2	6, 8, 10 mm	1.500	1.500	0.400	10°	0.035	0.060	100	Heavy Duty 60, 60P

- Note:**
1. For extremely high acceleration rates, consider using the next larger coupling size.
  2. When coupling an encoder to a shaft which is stepped down from a larger size, always use a heavy-duty or extra-heavy-duty coupling.
  3. For maximum life, encoders must be installed and aligned such that the encoder shaft to driving shaft alignment is within the 0.003" TIR NEMA standard despite the maximum misalignment specified.

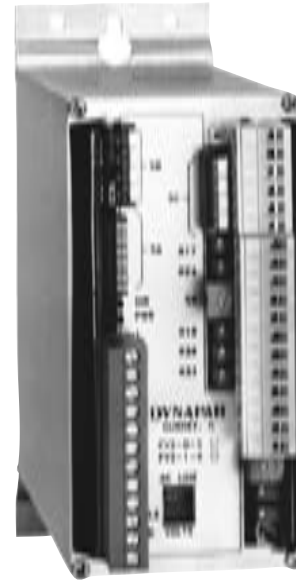
# SERIES FV2

# Dynapar™ brand

## Brushless Digital Feedback

### Key Features

- Bidirectional Frequency/Voltage or Frequency/Current Converter
- An FV2 and an Encoder Replace a DC Tachometer when Precision Feedback is Required.



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

#### Electrical

**Input Power Requirements:** 115/230 VAC  $\pm 10\%$ , 50/60 Hz; 120 mA @ 115 VAC, 60 mA @ 230 VAC  
**Available Power for the Transducer:** 12 VDC  $\pm 5\%$ , 200 mA max.

**Input Signal:** (Field-Selectable) 4 to 15V differential; or 8 to 15V single-ended; or magnetic 1.5 to 15V peak-to-peak

**Input Frequency Range:** (Field-Selectable)  
 Bidirectional: 0-500 Hz to 0-100 kHz;  
 Unidirectional: 0-1 kHz to 0-100 kHz;

**Analog Output:**  $\pm 10V$  bidirectional; 0-10V unidirectional @ 25 mA

**Output Linearity:**  $\pm 0.1\%$  of span

**Temperature Stability:**  $\pm 0.02\%$  per  $^{\circ}C$

**Current Range:** 4-20 mA

**Current Linearity:**  $\pm 0.2\%$  max.

**Compliance:** +16V min.

**Response Time:** <10 msec. switch selectable to <20, <36, or <46 msec.

**Output Ripple:** Volts RMS is generally less than brush generators and is predictable depending on input frequency from an encoder. For 240 PPR, open loop ripple is 0.080V at 25 RPM, 0.03V at 250 RPM and 0.015V at 2500 RPM

**Output Overrange:** 10% min. (volt. or current)

**Output Offset:** Adjustable

#### Environmental

**Operating Temperature:** 0 to 60 $^{\circ}C$

**Storage Temperature:** -18 $^{\circ}$  to +85 $^{\circ}C$

**Relative Humidity:** to 90% non-condensing

### OPTIONAL FEATURES

The following features are available with the FV2 option board, which can be factory- or field-installed:

#### Auxiliary Isolated Digital Outputs

When supplied separately with 12  $\pm 3$  VDC, an isolated digital differential line driver output is supplied corresponding to the A and B input phases. By connecting the analog power supply cable to the option board, the analog outputs can also be powered by the separate supply and optically isolated from the digital inputs.

#### Transducer Phase Reversal Detector

This feature monitors the A and B phases and detects reverse rotation. When reversal is detected, there is a user-selectable delay (2048 pulses max.) before the output relay drops out. The relay will not re-energize until: 1) the reset button is pressed, 2) an external reset signal is applied, or 3) power is removed and restored. An inhibit input is provided to override the reversal detection circuit.

#### Transducer Phase Failure Detector

This feature monitors the A and B phase inputs and detects a failure (i.e. one phase failed high or low). Its output is a normally-open relay contact which opens upon failure detection. This relay contact is shared with a Phase Loss Detection circuit.

#### Transducer Phase Loss Detector

This feature monitors current supplied to the encoder and reacts to a decrease in current required. Failure is indicated by opening the relay contact shared with the Phase Failure Detector. Current trip level is field-adjustable. Transducer supply must be provided by FV2.

#### Zero Speed Detector

This feature monitors transducer speed, and can be set by the user to trip at a specific level corresponding to desired speed. A relay with a single-pole-double-throw contact is used for the output.

### SPECIFICATIONS FOR FV2 OPTIONS

#### Auxiliary Digital Outputs

**Power Requirements:** 12  $\pm 3$  VDC

**Current Requirements:** 25 mA w/ digital outputs only; 250 mA w/ analog outputs only

Outputs	Voltage Range	Sink (mA)	Source (mA)	Standard IC
Differential Line Driver	12 $\pm 3$ VDC	22	40	88C30

#### Transducer Reversal Detector

**Forward Input Phasing:** A leads B

**Reversal Delay:** 16, 32, 64, 128, 256, 512, 1024, or 2048 pulses, selectable.

**Output:** Relay contacts\*, latched upon failure.

**Latch Reset & Inhibit Input Requirements:** TTL/CMOS, activates on high, 10K pull-down, 17V max.

#### Transducer Phase Failure Detector

**Failure Type:** A or B phase

**Delay:** 4 transitions

**Output:** N.O. contact\* shared with Phase Loss Detector

#### Transducer Phase Loss Detector

**Current Level:** 30 to 200 mA, adjustable

**Output:** N.O. contact\* shared with Phase Failure Detector

#### Zero Speed Detector

**Adjustable Range:** 10 Hz to 300 Hz

**Response Time:** Less than 0.1 sec.

**Output:** SPDT relay contact\*

\*Relay contacts are rated at (1) 1.0 amps, 24 VDC, or (2) 0.3 amps, 115 VDC resistive, or (3) 0.3 amps, 24 VDC, or (4) 0.2 amps, 115 VAC inductive.

### ORDERING INFORMATION

Model No.	Description
FV2-0-S	Frequency-to-Voltage Converter
FV2-1-S	Same as FV2-0-S with Factory-Installed Option Board
FV2-N1	Option Board Only (Kit for Field Installation with FV2-0-S)
845-24*	Technical Manual

\*A technical manual is automatically included with each FV2 unit shipped. Use this publication number for ordering extra copies.

# SERIES FV3

**Dynapar™ brand**

## Frequency to Voltage Converter

### Key Features

- Delivers 0 to +10 VDC or 4-20 mA Outputs Proportional to Input Pulse Rate (frequency).
- Accepts Variable Pulse Rate Inputs from a Variety of Sensors.
- Linearity ±0.2% Maximum.
- An FV3 and an Encoder Replace a DC Tachometer when Precision Feedback is Required.



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

#### Electrical

**Input Power Requirements:** 115/230 VAC ±10%, 50/60 Hz; 120 mA @ 115 VAC, 60 mA @ 230 VAC; Externally fuse with Slo-Blo type 1/8 A for 115 VAC or 1/16 A for 230 VAC  
**Available Power for the Transducer:** 12 VDC ±5%, 75 mA max.

**Input Signal:** (Field-Selectable) 2.5 to 15V single-ended; or magnetic 1.5 to 15V peak-to-peak

**Input Frequency Range:** (Adjustable)  
 Unidirectional: 0.03 to 0.1 kHz; 0.1 to 0.3 kHz; 0.3 to 1 kHz; 1-3 kHz; 3-10 kHz; 10-30 kHz; 20-60 kHz

**Analog Output:** 0 to +10V unidirectional @ 25 mA

**Voltage Output Linearity:** ±0.1% of full scale  
**Current Range:** 4-20 mA into load resistance range of 0-800 ohms

**Current Linearity:** ±0.2% max.

**Output Overrange:** 10% min. (volt. or current)

**Output Offset:** Adjustable

#### Speed Detector/Alarm Output (Optional)

This feature monitors transducer speed and can be adjusted—5% to 100%—from a front panel potentiometer to trip at a specific speed. The output is a relay contact, field selectable via an internal jumper as N.O. or N.C. Contact rating is 1.25 Amp AC/DC, 125 Volts.

#### Environmental

**Operating Temperature:** 0 to 60°C

**Storage Temperature:** -18° to +85°C

**Relative Humidity:** to 90% non-condensing

### APPLICATION CONSIDERATIONS

**Transducer Selection:** The FV3 operates on the frequency content of a sinusoidal, triangular, or square waveform. Typical transducers include:

- 1) A magnetic pick-up detecting a passing keyway, gear teeth, etc.
- 2) A photo eye which scans alternating opaque and transparent slots.
- 3) A digital tachometer or encoder.

For fast response of FV3 outputs, it is important that the transducer be located toward the high speed end of the drive train. For slow shaft speeds, the transducer must be capable of delivering a high number of cycles or pulses per revolution. The transducer should also be capable of delivering a usable output for the entire speed range through maximum speed.

The following formula is convenient for relating machine speeds and sensor frequency output:

$$FRQ \text{ (CPS or Hz)} = \frac{RPM \times PPR}{60}$$

Where:

**RPM** is the speed of the shaft where the sensor is located in revolutions per minute.

**PPR** is the number of pulses (or cycles) produced by the sensor for one shaft revolution.

**FV3 Performance:** The FV3 range adjustment allows the unit to deliver full-scale output for any input frequency within the limits of each range rating. It will provide a better combination of fast response and low ripple when input frequencies for full scale output are at least 3 kHz and above. The FV3 is provided with the capability for field-installed capacitance to optimize response time vs. ripple if required (see the technical manual).

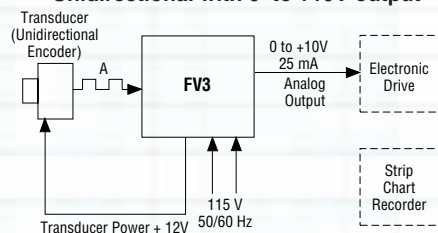
Full-Scale Range Adjustment <sup>1</sup>		Response Time <sup>2</sup>
Min.	Max.	
30 Hz	100 hZ	5.1 sec.
100 Hz	300 hZ	1.7 sec.
300 Hz	1 kHz	0.52 sec.
1 kHz	3 kHz	13 msec.
3 kHz	10 kHz	10 msec.
10 kHz	30 kHz	6 msec.
20 kHz	60 kHz	6 msec.

<sup>1</sup>Field-selectable range adjustment via jumpers (refer to technical manual).

<sup>2</sup>Response time is time required for the output to reach 99% of final value when the input frequency instantly changes from 0 to full scale.

### Typical Application

#### Unidirectional with 0 to +10V output



### Ordering Information

Model No.	Description
FV3-0-S-00	Frequency-to-Voltage Converter
FV3-1-S-00	Frequency-to-Voltage Converter with Speed Detection Option
845-26*	Technical Manual

\*A technical manual is automatically shipped with each FV3. Use this publication number to order extra copies.

# MOUNTING BRACKET

**Dynapar™ brand**

## “L” Mounting Bracket

### Key Features

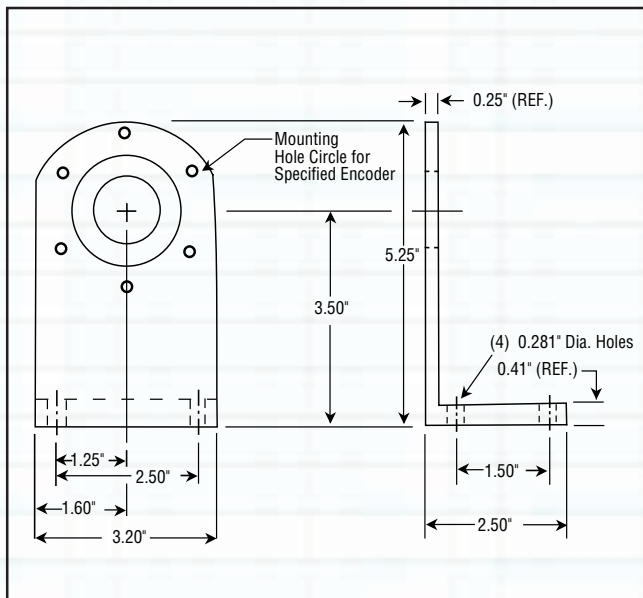
- Precision Machined Aluminum (6061-T6)
- Drilled and Tapped Where Required
- Mounting Hardware Included
- Encoder can be Mounted from Either Side
- Allows Servo-Ring Mount for Phasing Adjust



Encoder and coupling not included

## SPECIFICATIONS

### DIMENSIONS



### COMPATIBLE ENCODERS

The mounting bracket may be used with the listed series encoders having the specified mounting configurations.

Encoder Series	Mounting Configuration
<b>14005730000</b>	
60A	All
60C	All
H42	2.5" Flange
H25	2.5" Flange
H25	2.5" Servo
AI25	2.5" Flange
HA725	2.5" Flange
<b>108680-0001</b>	
H20	Servo with 1.25" Male Pilot Flange
H20	
H20	
21/22	2" BC Face Except metric
<b>108680-0002</b>	
AI25	Face 36 mm Pilot
H58	

### ORDERING INFORMATION

Model No.	Description
<b>14005730000</b>	Mounting Bracket for 60 Rotopulser, 2.5" Encoders
<b>108680-0001</b>	Mounting Bracket for QUBE Encoders
<b>108680-0002</b>	Mounting Bracket for 58mm Face Mount Encoders

# PIVOT MOUNT

**Dynapar™ brand**

## Pivot Mounting Bracket

### Key Features

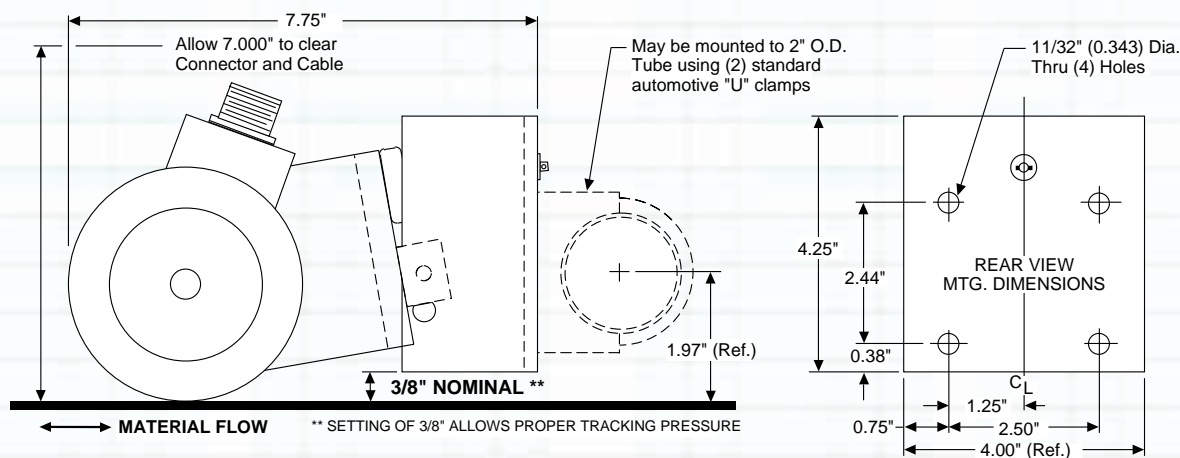
- Complete Pre-assembled Mounting System with Hardware Included
- Single or Dual Wheel uses Same Mount
- Easy Machine Attachment
- Built-in Spring Tension for Accurate Tracking



Encoder and measuring wheels not included

## SPECIFICATIONS

### DIMENSIONS



### COMPATIBLE ENCODERS

The mounting bracket may be used with the listed series encoders having the specified mounting configurations.

Encoder Series	Mounting Configuration
60A	All
60C	All
H42	2.5" Flange
H25	2.5" Flange
H25	2.5" Servo
HA725	2.5" Flange

### ORDERING INFORMATION

Model No.	Description
14005740000	Pivot Mounting Base



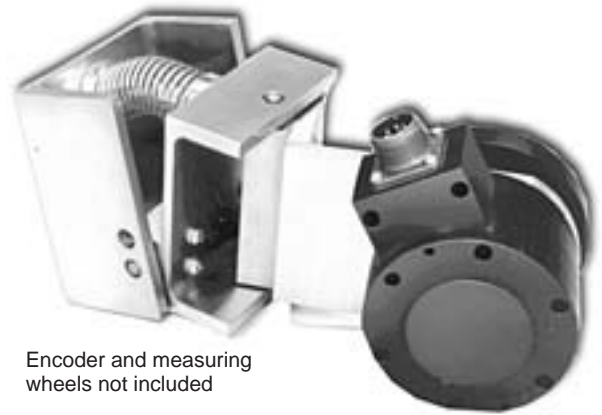
# UNIVERSAL MOUNT

**Dynapar™ brand**

## Universal Mounting Bracket

### Key Features

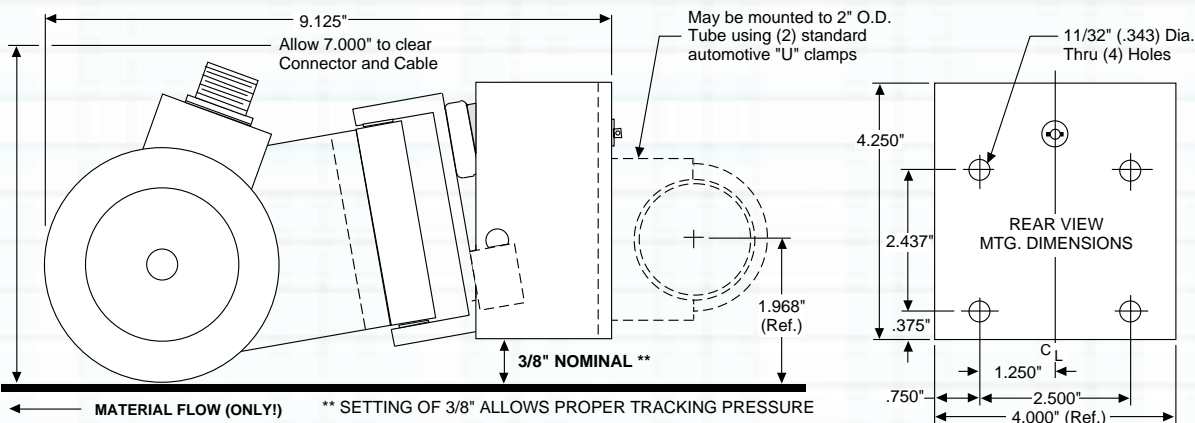
- Complete, Pre-assembled Mounting System with Hardware Included
- Single or Dual Wheel uses Same Mount
- Easy Machine Attachment
- Built-in Spring Tension with Two Degrees of Freedom for Accurate Tracking



Encoder and measuring wheels not included

## SPECIFICATIONS

### DIMENSIONS



### COMPATIBLE ENCODERS

The mount may be used with the listed series encoders having the specified mounting configurations.

Encoder Series	Mounting Configuration
60A	All
60C	All
H42	2.5" Flange
H25	2.5" Flange
H25	2.5" Servo
HA725	2.5" Flange

### ORDERING INFORMATION

Model No.	Description
14005750000	Universal Tracking Mounting Base

# QUBE PIVOT MOUNT *Dynapar™ brand*

## Qube Pivot Mounting Bracket

### Key Features

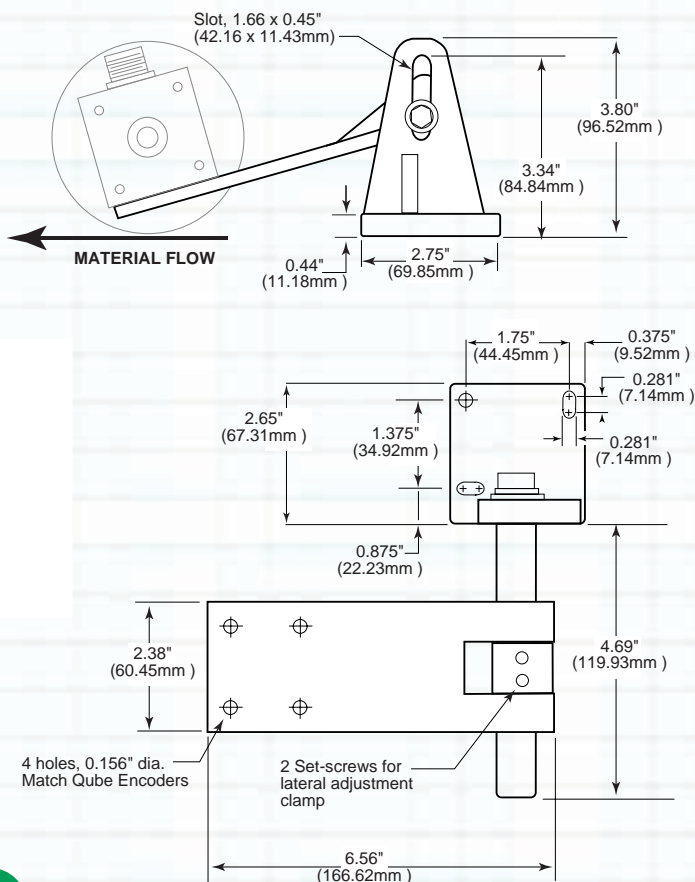
- Complete Mounting System with Hardware Included
- Single or Dual Wheel uses Same Mount
- Easy Machine Attachment
- Accepts Series 22 Qube Encoders



Encoder, cable and measuring wheels not included

## SPECIFICATIONS

### DIMENSIONS



### ORDERING INFORMATION

Model No.	Description
111328-0001	Qube Pivot Mounting Base

# C-FACE ADAPTER

**Dynapar™ brand**

## NEMA C-Face Adapter

### Key Features

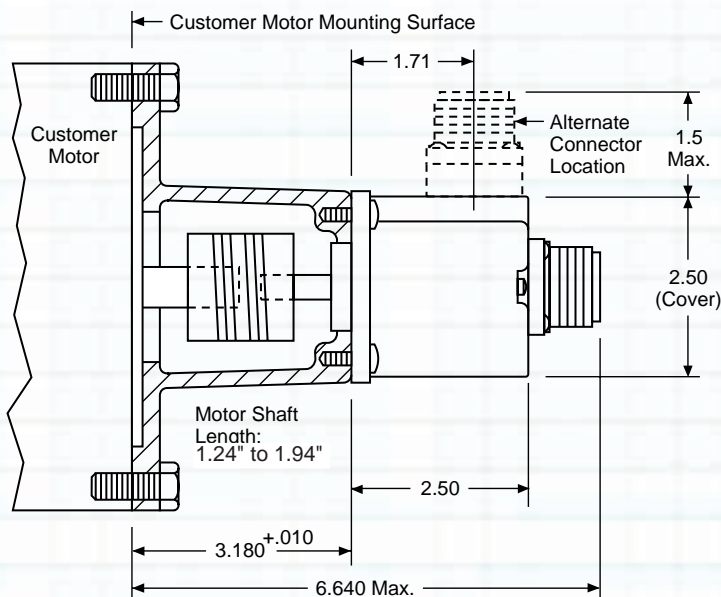
- “Flower Pot” Style Adapter Kit
- Provides Spacer, Coupling and all Necessary Hardware
- 5/8" I.D. Coupling for 56C Motor Shafts with Extensions from 1.1" to 1.8" Long



Shown with encoder mounted (not included)

## SPECIFICATIONS

### DIMENSIONS



### COMPATIBLE ENCODERS

The adapter may be used with the listed series encoders having the specified mounting configurations.

Encoder Series	Mounting Configuration
H42	2.5" Flange
H25	2.5" Flange
HA725	2.5" Flange

### ORDERING INFORMATION

Model No.	Description
FPA1	NEMA C Face Adapter, 5/8" Motor Shaft
FPA2	NEMA C Face Adapter, 7/8" Motor Shaft
FPA3	NEMA C Face Adapter, 1" Motor Shaft

# 5PY ADAPTER

**Dynapar™ brand**

## 5PY Adapter for 2-1/2" Encoders

### Key Features

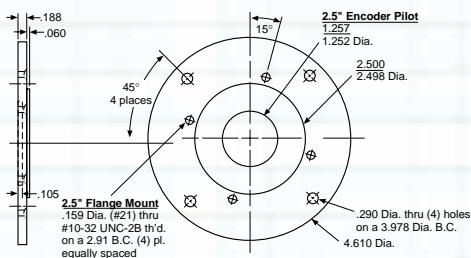
- Kits Include Mounting Plate and Hardware
- Makes Servo Mount 2.5" or 60A Encoders Interchangeable with 5PY DC Tach Generators.



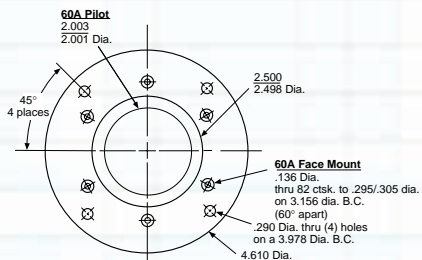
Encoder not included

## SPECIFICATIONS

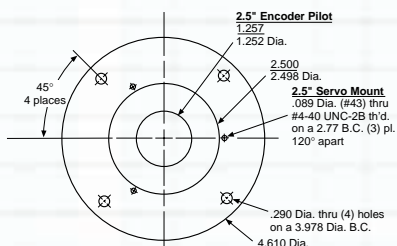
### DIMENSIONS



**FPY1**



**FPY2**



**FPY3**

### COMPATIBLE ENCODERS

The adapter may be used with the listed series encoders having the specified mounting configurations.

Encoder Series	Mounting Configuration
<b>5PY1</b>	
H42	2.5" Flange
H25	2.5" Flange
A125	2.5" Flange
HA725	2.5" Flange
<b>5PY2</b>	
60C	All
<b>5PY3</b>	
H25	2.5" Servo

### ORDERING INFORMATION

Model No.	Description
<b>5PY1</b>	5PY Adapter Kit for 2.5" flange encoders
<b>5PY2</b>	5PY Adapter Kit for 60A Rotopulers
<b>5PY3</b>	5PY Adapter Kit for 2.5" servo encoders

# 5PY ADAPTER

**Dynapar™ brand**

## 5PY Adapter for X25 Encoders

### Key Features

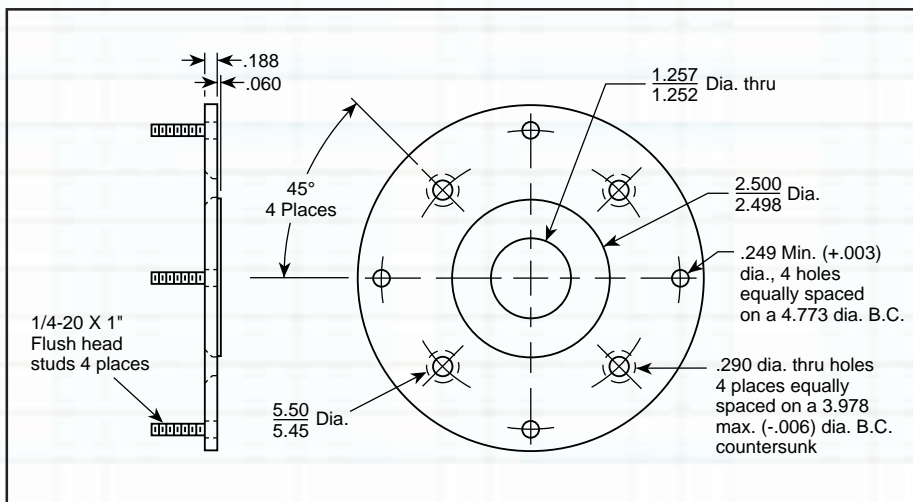
- Kits include Mounting Plate and Hardware
- Makes Servo X25 Encoders Interchangeable with 5PY DC Tach Generators.



Encoder not included. (Hardware to mount encoder to adapter is included.)

## SPECIFICATIONS

### DIMENSIONS



### ORDERING INFORMATION

Model No.	Description
MPAEX5PY	5PY Adapter Kit for X25 encoder

# RIM M100

**NorthStar™ brand**

## RIM M100 Encoder Tester

### Key Features

- Performs up to 18 Tests of Signal Output Quality; Simple One Keystroke Access to Tests
- Interfaces with Most Major Brands of Digital Tachometers and Encoders
- Fast Encoder Checkout with Numeric Value Display



## SPECIFICATIONS

### ELECTRICAL SPECIFICATIONS

**Controller:** 68HC11 microcomputer  
**Frequency Response:** 10Hz - 10kHz  
**Signal Input:** 5-15 VDC digital line driver signal  
**Power:** 110 VDC power pack or 9 VDC battery  
 Keyboard power on/off

### MECHANICAL SPECIFICATIONS

**Size:** 7.50"(191mm) x 4.00"(102mm) x 3.00"(77mm)  
**Weight:** 0.94 lbs. (0.43 kg)  
**Display:** 4 line x 16 character LCD  
**Keyboard:** 24 key membrane sealed, contamination resistant

\*Specifications subject to change without notice.

### ORDERING INFORMATION

Part Number:	Description
RIMM100RC	M100 system with RIM Tach® connector
RIMM100SC	M100 system with SLIM Tach® connector
RIMM100MS18D	M100 system with standard 10 PIN Differential
RIM M100 RSC	M100 system with RIM & SLIM
RIM TEST KIT	M100 system with 4 Connectors: RIM; SLIM; MS-10 PIN; Avtron 10 PIN
Options	
RIMETEUROCON	Spare Eurostyle connector with strain relief
RIMETCABLE-RIM	Cable harness, RIM Tach® connector
RIMETCABLE-SL	Cable harness, SLIM Tach® connector
RIMETCERT	Recalibration and certification service

### TESTS PERFORMED

	Test	Function
<b>Function</b>	Signal Pulse State	Continuous display of high/low signal state (A,B,Z)
	Complementary	Display high/low state of complementary signals
	Pulses Per Second	Count number of pulses detected each second (100 kHz maximum)
	Pulse Counter	Display a continuous bidirectional count of detected pulses (10 digits)
<b>Phase</b>	Quadrature Phase	Display actual phase angle (±1% accuracy, derated at higher speeds)
	Min & Max Phase	Detects and holds the extreme quadrature phase angles
	Pulse Duty Cycle	Continuous update display (±1% accuracy, derated at higher speeds)
	Min & Max Duty	Detects and holds the extreme duty cycles
<b>RPM</b>	RPM	Calculates RPM (100 kHz maximum)
	Min & Max RPM	Detects and holds the extreme RPM (100 kHz maximum)
	Direction of Rotation	Displays + or - to indicate direction of signal input
<b>Marker</b>	Number of Pulses	Display number of pulses detected between markers (10,000 PPR max)
	Marker Pulse Presence	Display signal when marker is received
	Count Error	Detects and displays the number of pulse counts different from input count
	Revolution Counter	Display a continuous bidirectional count of revolution (10,000 revolutions)

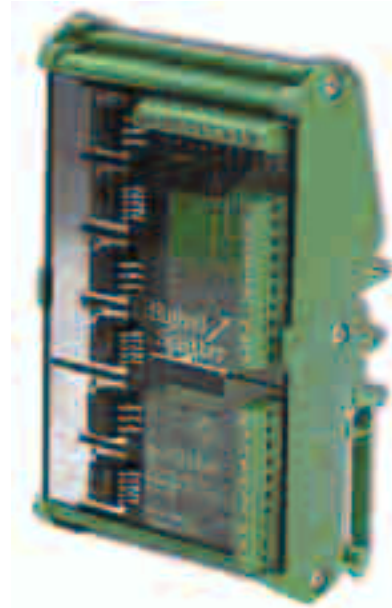
# RIM SS2

# NorthStar™ brand

## RIM SS2 Signal Splitter

### Key Features

- Eliminates the Expense and Maintenance of Two Separate Encoders
- Optically Isolated Outputs can be Sent to a Motor Drive and a Display at the Same Time
- Compatible with Virtually Every Incremental Digital Encoder
- Combats Long Distance and Electrical Interference Problems



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Input Signal:** 2 or 3 channel quadrature signal, sine or square wave, open collector, differential, or single ended line driver

### ELECTRICAL

**Input Signal Voltage:** 4 - 26 VDC  
**Input Signal Current:** 2.2 mA minimum, 3.5 mA typical  
**Input Impedance:** Optically isolated, 1 kOhm at 4V, 6.8 kOhms at 24V typical. Current limited.  
**Frequency Range:** 0 - 120 kHz  
**Output Signal:** Two independent, isolated line driver output sets (A/A, B/B)  
**Supply Voltage:** 5 - 26 VDC  
**Output Current:** 150 mA (maximum per channel)  
**Wire Gauge Accepted:** 26 -16 AWG  
**Output Protection:** ESD to MIL-STD-883 and short circuit protected

### MECHANICAL

**Enclosure Material:** PVC  
**Mounting Options:** DIN 32 or 35

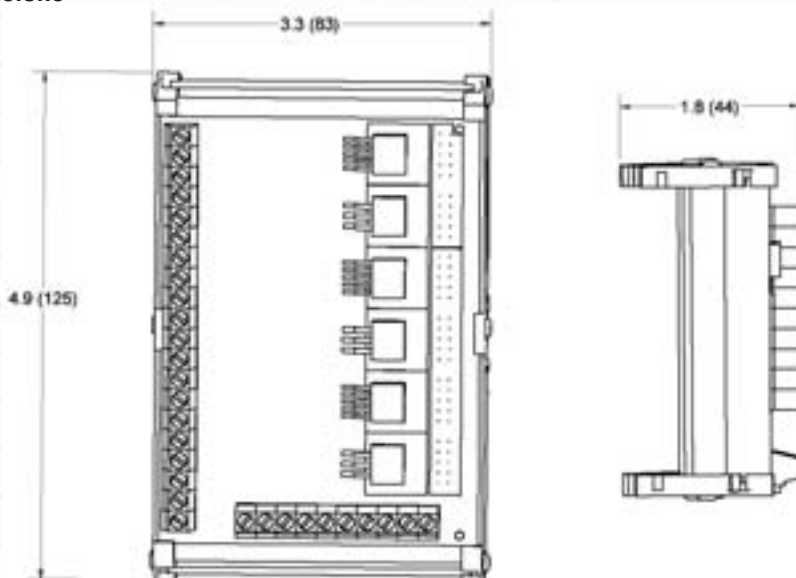
### ENVIRONMENTAL

**Operating Temperature:** 0°C to 50°C  
**Storage Temperature:** -20°C to 70°C  
**Operational Humidity:** 98% non-condensing

### ORDERING INFORMATION

**Part Number:** RIM SS2

### DIMENSIONS



# RIM SSW

**NorthStar™ brand**

## RIM SSW Signal Switcher

### Key Features

- Eliminates Need for Two PLCs or Input Devices
- Accepts A, B, and Z Inputs from Two Separate Encoders
- May Switch Two Encoders of Different Resolutions for Coarse and Fine Position Control
- Can Select Spare Encoder that Acts as Backup of First
- Input Voltage Range from 4 to 26 VDC



## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Input Signal:** 2 or 3 channel quadrature signal, sine or square wave, open collector, differential, or single ended line driver

### ELECTRICAL

**Input Signal Voltage:** 4 - 26 VDC

**Input Signal Current:** 2.2 mA minimum, 3.5 mA typical

**Input Signal Impedance:** Optically isolated, 1 k Ohm at 4V, 6.8 k Ohms at 24V typical. Current limited.

**Operating Frequency Range:** 0 - 100 kHz

**Output Signal:** Differential driven square wave, signal level approximately equivalent to input supply voltage.

**Error Output Signal:** Sinking normally open, closes on error. 5V, 20 mA maximum load

**Supply Voltage:** 5 - 26 VDC

**Current Consumption:** Less than 150 mA at 100 kHz and 26 VDC typical with no output driver load

**Output Current:** 150 mA (maximum)

**Power Up Time:** Less than 10 ms

**Encoder Switching Time:** Less than 8  $\mu$ s

**Connector Wire Gauge:** 26 -16 AWG

**Electrical Protection:** Reverse polarity protected

**Output Protection:** Under voltage, short circuit, and thermally protected

**Fail Safe Feature:** Fail safe mode connects device's ENCODER 1 INPUT directly to device's OUTPUT terminals

### MECHANICAL

**Enclosure Material:** PVC

**Side Element Material:** Polyamide PA non-reinforced

**Mounting Options:** DIN 35 or 32

### ENVIRONMENTAL

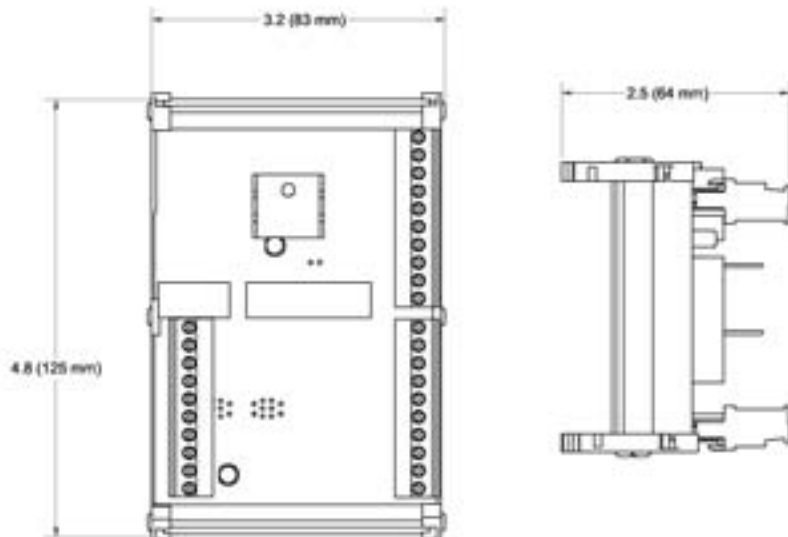
**Operating Temperature:** 0°C to 50°C

**Storage Temperature:** -20°C to 70°C

**Operational Humidity:** 98% non-condensing

\*Specifications subject to change without notice

### DIMENSIONS inches [mm]



### ORDERING INFORMATION

**Part Number: RIMSSW**



## DYNAPAR'S GLOBAL PRESENCE

Dynapar has been manufacturing encoders for over fifty years, and our breadth of product offering has served us well in industries such as: Oil exploration and drilling, Paper and Steel production, Industrial Servomotor manufacturing, Renewable Wind Energy, and Elevator manufacturing.

The NorthStar™ brand of harsh duty optical encoders is a recognized name in Oil exploration and drilling. Oil & gas applications require reliable, intrinsically safe feedback, so ATEX-certified units are in service across the globe in some of the most hostile environments known. Environments such as Paper and Steel Mills are tough on encoders, and downtime is not an option. These production facilities rely on Dynapar's NorthStar™ brand of Magneto Resistive encoders to provide reliable digital tachometer feedback needed to control critical processes and eliminate the risk of waste and injury.

Dynapar supplies the world's Servomotor manufacturers with the broadest range of

feedback available. Whether it is an absolute encoder, commutation encoder, or frameless resolver, Dynapar has a suitable feedback solution at the ready. Dynapar's Acuro™ brand encoders and Harowe™ brand resolvers are tough, reliable, and in many cases interchangeable for a "One Size Fits All" solution.

The world of Renewable Wind Energy is currently growing at a global rate of 25%. As the world continues to look for renewable energy sources, Dynapar's products continue to evolve to meet this demand. Dynapar's Acuro and NorthStar encoders are constantly being looked to for reliable feedback in critical pitch, yaw, and generator axes.

Dynapar encoders can be found busy at work within elevators around the world performing a host of functions, including governor positioning, door positioning, and traction drive speed and position control. Dynapar offers a range of industrial duty encoders designed to meet the Elevator Industry's complex manufacturing and maintenance requirements.

Dynapar is proud to be a member of the following industrial organizations:



### DYNAPAR CERTIFICATIONS:

Many products contained in this resource are certified to the following standards, where noted:





For additional information, contact your Dynapar representative at  
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Satellite Locations:

**North America:** North Carolina, South Carolina, Connecticut, Massachusetts, New York, Canada, British Virgin Islands

**West Indies:** St. Kitts

**Europe:** United Kingdom, Italy, France, Germany, Spain, Slovakia

**South America:** Brazil

**Asia:** China, Japan, Korea, Singapore

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