

Key Features

- UL Certified for Hazardous Applications**
- Rugged Design Resists up to 400g Shock and 20g Vibration**
- Compact Design with Field Serviceable Connector for Solder-Less Connections**
- Dual Isolated Output Option for Redundancy**



Class 1, Div 2 Group A,B,C&D
Class 2, Div 2 Group F&G

WARNING FOR INSTALLATION AND OPERATING INSTRUCTIONS IN

HAZARDOUS LOCATIONS. SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS A, B, C AND D HAZARDOUS LOCATIONS, OR NONHAZARDOUS LOCATIONS ONLY.

AVERTISSEMENT - POUR INSTRUCTIONS D'INSTALLATION ET D'UTILISATION DANS DES ENDROITS DANGEREUX. ADAPTÉ POUR UNE UTILISATION DANS LA CLASSE I, division 2, Groupes A, B, C ET D, endroits dangereux ou non dangereux seulement.

WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT WHILE THE CIRCUIT IS LIVE OR UNLESS THE AREA IS KNOWN TO BE FREE OF IGNITABLE CONCENTRATIONS.

AVERTISSEMENT - RISQUE D'EXPLOSION - NE DÉBRANCHEZ PAS L'ÉQUIPEMENT PENDANT QUE LE CIRCUIT EST sous tension, ou s'il est connue que LA RÉGION est LIBRE DE CONCENTRATIONS inflammables.

WARNING - EXPLOSION HAZARD - SUBSTITUTION OF ANY COMPONENT MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2.

AVERTISSEMENT - RISQUE D'EXPLOSION - LA SUBSTITUTION DE TOUTe composante peut nuire à la conformité Classe I, division 2.

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 200 to 300PPR and 1200PPR and above: $90^\circ \pm 30^\circ$ electrical; all other resolutions: $90^\circ \pm 15^\circ$

Symmetry:

For resolutions 200-300PPR and above 1024P-PR: $180^\circ \pm 25^\circ$ electrical; all other resolutions: $180^\circ \pm 18^\circ$

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

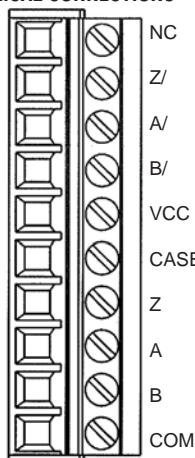
ELECTRICAL

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

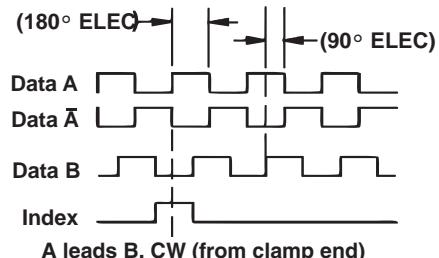
Outputs: ET7272, ET7273, 4469, MOSFET

Frequency Response: 125 kHz (data & index)

Termination: Pluggable screw terminals, inside terminal box with 1/2" conduit connector

ELECTRICAL CONNECTIONS

* Index (Z) optional. See Ordering Information

DATA AND INDEX
Not all complements shown
A shown for reference**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: 11.0 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

Weight: 3.2 lbs (51.2 Oz) Typical

ENVIRONMENTAL

Operating Temperature: -40° to +85°C, with 7272 Line Driver; -40° to +70°C with 4469 line driver; see "Ordering Information"). At shaft speed above 3000 RPM, derate 10°C per 1000 RPM

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)

Hazardous Location Certification:

Class I, Division 2, Groups A, B, C & D;

Class II, Division 2, Groups F & G

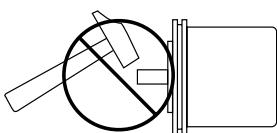
Page 2

IMPORTANT INSTALLATION INFORMATION

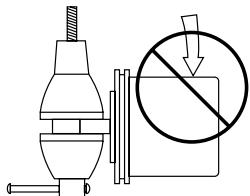
GENERAL GUIDELINES

Encoders provide quality measurements and long life when common sense, care, and accurate alignments are provided during installation. The following general guide-lines will help to ensure a trouble-free installation.

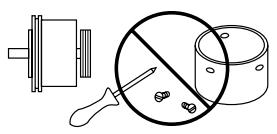
Mounting the Encoder



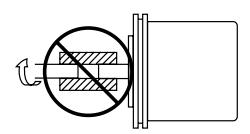
Do not shock the encoder.



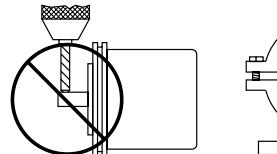
Do not subject the encoder to axial or radial shaft stresses.



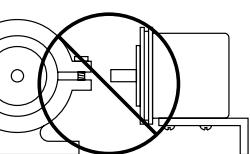
Do not disassemble the encoder.



Do not use a rigid coupling.



Do not tool the encoder or its shaft.



Do not use makeshift techniques to mount the encoder.

Wiring the Encoder

- Never connect or disconnect the encoder connector or wiring while power is ON. Doing so may damage the encoder.
- Power should always be connected to the + side of DC power.
- Common should always be connected to the - side of DC power.
- Never connect A, B, or Z to the + or - side of DC power.

ELECTRICAL CONNECTIONS

Cable - The use of shielded cable is recommended for all encoder installations. When a Dynapar brand encoder is ordered, the type of termination is generally defined (usually the last selectable code in Ordering Information). If a code for a cable was indicated, the encoder was manufactured to include a shielded cable. If any other type of termination was selected or if selection of termination type was not requested, a cable assembly must be ordered. (The cable assembly easily hooks onto the encoder's connector making it ready for wiring).

To determine which cable assembly to order, refer to the Electrical Connections table (in the encoder's manual).

ELECTRICAL CONNECTIONS (cont.)

In some cases, there may be more than one table or the table may be broken into sections due to different output types. If so, refer to the information listed for the output type selected for the encoder (in Ordering Information).

Wiring should be run through dedicated conduits or harnesses (not shared with any other wiring) which are spaced at least 12 inches apart. This protects the cable from physical damage while providing a degree of electrical isolation. Also, do not run cable in close proximity to other conductors which carry current to heavy loads such as motors, motor starters, contactors, or solenoids. Doing so could result in electrical transients in the encoder cable which cause undesired signal pulses.

NOTE: Never connect or disconnect the encoder connector or wiring while power is ON. Doing so may damage the encoder.

Grounding - DO NOT ground the encoder through both the machine and the cable wiring. Connect the shield at the input device only. **NOTE: If the shield is connected at both ends, grounding problems that degrade system performance may result.**

For European-based applications requiring CE compliance, cable length must not exceed 30m. Connect the shield to building ground on either the Encoder or Controls end. CE compliant products are tested to EN61326 EMC.

FEATURES

All encoders have the following electrical features:

- Power (+DC)
- Common
- Output Signal(s)

Power (also referred to as supply, power source, and power +V/VCC) is always +DC for encoders. **Therefore, power should always be connected to the positive (+) side of DC power.** In addition, encoder power should be regulated to within $\pm 5\%$ at the encoder and should be free of induced transients. Common (also referred to as Com, supply common, and ground) is generally a black wire (verify via Electrical Connections table). Common should always be connected to the negative (-) side of DC power.

All encoders have at least one output signal (A); however, it is common for encoders to have three signals A, B, Z (may also be referred to as C, X, or index). The outputs should each be connected to the receiving device at the appropriate terminal. **NOTE: Never connect A, B, or Z to the + or - side of DC power.**

IMPORTANT INSTALLATION INFORMATION

FEATURES (cont.)

When encoders have a differential line driver, there are two signals for each of the outputs. Each signal (A, B and Z) has a compliment or inverse \bar{A} , \bar{B} and \bar{Z} referred to as A not, B not, and Z not). The signal and its compliment (i.e. A and \bar{A}) are separate outputs. Connect each output to a separate input.

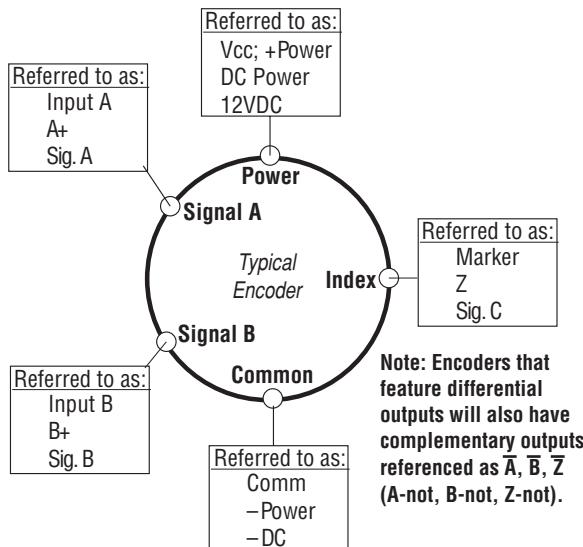
NOTE: Never connect these signals together or to the + or - side of DC power. Never connect differential signals to the same input.

CONNECTIONS

Obviously not all receiving devices are the same. However, connecting your encoder to one, no matter what type or brand it may be, is not difficult. As discussed in the previous section, all encoders have certain electrical features. Each of these features/functions are identified in the encoder's Electrical Connections table along with its corresponding pin and wire color. Each wire specified in the table must be connected to the receiving device.

Determining where to connect each wire is as easy as following the Electrical Connections table and matching each wire to the proper terminal on the receiving device. In general, no matter what type of receiving device you are using, the terminal strip is marked, indicating the proper location for each function/wire. These markings may either be numbers or text labels identifying functions. If they are numbers, the receiving device's manual should define what function corresponds to each number.

Since receiving devices are made by various manufacturers, not all text labels/references are the same. There are various ways to identify each function. Following are a few examples:



FREQUENTLY ASKED QUESTIONS

There are additional colored wires which are not referred to in the Electrical Specifications table. What do I do with them?

Do not connect them to the receiving device. Any unused encoder signal wires must be individually insulated and tied back. They should NEVER be in contact with common, power sources, or other output signal lines.

The encoder is correctly connected to the receiving device per the Electrical Specifications table and the receiving device's terminal strip label; however, it's counting in the wrong direction. What's wrong?

In order to reverse the counting direction, the output signal connections must be switched. If the encoder has a single ended output, swap A and B. If the encoder has a differential line driver, swap A and \bar{A} .

I've connected the encoder and it doesn't work (No Outputs). What can I do?

Many encoders have internal protection circuits which shut down the encoder to prevent damage if the input power is not correct or the outputs are overloaded. Check the following: Input Voltage (is it too high?); Input Polarity (is it reversed?); and Output Wiring (are they wired properly?).

I've read and followed the technical manual and these guidelines and the encoder still doesn't work properly. Help!?

Calm down - help is at your fingertips! Simply pick up the phone and dial our Applications Engineering Department at 1-800-234-8731 (US & Canada) or 847-662-2666 from 8:00 AM to 4:45 PM (Central time) Monday - Friday. One of our engineers will gladly help you solve the problem.

Page 4

MECHANICAL INSTALLATION

A. GENERAL OVERVIEW

The following instructions are meant to assist in proper installation of Dynapar brand, Series HSD35 hollowshaft encoders. The encoder is a speed and position transducer that when mounted to a rotating shaft, produces output pulses that are directly proportional to the shaft speed and direction. The hollowshaft encoder is attached to the motor shaft by using a clamp down collar. The HSD35 can accommodate several machine shaft diameters by selecting the appropriate bore size. During installation, certain physical properties associated with the mechanical coupling must be observed to ensure a long operation life of the encoder.

B. SHAFT EXTENSION

Solid shaft preferred, keyway allowed; flatted shaft must not be used. The minimum shaft engagement length that will allow support to encoder housing is 1.25". Shaft engagement length of 1.60" (40.6mm) or longer is recommended for reduced wobble. The longest shaft length as measured from the mounting face that will allow installation of the shaft cover is 2.60" (66 mm) maximum. Installations that employ a press-fit or screwed-on stub shaft adapter should align the stub shaft to 0.002" TIR or less with a dial indicator

C. TETHER POINT

For general industrial machinery and C-face motor installations, locate the tether hole at the nominal bolt circle location.

TETHER	HOLE LOCATION	BOLT SIZE	RECOMMENDED TORQUE
4.5" C-Face	2.94" (75 mm)	3/8" (9.5 mm)	100-125 in-lbs
8.5" C-Face	3.63" (92 mm)	1/2" (13 mm)	125-150 in-lbs
Slotted	2.5"-3.25" (63-82mm)	1/4" (6 mm) 5/16" (8 mm)	50-60 in-lbs 70-80 in-lbs

STEP 1: PREPARATION



Remove the encoder, tether kit and mounting kit provided from the box.

STEP 2: ORIENT TETHER



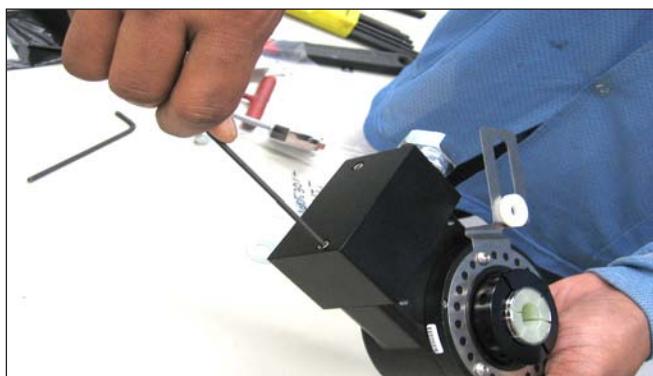
Rotate the tether to the required orientation and tighten the tether to the encoder body using three #10-32 screws provided. The hollow-shaft series encoder tether can be rotated in 15 degree increments so that connector or cable exit can be conveniently located.

STEP 3: PLACE NYLON WASHER

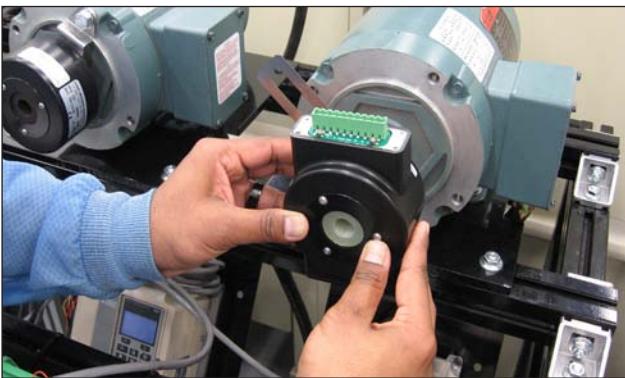


Slide the flat nylon washer one the side away from the bend and the flanged nylon washer on the side of the bend and press them together until they are fully seated in the tether slot or hole. One steel washer is to be used on each side of the nylon washer (step 6).

STEP 4: REMOVE CONDUIT COVER



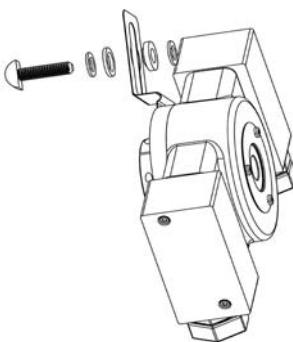
Remove conduit cover to remove the plug connector component

STEP 5: SLIDE ENCODER ON SHAFT

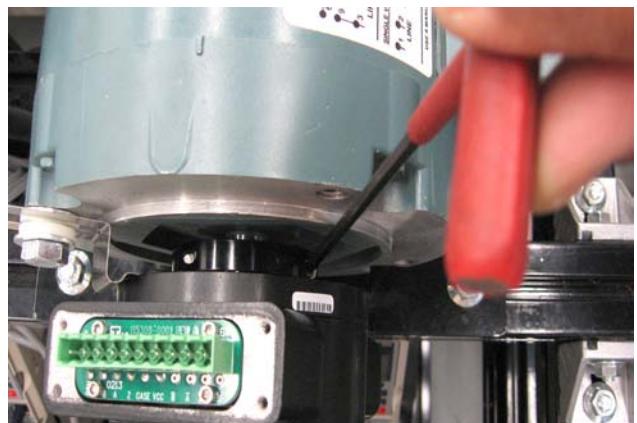
Carefully slide the encoder all the way down until the tether rests on the motor face without any stress on the tether. Do not tighten the shaft clamp on the encoder yet.

STEP 6A: SECURE TETHER TO MOUNTING FACE (MOTOR MOUNT)

Rotate the tether arm until it is at the correct orientation and is aligned with the mounting holes on the motor or equipment. Install one steel washer on both sides of the nylon washer. Fasten the tether arm to the motor housing using the supplied bolt. Ensure that there is no stress or flexing of the tether arm when secured.

STEP 6B: SECURE TETHER TO MOUNTING FACE (FAN COVER MOUNT)

Slide and insert the T-bolt as shown in the figure into the fan cover. Use the supplied insulating hardware and washers as shown. Tighten the jamnut to firmly secure the tether.

STEP 7: TIGHTEN THE COLLAR CLAMP

Tighten the collar clamp to stated torque provided on the encoder datasheet (50-55 in-lbs).

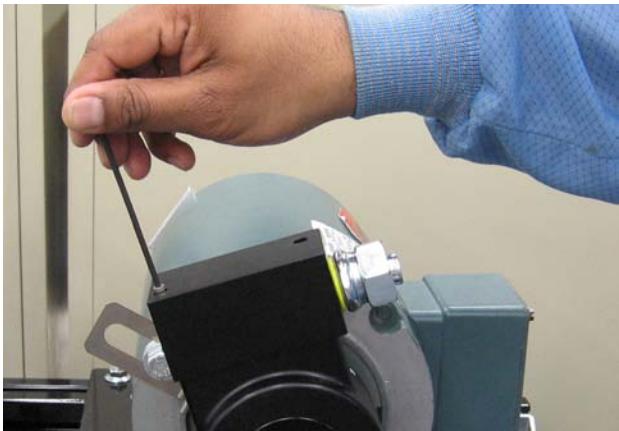
STEP 8: PREPARE THE CABLE

Prepare the cable by connecting it to the plug connector component per the electrical connection table provided on the encoder datasheet.

STEP 8: LOOSEN CONDUIT FITTING NUT

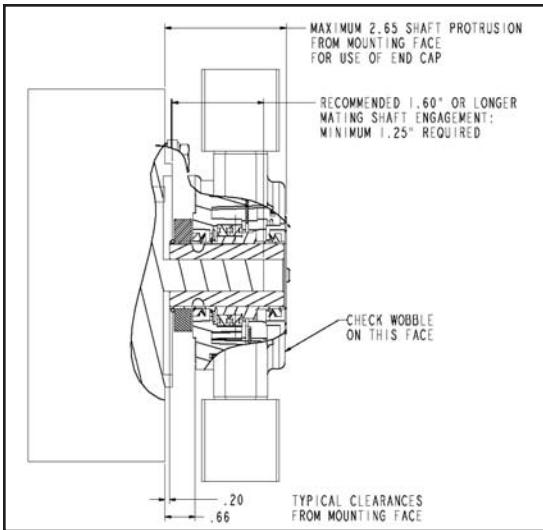
Loosen the conduit fitting nut to guide the cable through it and then fully tighten the nut.

STEP 9: INSTALL THE CONDUIT COVER



Install the conduit cover along with the spacer gasket provided.

STEP 10: GOOD INSTALLATION CHECK POINT



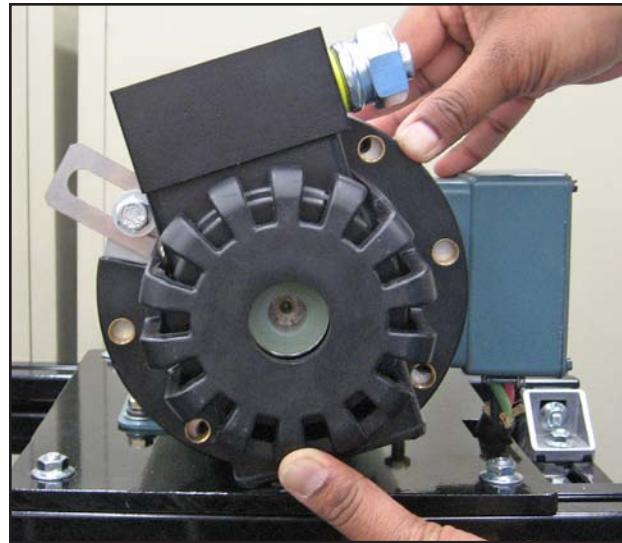
Follow the 3 step installation check to ensure a good installation thus far. Refer to figure above for key reference dimensions

A. Check clearances from mounting face. Ensure you have a minimum clearance of 1/16" between the encoder shaft and any non-rotating surface closest to the encoder shaft

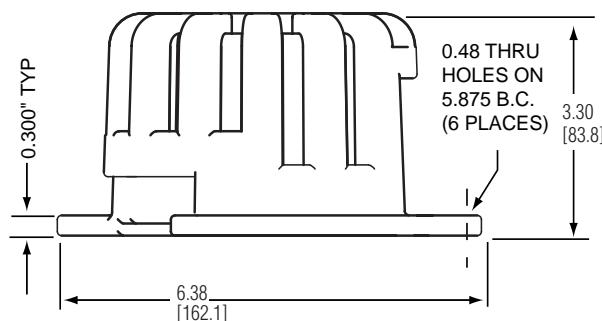
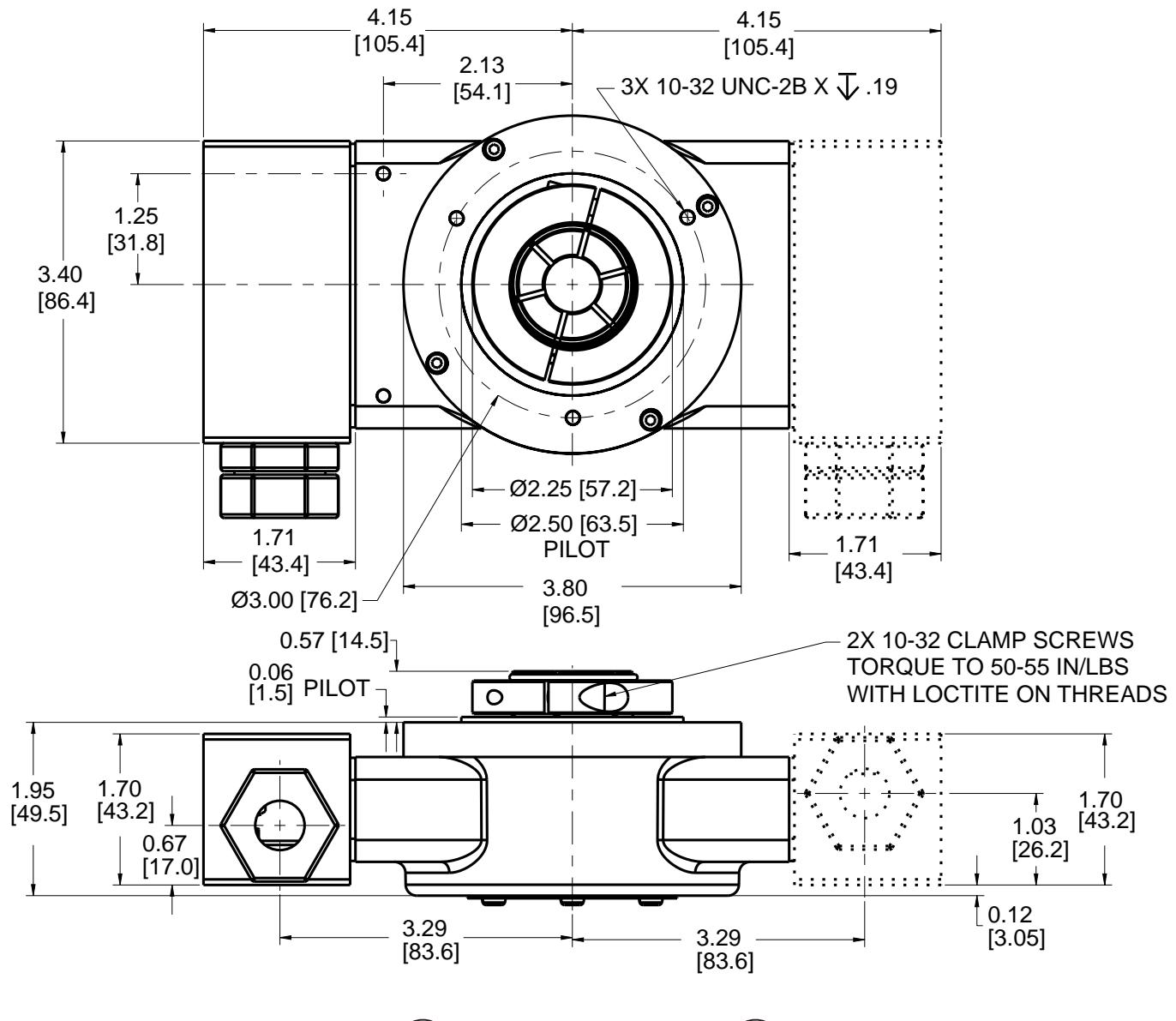
B. Check tether installation. Make sure that the tether is unstressed. There should be no visible bending or deflection on any surface of the tether. Visible tether deflections should be corrected immediately. If the tether is bent or distorted, DO NOT USE, and call the factory for a replacement tether. Tether installation is critical to the long life of the bearings and improper tether installation will lead to excessive bearing loads and encoder failure.

C. Check wobble of encoder housing. Turn the shaft by hand and make sure that the shaft turns freely and does not produce excessive runout/wobble of the encoder. Most encoder installations will have wobble arising from shaft tolerances. Measure the wobble on the visible back face of the encoder. A wobble of less than 0.007" TIR will not have any adverse effect on encoder performance. In general, the lower the TIR of runout, the better.

STEP 11: BASKET GUARD INSTALLATION

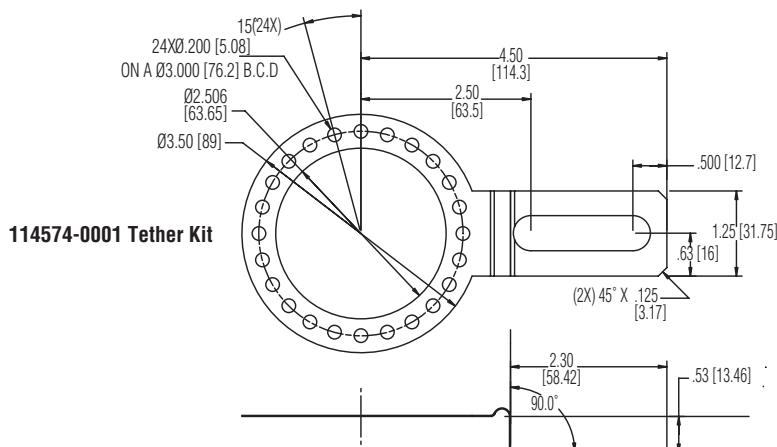
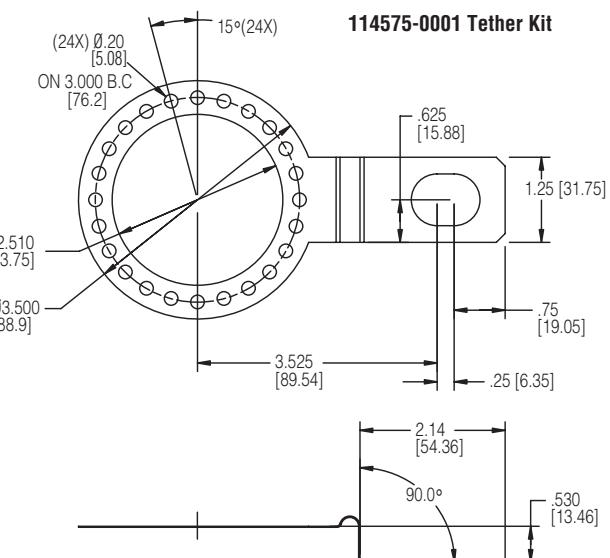
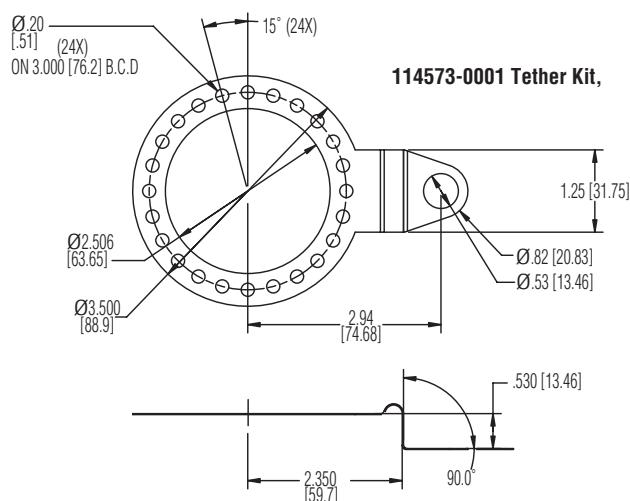


After installation of the encoder place the basket guard over the encoder with the large opening over the conduit cover and tether. Ensure the cover is fully seated on the motor face and secure with bolts and washers provided.

DIMENSIONS inch [mm]

OPTIONAL SAFETY COVER(S)

DIMENSIONS inch [mm]



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: Bore Size	Code 4: Fixing	Code 5: Output Format	Code 6: Options
HSD35	□□□□	□	□	□	D2
Ordering Information					
HSD35	0001 0512	0 6mm	Stamped Metal	Swivel Rod	0 Single Ended ABZ, 5-26VDC push-pull
Hazardous Series, Hollowshaft En- coder	0003 0600	1 1/4"	0 None	A AC motor fan cover tether with T-bolt	1 Single Ended ABZ, 5-26VDC O/C
	0010 0900	2 5/16"	1 4.5" C-Face tether	B 4.5" C-face tether with 3/8" bolt	2 Single Ended ABZ, 5-26VDC O/C w/2.2kOhm
	0012 1000	3 8mm	2 8.5" C-Face tether	C 8.5" C-face tether with 1/2" bolt	4 Differential AB only, 5-26V, 5-26V out (7272)
	0015 1024	4 3/8"		D Same as "A" w/ cover kit	5 Differential AB only, 5-26V in, 5V out (7272)
	0032 1200	5 10mm	3 Slotted tether	E Same as "B" w/ cover kit	A Differential AB, 5-26V in, 5V out (4469)
	0050 1500	6 12mm			C Differential AB, 5-15V in, 5-15V out (4469)
	0060 2000	7 1/2"	4 Same as 1 w/56C-face cover		6 Differential ABZ, 5-26V in, 5V out (7272)
	0100 2048	8 5/8"	5 Same as 3 w/cover		7 Differential ABZ, 5-26V in, 5-26V out (7272)
	0120 2400	9 15mm			8 Differential ABZ, 5-26V in, 5V out (4469)
	0200 2500	A 16mm			9 Differential ABZ, 5-15V in, 5-15V out (4469)
	0240 3072	C 19mm			D Dual isolated outputs, same as "6"
	0250 4000	D 3/4"			E Dual isolated outputs, same as "7"
	0300 4096	E 20mm			F Dual isolated outputs, same as "8"
	0360 5000	F 7/8"			G Dual isolated outputs, same as "9"
	0500	G 24mm			W Differential ABZ, 10-24V in, 10-24V out (MOSFET)
		H 1"			
		J 1-1/8"			
		K 1-1/4"			
		M 14mm			
		N 18mm			
		P 25mm			
		R 28mm			

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)
- 114928-0001** Cover Kit, 180C-face (single or dual output)
- 114623-0001** Cover Kit, Fan cover (single or dual output)