



# *Dynapar brand encoders*

## **General Wiring and Installation Guidelines**

- **Typical Mounting Installations**
- **Electrical Connections**
- **General Guidelines**
- **Common Questions & Answers**

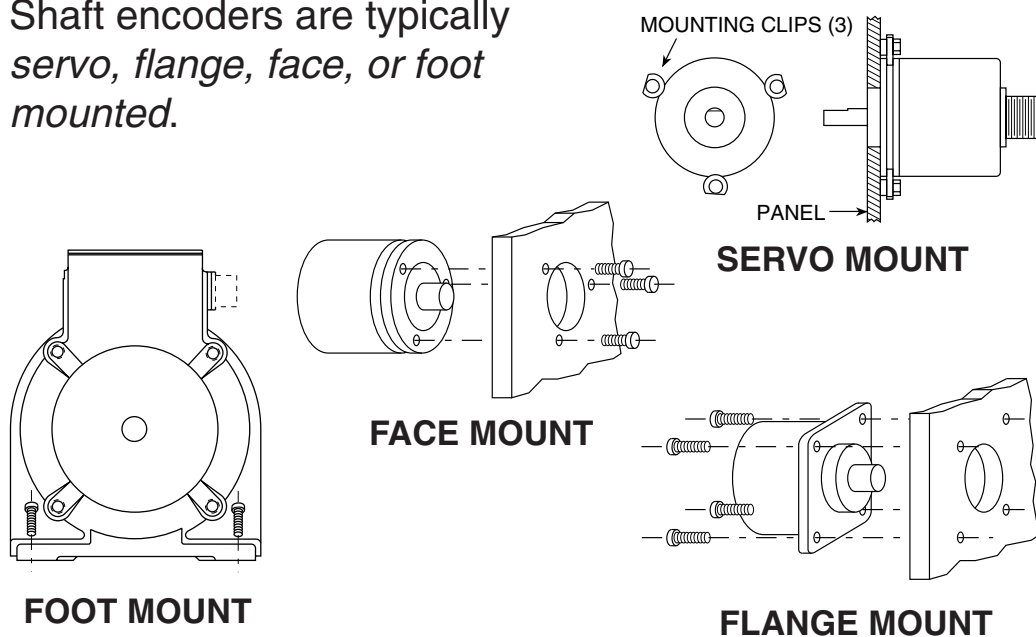
Congratulations on your purchase of a Dynapar brand encoder. All Dynapar brand encoders are 100% final tested and have a full one-year warranty against defects in material and workmanship. This booklet is provided to you as a guideline for the installation of your new encoder.

## TYPICAL MOUNTING INSTALLATIONS

Dynapar brand encoders feature industry standard mounting configurations and mounting bracket accessories to help simplify installation.

### Shaft Encoders

Shaft encoders are typically *servo, flange, face, or foot mounted*.



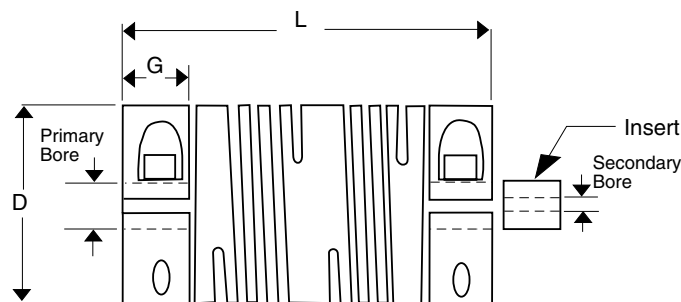
Because shaft encoders have no flexure, mechanically coupling one to a machine requires important consideration. Backlash or modulation in the coupling can cause errors in position indication. Rigid attachment of the shaft may cause bearing failure. Therefore, **a flexible coupling, which compensates for misalignment between the encoder shaft and the machine, must be used.**

**Flexible Couplings** - Encoder shafts and bearings are designed to require very restricted axial and radial play. When shafts are coupled, excessive shaft loading, electrical leakage, and thermal stress can cause encoder failures. Therefore, a flexible coupling (Dynapar brand CPL Series) which provides maximum mechanical, thermal, and electrical protection for encoder shaft connections, should be used to ensure long encoder life.

The CPL Series provides a full range of flexible coupling models designed to match specific encoders. Each is supplied with input-shaft size adapters. When selecting a flexible shaft coupling, there are four major criteria which must be considered:

1. Encoder Application (light duty to extra heavy duty)
2. Encoder Shaft Size
3. Drive Shaft Size
4. Endplay of Shaft

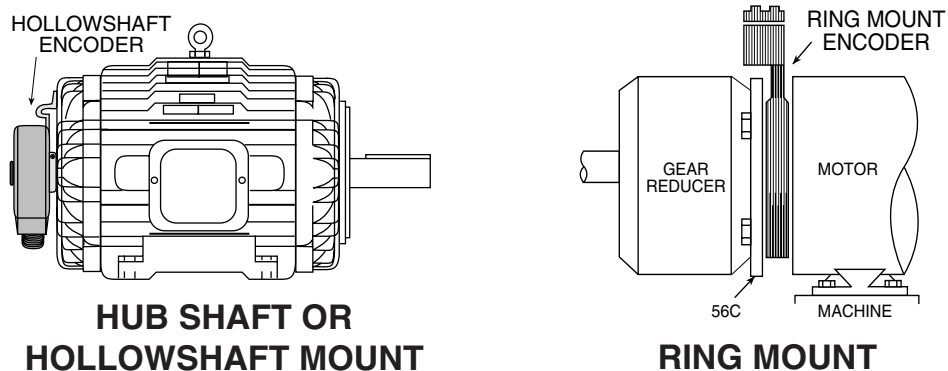
Most applications use the Primary Bore as the encoder end; however, it is permissible to reverse the coupling to provide for specific shaft accommodations. Secondary bore inserts are supplied. There are also dimensional options available - D=Diameter (0.75" to 2.0"), L=Length (0.875" to 2.0"), and G=Grip (0.23" to 0.45").



Attachment of a flexible coupling at both ends is via integral 360° clamps which firmly grip the encoder shaft and the input shaft while remaining slip-free to the rated torque of the coupling. NOTE: Shafts may extend beyond the clamp-grip area (G) to the flexture area but they must not butt.

## Direct Mounted Encoders

There are encoders which do not have shafts and are mounted directly onto machine or motor shafts. Examples include hub shaft or hollowshaft models with integral flexible mounts and ring kits which include separately mounted rings and gears. Since coupling between encoder and machine or motor shafts does not occur, flexible shaft couplings are not required. In addition, there may be no need for mounting brackets or adapters.



A *hub shaft or hollowshaft encoder* should be mounted so that its shaft receptacle is in as close as possible alignment with the axis of the driving machine or motor shaft. Clamp or set screws should then be tightened to secure the encoder. NOTE: Do not defeat or restrict the flexure. This causes failure of the encoder or driving shaft bearings.

A *ring kit encoder* should be mounted so that its mounting holes are in exact alignment with the holes or studs on the motor frame. All fasteners should then be firmly tightened with equal torque so as not to distort the shape of the ring. The gear is then positioned on the motor so that it is centered relative to the sensor. NOTE: Check the rotation of the motor shaft and gear to determine that the specified gap between the gear teeth and sensor is properly maintained.

## 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 technical bulletin). 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 will 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, and Z {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.**

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.  $\bar{A}$  and A) are separate outputs. Connection of the outputs is the same as for single signals per output. **NOTE: Never connect these signals together or to the + or - side of DC power.**

**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 is 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 (such as on the illustrations on page 7) 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 are the same. There are various ways to identify each function. Following are a few examples:

Power = DC Power Supply + = +12VDC

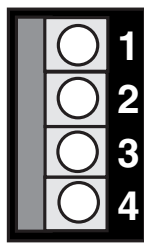
Common = DC Power Supply - = COMM

A = Input A = A+ = Term A

$\bar{A}$  = A- = A Not

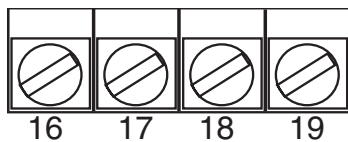
Z = C = Index = Marker

The receiving device will have one of two types of connection methods:



Each wire is inserted into the appropriate opening. The corresponding screws (located on the side of the terminal block) are then turned to tighten the clamps and secure the wires.

**OR**



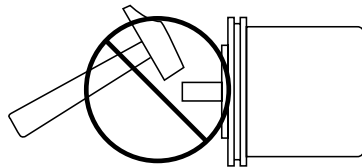
The screws are loosened, and each wire is wrapped around the appropriate screw. The screws are then turned to secure the wires.



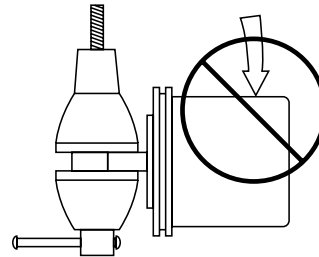
## GENERAL GUIDELINES

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

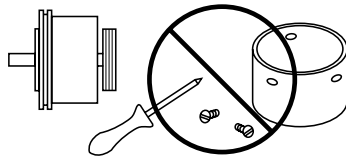
### Mounting the Encoder



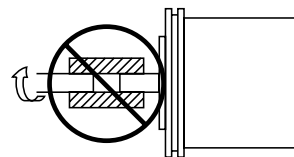
Do not shock the encoder.



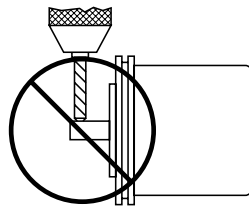
Do not subject the encoder to axial or radial shaft stresses.



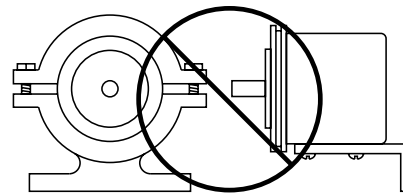
Do not disassemble the encoder.



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.

## COMMON QUESTIONS & ANSWERS

**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. Simply flip-flop the connections for signals A and B. However, if the encoder has a differential line driver, one signal and its complement must be reversed (flip-flop the connections for A and  $\bar{A}$ ).

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

*Hxxx Series* 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?). For *all other series encoders*, check power and output wiring.

**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 walk through the problem with you and help determine a solution.



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