

**NexGen SERIES 22 QUBE Encoder****Key Features**

- New phased-array ASIC sensor
- Double the shaft loading of previous Qube
- Expanded resolution up to 3600PPR
- New IP67 sealing option
- Unbreakable code disc

**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 CW shaft rotation when viewing the shaft farthest from connector or cable

**Quadrature Phasing:**

For resolutions to 625 PPR:  $90^\circ \pm 15^\circ$  electrical;

For resolutions over 625 PPR:  $90^\circ \pm 30^\circ$  electrical

**Symmetry:**

For resolutions to 625 PPR:  $180^\circ \pm 18^\circ$  electrical

For resolutions over 625 PPR:  $180^\circ \pm 25^\circ$  electrical

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

**ELECTRICAL**

**Input Power:** 5-26VDC; 75 mA max., not including output loads.

**Outputs:** ET7272, ET7273

**Frequency Response:** 125 kHz (data & 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:** 80 lbs. radial, 80 lbs. axial

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

**Shaft Tolerance:** Nominal  $+0.005''/-0.002''$

**Starting Torque:** 2.5 oz-in max.; w/shaft seals: 4.0 oz-in max.; w/double shaft seal: 6.0 oz-in max.

**Weight:** 14 oz. max.

**ENVIRONMENTAL**

**Operating Temperature:**  $-40$  to  $+100^\circ\text{C}$

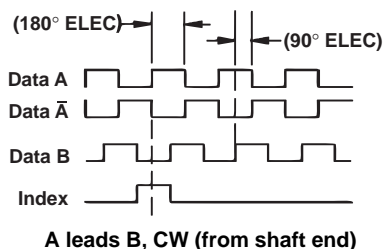
**Storage Temperature:**  $-40$  to  $+100^\circ\text{C}$

**Shock:** 100Gs for 11 milliseconds duration

**Vibration:** 5 to 2000 Hz at 20Gs

**Enclosure Rating:** IP67 with shaft seals

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



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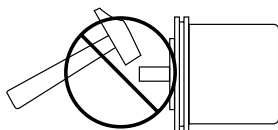
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## IMPORTANT INSTALLATION INFORMATION

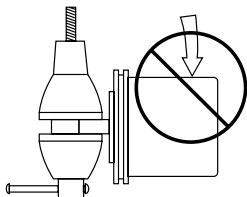
### GENERAL GUIDELINES

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.

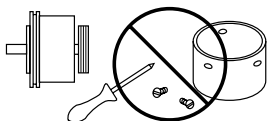
#### Mounting the Encoder



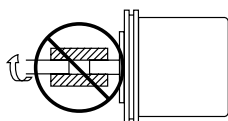
Do not shock the encoder.



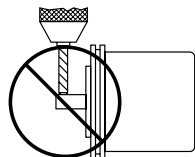
Do not subject the encoder to axial or radial shaft stresses.



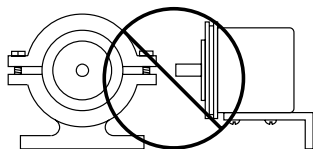
Do not disassemble the encoder.



Do not use a rigid coupling.



Do not tool the encoder or its shaft.



Do not use makeshift techniques to mount the encoder.

### FLEXIBLE COUPLINGS

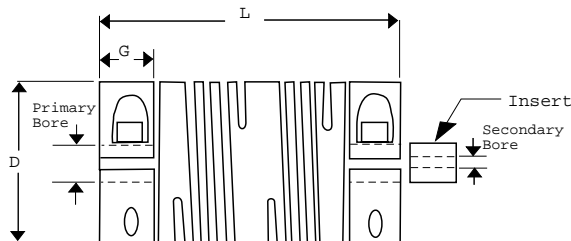
Encoder shafts and bearings are designed to require very restricted axial and radial play. When shafts are coupled, excessive shaft loading, electrical leakage, and thermal stress can cause encoder failures. Therefore, a flexible coupling (Dynapar brand CPL Series) which provides maximum mechanical, 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").

### FLEXIBLE COUPLINGS (cont.)



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 flexure area but they must not butt.

### ELECTRICAL CONNECTIONS

#### 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.**

**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).

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.**

## IMPORTANT INSTALLATION INFORMATION

### ELECTRICAL CONNECTIONS (cont.)

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.

**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.

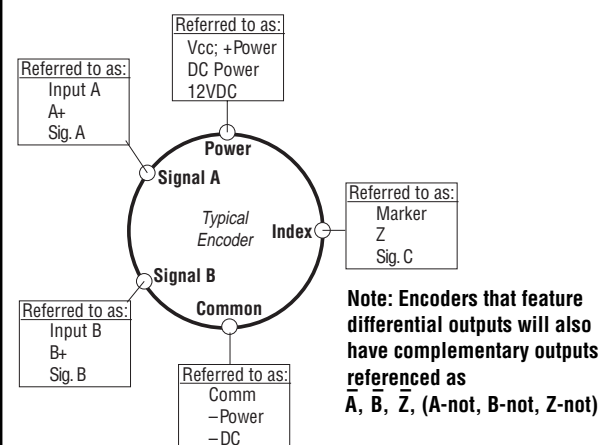
When encoders have a differential line driver, there are two signals for each of the outputs. Each signal (A, B and Z) has a compliment or inverse ( $\bar{A}$ ,  $\bar{B}$  and  $\bar{Z}$  referred to as A not, B not, and Z not). The signal and its compliment (i.e. A and  $\bar{A}$ ) are separate outputs.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

### FEATURES (cont.)

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  $\bar{A}$  and 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.

# 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	GRN
D	Signal A	BRN	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	BRN	RED
B	Signal B	ORN	BLU
C	Signal $\bar{A}$	BRN/WHT	YEL
D	Power Source	RED	WHT
E	Signal $\bar{B}$	ORN/WHT	GRN
F	Common	BLK	BLK
G	Case (Ground)	GRN	

**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	YEL	GRN
D	Signal A	BRN	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	BRN	BRN
D	Signal $\bar{A}$	BRN/WHT	BRN/WHT
E	Signal B	ORN	ORN
F	Signal $\bar{B}$	ORN/WHT	ORN/WHT

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

Function	Wire Color Code
Signal A	BRN
Signal B	ORN
Signal Z	YEL
Power Source	RED
Supply Common	BLK
Case (Ground)	GRN
Signal $\bar{A}$	BRN/WHT
Signal $\bar{B}$	ORN/WHT
Signal $\bar{Z}$	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 4= 5 to 9 and A

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

	Table 6 5 Pin Single Ended		Table 7 8 Pin Single Ended		Table 8 8 Pin Differential	
Encoder Function	Cable # 112859-		Cable # 112860-		Cable # 112860-	
	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

# 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
<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>22</b> Qube Encoder, Bidirectional	<b>0001</b>	<b>0360</b>	available only when Code 1 is 22	available when Code4 = 0, 1, 5, 6, 7 or 8: <b>0</b> 5-26 VDC in, 5-26 VDC Open Collector w/2.2k pull-ups out	<b>0</b> MS Connector
	<b>0010</b>	<b>0500</b>	<b>0</b> 3/8" Double ended shaft		available when Code 3 is 0, 1, 2, 3, 4 or 5
<b>22M</b> Metric Qube Encoder, Bidirectional	<b>0012</b>	<b>0512</b>	<b>1</b> 3/8" Single ended shaft	<b>1</b> 5-26 VDC in, 5-26 VDC Open Collector w/o pull-up out	<b>1</b> 18" Cable
	<b>0024</b>	<b>0600</b>	<b>2</b> 1/4" Double ended shaft		<b>2</b> 3' Cable
	<b>0025</b>	<b>0625</b>	<b>3</b> 1/4" Single ended shaft		<b>3</b> 6' Cable
	<b>0035</b>	<b>0720</b>	<b>A</b> Same as "0" with shaft seal	<b>2</b> 5-26 VDC in, 5V Totem Pole out	<b>4</b> 10' Cable
	<b>0040</b>	<b>0800</b>	<b>B</b> Same as "1" with shaft seal		<b>5</b> 15' Cable
	<b>0050</b>	<b>1000</b>	<b>C</b> Same as "2" with shaft seal	available when Code4 = 2, 3, 4, 9 or A: <b>3</b> 5-26 VDC in, 5V Line Driver out	available when Code 4 is 5, 6, 7, 8, 9 or A
	<b>0060</b>	<b>1024</b>	<b>D</b> Same as "3" with shaft seal		<b>6</b> M12 Connector
	<b>0100</b>	<b>1200</b>	available only when Code 1 is 22M		available when Code 3 is A,B,C,D,E or F
	<b>0120</b>	<b>1250</b>	<b>4</b> 6mm Double ended shaft		<b>A</b> 18" Sealed Cable
	<b>0125</b>	<b>1270</b>	<b>5</b> 6mm Single ended shaft		<b>B</b> 3' Sealed Cable
	<b>0150</b>	<b>1440</b>	<b>E</b> Same as "4" with shaft seal		<b>C</b> 6' Sealed Cable
	<b>0192</b>	<b>2000</b>	<b>F</b> Same as "5" with shaft seal		<b>D</b> 10' Sealed Cable
	<b>0200</b>	<b>2048</b>			<b>E</b> 15' Sealed Cable
	<b>0240</b>	<b>2500</b>			
	<b>0250</b>	<b>2540</b>			
	<b>0256</b>	<b>2600</b>			
	<b>0300</b>	<b>3600</b>			
			available only when Code 1 is 22	available only when Code 1 is 22 or 22M: <b>1</b> Single Ended, with Index, Table 3	
			available only when Code 6 is 1 to 5 or A to E: <b>3</b> Differential, with Index, Table 5		
			available only when code 6 is 0: <b>4</b> Differential, Table 4	available when Code4 = 5-26 VDC in, 5-26 VDC CMOS Line Driver	
			available only when Code 6 is 6: <b>5</b> 5 pin M12 connector, single ended, no index, Table 6		
			<b>6</b> 5 pin M12 connector, single ended, with index, Table 6		
			<b>7</b> 8 pin M12 connector, single ended, no index, Table 7		
			<b>8</b> 8 pin M12 connector, single ended, with index, Table 7		
			<b>9</b> 8 pin M12 connector, differential, no index, Table 8		
			<b>A</b> 8 pin M12 connector, differential, with index, Table 8		

## 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)

DIMENSIONS

