**Model 716 - Incremental Shaft Encoder**

**Features**
The Original Industry-Standard Cube
Five Versatile Housing Styles
Quadrature Output
New Resolutions Available to 10,000 CPR

The Model 716 Accu-Coder™ is ideally suited for applications requiring a quadrature output. Designed for compatibility with most programmable controllers, electronic counters, motion controllers, and motor drives, it is ideally suited for industrial applications where it is important that the direction of rotation be known. Critical performance specifications for the most popular resolutions and advanced Opto-ASIC circuitry—a single chip design that eliminates many board level components—increase the reliability of an already dependable and durable encoder. With new options continually being added, the Model 716 excels in a wide variety of industrial applications.

**Common Applications**
Feedback for Counters, PLCs & Motors, Cut-to-Length, Labeling, Measuring for Packaging, Filling & Material Handling Machines, Wire Winding, Film Extrusion

**Model 716 Ordering Guide**
Blue type indicates price adder options. Not all configuration combinations may be available. Contact Customer Service for details.

- **Model** 716 - Quadrature Cube
- **Index Pulse** Blank - No Index 1 - Index Pulse
- **Output Type** S - Pull-Up Resistor
  - O - Open Collector
  - PP - Push-Pull
  - HV - Line Driver
- **Pulse Polarity**
  - P - Positive
  - N - Negative
- **Shaft Diameter**
  - 4 - 1/4", 0.250"6
  - 5 - 5/16", 0.3125"7
  - 6 - 3/8", 0.375"
  - 8 - 1/2", 0.500"8
  - 10 - 5/8", 0.625"8
- **Shaft Type**
  - S - Single
  - D - Double ended9
- **Connector Type**
  - S - Standard 6-pin MS
  - Y - 7-pin MS
  - T - Solder or Screw Terminal12
  - B - Solder Terminal with Conduit Box
- **Mating Connector**
  - N - No Connector
  - Y - Yes
- **Housing Type**
  - S - 2.25" Standard Housing
  - S1 - 2.25" Standard Housing with IP50 Felt Shaft Seal2
  - IND12 - Industrial Housing with IP66 Shaft Seal
  - HD1 - 3" x 3" x 6" Heavy Duty Housing3
  - HD3 - Heavy Duty Housing with Conduit Connector & Terminal Strip
  - HD5 - Heavy Duty Housing with 10 mm Outer Bearing3
  - HD10 - Heavy Duty Housing with Ultra Heavy Duty Bearings, 0.625" or 0.500" Shaft3
  - HD12 - Heavy Duty Housing with IP66 Shaft Seal3
  - HD14 - Heavy Duty Housing with IP66 Shaft Seal and with Conduit Connector & Terminal Strip
  - 5PY - Standard Cube With 5PY Adaptor4
  - EX - Explosion-proof Housing

**Model 716 CPR Options**
- 000* thru 0189* 0193 0198 0200 0205 0210 0240
- 0250 0256 0276 0298 0300 0306 0308 0315 0333
- 0336 0350 0380 0400 0480 0500 0512 0580 0597
- 0600 0700 0720 0800 0840 0960 1000 1024 1200
- 1250 1270 1500 1800* 2000 2048 2500 3000 3600*
- 4096 5000 6000 7200* 8192 10,000

*Contact Customer Service for availability.

Contact Customer Service for other disk resolutions. Not all disk resolutions available with all output types.

**Notes:**
1. Complete only if Index Pulse option is selected.
2. Available with 0.250" shaft only.
3. Only available with 6-pin MS or Screw Terminal Connector Types.
4. Only available with 5/16" (0.3125") shaft.
5. Contact Customer Service for custom shaft lengths and diameters.
6. Standard housing only.
7. Standard or 5PY housing only.
8. HD10 housing only.
9. Not available for HD or EX housings.
10. For mating connectors, cables, and cordsets see **Accessories** at encoder.com. For Connector Pin Configuration Diagrams, see Technical Information or see **Connector Pin Configuration Diagrams** at encoder.com.
11. For non-standard cable lengths, add a forward slash (/) plus cable length expressed in feet. Example: G/6 = 6 feet of cable. For CPR > 2500. Standard cable length only.
STANDARD CUBE HOUSING (S, S1) SPECIFICATIONS

Mechanical
- Shaft Type: Single or double-ended (specify choice)
- Radial Loading: 15 lb maximum (0.250" diameter shaft) 40 lb maximum (0.375" diameter shaft)
- Axial Loading: 10 lb maximum (0.250" diameter shaft) 30 lb maximum (0.375" diameter shaft)
- Starting Torque: 0.13 oz-in typical for 0.250" shaft 0.38 oz-in typical for 0.375" shaft
- Moment of Inertia: 6.5 x 10^-6 oz-in-sec²
- Weight: 10 oz for standard housing

Electrical
- Max Frequency: 1 to 2500 CPR 125 kHz, 2501 to 5000 CPR 250 kHz, 5001 to 10,000 CPR 500 kHz
- Electrical Protection: Reverse voltage and output short circuit protected. NOTE: Sustained reverse voltage may result in permanent damage.
- Index: Once per revolution, 180° electrical
- Quadrature: 67.5° electrical or better is typical, 54°
- Edge Separation: electrical minimum at temperatures > 99° C
- Rise Time: Less than 1 microsecond
- Accuracy: Within 0.05° mechanical from one cycle to any other cycle, or 3 arc minutes

For EPC-supplied mating cables, refer to wiring table provided with cable. Trim back and insulate unused wires.

WIRING TABLE

<table>
<thead>
<tr>
<th>Function</th>
<th>Wire Color</th>
<th>5-pin M12</th>
<th>8-pin M12</th>
<th>10-pin MS HV</th>
<th>7-pin MS HV</th>
<th>7-pin MS O,S,PP</th>
<th>6-pin MS HV, No Index</th>
<th>6-pin MS O,S,PP</th>
<th>Term. Block HV, No Index</th>
<th>Term. Block O,S,PP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Com</td>
<td>Black</td>
<td>3</td>
<td>7</td>
<td>F</td>
<td>F</td>
<td>A</td>
<td>1</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+VDC</td>
<td>Red</td>
<td>1</td>
<td>2</td>
<td>D</td>
<td>D</td>
<td>B</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>White</td>
<td>4</td>
<td>1</td>
<td>A</td>
<td>A</td>
<td>C</td>
<td>3</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A'</td>
<td>Brown</td>
<td>--</td>
<td>3</td>
<td>H</td>
<td>C</td>
<td>--</td>
<td>D</td>
<td>--</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Blue</td>
<td>2</td>
<td>4</td>
<td>B</td>
<td>B</td>
<td>E</td>
<td>E</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>B'</td>
<td>Violet</td>
<td>--</td>
<td>5</td>
<td>I</td>
<td>E</td>
<td>F</td>
<td>--</td>
<td>--</td>
<td>6</td>
<td>--</td>
</tr>
<tr>
<td>Z</td>
<td>Orange</td>
<td>5</td>
<td>6</td>
<td>C</td>
<td>--</td>
<td>C</td>
<td>--</td>
<td>--</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Z'</td>
<td>Yellow</td>
<td>--</td>
<td>8</td>
<td>J</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Case</td>
<td>Green</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>G</td>
<td>G</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Shield</td>
<td>Bare</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
</tbody>
</table>

1 Standard cable is 24 AWG conductors with foil and braid shield.

STANDARD CUBE HOUSING (S, S1)

Cube Housing with 1/4" Shaft (4)
Cube Housing with 3/8" Shaft (6)

CUBE PIVOT MOUNTING BRACKETS

For EPC-supplied mating cables, refer to wiring table provided with cable. Trim back and insulate unused wires.

1-800-366-5412 • www.encoder.com • sales@encoder.com
**CUBE HOUSINGS**

**INDUSTRIAL CUBE HOUSING (IND12)**

This more robust unit meets requirements between Standard and Heavy Duty housings while retaining the Cube design. The Industrial 12 (IND12) model features an IP66 shaft seal. The tough, sealed aluminum housing has a wall thickness of 0.187" and offers greater protection from wash down, sprays, dust, moisture, shock, vibration, and other hazards found in industrial environments.

**INDUSTRIAL CUBE HOUSING (IND12) SPECIFICATIONS**

Refer to all Standard Cube Housing specifications except as follows:

**Mechanical**

- Shaft Size: 0.375" diameter
- Shaft Type: Single- or Double-Ended Shaft Available
- Radial Loading: 40 lb Maximum
- Axial Loading: 30 lb Maximum
- Starting Torque: 3 oz-in; 3 oz-in w/IP66 shaft seal

**Heavy Duty CUBE HOUSING (HD12)**

The Heavy Duty housing uses a separate 0.375" diameter external shaft and bearing assembly to rotate the shaft of an internally mounted Cube Housing. This provides mechanical isolation from external loads and stress. A flexible coupling between the external shaft and the encoder protects the internal unit from axial and radial loading. The 0.250" aluminum walls protect the encoder from external shock, vibration, and the outside environment.

**Heavy Duty Housing Options**

- **HD 1** Heavy Duty 3" x 6" housing
- **HD 3** Heavy Duty w/conduit connector (threaded for 0.500" NPT Conduit) and terminal strip
- **HD 5** Heavy Duty w/10 mm outer bearing
- **HD 12** Heavy Duty w/IP66 rated outer shaft seal
- **HD 14** Heavy Duty w/IP66 rated outer shaft seal, conduit connector (threaded for 0.500" NPT Conduit), and terminal strip

*These units have an outer boss diameter of 1.000"

**Ultra Heavy Duty CUBE HOUSING (HD10)**

The HD 10 Ultra Heavy Duty encoder is designed for use in applications with severe shaft loading conditions. The HD 10 offers two shaft sizes: 0.500" and 0.625". Shaft material is 303 stainless steel. Bearings are conservatively rated at 95 lb radial and 60 lb axial shaft loading. The HD 10 Heavy Duty housing uses a larger external shaft and R10 bearing assembly to rotate the shaft of an internally mounted Cube Housing. This provides mechanical isolation from external loads and stress. A flexible coupling between the external shaft and the encoder protects the internal unit from axial and radial loading. The 0.250" aluminum walls protect the encoder from external shock, vibration, and the outside environment.

**Ultra Heavy Duty CUBE HOUSING (HD10) SPECIFICATIONS**

- **Mechanical**
  - Max Speed: 6000 RPM
  - Shaft Size: 0.375" or 0.500" or 0.625"
  - Rotation: Either direction
  - Radial Loading: 95 lb operating
  - Axial Loading: 60 lb operating
  - Bearings: ABEC precision ball bearings
  - Bearing Life: 15,000 hours at rated load
  - Starting Torque: 3 oz-in IP66 rated
  - Mounting: Tapped holes face and base
  - Weight: 3.85 lb

All dimensions are in inches with a tolerance of ±0.005" or ±0.01" unless otherwise specified.
EXPLOSION-PROOF HOUSING (EX)

An explosion-proof housing is available for installing the Cube Series Accu-Coder™ in hazardous locations. The Cube Series encoder is mounted within the explosion-proof housing and is coupled to the 0.375" shaft assembly by a flexible shaft coupling. This decreases radial and axial loading on the internal encoder shaft and bearings to ensure long life. Electrical connection to the Accu-Coder™ is by an internal barrier terminal strip. A threaded hole for 0.500" NPT conduit is provided.

EXPLOSION-PROOF HOUSING (EX) SPECIFICATIONS

The explosion-proof housing is designed to meet the following:
NEC Class 1, Groups C and D
NEC Class 2, Groups E, F, and G
UL Standard 1203
Class 1, Division 1, Groups C and D
Class 2, Division 1, Groups E, F, and G
CSA Standard C 22.2 No. 30-M 1986
NEMA 7 and NEMA 9

Refer to all cube specifications except as follows:
Mechanical
Max Speed .................... 4000 RPM
Radial Loading ............ 30 lb operating
Axial Loading .............. 30 lb operating
Weight ....................... 6 lb
Finish ....................... Unpainted Aluminum

CUBE SERIES OPTIONAL 5PY ADAPTER (175443)

The all aluminum optional 5PY adapter allows any standard housing Cube Series encoder to replace DC tachometer technology. The 5PY adapter is interchangeable with any 5PY tach generator.

Order standard housing Cube Series Accu-Coder™ with 5/16" shaft and specify part #175443.