

# MODEL 716 – INCREMENTAL SHAFT ENCODER



## FEATURES

**The Original Industry-Standard Cube**

**Five Versatile Housing Styles**

**Quadrature Output**

**New Resolutions Available to 10,000 CPR**

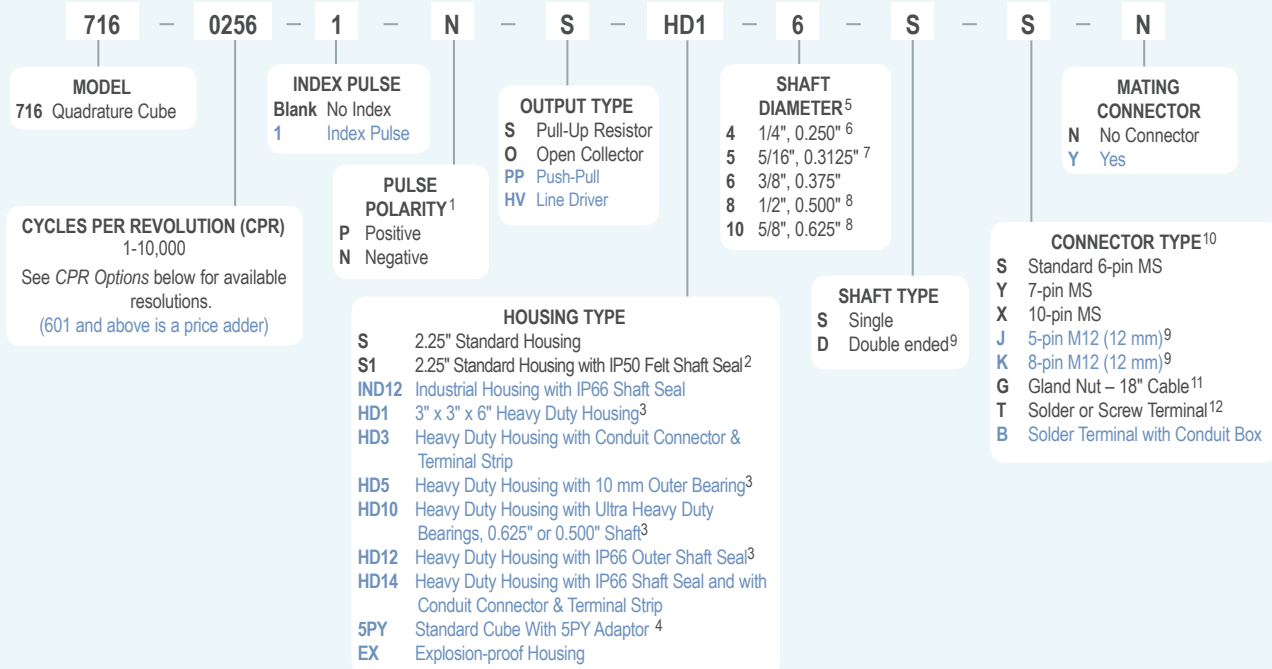
The Model 716 Accu-Coder™ is ideally suited for applications requiring a quadrature output. Designed for compatibility with most programmable controllers, electronic counters, motion controllers, and motor drives, it is ideally suited for industrial applications where it is important that the direction 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 CPR OPTIONS

0001 thru 0189*	0193	0198	0200	0205	0210	0240
0250	0256	0276	0298	0300	0305	0308
0308	0315	0333	0336	0350	0360	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.
- 12 Screw terminals available for HD and EX housings. Solder terminals available for S and S1 housings.

## MODEL 716 SPECIFICATIONS

Common to All Cube Housing Styles

### Electrical

Input Voltage..... 4.75 to 28 VDC max for temperatures up to 85° C  
 4.75 to 24 VDC for temperatures between 85° C and 100° C.  
 Input Current ..... 80 mA maximum with no output load  
 Input Ripple..... 100 mV peak-to-peak at 0 to 100 kHz  
 Output Format ..... Incremental – Square wave with single channel  
 Output Types..... Open Collector – 250 mA max per channel  
 Pull-Up – Open collector with 1.5K ohm internal resistor, 250 mA max per channel  
 Push-Pull – 20 mA max per channel  
 Line Driver – 20 mA max per channel (Meets RS 422 at 5 VDC supply)

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 gated to Channel A. See *Waveform Diagrams*.  
 Quadrature..... 67.5° electrical or better is typical, 54° electrical minimum at temperatures > 99° C  
 Edge Separation .. Less than 1 microsecond  
 Rise Time..... Within 0.05° mechanical from one cycle to any other cycle, or 3 arc minutes

### Mechanical

Max Speed ..... 6000 RPM. Higher shaft speeds achievable, contact Customer Service.  
 Shaft Material ..... 303 Stainless Steel  
 Housing ..... Black non-corrosive finished 6063-T6 aluminum  
 Bearings..... Precision ABEC ball bearings

### Environmental

Operating Temp ..... 0° to 85° C  
 Storage Temp ..... -25° to 85° C  
 Humidity..... 98% RH non-condensing  
 Vibration..... 10 g @ 58 to 500 Hz  
 Shock..... 50 g @ 11 ms duration

## 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<sup>-6</sup> oz-in-sec<sup>2</sup>  
 Weight..... 10 oz for standard housing

## WIRING TABLE

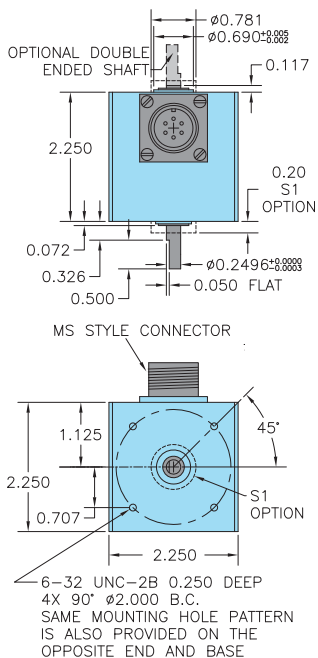
For EPC-supplied mating cables, refer to wiring table provided with cable.  
 Trim back and insulate unused wires.

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

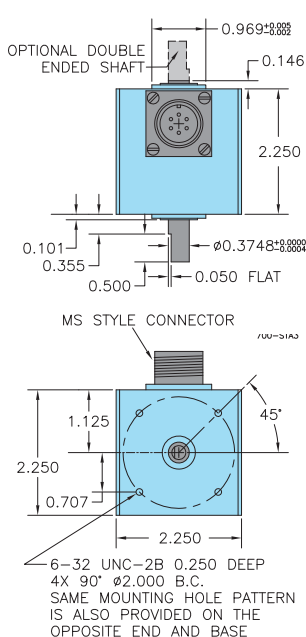
†Standard cable is 24 AWG conductors with foil and braid shield.

## STANDARD CUBE HOUSING (S, S1)

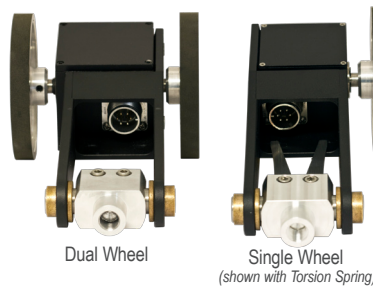
Cube Housing with 1/4" Shaft (4)



Cube Housing with 3/8" Shaft (6)



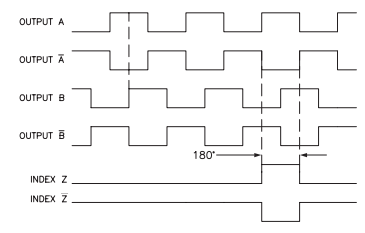
## CUBE PIVOT MOUNTING BRACKETS



- 176430-01 Single Pivot
  - 176431-01 Double Pivot
  - 176430-02 Spring Loaded Single Pivot
  - 176431-02 Spring Loaded Double Pivot
- Encoder sold separately.

## WAVEFORM DIAGRAMS

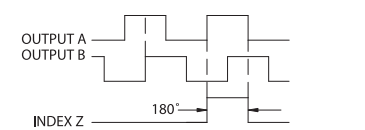
Line Driver and Push-Pull



CLOCKWISE ROTATION AS VIEWED FROM THE MOUNTING FACE

NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES. WAVEFORM SHOWN WITH OPTIONAL COMPLEMENTARY SIGNALS A, B, Z FOR HV OUTPUT ONLY.

Open Collector and Pull-Up



CLOCKWISE ROTATION AS VIEWED FROM THE MOUNTING FACE

# CUBE HOUSINGS

## INDUSTRIAL CUBE HOUSING (IND12)

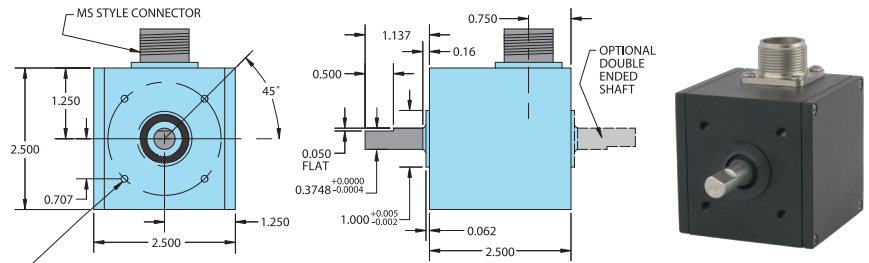
This more robust unit meets requirements between Standard and Heavy Duty housings while retaining the Cube design. The Industrial 12 (IND12) model features an IP66 shaft seal. The tough, sealed aluminum housing has a wall thickness of 0.187" and offers greater protection from wash down, sprays, dust, 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 Starting Torque w/IP66 Shaft Seal



All dimensions are in inches with a tolerance of  $\pm 0.005"$  or  $\pm 0.01"$  unless otherwise specified

## 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

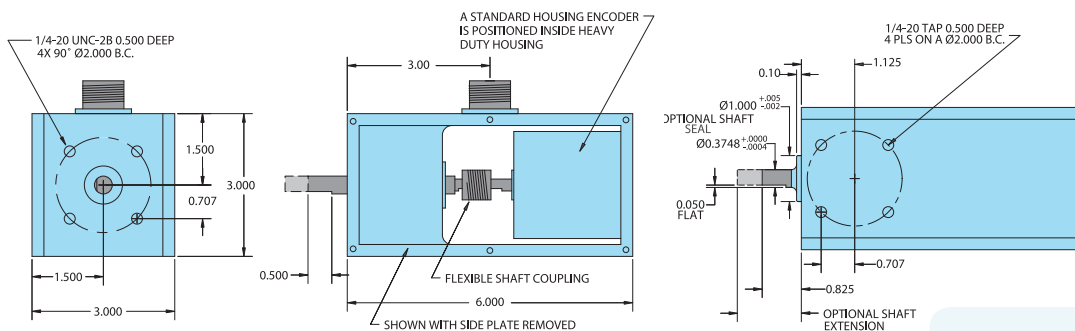
- HD 1 Heavy Duty 3" x 6" housing
  - HD 3 Heavy Duty w/conduit connector (threaded for 0.500" NPT Conduit) and terminal strip
  - HD 5 Heavy Duty w/10 mm outer bearing
  - HD 12\* Heavy Duty w/IP66 rated outer shaft seal
  - HD 14\* Heavy Duty w/IP66 rated outer shaft seal, conduit connector (threaded for 0.500" NPT Conduit), and terminal strip
- \*These units have an outer boss diameter of 1.000"

### HEAVY DUTY CUBE HOUSING (HD12) SPECIFICATIONS

Refer to all cube specifications except as follows:

#### Mechanical

- Max Speed ..... 6000 RPM
- Shaft Size..... 0.375"
- Rotation..... Either direction
- Radial Loading..... 40 lb maximum (50 lb for HD 5)
- Axial Loading..... 30 lb maximum (35 lb for HD 5)
- Bearings..... Precision ABEC ball bearings
- Starting Torque ..... 1 oz-in; 3 oz-in w/IP66 seal
- Mounting ..... Tapped holes face and base
- Weight..... 3.25 lb



## ULTRA HEAVY DUTY CUBE HOUSING (HD10)

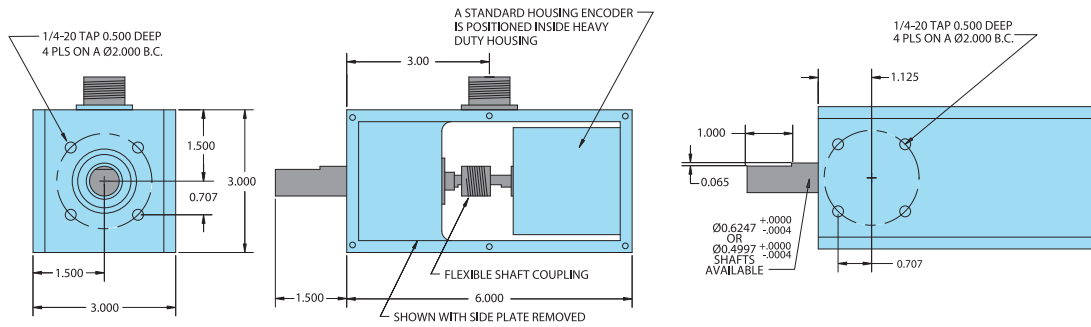
The HD 10 Ultra Heavy Duty encoder is designed for use in applications with severe shaft loading conditions. The HD 10 offers two shaft sizes: 0.500" and 0.625". Shaft material is 303 stainless steel. Bearings are conservatively rated at 95 lb radial and 60 lb axial shaft loading. IP66 shaft seal is standard on all units. The HD 10 Ultra 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 (HD 10) SPECIFICATIONS

#### Mechanical

- Max Speed ..... 6000 RPM
- Shaft Size..... 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

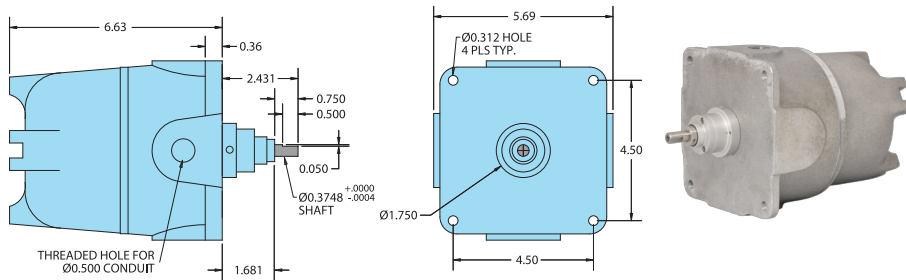
## ULTRA HEAVY DUTY CUBE HOUSING (HD10)—CONT'D



All dimensions are in inches with a tolerance of  $\pm 0.005"$  or  $\pm 0.01"$  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

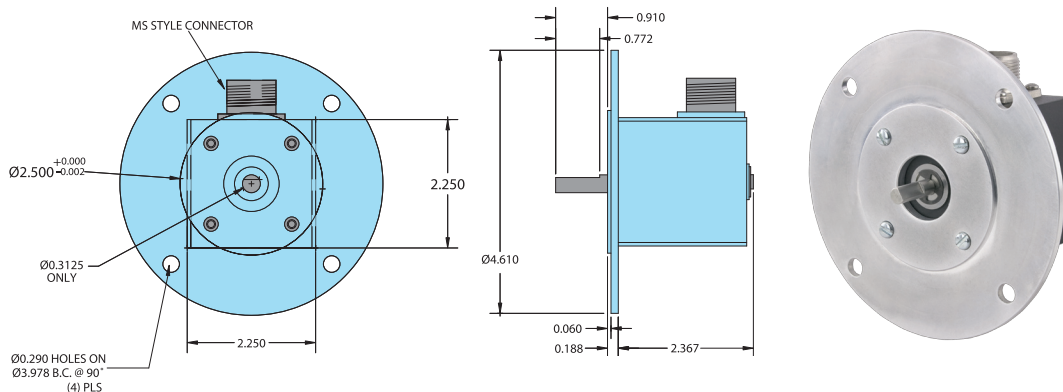
Refer to all cube specifications except as follows:

#### Mechanical

Max Speed ..... 4000 RPM  
Radial Loading ..... 30 lb operating  
Axial Loading ..... 10 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.

All dimensions are in inches with a tolerance of  $\pm 0.005"$  or  $\pm 0.01"$  unless otherwise specified.