

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.

716	–	0256	–	1	–	N	–	S	–	HD1	–	6	–	S	–	S	–	N
MODEL 716 Quadrature Cube		INDEX PULSE¹ Blank No Index 1 Index Pulse			OUTPUT TYPE S Pull-Up Resistor O Open Collector PP Push-Pull HV Line Driver			SHAFT DIAMETER⁴ 4 1/4", 0.250" ⁵ 5 5/16", 0.3125" ⁶ 6 3/8", 0.375" ⁷ 8 1/2", 0.500" ⁷ 10 5/8", 0.625" ⁷			MATING CONNECTOR N No Connector Y Yes							
CYCLES PER REVOLUTION (CPR) 1-10,000 See CPR Options below for available resolutions. (601 and above is a price adder)		PULSE POLARITY¹ P Positive N Negative			HOUSING TYPE S 2.25" Standard Housing S1 2.25" Standard Housing with IP50 Felt Shaft Seal ² IND12 Industrial Housing with IP65 Shaft Seal HD1 3" x 3" x 6" Heavy Duty Housing HD3 Heavy Duty Housing with Conduit Connector & Terminal Strip HD5 Heavy Duty Housing with 10 mm Outer Bearing HD10 Heavy Duty Housing with Ultra Heavy Duty Bearings, 0.625" or 0.500" Shaft HD12 Heavy Duty Housing with IP65 Outer Shaft Seal HD14 Heavy Duty Housing with IP65 Shaft Seal and with Conduit Connector & Terminal Strip 5PY Standard Cube With 5PY Adaptor ³ EX Explosion-proof Housing						SHAFT TYPE S Single D Double ended ⁸			CONNECTOR TYPE⁹ S Standard 6-pin MS Y 7-pin MS X 10-pin MS J 5-pin M12 (12 mm) ⁸ K 8-pin M12 (12 mm) ⁸ G Gland Nut - 18" Cable ¹⁰ T Solder or Screw Terminal ¹¹ B Solder Terminal with Conduit Box				

MODEL 716 CPR OPTIONS

0001 thru 0189*	0193	0198	0200	0205	0210	0240
0250	0256	0276	0298	0300	0305	0308
0315	0330	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:

- Complete only if Index Pulse option is selected.
- Available with 0.250" shaft only.
- Only available with 5/16" (0.3125") shaft.
- Contact Customer Service for custom shaft lengths and diameters.
- Standard housing only.
- Standard or 5PY housing only.
- HD10 housing only.
- Not available for HD or EX housings.
- For mating connectors, cables, and cordsets see Encoder Accessories on page 102 or visit www.encoder.com. For Pin Configuration Diagrams, see page 107 or visit www.encoder.com.
- 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.
- 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- 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
 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..... Less than 1 microsecond
 Accuracy 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

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 10⁻⁶ oz-in-sec²
 Weight..... 10 oz for standard housing

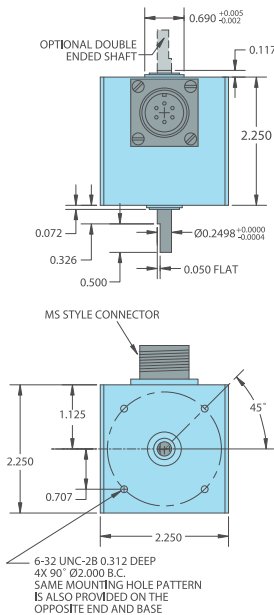
WIRING TABLE

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	--	--	--	--	--	--	--	--	--

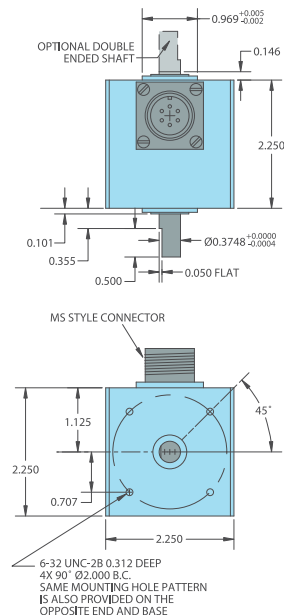
†Standard cable is 24 AWG conductors with foil and braid shield.

STANDARD CUBE HOUSING (S, S1)

Cube Housing With 1/4" Shaft (4)



Cube Housing With 3/8" Shaft (6)



CUBE PIVOT MOUNTING BRACKETS



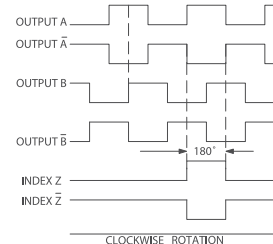
Dual Wheel

Single Wheel
(shown with Torsion Spring)

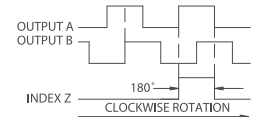
176430-01 Single Pivot
 176431-01 Double Pivot
 176430-02 Spring Loaded Single Pivot
 176431-02 Spring Loaded Double Pivot
 Encoder sold separately.

WAVEFORM DIAGRAMS

Line Driver and Push-Pull



Open Collector and Pull-Up



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

CUBE HOUSINGS

INDUSTRIAL CUBE HOUSING (IND12)

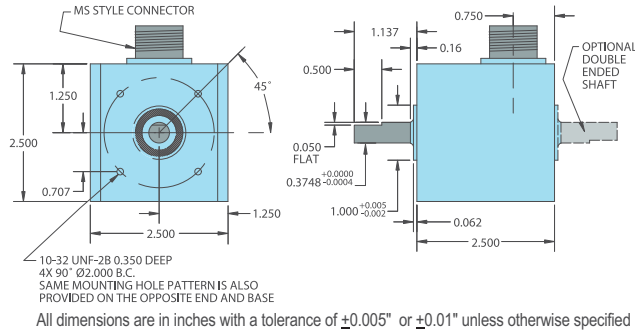
This more robust unit meets requirements between Standard and Heavy Duty housings while retaining the Cube design. The Industrial 12 (IND12) model features an IP65 shaft seal. The tough, sealed aluminum housing has a wall thickness of 0.187" and offers greater protection from wash down, sprays, dust, 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 TypeSingle- or Double-Ended Shaft Available
 Radial Loading.....40 lb Maximum
 Axial Loading.....30 lb Maximum
 Starting Torque3 oz-in Starting Torque w/IP65 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

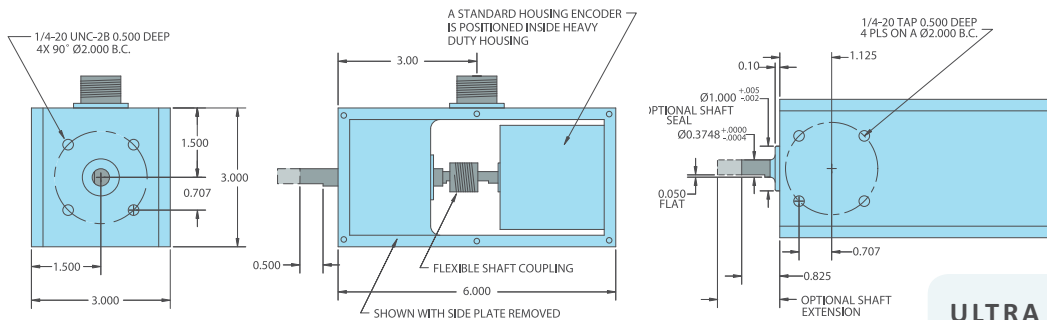
- HD 1 Heavy Duty 3" x 6" housing
 - HD 3 Heavy Duty w/conduit connector (threaded for 0.500" NPT Conduit) and terminal strip
 - HD 5 Heavy Duty w/10 mm outer bearing
 - HD 12* Heavy Duty w/IP65 rated outer shaft seal
 - HD 14* Heavy Duty w/IP65 rated outer shaft seal, conduit connector (threaded for 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 Speed6000 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 Torque1 oz-in; 3 oz-in w/IP65 seal
 MountingTapped holes face and base
 Weight.....3.25 lb



ULTRA HEAVY DUTY CUBE HOUSING (HD10)

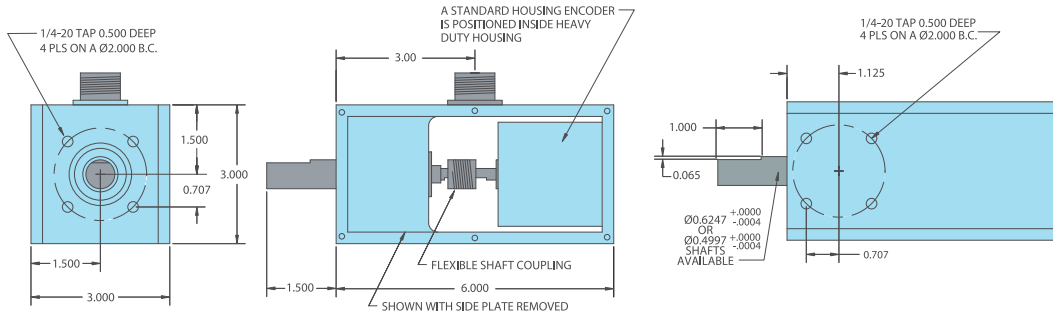
The HD 10 Ultra Heavy Duty encoder is designed for use in applications with severe shaft loading conditions. The HD 10 offers two shaft sizes: 0.500" and 0.625". Shaft material is 303 stainless steel. Bearings are conservatively rated at 95 lb radial and 60 lb axial shaft loading. IP65 shaft seal is 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 Speed6000 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 Life15,000 hours at rated load
 Starting Torque3 oz-in IP65 rated
 MountingTapped holes face and base
 Weight.....3.85 lb

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

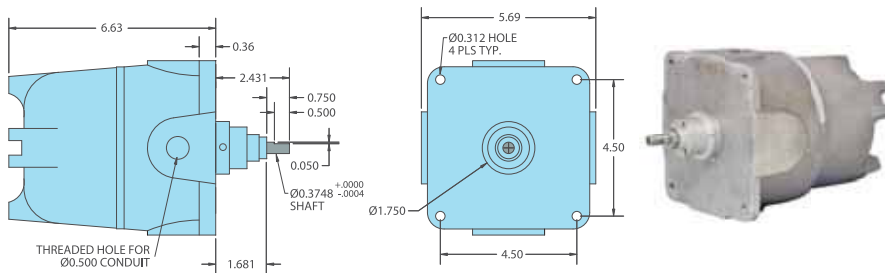


All dimensions are in inches with a tolerance of $\pm 0.005''$ or $\pm 0.01''$ unless otherwise specified



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

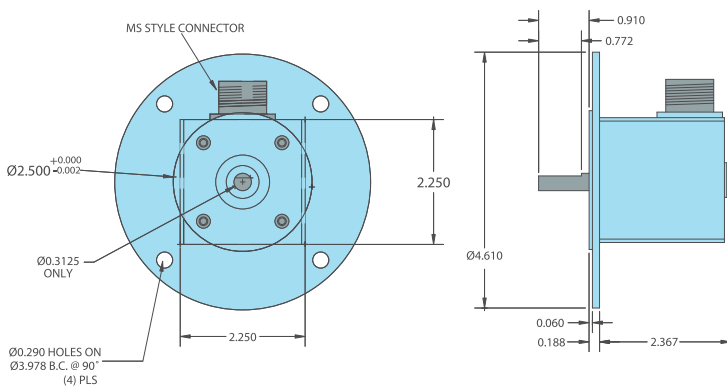
Refer to all cube specifications except as follows:

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.



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



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