ENCODER PRODUCTS COMPANY

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

CYCLES PER REVOLUTION (CPR)
1-10,000
See *CPR Options* below for available resolutions.
(601 and above is a price adder)

INDEX PULSE
Blank No Index
1 Index Pulse

PULSE POLARITY[1]
P Positive
N Negative

OUTPUT TYPE
S Pull-Up Resistor
O Open Collector
PP Push-Pull
HV Line Driver

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 DIAMETER[4]
4 1/4", 0.250" [5]
5 5/16", 0.3125" [6]
6 3/8", 0.375"
8 1/2", 0.500" [7]
10 5/8", 0.625" [7]

SHAFT TYPE
S Single
D Double ended[8]

CONNECTOR TYPE[9]
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

MATING CONNECTOR
N No Connector
Y Yes

MODEL 716 CPR OPTIONS

0001 thru 0189*			0193	0198	0200	0205	0210	0240
0250	0256	0276	0298	0300	0305	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 5/16" (0.3125") shaft.
4 Contact Customer Service for custom shaft lengths and diameters.
5 Standard housing only.
6 Standard or 5PY housing only.
7 HD10 housing only.
8 Not available for HD or EX housings.
9 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.
10 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.
11 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° 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

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 ... 6.5×10^{-6} oz-in-sec^2
Weight..... 10 oz for standard housing

WIRING TABLE

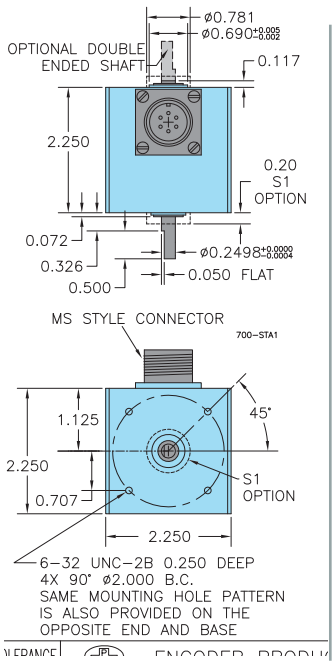
For EPC-supplied mating cables, refer to wiring table provided with cable.
Trim back and insulate unused wires.

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

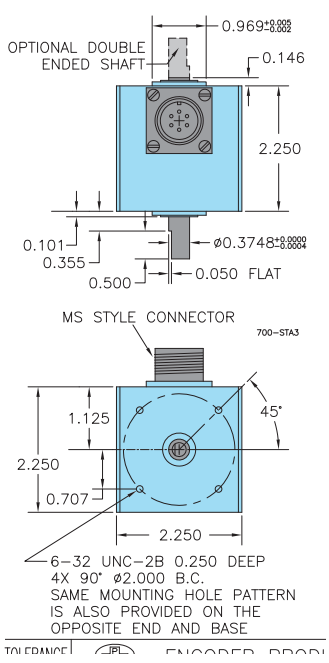
†Standard cable is 24 AWG conductors with foil and braid shield.

STANDARD CUBE HOUSING (S, S1)

Cube Housing With 1/4" Shaft (4)



Cube Housing With 3/8" Shaft (6)



CUBE PIVOT MOUNTING BRACKETS


Dual Wheel

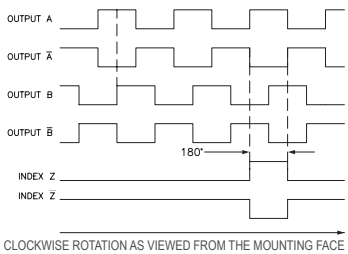

Single Wheel
(shown with Torsion Spring)

176430-01 Single Pivot
176431-01 Double Pivot
176430-02 Spring Loaded Single Pivot
176431-02 Spring Loaded Double Pivot

Encoder sold separately.

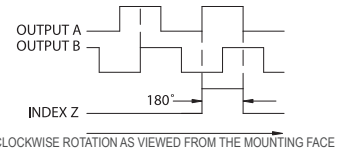
WAVEFORM DIAGRAMS

Line Driver and Push-Pull



NOTE: ALL DEGREE REFERENCES ARE ELECTRICAL DEGREES. WAVEFORM SHOWN WITH OPTIONAL COMPLEMENTARY SIGNALS Ā, B̄, Z̄ FOR HV OUTPUT ONLY.

Open Collector and Pull-Up



ENCODER PRODUCTS COMPANY

CUBE HOUSINGS

INDUSTRIAL CUBE HOUSING (IND12)

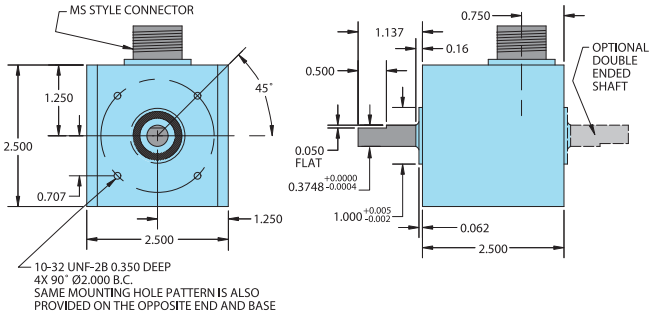
This more robust unit meets requirements between Standard and Heavy Duty housings while retaining the Cube design. The Industrial 12 (IND12) model features an IP65 shaft seal. The tough, sealed aluminum housing has a wall thickness of 0.187" and offers greater protection from wash down, sprays, dust, 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 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/IP65 Shaft Seal



All dimensions are in inches with a tolerance of ±0.005" or ±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

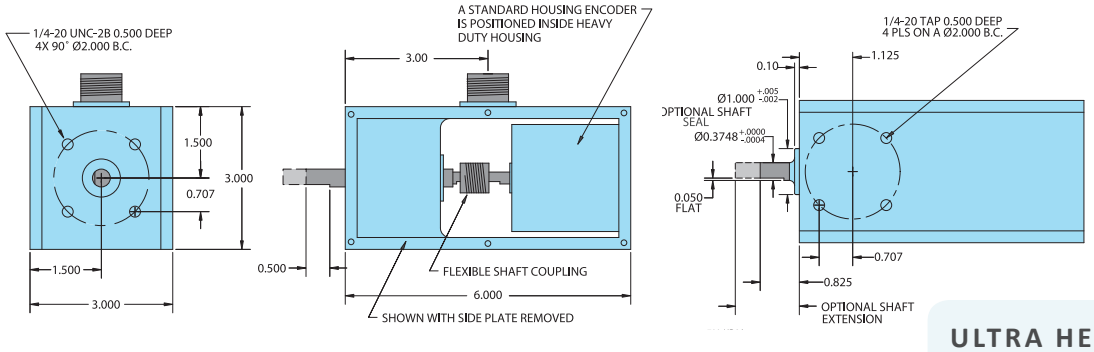
HD 1 Heavy Duty 3" x 6" housing
HD 3 Heavy Duty w/conduit connector (threaded for 0.500" NPT Conduit) and terminal strip
HD 5 Heavy Duty w/10 mm outer bearing
HD 12* Heavy Duty w/IP65 rated outer shaft seal
HD 14* Heavy Duty w/IP65 rated outer shaft seal, conduit connector (threaded for 0.500" NPT Conduit),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



ULTRA HEAVY DUTY CUBE HOUSING (HD10)

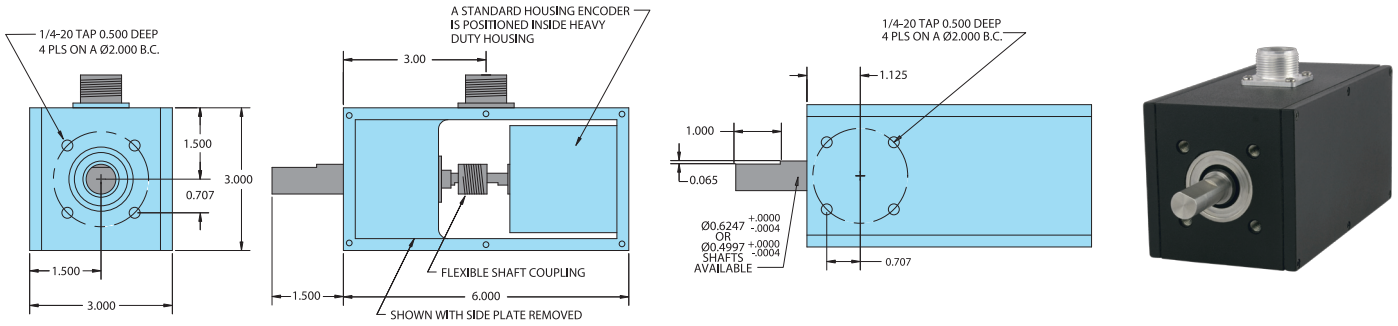
The HD 10 Ultra Heavy Duty encoder is designed for use in applications with severe shaft loading conditions. The HD 10 offers two shaft sizes: 0.500" and 0.625". Shaft material is 303 stainless steel. Bearings are conservatively rated at 95 lb radial and 60 lb axial shaft loading. IP65 shaft seal is 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 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 IP65 rated
Mounting	Tapped holes face and base
Weight	3.85 lb

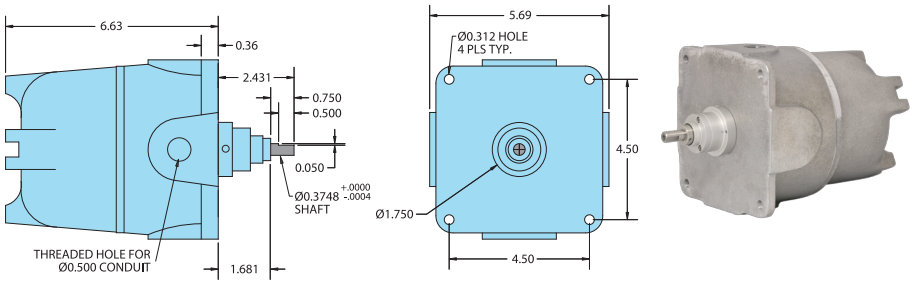
ULTRA HEAVY DUTY CUBE HOUSING (HD10)—CONT'D



All dimensions are in inches with a tolerance of ±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

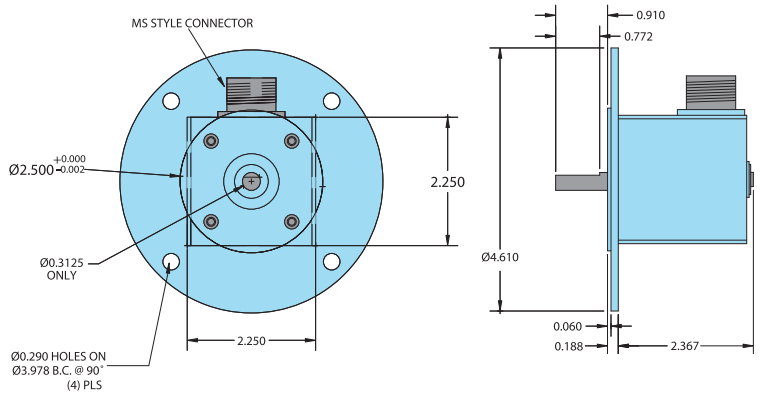
Refer to all cube specifications except as follows:

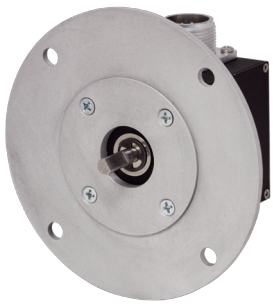
Mechanical

Max Speed ..... 4000 RPM
Radial Loading..... 30 lb operating
Axial Loading..... 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 ±0.005" or ±0.01" unless otherwise specified.