

# Series 21/22

- Up to 1270 PPR with marker
- Compact 2.25" cube shape
- Economical design



## APPLICATION/INDUSTRY

The Series 21/22 QUBE encoder is designed for application in industrial environments, and is stable in temperatures from 0° to 70°C.

- Measuring, cut-to-length or size for textile, metal, lumber and rubber industries
- Tracking, storage & retrieval, pick & place, conveying, and elevating for material handling applications
- Winding, including films, foils, wire and extrusions
- Measuring mechanical motion for processing, labeling, filling, mixing, batching, and packaging
- Position control, for flexible and automatic assembly equipment
- Speed feedback, for precise drive and machine monitoring and control

## DESCRIPTION

The Series 21/22 QUBE generates digital incremental position data proportional to shaft rotation. Through higher mechanical and electronic operating speeds, the Series 21/22 QUBE can boost system speeds, cycle times, and productivity.

Its general-purpose design makes the Series 21/22 QUBE compatible with most programmable controllers, electronic counters, motion controllers, and motor drives. The Series 21/22 QUBE is electrically and physically interchangeable with most cube-style encoders on the market. It can easily be applied with belts and pulleys, leadscrews, rack and pinions, lineshafts, etc..

## FEATURES AND BENEFITS

### Mechanical and Environmental Features

- Environmentally sealed enclosure
- Large 3/8", 1/4" or 6 mm diameter stainless steel shafts
- Durable anodized aluminum housing with 5/16" thick housing walls
- Extra-wide bearing span with heavy-duty sealed bearings front and rear
- 6000 RPM capability

### Electrical Features

- Wide selection of resolutions up to 1270 PPR
- Wide input voltage range eliminates the need for multiple models
- Unidirectional or quadrature outputs
- Optional complementary (differential) outputs

## SPECIFICATIONS

### STANDARD OPERATING CHARACTERISTICS

**Code:** Incremental  
**Resolution:** 1 to 1270 PPR (pulses/revolution)  
**Accuracy:** (Worst case any edge to any other edge)  $\pm 2.5$  arc-min.  
**Format:** Two channel quadrature (AB) with optional Index (Z) and complementary outputs  
**Phase Sense:** A leads B for CW shaft rotation as viewed from the shaft end of the encoder farthest from the connector or cable  
**Quadrature Phasing:**  $90^\circ \pm 18^\circ$  electrical  
**Symmetry:**  $180^\circ \pm 18^\circ$  electrical  
**Index:**  $225^\circ \pm 90^\circ$  electrical (active high)  
**Waveforms:** Squarewave with rise and fall times less than 1 microsecond into a load capacitance of 1000 pf

### ELECTRICAL

**Input Power:**  
 4.5 min. to 26 VDC max. at 110 mA max., not including output loads  
**Outputs:**  
 7273 Open Collector: 30 VDC max., 40 mA sink max.  
 7272 Push-Pull and Differential Line Driver: 40 mA sink or source  
**Frequency Response:** 120 kHz min. data, 50 kHz min. Index  
**Electrical Protection:** Overvoltage, reverse voltage and output short circuit protected  
**Noise Immunity:** Tested to EN50082-2 (Heavy Industrial) for Electro Static Discharge, Radio Frequency Interference, Electrical Fast Transients, Conducted and Magnetic Interference

### 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:** 40 lbs. radial, 30 lbs. axial  
**Shaft Speed:** 6,000 RPM max.  
**Shaft Tolerance:** Nominal -0.0003"/-0.0007"  
**Starting Torque:** 2.5 oz-in max.  
**Moment of Inertia:**  $1.3 \times 10^{-4}$  oz-in-sec<sup>2</sup>  
**Weight:** 14 oz. max.

### ENVIRONMENTAL

**Operating Temperature:** 0 to +70 °C;  
**Storage Temperature:** -40 to +90 °C  
**Enclosure:** Environmentally sealed

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

**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	WHT	GRN
D	Signal A	GRN	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	GRN	BRN
D	Signal A	RED/BLK	BRN/WHT
E	Signal B	ORN	ORN
F	Signal B	WHT/BLK	ORN/WHT

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

Function	Wire Color Code
Signal A	GRN
Signal B	ORN
Signal Z	WHT
Power Source	RED
Supply Common	BLK
Case (Ground)	GRN/BLK
Signal A	RED/BLK
Signal B	WHT/BLK
Signal Z	BLU

**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.

Encoder Function	Table 6 5 Pin Single Ended		Table 7 8 Pin Single Ended		Table 8 8 Pin Differential	
	Pin	Wire Color	Pin	Wire Color	Pin	Wire Color
Sig. A	4	BLK	1	BRN	1	BRN
Sig. B	2	WHT	4	ORG	4	ORG
*Sig. Z	5	GRY	6	YEL	6	YEL
Power +V	1	BRN	2	RED	2	RED
Com	3	BLU	7	BLK	7	BLK
Sig. A	–	–	–	–	3	BRN/WHT
Sig. B	–	–	–	–	5	ORG/WHT
*Sig. Z	–	–	–	–	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

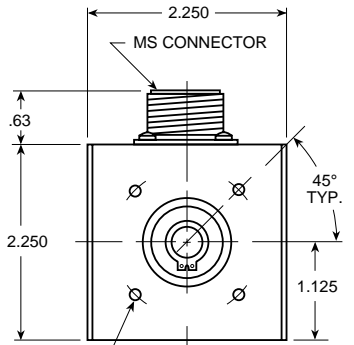
See "Accessories" Section for Connectors and Cable Assemblies Ordering Information

**DIMENSIONS**

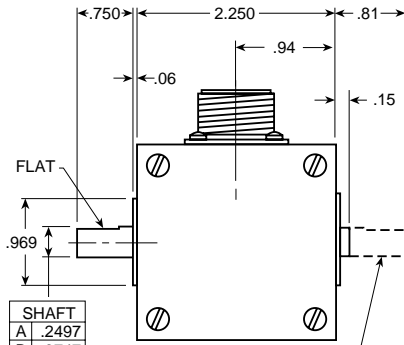
# Series 21/22

**MS Connector Models**

Approximate Dimensions (in inches)



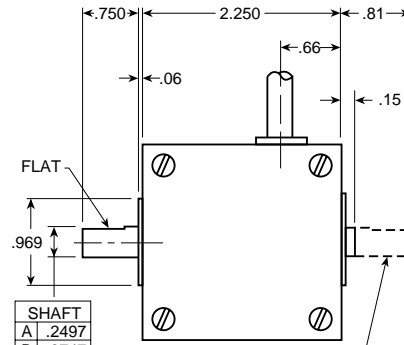
6-32 UNC-2B THREADS x .187 DEEP ON 2.00 DIA. B.C., 4 HOLES ON 3 FACES (FRONT, REAR & BOTTOM).  
FOR MODELS 22M ONLY: M3 x 0.5<sup>RH</sup> THREADS x 5mm DEEP ON A 50.8mm DIA. B.C. ON (3) FACES



SHAFT	
A	.2497
B	.3747
C	6 mm

OPTIONAL DOUBLE-ENDED SHAFT

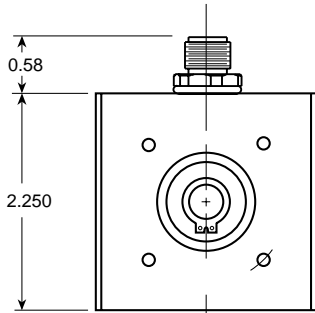
**Prewired Cable Models**



SHAFT	
A	.2497
B	.3747
C	6 mm

OPTIONAL DOUBLE-ENDED SHAFT

**M12 Connector Models**



**ORDERING INFORMATION**

# Series 21/22

INDUSTRIAL

Code 1: Model	Code 2: Pulses/Rev	Code 3: Mechanical	Code 4: Output	Code 5: Electrical	Code 6: Termination
□ □ □	□ □ □ □	□	□	□	□
Ordering Information					
21 Qube Encoder, Unidirectional	0001 0150 0002 0180 0003 0192	0 3/8" Double Ended Shaft	0 Single Ended, Table 1 2 Differential, Table 2	available when Code4 = 0, 1, 5, 6, 7 or 8: 0 5-26 VDC in, 5-26 VDC Open Collector w/2.2k pull-ups out	0 MS Connector 1 18' Cable 2 3' Cable 3 6' Cable 4 10' Cable 5 15' Cable 6 M12 Connector
22 Qube Encoder, Bidirectional	0004 0200 0005 0250 0006 0256	1 3/8" Single Ended Shaft 2 1/4" Double Ended Shaft	available only when code 6 is 0: 4 Differential, Table 4	1 5-26 VDC in, 5-26 VDC Open Collector w/o pull-up out 2 5-26 VDC in, 5V Totem Pole out	
22M Metric Qube Encoder, Bidirectional	0007 0300 0008 0360 0009 0400 0010 0480 0012 0500 0015 0512 0018 0600 0020 0720 0025 0800 0030 0900 0050 1000 0060 1024 0100 1200 0120 1250 0125 1270	3 1/4" Single Ended Shaft available when Code 1 = 22M: 4 6mm Double Ended Shaft 5 6mm Single Ended Shaft	available only when Code 1 is 22 or 22M: 1 Single Ended, with Index, Table 3 available only when Code 6 is 1 to 5: 3 Differential, with Index, Table 5 available only when Code 6 is 6: 5 5 pin M12 connector, single ended, no index, Table 6 6 5 pin M12 connector, single ended, with index, Table 6 7 8 pin M12 connector, single ended, no index, Table 7 8 8 pin M12 connector, single ended, with index, Table 7 9 8 pin M12 connector, differential, no index, Table 8 A 8 pin M12 connector, differential, with index, Table 8	available when Code4 = 2, 3, 4, 9 or A: 3 5-26 VDC in, 5V Line Driver out 4 5-26 VDC in, 5-26 VDC Line Driver	