

## Description

The EC35 quick assembly optical commutation encoder is designed for high volume, low cost, OEM motion control applications. The EC35 provides A/B/Z incremental outputs and U/V/W outputs for brushless motor commutation.

The EC35 mounts to the motor using 2 screws on a 1.28" or 1.812" diameter bolt circle. The precision machined codewheel pushes on when the encoder assembly is put on the motor shaft. This patent pending scheme securely grips the shaft without set screws. A built in, removable spacer tool ensures that the codewheel is automatically set to the correct gap when the encoder housing is mounted. The encoder can be "timed" by rotating a ring on the assembly and pressing the ring in with a simple tool to lock everything into place.

The EC35 is powered by a single 5V supply and comes with a 15-pin connector that provides differential outputs for A/B/Z and U/V/W. Open-collector U/V/W outputs are available as an option. Single ended output can be obtained by only using the + outputs of each differential pair. The internal 26C31 line drivers can source and sink 20 mA at TTL levels. The recommended differential receiver is the industry standard 26C32. Maximum noise immunity is achieved when the differential receiver is terminated with a 150  $\Omega$  resistor in series with a .0047  $\mu$  F capacitor placed across each differential pair.

A low operating temperature (-40C to 60C) version of the EC35 is available for CPR up to 2500. Please contact US Digital customer service for more information.

**Please Note:** Due to the EC35's push-on hub design, it is recommended for use as a one-time installation.

Download the EC35 datasheet.

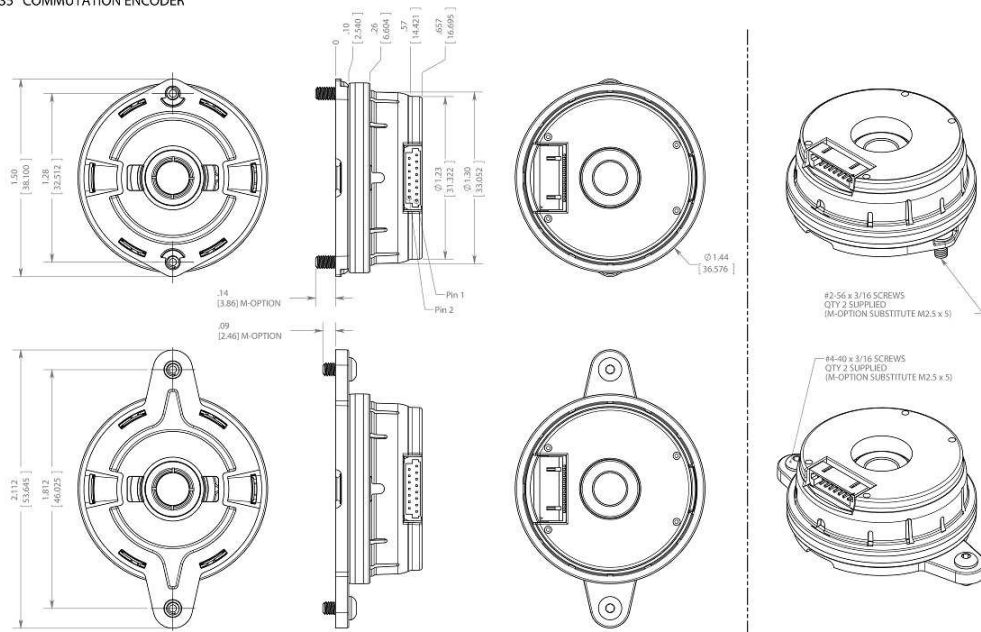
## Mechanical Drawing



## Features

- ▶ Quick, simple assembly
- ▶ A/B/Z differential outputs
- ▶ U/V/W commutation outputs (differential or open-collector)
- ▶ Frequency response from DC up to 1 MHz
- ▶ 500 to 10000 cycles per rev. (CPR)
- ▶ 2000 to 40000 quadrature states per rev.
- ▶ Fits shaft diameters from 0.197" (5mm) to 0.394" (10mm)
- ▶ Single 5V supply

EC35 COMMUTATION ENCODER



RELEASE DATE: 3/7/2012

## Environmental

Parameter	Parameter	Units
Relative Humidity	90	%, Non-Condensing
Storage Temperature	-40 to 105	C
Operating Temperature	-20 to 105	C
	-40 to 60 (contact customer service)	C
Vibration, 10Hz to 2kHz, sinusoidal	20	G
Shock, 6 millisecond, half-sine	75	G
ESD, Human Body Model, all pins	±12	kV

## Mechanical

Parameter	Min.	Max.	Units
Codewheel Moment of Inertia		6.48 x 10 <sup>-5</sup>	oz-in-s <sup>2</sup>
Required Shaft Length (for center hole encoder cover)	0.5	0.565	in.
Shaft Axial Play	-0.003	0.003	in.
Mounting Shaft Total Runout	-	0.001	in.
Acceleration	-	250000	rad/sec <sup>2</sup>

Parameter	Min.	Max.	Units
Maximum RPM, CPR ≤ 2500 e.x. CPR = 1250, max. rpm = 19200 e.x. CPR = 2500, max. rpm = 9600	-	24000000/CPR	rpm
Maximum RPM, CPR = 4000	12000		rpm
Maximum RPM, CPR = 5000	9600		rpm
Maximum RPM, CPR = 10000	6000		rpm
Base to Mounting Surface Screw Torque	-	3	in-lbs
Technical Bulletin TB1001 - Shaft and Bore Tolerances			

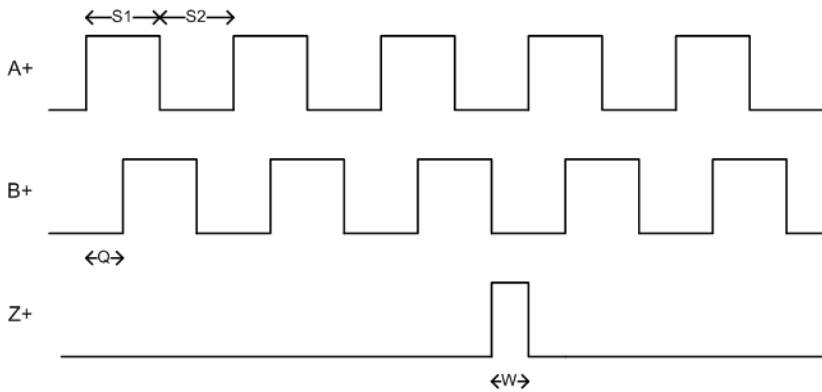
### Materials

Part	Material
Base/Housing	20% glass filled PBT
Codewheel	Aluminum/Mylar

### Electrical

Specifications	Min.	Typ.	Max.	Units	Notes
Supply Current					
CPR ≤ 2500		13	17	mA	no output load, max. frequency output
CPR > 2500		37	44		
Supply Voltage	4.5	5.0	5.5	V	
Differential High Level Output	2.5	3.5		V	loh = -8 mA
Differential Low Level Output			0.5	V	lol = 8 mA
Differential Rise/Fall Time		100		ns	
Open collector pullup voltage			30	V	Iload = 100 mA
Open collector "on" resistance		0.2		ohm	Iload = 100 mA
Frequency Response, CPR ≤ 2500			400	kHz	
Frequency Response, CPR = 4000 or 5000			800	kHz	
Frequency Response, CPR = 10000			1	MHz	

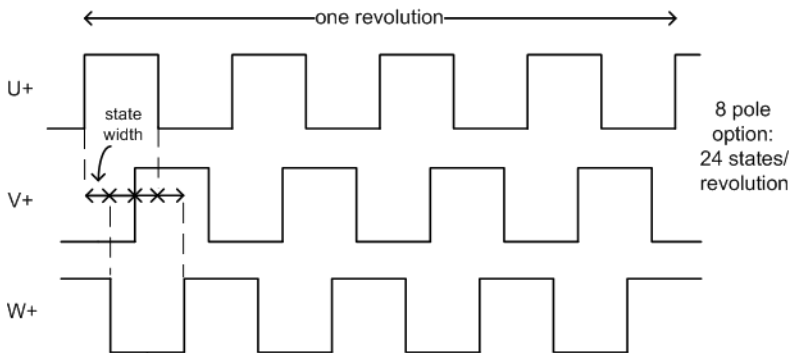
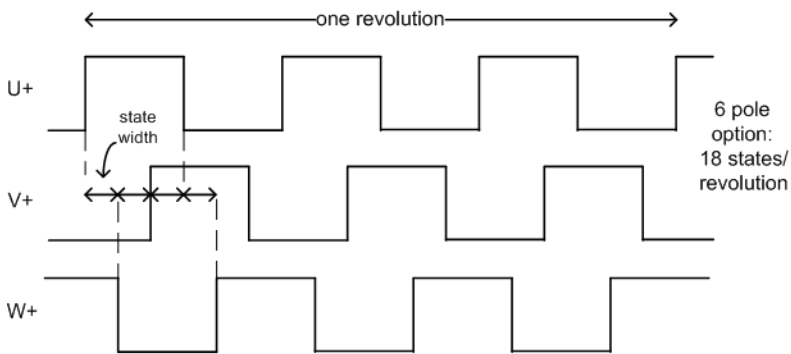
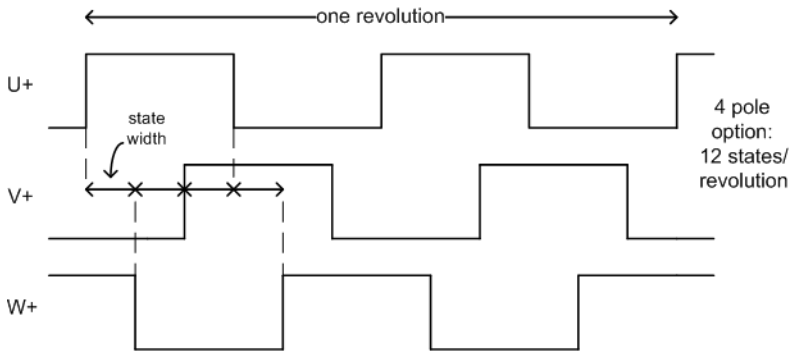
 Incremental Output Timing



Parameter	Min.	Typ.	Max.	Units
Symmetry, S1, S2	108	180	252	elec. deg.
Quadrature Delay, Q	45	90	135	elec. deg.
Index Width, W	45	90	135	elec. deg.

A leads B for CCW shaft rotation, and B leads A for CW rotation viewed from the top side of the encoder.

## Commutation Output Timing



Parameter	Min.	Typ.	Max.	Units
State width, 4 pole	27	30	33	angular deg.
State width, 6 pole	17	20	23	angular deg.
State width, 8 pole	12	15	18	angular deg.
State width, 10 pole	9	12	15	angular deg.
State width, 12 pole	7	10	13	angular deg.

### Pin-outs

Pin	"D" Output Option	"C" Output Option	"0" pole Option
1	A+ (A Quadrature)	A+ (A Quadrature)	A+ (A Quadrature)
2	A-	A-	A-
3	B+ (B Quadrature)	B+ (B Quadrature)	B+ (B Quadrature)
4	B-	B-	B-
5	Z+ (Index)	Z+ (Index)	Z+ (Index)
6	Z-	Z-	Z-
7	U+ (U Commutation)	U (Open collector)	no connection
8	U-	no connection	no connection
9	V+ (V Commutation)	V (Open collector)	no connection
10	V-	no connection	no connection
11	W+ (W Commutation)	W (Open collector)	no connection
12	W-	no connection	no connection
13	+5V power	+5V power	+5V power
14	GND	GND	GND
15	no connection	no connection	no connection

### Assembly Instructions

EC35 Assembly Instructions - <http://usdigital.com/assets/assembly/EC35%20Assembly%20Instructions.pdf>

EC35 Removal Instructions - <http://usdigital.com/assets/assembly/EC35%20Removal%20Instructions.pdf>

### Ordering Information

EC35						
CPR	Motor Poles	Bore	Index Gating	Output	Base	Packaging
500 =	0	197 =	H =A/B High	D =Differential	D = 1.28"	B =Encoder
1000 =	4 =	5mm	L =A/B Low	A/B/Z and	diam. bolt	components
1250 =	6 =	236 =		Differential	circle mount,	packaged in bulk -
2000 =	8 =	6mm		U/V/W	#2-56 x 3/16	One centering tool
2500 =	10 =	250 =		C =Differential	screws (qty. 2)	per 10 encoders
4000 =	12 =	1/4"		A/B/Z and Open-	DM = 1.28"	
5000 =		315 =		collector U/V/W	diam. bolt	
10000 =		8mm			circle mount,	
		375 =			M2.5 x 5	
		3/8"			screws (qty. 2)	
		394 =			G = 1.812"	
		10mm			diam. bolt	
					circle mount,	
					#4-40 x 3/16	
					screws (qty. 2)	
					GM = 1.812"	
					diam. bolt	
					circle mount,	
					M2.5 x 5	
					screws (qty. 2)	

### Rules

- Output must be equal to D when Motor Poles is equal to 0

### Notes

- Cables and connectors are not included and must be ordered separately.
- US Digital warrants its products against defects in materials and workmanship for two years. See complete warranty for details.

### Base Pricing

Quantity	Price
1	\$115.00
10	\$96.22

For volume discounts, please contact us at sales@usdigital.com or 800.736.0194.