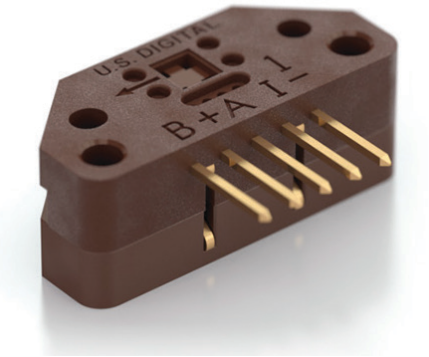
Transmissive Optical Encoder Module

Product ID | EM2 »



Features of the EM2 Transmissive Optical Encoder Module

- Encoder module for measuring rotary or linear movement
- Two-channel quadrature with index channel
- 11 Rotary Resolutions from 2,000 to 10,000 CPR (8,000 to 40,000 PPR)
- 2 Linear resolutions from 1,000 to 2,000 LPI (x1 quadrature decoding)
- Sink/source 5 mA
- Internal decoupling capacitor for enhanced noise immunity
- Single 5V supply

Description

The EM2 is a transmissive optical encoder module designed to measure rotary or linear movement when paired with an encoder disk or linear strip. The EM2 consists of a lensed LED source and a monolithic detector IC enclosed in a small polymer package. The EM2 uses phased array detector technology, allowing for a wider gap tolerance and reliable performance even with some disk contamination.

RoHS COMPLIANT

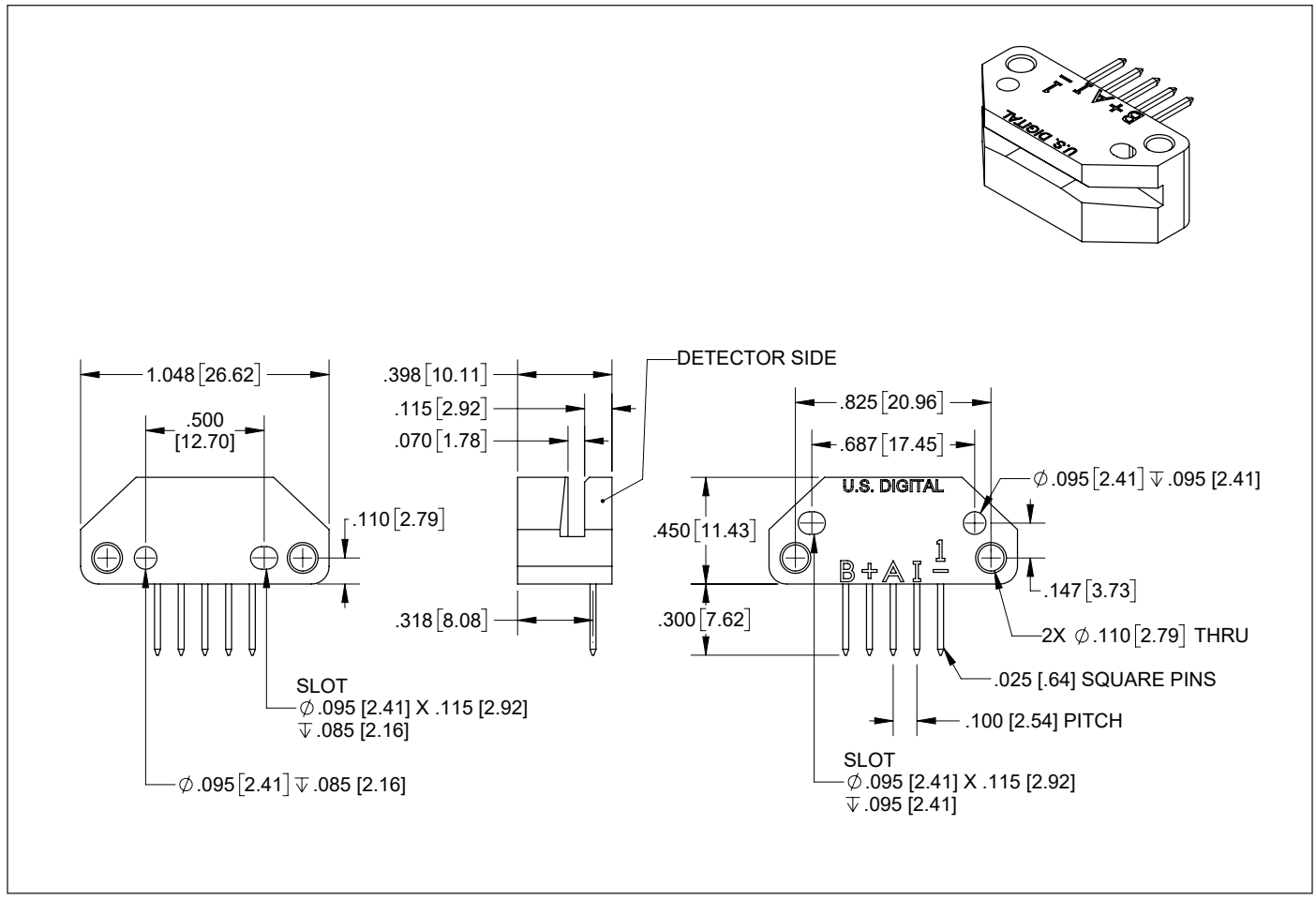
The EM2 encoder module provides digital A & B quadrature outputs with an index channel. Each EM2 module is resolution-specific and is matched to the resolution of an encoder disk or linear strip. The EM2 module supports 12 different resolutions. The EM2 operates with a single 5V supply and provides single-ended outputs capable of sinking and sourcing 5mA. An internal 0.1 µF decoupling capacitor provides enhanced noise immunity.

For open collector and higher voltage applications, add the *PC3*[(1)] cable driver, or for differential cable driver outputs, add the *PC4*[(2)] cable driver.

Accessories such as encoder disks, linear strips, mating connectors, and cables are also available.

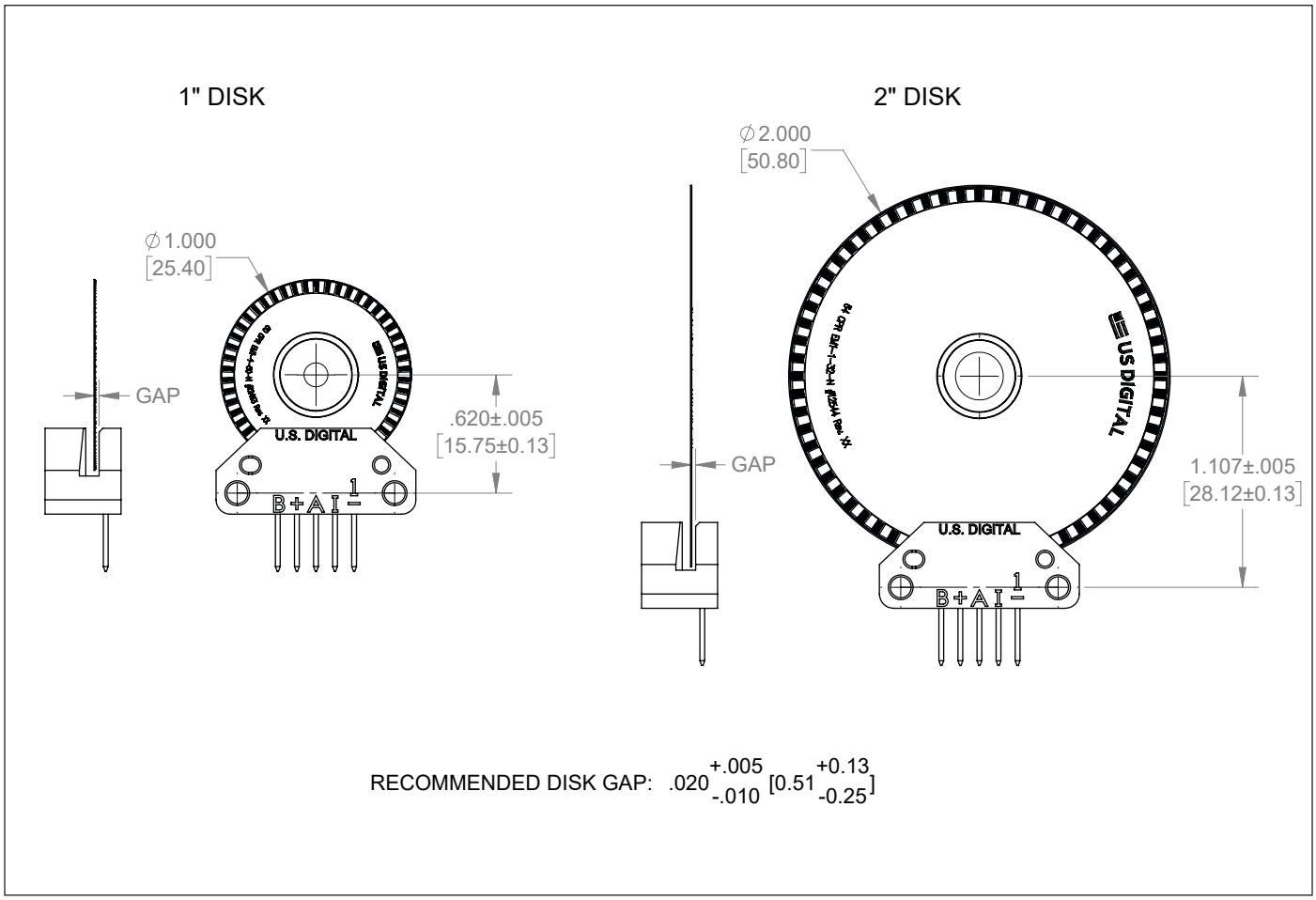
Download[(3)] the EM2/EM1 comparison chart.

Mechanical Drawings



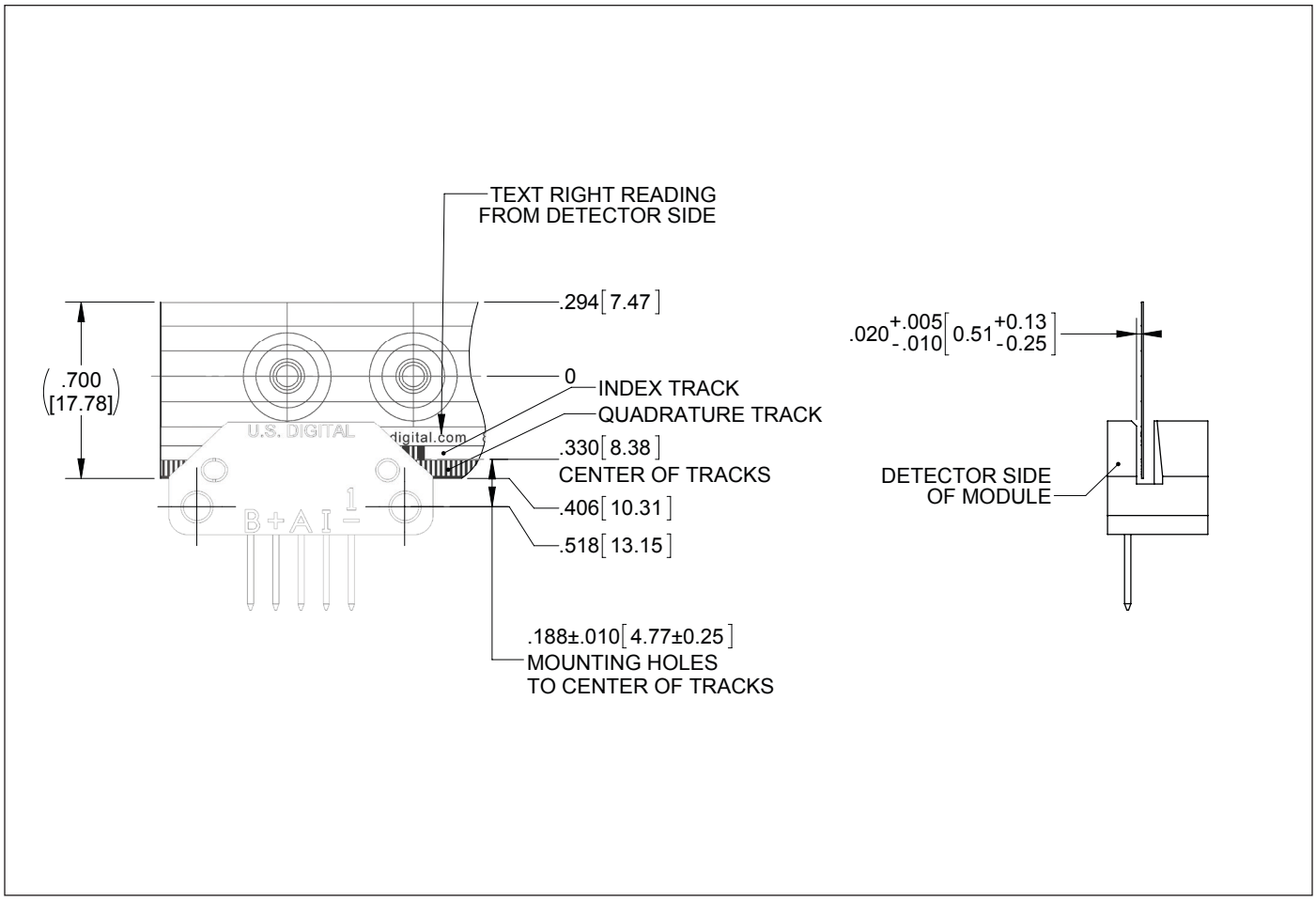
EM2 Transmissive Optical Encoder Module

Mechanical Drawings



EM2 Transmissive Optical Encoder Module - Disk Alignment

Mechanical Drawings



EM2 Transmissive Optical Encoder Module - Linear Strip Alignment

Specifications

Compatible 1 in. and 2 in. Disks

1 in. Disks

CPR	Module Index	1 in. Disk Index
2000	EM2-1-2000-I	DISK-1-2000-*-IE
2048	EM2-1-2048-I	DISK-1-2048-*-IE
2500	EM2-1-2500-I	DISK-1-2500-*-IE
4000	EM2-1-4000-I	DISK-1-4000-*-IE
4096	EM2-1-4096-I	DISK-1-4096-*-IE
5000	EM2-1-5000-I	DISK-1-5000-*-IE

*Represents the bore size.

2 in. Disks

CPR	Module Index	2 in. Disk Index
3600	EM2-2-3600-I	DISK-2-3600-*-IE
4000	EM2-2-4000-I	DISK-2-4000-*-IE
4096	EM2-2-4096-I	DISK-2-4096-*-IE
5000	EM2-2-5000-I	DISK-2-5000-*-IE
7200	EM2-2-7200-I	DISK-2-7200-*-IE
8000	EM2-2-8000-I	DISK-2-8000-*-IE
8192	EM2-2-8192-I	DISK-2-8192-*-IE
10000	EM2-2-10000-I	DISK-2-10000-*-IE

*Represents the bore size.

Specifications

Compatible 1 in. and 2 in. Hubdisks

1 in. Hubdisks

CPR	Module Index	1 in. Hubdisk Index
2000	EM2-1-2000-I	HUBDISK-1-2000-*-IE
2048	EM2-1-2048-I	HUBDISK-1-2048-*-IE
2500	EM2-1-2500-I	HUBDISK-1-2500-*-IE
4000	EM2-1-4000-I	HUBDISK-1-4000-*-IE
4096	EM2-1-4096-I	HUBDISK-1-4096-*-IE
5000	EM2-1-5000-I	HUBDISK-1-5000-*-IE

*Represents the bore size.

2 in. Hubdisks

CPR	Module Index	2 in. Hubdisk Index
3600	EM2-2-3600-I	HUBDISK-2-3600-*-IE
4000	EM2-2-4000-I	HUBDISK-2-4000-*-IE
4096	EM2-2-4096-I	HUBDISK-2-4096-*-IE
5000	EM2-2-5000-I	HUBDISK-2-5000-*-IE
7200	EM2-2-7200-I	HUBDISK-2-7200-*-IE
8000	EM2-2-8000-I	HUBDISK-2-8000-*-IE
8192	EM2-2-8192-I	HUBDISK-2-8192-*-IE
10000	EM2-2-10000-I	HUBDISK-2-10000-*-IE

*Represents the bore size.

Specifications

Compatible Linear Strips

LPI	Module Non-Index	Linear Strip Non-Index	Module Index	Linear Strip Index
1000	EM2-0-1000-N	LIN-1000-*-N	EM2-0-1000-I	LIN-1000-*-#
2000	EM2-0-2000-N	LIN-2000-*-N	EM2-0-2000-I	LIN-2000-*-#
	* Represents length of Linear Strip		* Represents length of Linear Strip # Represents location of Index	

Environmental

Parameter	Value	Units
Operating Temperature	-25 to 100	C
Electrostatic Discharge, IEC 61000-4-2	± 4	kV
Vibration (10Hz to 2kHz, sinusoidal)	20	G
Shock (6 milliseconds, half-sine)	75	G

Operating Conditions

Parameter	Min.	Max.	Units	Notes
A/B Output Frequency	0	360	kHz	2000, 2048, 2500 CPR (1 in.) 3600, 4000, 4096, 5000 CPR (2 in.) 1000 CPI (Linear)
	0	720	kHz	4000, 4096, 5000 CPR (1 in.) 7200, 8000, 8192, 10000 CPR (2 in.) 2000 CPI (Linear)
Disk RPM	0	(21.6 x 10^6) / CPR	RPM	2000, 2048, 2500 CPR (1 in.) 3600, 4000, 4096, 5000 CPR (2 in.)
	0	(43.2 x 10^6) / CPR	RPM	4000, 4096, 5000 CPR (1 in.) 7200, 8000, 8192, 10000 CPR (2 in.)
Linear Strip Speed	0	360	in./sec.	1000, 2000 CPI (Linear)
Disk/Linear Strip Radial Position Tolerance	± .005		inch	

Specifications

Electrical

- Specifications apply over the entire operating temperature/voltage range.
- Typical values are specified at Vcc = 5.0V and 25C.

Parameter	Min.	Typ.	Max.	Units	Conditions
Supply Voltage	4.5	5.0	5.5	V	Ripple < 100 mVpp
Supply Current		72	85	mA	no load
Low-level Output		0.25	0.5	V V	I_{OL} = 5 mA no load
High-level Output	2.0	4.0		V V	I_{OH} = -5 mA no load
Output Current Per Channel	-5		5	mA	
Load Capacitance			100	pF	
Output Rise Time		50		nS	± 5 mA load
Output Fall Time		50		nS	± 5 mA load

Timing Characteristics

Encoding Characteristics

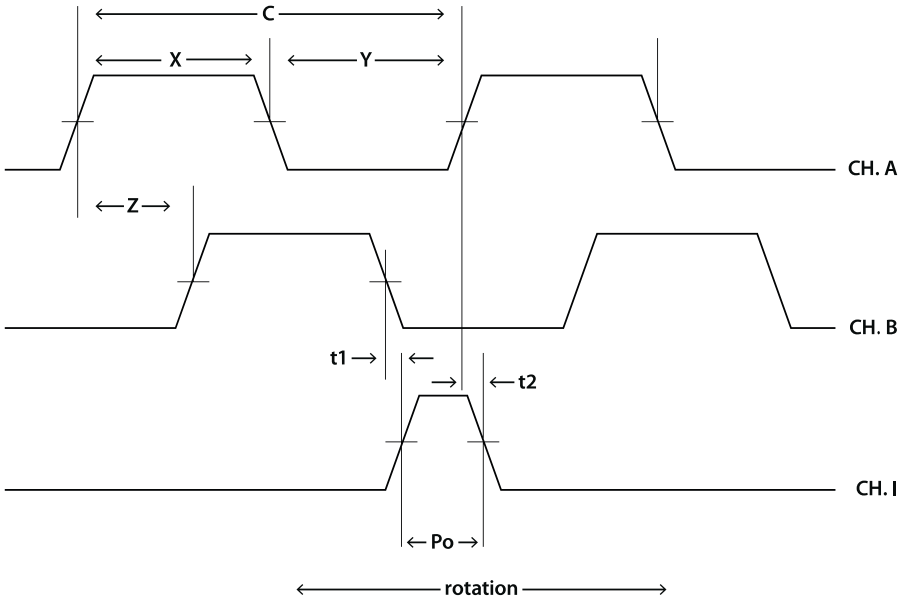
- Specifications apply over the entire operating temperature/voltage range.
- Values are for the worst error over full rotation.
- Refer to the timing diagram below.

Parameter	Symbol	Min.	Typ.	Max.	Units
Symmetry	X, Y	108	190	252	°e
Quadrature	Z	45	90	135	°e
Index Pulse Width	Po	40	90	135	°e
Ch. I Rise After Ch. B or Ch. A Fall	t1		-40		ns
Ch. I Fall After Ch. B or Ch. A Rise	t2		25		ns

Specifications

Timing Characteristics

Timing Diagram



CPR: The number of Cycles (C) of the A or B outputs Per Revolution.

Cycle Error: An indication of cycle uniformity. The difference between an observed shaft angle which gives rise to one electrical cycle, and the nominal angular increment of 1/CPR of a revolution.

Index (I): The index output goes high once per revolution, coincident with the low states of channels A and B, nominally 1/4 of one cycle (90 °e).

LPI: Lines Per Inch. The number of Cycles (C) of the A or B output per inch of linear strip movement.

One Shaft Rotation: 360 mechanical degrees.One Electrical Degree (°e): 1/360th of one cycle.One Cycle (C): 360 electrical degrees (°e). Each cycle can be decoded into 1 or 4 states, referred to as X1 or X4 resolution multiplication.

PPR: The number of resolvable Positions Per Revolution of the encoder disk with x4 quadrature decoding.

Quadrature (Z): The phase lag or lead between channels A and B in electrical degrees, nominally 90 °e.

Symmetry: A measure of the relationship between (X) and (Y) in electrical degrees, nominally 180°e.

Specifications

Installation Torque

Parameter	Torque
Mounting Screws	3.5-4 in-lbs

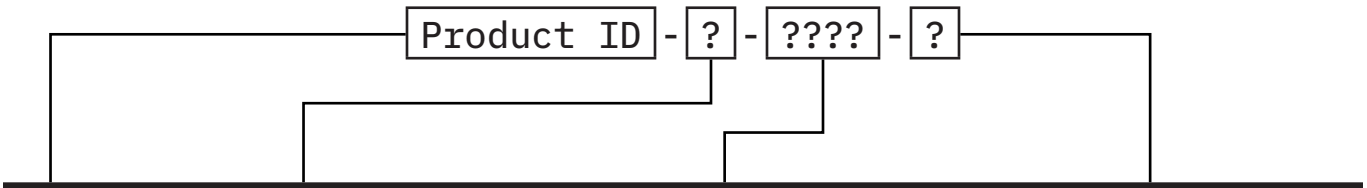
Pin-Outs

Pin	Description
1	Ground
2	Index
3	A channel
4	+5VDC power
5	B channel

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*[4] for details.

Part Number Guide and Configuration Options



EM2	Type	Resolution	Index
	0 (Linear Strip) **1** (1 in. Disk) **2** (2 in. Disk)	1000 LPI 2000 LPI 2000 CPR 2048 CPR 2500 CPR 4000 CPR 4096 CPR 5000 CPR 3600 CPR 4000 CPR 4096 CPR 5000 CPR 7200 CPR 8000 CPR 8192 CPR 10000 CPR	**I** (Index) **N** (Non-Index)

PLEASE NOTE: This chart is for informational use only. Certain product configuration combinations are not available. Visit the *EM2*[5] product page for pricing and additional information.

Reference Links

(1) PC3 Encoder Open Collector Cable Driver

(2) PC4 Incremental Encoder Cable Driver

(3) EM2/EM1 Comparison Chart

(4) Legal Terms and Conditions, Warranty

(5) EM2 Transmissive Optical Encoder Module