

## Description

The S2 series high resolution optical shaft encoder is a non-contacting rotary to digital converter. Useful for position feedback or manual interface, the encoder converts real-time shaft angle, speed, and direction into TTL-compatible quadrature outputs with or without index. It operates from a single +5VDC supply.

The S2 is our first generation ball bearing optical shaft encoder and is available for those customers who have designed it into their products; however, the S6 is recommended for new designs in place of the S2.

The S2 is designed to drive cables up to 10 feet long. For longer cable lengths, adding a PC4 / PC5 differential line driver is recommended.

Three shaft torque versions are available. The standard torque version has a sleeve bushing designed to provide torque and feel that is ideal for front panel human interface applications.

The no torque added option has a sleeve bushing that does not intentionally add torque for low RPM applications where a small amount of torque is acceptable.

The ball bearing version uses miniature precision ball bearings that are suitable for high speed and ultra low torque applications.

Connection to the S2 series encoder is made through a 5-pin standard connector. The mating connectors are available from US Digital with several cable options and lengths.

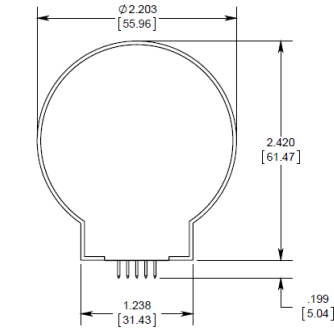


## Features

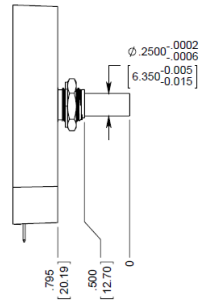
- ▶ 2-channel quadrature, TTL square wave outputs
- ▶ 3rd channel index option
- ▶ 64 to 10000 CPR (256 to 40000 PPR)
- ▶ Ball bearing option tracks to 10,000 RPM
- ▶ Wide operating temperature
- ▶ Single +5V supply

## Mechanical Drawing

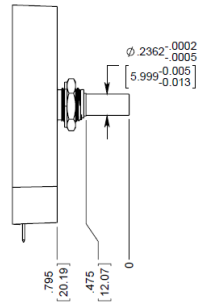
S2 Optical Shaft Encoder



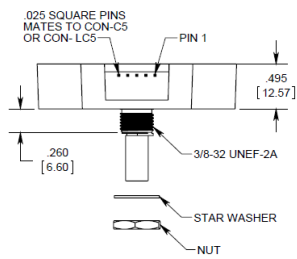
1/4" SLEEVE BUSHING



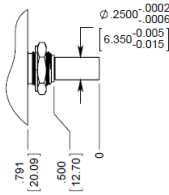
6MM SLEEVE BUSHING



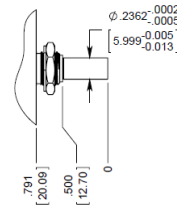
RELEASE DATE: 02/01/2016



1/4" BALL BEARING



6MM BALL BEARING



**Environmental**

Parameter	Value	Units
Operating Temperature (CPR < 3600)	-40 to 100	C
Operating Temperature (CPR ≥ 3600)	-25 to 100	C
Vibration (5Hz to 2kHz)	20	G
Electrostatic Discharge, IEC 61000-4-2	± 4	kV

**Mechanical**

Parameter	Sleeve Bushing	Ball Bearing
Max. Acceleration	250000 rad/sec <sup>2</sup>	250000 rad/sec <sup>2</sup>
Max. Shaft Speed (mechanical)	100 rpm (1)	10000 rpm (1)
Max. Shaft Torque	0.5 ±0.2 in-oz 0.3 in-oz (N-option)	0.05 in-oz
Max. Shaft Loading	2 lbs. dynamic 20 lbs. static	1 lb.
Bearing Life	> 1000000 revolutions	$L_{10} = (19.3/F_r)^3 *$ Where $L_{10}$ = bearing life in millions of revs, and $F_r$ = radial shaft loading in pounds
Weight	1.28 oz.	1.28 oz.

Parameter	Sleeve Bushing	Ball Bearing
Max. Shaft Total Indicated Runout	0.0015 in.	0.0015 in.
Max. Panel Nut Tightening Torque	20 in-lbs	20 in-lbs
Technical Bulletin TB1001 - Shaft and Bore Tolerances		Download

\* Only valid with negligible axial shaft loading.

(1) The maximum speed due to electrical considerations is dependent on the CPR. See the EM1 and EM2 product pages.

## Phase Relationship

B leads A for clockwise shaft rotation, and A leads B for counterclockwise rotation when viewed from the shaft side of the encoder.

## Electrical

- Specifications apply over entire operating temperature range.
- Typical values are specified at  $V_{cc} = 5.0V_{dc}$  and  $25^{\circ}C$ .
- For complete details, see the EM1 and EM2 product pages.

Parameter	Min.	Typ.	Max.	Units	Conditions
Supply Voltage	4.5	5.0	5.5	V	
Supply Current		27	33	mA	CPR < 1000, no load
		54	62	mA	CPR $\geq$ 1000 and < 3600, no load
		72	85	mA	CPR $\geq$ 3600, no load
Low-level Output			0.5	V	IOL = 8mA max., CPR < 3600
			0.5	mA	IOL = 5mA max., CPR $\geq$ 3600
		0.05		mA	no load, CPR < 3600
		0.25		mA	no load, CPR $\geq$ 3600
High-level Output	2.0			V	IOH = -8mA max., CPR < 3600
	2.0			V	IOH = -5mA max., CPR $\geq$ 3600
		4.8		V	no load, CPR < 3600
		3.5		V	no load, CPR $\geq$ 3600
Output Current Per Channel	-8		8	mA	CPR < 3600
	-5		5	mA	CPR $\geq$ 3600
Output Rise Time		110		nS	CPR < 3600
		50		nS	CPR $\geq$ 3600
Output Fall Time		35		nS	CPR < 3600
		50		nS	CPR $\geq$ 3600

 **Pin-out**

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

**Note:** 5-pin single ended mating connector is CON-C5 or CON-LC5

 **Ordering Information**

<b>S2</b>	-	<input type="text"/>	-	<input type="text"/>	-	<input type="text"/>	-	<input type="text"/>	-	<input type="text"/>
<b>CPR</b>		<b>Shaft</b>		<b>Index</b>		<b>Torque</b>		<b>Housing</b>		
64 =		236 = 6mm diameter		NE = No Index		D = Default		D = Default		
1000 =		250 = 1/4" diameter		IE = Index		B = Ball Bearing				
1024 =						N = Light Static Drag				
2000 =										
2048 =										
2500 =										
3600										
4000										
4096										
5000										
7200										
8000										
8192										
10000										

**Notes**

- Cables and connectors are not included and must be ordered separately.
- For ordering information please see the Compatible Cables / Connectors section above.
- US Digital® warrants its products against defects in materials and workmanship for two years. See complete warranty for details.