US DIGITAL S1 Optical Shaft Encoder

RoHS COMPLIANT

Description

The S1 series 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. The encoder utilizes an unbreakable mylar disk, metal shaft and bushing, LED light source, and monolithic electronics. It operates from a single +5VDC supply.

The S1 is normally designed for applications of 10 feet or less. 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 lubricated with a viscous motion control gel to provide torque and feel that is ideal for front panel human interface applications.

The no torque added option has a sleeve bushing and a low viscosity lubricant (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 S1 series encoder is made through a 5-pin standard connector (sold separately). The mating connectors are available from US Digital with several cable options and lengths.

Features

- Small size
- Low cost
- 2-channel quadrature,TTL squarewave outputs
- 3rd channel index option
- Tracks from 0 to 300000 cycles/sec
- Ball bearing option tracks to 10,000 RPM
- -25 to +100C operating temperature
- Single +5VDC supply
- 32 - 5000 CPR

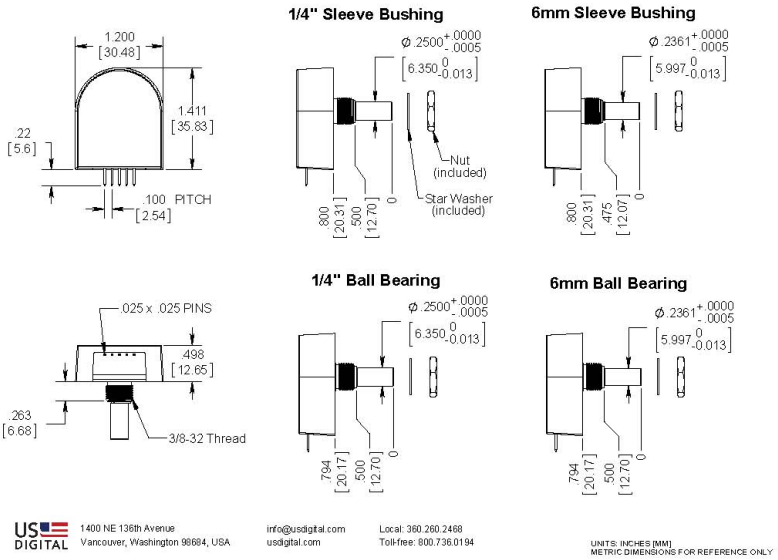
Mechanical Drawing

Rev. 140521111658

S1 Optical Shaft Encoder

RoHS COMPLIANT

S1 Optical Shaft Encoder Drawing



Environmental

Parameter	Value	Units
Operating Temperature, CPR < 2000	-40 to 100	C
Operating Temperature, CPR ≥ 2000	-25 to 100	C
Vibration (5Hz to 2kHz)	20	G
Electrostatic Discharge, Human Body Model	± 4	kV

Mechanical

Parameter	Sleeve Bushing	Ball Bearing
Max. Acceleration	250000 rad/sec²	250000 rad/sec²
Max. Shaft Speed	100 rpm	10000 rpm
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	$L10 = (19.3/Fr)^3$ * Where $L10$ = bearing life in millions of revs, and Fr = radial shaft loading in pounds
Weight	0.70 oz.	0.70 oz.

Rev. 140521111658

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.

Phase Relationship

B leads A for clockwise shaft rotation, and A leads B for counterclockwise rotation viewed from the shaft side of the encoder (*see the EM1 page*).

Electrical

- Specifications apply over entire operating temperature range.
- Typical values are specified at Vcc = 5.0Vdc and 25 ° C.
- For complete details, see the EM1 or EM2 product pages.

Parameter	Min.	Typ.	Max.	Units	Conditions
Supply Voltage	4.5	5.0	5.5	V	
Supply Current		27	33	mA	CPR < 500, no load
		54	62	mA	CPR ≥ 500 and <2000, no load
		72	85	mA	CPR ≥ 2000, no load
Low-level Output			0.5	V	I_{OL} = 8mA max., CPR < 2000
			0.5	V	I_{OL} = 5mA max., CPR ≥ 2000
		0.25		V	no load, CPR ≥ 2000
High-level Output	2.0			V	I_{OH} = -8mA max. and CPR < 2000
	2.0			V	I_{OH} = -5mA max. and CPR ≥ 2000
		4.8		V	no load and CPR < 2000
		3.5		V	no load and CPR ≥ 2000
Output Current Per Channel	-8		8	mA	CPR < 2000
	-5		5	mA	CPR ≥ 2000
Output Rise Time		110		nS	CPR < 2000
		50		nS	CPR ≥ 2000, ± 5mA load
Output Fall Time		100		nS	CPR < 2000
		50		nS	CPR ≥ 2000, ± 5mA load

Pin-out

Experts on Design-In
Angst+Pfister Sensors and Power

US DIGITAL **S1** **Optical Shaft Encoder**
Page 4 of 6

RoHS COMPLIANT

Parameter	Dimension
1	Ground
2	Index
3	A channel
4	+5VDC power
5	B channel

Note: 5-pin single ended mating connector isCON-C5 orCON-LC5

Rev. 140521111658

S1 Optical Shaft Encoder

Ordering Information

S1 - [ ] - [ ] - [ ] - [ ] - [ ]

CPR	Shaft	Index	Torque	Housing
32 =	236 =*6mm dia. sleeve bushing*	NE =*No Index*	D =*Standard*	D =*Default*
50 =	250 =*1/4"*	IE =*Index*	B =*Ball Bearing*	
96 =			N =*No Torque Added*	
100 =				
192 =				
200 =				
250 =				
256 =				
360 =				
400 =				
500 =				
512 =				
540 =				
720 =				
900 =				
1000 =				
1024 =				
1250 =				
2000 =				
2048 =				
2500 =				
4000 =				
4096 =				
5000 =				

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.

Rev. 140521111658