

## Description

The S4T miniature optical shaft encoder is a non-contacting rotary to digital converter. The S4T incorporates an LED light source, monolithic photo detector and mylar disk. A metal shaft with bushing or bearing versions are available. Useful for position feedback or manual interface, the encoder converts real-time shaft angle, speed, and direction into TTL-compatible quadrature outputs without index. It operates from a single +5VDC supply.

The S4T encoder is available with ball bearings for motion control applications, or static drag to feel like a potentiometer for front-panel manual interface.

The S4T uses a high retention, 4 conductor snap-in polarized 1.25mm pitch connector. Mating cables and connectors (See the Cables / Connectors web page) are not included, and are available separately.



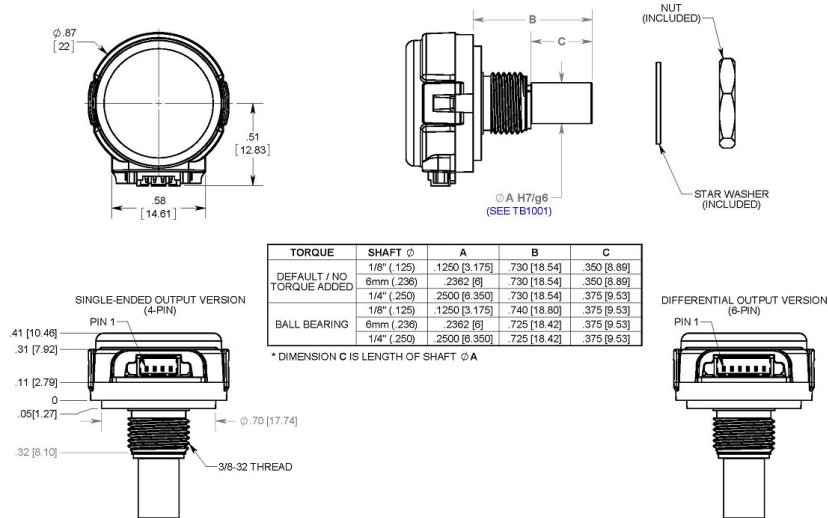
## Features

- Small size
- Low cost
- High retention snap-in polarized connector
- -20C to 100C operating temperature
- 100 to 360 cycles per revolution (CPR)
- 400 to 1440 pulses per revolution (PPR)
- 2 channel quadrature TTL square wave outputs

## Mechanical Drawing

## S4T Miniature Optical Shaft Encoder

RELEASE DATE 01/20/2015

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Toll-free: 800.736.0194UNITS: INCHES (MM)  
METRIC SHOWN FOR REFERENCE ONLY

## Environmental

Parameter	Value	Units
Operating Temperature	-20 to 100	C
Electrostatic Discharge, Human Body Model (MIL-STD-883, Method 3015.8)	± 12	kV
Shock, 6 millisecond, half-sine	75	G
Vibration (20Hz to 2kHz, sinusoidal)	20	G



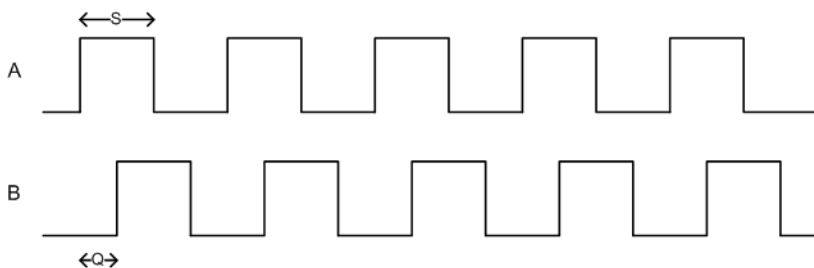
## Mechanical

Specification	Sleeve Bushing	Ball Bearing
Max. Acceleration	10000 rad/sec <sup>2</sup>	250000 rad/sec <sup>2</sup>
Max. Shaft Speed	100 rpm	15000 rpm
Max. Shaft Torque	0.5 ±0.2 in-oz (D-option) 0.3 in-oz (N-option)	0.05 in-oz
Max. Shaft Loading	2 lbs. dynamic 20 lbs. static	1 lb.
Bearing Life	> 1,000,000 revolutions	$L_{10} = (22/F_r)^3 *$ Where $L_{10}$ = bearing life in millions of revs, and $F_r$ = radial shaft loading in pounds

Specification	Sleeve Bushing	Ball Bearing
Weight	0.48 oz.	0.43 oz.
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



Parameter	Min.	Typ.	Max.	Units
Symmetry, S	105	180	255	electrical degrees
Quadrature Delay, Q	30	90	150	electrical degrees

(1) A leads B for clockwise shaft rotation, B leads A for counter clockwise shaft rotation viewed from the cover/label side of the encoder.

(2) Typical values represent the encoder performance at typical mounting alignment, whereas the maximum values represent the encoder performance across the range of recommended mounting tolerance.

## Single-ended Electrical

Specifications	Min.	Typ.	Max.	Units	Notes
Supply Voltage	4.5	5.0	5.5	V	
Supply Current		25	30	mA	no load
Low-level Output			0.4	V	IOL = 8 mA
		0.035		V	no load
High-level Output	2.4			V	IOH = -8 mA
		4.0		V	no load
Output Rise Time		100		ns	no load
Output Fall Time		50		ns	no load

### Differential Electrical

Specifications	Min.	Typ.	Max.	Units	Notes
Supply Voltage	4.5	5.0	5.5	V	
Supply Current		27	32	mA	no load
Single-Ended Output Voltage High	4.75	5.0		V	Min. @ 25mA load, Typ. @ no load
Single-Ended Output Voltage Low		0.25	0.60	V	Typ. @ no load, Max. @ 4.5mA load
Differential Output Voltage	3.0	3.8		V	RL = 100 ohm
Differential Output Rise/Fall Time			20	ns	

### Pin-out

4-pin Single-ended (1)		6-pin Differential (2)	
Pin	Description	Pin	Description
1	+5VDC power	1	Ground
2	A channel	2	A channel
3	Ground	3	A- channel
4	B channel	4	+5VDC power
		5	B channel
		6	B- channel

(1) 4-pin single-ended mating connector is CON-MIC4

(2) 6-pin differential mating connector is CON-MIC6

### Ordering Information

S4T	-		-		-		-		-	
		<b>CPR</b>		<b>Shaft</b>		<b>Index</b>		<b>Output</b>		<b>Torque</b>
		100		125 = 1/8"		N =No Index		S =Single Ended		D =Default
		108		236 =Metric 6mm diameter shaft				D =Differential		B =Ball Bearing
		120		250 = 1/4"						N =Light Static Drag
		125								
		128								
		200								
		250								
		256								
		300								
		360								

### Notes

- 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.

### Base Pricing

Quantity	Price
1	\$69.70
5	\$64.56
10	\$54.33

For volume discounts, please contact us at [sales@usdigital.com](mailto:sales@usdigital.com) or 800.736.0194.

- Add \$1.00 per unit for **Shaft** of Metric 6mm diameter shaft
- Add 19% per unit for **Output** of Differential
- Add \$5.80 per unit for **Torque** of Ball Bearing