

S4T Features

- Miniature incremental shaft encoder
- 16 resolutions from 100 to 1,000 CPR (400 to 4,000 PPR)
- Three shaft sizes: 1/8 in., 6 mm, 1/4 in.
- Three torque options
- Single-ended and differential output options
- High retention polarized connector/cable (sold separately)



US Digital S4T Miniature Shaft Encoder Description

The S4T miniature optical shaft encoder converts shaft position or speed into a quadrature output signal. This rotary encoder delivers up to 4000 PPR resolution in a compact package less than 1" in diameter. Available in 3 shaft sizes: 1/8 in., 6 mm, 1/4 in.



US Digital offers three different torque options for various uses:

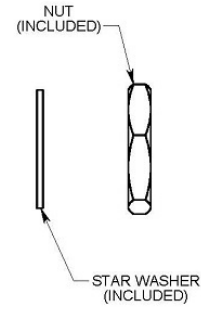
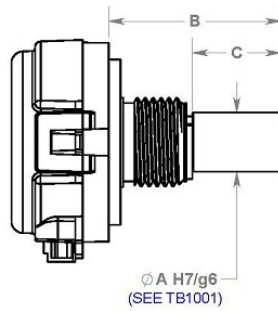
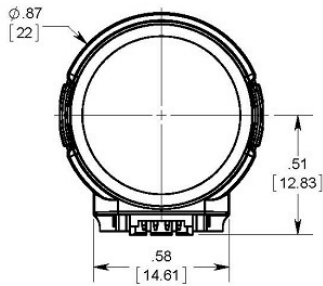
- Default (-D): sleeve bushing with higher damping for human interface applications.
- Ball bearing (-B): miniature precision ball bearings suitable for high-speed applications.
- Light static drag (-N): sleeve bushing with lower damping for low-speed applications.

This incremental encoder is designed for use with a high-retention connector. After you make your selections in the Product Configurator, compatible cables and connectors will be displayed below and must be ordered separately.

Mechanical Drawings

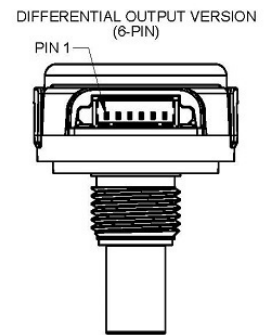
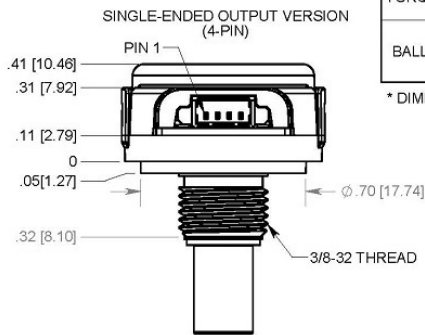
S4T Miniature Optical Shaft Encoder

RELEASE DATE: 01/20/2015



TORQUE	SHAFT ϕ	A	B	C
DEFAULT / NO TORQUE ADDED	1/8" (.125)	.1250 [3.175]	.730 [18.54]	.350 [8.89]
	6mm (.236)	.2362 [6]	.730 [18.54]	.350 [8.89]
	1/4" (.250)	.2500 [6.350]	.730 [18.54]	.375 [9.53]
BALL BEARING	1/8" (.125)	.1250 [3.175]	.740 [18.80]	.375 [9.53]
	6mm (.236)	.2362 [6]	.725 [18.42]	.375 [9.53]
	1/4" (.250)	.2500 [6.350]	.725 [18.42]	.375 [9.53]

* DIMENSION C IS LENGTH OF SHAFT ϕA



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UNITS: INCHES [MM]
METRIC SHOWN FOR REFERENCE ONLY

Specifications

ENVIRONMENTAL

PARAMETER	VALUE	UNITS
Operating Temperature	-20 to 100	C
Electrostatic Discharge, IEC 61000-4-2		
Single-ended (-S version)	± 12	kV
Differential (-D version)	± 7	
Vibration (10Hz to 2kHz, sinusoidal)	20	G
Shock (6 milliseconds, half-sine)	75	G



MECHANICAL

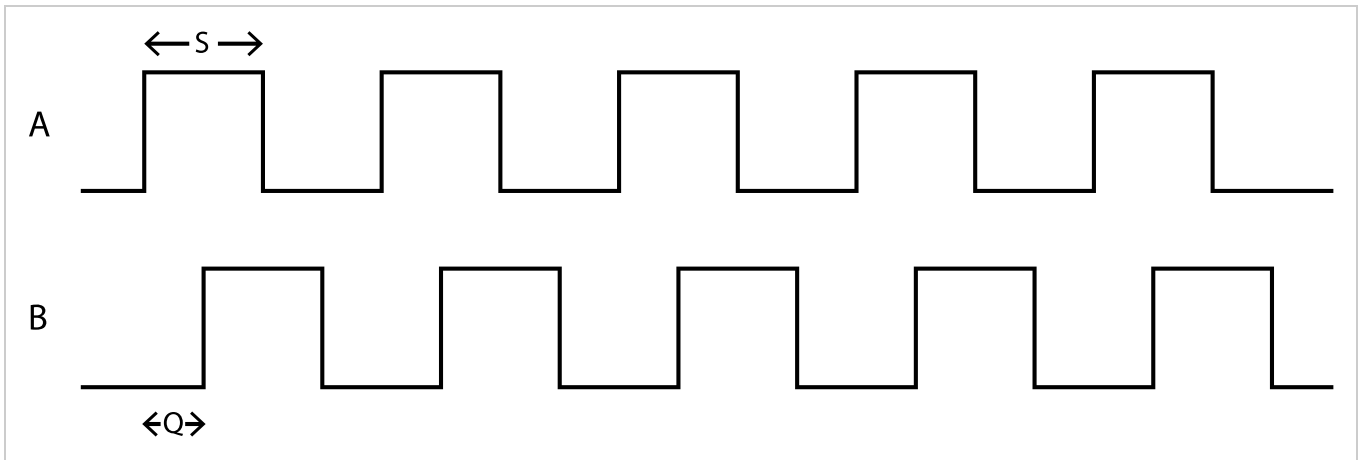
SPECIFICATION	SLEEVE BUSHING	BALL BEARING
Max. Acceleration	10000 rad/sec ²	250000 rad/sec ²
Max. Shaft Speed (1) (mechanical)	100 RPM	15000 RPM
Max. Shaft Torque	0.5 in-oz (D-option) 0.3 in-oz (N-option)	0.05 in-oz (B-option)
Max. Shaft Loading	2 lbs. dynamic 20 lbs. static	1 lb.
Bearing Life	> 1000000 revolutions	$L_{10} = (22/F_r)^3 *$ Where L_{10} = bearing life in millions of revs, and F_r = radial shaft loading in pounds
Weight	0.48 oz.	0.43 oz.
Max. Shaft Runout	0.0015 in. T.I.R.	0.0015 in. T.I.R.
Max. Panel Nut Tightening Torque	20 in-lbs	20 in-lbs
Technical Bulletin TB1001 - Shaft and Bore Tolerances	Download (https://www.usdigital.com/support/resources/reference/technical-docs/technical-bulletins/shaft-and-bore-tolerances-tb1001/)	

* only valid with negligible axial shaft loading.

(1) The maximum speed due to electrical considerations is dependent on the CPR. See the E4T (<https://www.usdigital.com/products/encoders/incremental/kit/e4t/>) product page.



PHASE RELATIONSHIP



PARAMETER	MIN.	TYP.	MAX.	UNITS
Symmetry, S	105	180	255	electrical degrees
Quadrature Delay, Q	30	90	150	electrical degrees

(1) B leads A for clockwise rotation, A leads B for counterclockwise rotation viewed from the shaft side of the encoder.

SINGLE-ENDED ELECTRICAL

SPECIFICATIONS	MIN.	TYP.	MAX.	UNITS	NOTES
Supply Voltage	4.5	5.0	5.5	V	
Supply Current		25 34	30 42	mA mA	CPR ≤ 500, no load CPR > 500, no load
Low-level Output		0.035	0.4	V V	CPR ≤ 500, I _{OL} = 8 mA CPR > 500, I _{OL} = 5 mA no load
High-level Output	2.4			V V	CPR ≤ 500, I _{OH} = -8 mA CPR > 500, I _{OH} = -5 mA 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 36	32 44	mA mA	CPR ≤ 500, no load CPR > 500, 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 (<https://www.usdigital.com/products/accessories/connectors/con-mic4/>)

(2) 6-pin differential mating connector is CON-MIC6 (<https://www.usdigital.com/products/accessories/connectors/con-mic6/>)

Notes

- Cables and connectors are not included and must be ordered separately.
- For ordering information please see the Compatible Cables / Connectors section above.



Configuration Options

S4T	CPR (Cycles Per Revolution)	Shaft Diameter	Output	Torque
	100	125 (1/8")	S (Single-Ended)	D (Default Torque)
	108	236 (6mm)	D (Differential)	B (Ball Bearing)
	120	250 (1/4")		N (Light Static Drag)
	125			
	128			
	200			
	250			
	256			
	300			
	360			
	400			
	500			
	512			
	720			
	800			
	1000			

PLEASE NOTE: This chart is for informational use only. Certain product configuration combinations are not available. Visit the S4T product page (<https://www.usdigital.com/products/S4T>) for pricing and additional information.