S4 Miniature Optical Shaft Encoder

Description

On January 16, 2012, the S4 part number was modified. The S4 optical encoder is now offered with a differential output option; as a result, the S4 part number was changed to accommodate either the *single* ended or *differential* output options. The S4 part number also has a place holder added for a possible future index option. The index option is currently not available and there is not a projected date at which it will be made available. The current "Power" option for the S4 was also removed from the part number. The power option is very rarely selected and therefore is being eliminated from the S4 part number.

The S4 miniature 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 without index. The encoder utilizes a mylar disk, metal shaft, and bushing or bearing. It operates from a single +5VDC supply.

The S4 encoder is available with ball bearings for motion control applications, or static drag to feel like a potentiometer for front-panel manual interface.

The reflective sensor incorporates an LED light source and a monolithic photo detector with signal shaping electronics, providing two channel bounceless quadrature TTL outputs.

The S4 can be connected by using a high retention 4 conductor snap-in polarized 1.25mm pitch connector. The mating connector is polarized and should attach smoothly to the encoder; do not force. See below for Cables & Connectors.

Features

- Miniature size
- Low High retention snap-in polarized connector
- Tracks from 0 to 30,000 cycles/sec
- Ball bearing option tracks up to 10,000 RPM
- Wide operating temperatures
- 100 to 360 cycles per revolution (CPR)
- 400 to 1440 pulses per revolution (PPR)
- 2 channel quadrature TTL squarewave outputs

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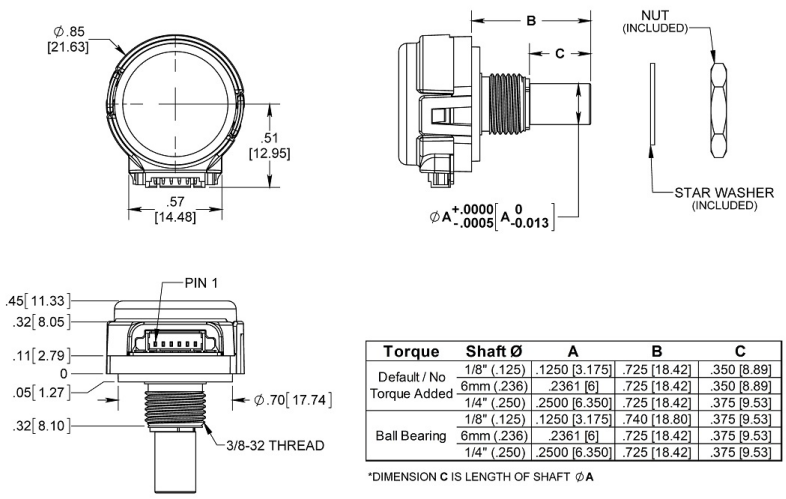
RoHS COMPLIANT

S4 Differential

S4 Differential Miniature Optical Shaft Encoder

RELEASE DATE: 12/09/2011



Torque	Shaft Ø	A	B	C
Default / No Torque Added	1/8" (.125)	.1250 [3.175]	.725 [18.42]	.350 [8.89]
	6mm (.236)	.2361 [6]	.725 [18.42]	.350 [8.89]
	1/4" (.250)	.2500 [6.350]	.725 [18.42]	.375 [9.53]
Ball Bearing	1/8" (.125)	.1250 [3.175]	.740 [18.80]	.375 [9.53]
	6mm (.236)	.2361 [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 Ø**A**

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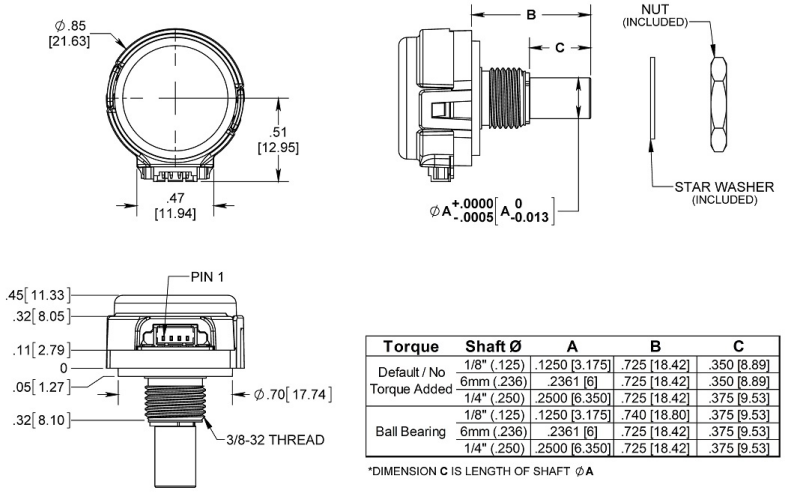
UNITS: INCHES [MM]
METRIC SHOWN FOR REFERENCE ONLY

S4 Single Ended

S4 Single-Ended Miniature Optical Shaft Encoder

RELEASE DATE: 12/09/2011



Torque	Shaft Ø	A	B	C
Default / No Torque Added	1/8" (.125)	.1250 [3.175]	.725 [18.42]	.350 [8.89]
	6mm (.236)	.2361 [6]	.725 [18.42]	.350 [8.89]
	1/4" (.250)	.2500 [6.350]	.725 [18.42]	.375 [9.53]
Ball Bearing	1/8" (.125)	.1250 [3.175]	.740 [18.80]	.375 [9.53]
	6mm (.236)	.2361 [6]	.725 [18.42]	.375 [9.53]
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Environmental

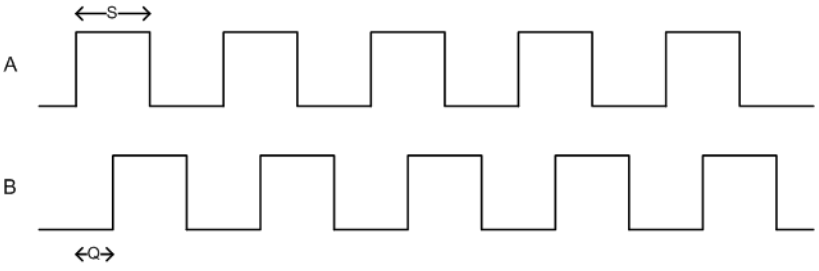
Parameter	Value	Units
Vibration (5Hz to 2kHz)	20	G
Operating Temperature	-20 to 100	C
Electrostatic Discharge, IEC 61000-4-2 Single-ended (**S**-option) Differential (**D**-option)	 ± 3 ± 15	 kV

Mechanical

Specification	Sleeve Bushing	Ball Bearing
Max. Acceleration	10000 rad/sec²	250000 rad/sec²
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	$L10 = (22/Fr)^3$ * Where $L10$ = bearing life in millions of revs, and Fr = radial shaft loading in pounds
Weight	0.46 oz.	0.42 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	Typ.	Max.	Units
Symmetry, S	180 ± 16	180 ± 75	electrical degrees

Parameter	Typ.	Max.	Units
Quadrature Delay, Q	90 ± 10	90 ± 60	electrical degrees

(1) B leads A for clockwise shaft rotation, and A leads B for counterclockwise rotation viewed from the shaft 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		21	27	mA	no load
Low-level Output			0.4	V	I_{OL} = 6 mA
High-level Output	2.4			V	I_{OH} = -1 mA
Rise Time		500		ns	CL = 25 pF, RL = 2.7 kΩ
Fall Time		100		ns	

Differential Electrical

Specifications	Min.	Typ.	Max.	Units	Notes
Supply Voltage	4.5	5.0	5.5	V	
Supply Current		23	29	mA	no 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)

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

6-pin Differential (2)

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

(1) 4-pin single-ended mating connector isCON-MIC4

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(2) 6-pin differential mating connector isCON-MIC6

Ordering Information

S4 - [ ] - [ ] - [ ] - [ ] - [ ]

CPR	Shaft	Index	Output	Torque
100 =	125 =*1/8" diameter*	N =*No Index*	S =*Single Ended*	D =*Default*
108 =	236 =*6mm diameter*		D =*Differential*	B =*Ball Bearing*
120 =	250 =*1/4" diameter*			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.

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