

S4 Miniature Optical Shaft Encoder

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Description

On January 16, 2012, the S4 part number will be modified. The S4 optical encoder will be offered with a differential output option; as a result, the S4 part number will be changed to accommodate either the *single* ended or *differential* output options. The S4 part number will also have 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 will also be 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 an unbreakable 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 L-option can have the power strobed on just long enough to read the A/B outputs to reduce average power consumption. It is identical to a standard S4 except that the internal bypass capacitor is not installed. The output settling time is typically 400 nsec. after power up. The S4 should be sampled faster than $(\text{Max. RPM} * \text{CPR} / 10)$ Hz in this case to avoid aliasing of the quadrature waveform.

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 cost
- ▶ High retention snap-in polarized connector
- ▶ Tracks from 0 to 30,000 cycles/sec
- ▶ Ball bearing option tracks up to 7,000 or 15,000 RPM
- ▶ -10 to +85C operating temperature
- ▶ 100 to 360 cycles per revolution (CPR)
- ▶ 400 to 1440 pulses per revolution (PPR)
- ▶ 2 channel quadrature TTL squarewave outputs
- ▶ Low power strobe option available

Rev. 120119115651



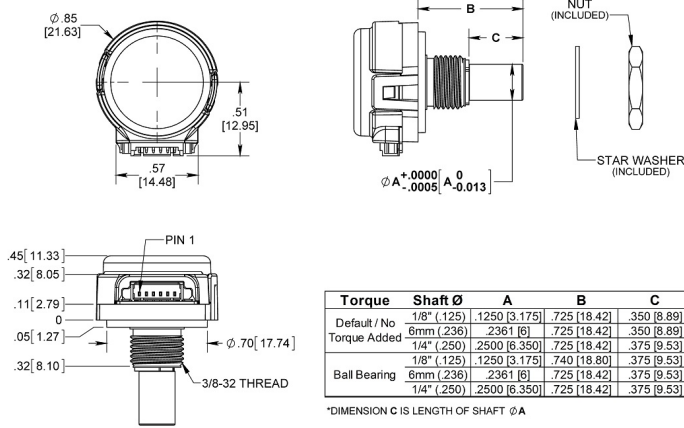
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S4 Differential

S4 Differential Miniature Optical Shaft Encoder



RELEASE DATE: 12/09/2011

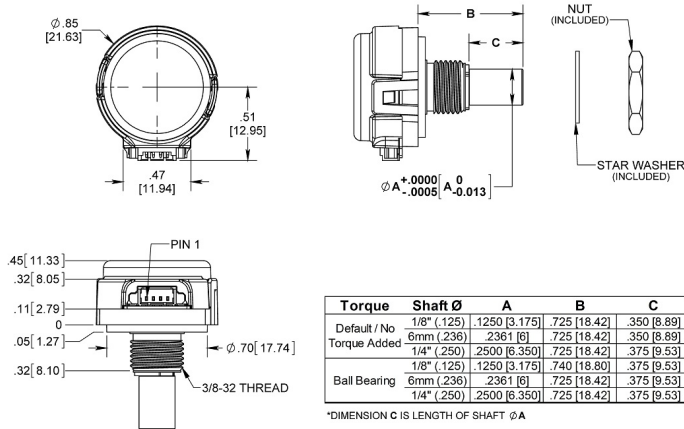
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UNITS: INCHES (MM)
METRIC SHOWN FOR REFERENCE ONLY

S4 Single Ended

S4 Single-Ended Miniature Optical Shaft Encoder



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Mechanical

Specification	Sleeve Bushing	Ball Bearing
Acceleration	10,000 rad/sec ²	250,000 rad/sec ²
Vibration	5 Hz to 2 kHz, 20 G	5 Hz to 2 kHz, 20 G
Shaft Speed	100 RPM max. continuous	15,000 RPM max. continuous
Shaft Torque	0.5 ±0.2 in. oz. 0.3 in. oz. max. (N-option)	0.05 in. oz.
Shaft Loading	2 lbs. max. dynamic 20 lbs. max. static	1 lb. max.
Bearing Life	> 1,000,000 revolutions	$L_{10} = (22/Fr)^3 *$ Where L_{10} = bearing life in millions of revs, and Fr = radial shaft loading in pounds
Weight	0.46 oz.	0.42 oz.
Shaft Runout	0.0015 T.I.R. max.	0.0015 T.I.R. max.

* only valid with negligible axial shaft loading.

Materials

Shaft	Brass or Stainless
Bushing	Brass
Connector	Gold plated

Mounting

Hole Diameter	0.375" +0.005 - 0
Panel Thickness	0.125 in. max.
Panel Nut Max. Torque	20 in.-lbs.

Phase Relationship

B leads A for clockwise shaft rotation, A leads B for counter clockwise shaft rotation viewed from the shaft/bushing side of the encoder (see the AEDR page).

Electrical

Parameter	Min.	Typ.	Max.	Units	Notes
Detector Supply Current	-	6	9	mA	
High Level Output Voltage	2.4	-	-	V	IOH = -1.2 mA

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Parameter	Min.	Typ.	Max.	Units	Notes
Low Level Output Voltage	-	-	0.4	V	IOL = 6.0 mA
Rise Time	-	500	-	ns	CL = 25pF, RL = 2.7kOhm
Fall Time	-	100	-	ns	
ESD	-	-	-	-	Human Body Model JESD22-A114-A Class 2 Machine Model JESD22-A115-A Class B

- Specifications apply over entire operating temperature range.
- Values are for the worst error over full rotation.
- Specifications are based on the AEDR module used in the product, together with 2.67k pull-ups on the quadrature outputs.

Pin-out

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

Product Change Notifications

Title	Date	Description	Download
E4 - E4P - S4 Update - PCN 1014	11/29/2011	We have modified the E4, E4P and S4 product lines in order to improve the performance and durability of the encoder. Changes include new molds for the plastic base and cover parts with an over-molded bushing in the S4 base, a new SMT connector (compatible with current mating connector), and a modified PCB profile to accommodate the new connector and plastic part modifications.	Download

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Ordering Information

CPR	Shaft	Index	Output	Torque
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.

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We are here for you. Addresses and Contacts

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