

S1 Features

- Shafted rotary encoder
- 26 Resolutions from 32-5,000 CPR (128-20,000 PPR)
- Two shaft sizes: 6 mm , 1/4 in.
- Three torque options
- 2 channel quadrature TTL square wave output
- Optional Index channel
- High-retention connector/cable (sold separately)



US Digital S1 Rotary Shaft Encoder Description

The S1 optical shaft encoder converts shaft position or speed into a quadrature output signal. This rotary encoder delivers up to 20,000 PPR resolution in a glass-filled polymer housing. Available in two shaft sizes: 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.

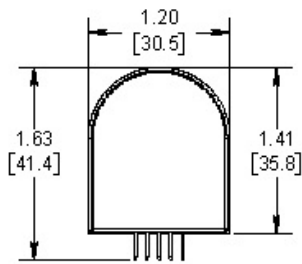
The S1 rotary encoder is designed to drive cables up to 10 feet long. For longer cable lengths, we recommend using the model S5 and selecting the differential output. Another option is to add a PC4

(<https://www.usdigital.com/products/accessories/interfaces/cable-drivers/pc4/>)/PC5 (<https://www.usdigital.com/products/accessories/interfaces/cable-drivers/pc5/>) differential line driver to this encoder.

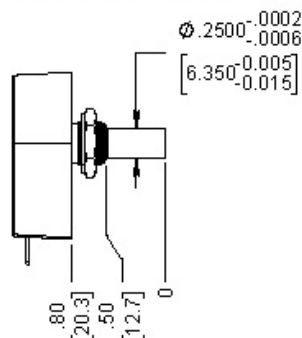
This incremental encoder is designed for use with a high-retention connector. After you make your selections in the Product Configurator, compatible cables and connectors will be displayed below and must be ordered separately.

Mechanical Drawings

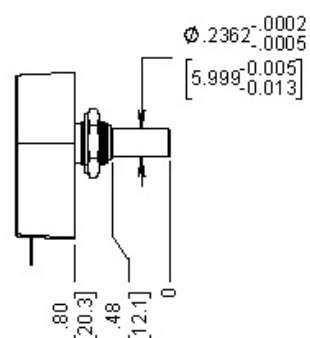
S1 Optical Shaft Encoder



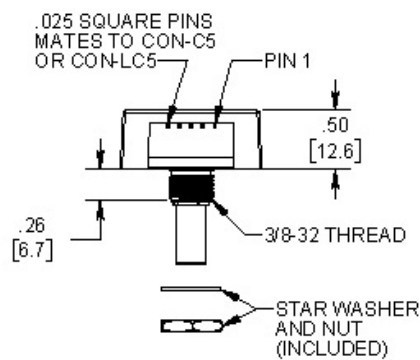
BUSHING - 1/4" SHAFT



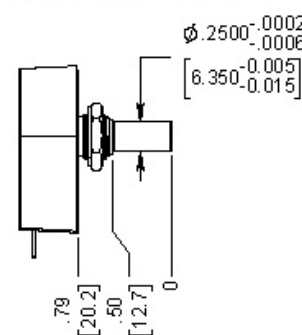
BUSHING - 6MM SHAFT



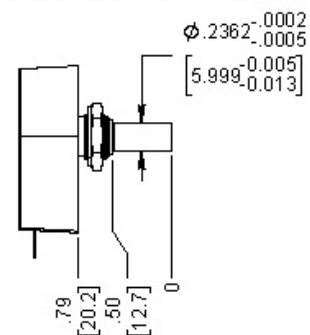
RELEASE DATE: 7/17/2017



BALL BEARING - 1/4" SHAFT



BALL BEARING - 6MM SHAFT



US DIGITAL 1400 NE 136th Avenue
Vancouver, Washington 98684, USA

info@usdigital.com
www.usdigital.com

Local: 360.260.2468
Toll-free: 800.736.0194

UNITS: INCHES (MM)
METRIC SHOWN FOR REFERENCE ONLY

Specifications

ENVIRONMENTAL

PARAMETER	VALUE	UNITS
Operating Temperature, CPR < 2000	-40 to 100	C
Operating Temperature, CPR ≥ 2000	-25 to 100	C
Electrostatic Discharge, IEC 61000-4-2	± 4	kV
Vibration (10Hz to 2kHz, sinusoidal)	20	G
Shock (6 milliseconds, half-sine)	75	G

MECHANICAL

PARAMETER	SLEEVE BUSHING	BALL BEARING
Max. Acceleration	250000 rad/sec ²	250000 rad/sec ²
Max. Shaft Speed (mechanical)	100 rpm (1)	10000 rpm (1)
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	$L_{10} = (19.3/F_r)^3 *$ Where L_{10} = bearing life in millions of revs, and F_r = radial shaft loading in pounds
Weight	0.70 oz.	0.70 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 EM1 (<https://www.usdigital.com/products/encoders/incremental/components/modules/em1/>) or EM2 (<https://www.usdigital.com/products/encoders/incremental/components/modules/em2/>) product pages.

PHASE RELATIONSHIP

B leads A for clockwise shaft rotation, and A leads B for counterclockwise rotation when viewed from the shaft side of the encoder.

ELECTRICAL

- Specifications apply over the entire operating temperature range.
- Typical values are specified at $V_{CC} = 5.0V_{DC}$ and $25^{\circ}C$.
- For complete details, see the EM1 (<https://www.usdigital.com/products/encoders/incremental/components/modules/em1/>) or EM2 (<https://www.usdigital.com/products/encoders/incremental/components/modules/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 $\geq$ 500 and < 2000, no load
		72	85	mA	CPR $\geq$ 2000, no load
Low-level Output			0.5	V	$I_{OL} = 8mA$ max., CPR < 2000
			0.5	V	$I_{OL} = 5mA$ max., CPR $\geq$ 2000
		0.25		V	no load, CPR $\geq$ 2000
High-level Output	2.0			V	$I_{OH} = -8mA$ max. and CPR < 2000
	2.0			V	$I_{OH} = -5mA$ max. and CPR $\geq$ 2000
	4.8			V	no load and CPR < 2000
	3.5			V	no load and CPR $\geq$ 2000
Output Current Per Channel	-8		8	mA	CPR < 2000
	-5		5	mA	CPR $\geq$ 2000
Output Rise Time		110		nS	CPR < 2000
		50		nS	CPR $\geq$ 2000, $\pm 5mA$ load
Output Fall Time		100		nS	CPR < 2000
		50		nS	CPR $\geq$ 2000, $\pm 5mA$ load

PIN-OUT

PIN	DESCRIPTION
1	Ground
2	Index
3	A channel
4	+5VDC power
5	B channel

Note: 5-pin single ended mating connector is CON-C5 (<https://www.usdigital.com/products/accessories/connectors/con-c5/>) or CON-LC5 (<https://www.usdigital.com/products/accessories/connectors/con-lc5/>)

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 (<https://www.usdigital.com/company/warranty>) for details.

Configuration Options

S1	CPR (Cycles Per Revolution)	Shaft Diameter	Index	Torque	Housing
	32	236 (6mm)	IE (Index)	D (Default Torque)	D (Default)
	50	250 (1/4")	NE (Non-Index)	B (Ball Bearing)	
	96			N (Light Static Drag)	
	100				
	120				
	192				
	200				
	250				
	256				
	360				
	400				
	500				
	512				
	540				
	720				
	800				
	900				
	1000				
	1024				
	1250				
	2000				
	2048				
	2500				
	4000				
	4096				
	5000				

PLEASE NOTE: This chart is for informational use only. Certain product configuration combinations are not available. Visit the S1 product page (<https://www.usdigital.com/products/S1>) for pricing and additional information.